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Disrupting surveillance: critical software design-led practice to obfuscate and reveal surveillance economies and knowledge monopolies.

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Declaration page

"I hereby declare that I am the sole author of this thesis; that the following thesis is entirely my own work; and that no part of this thesis has been submitted for another degree or qualification".

PhD Abstract

Big data collection, behavioural economics and targeted advertisement are changing the dynamics and notions of our individuality and societies. By mobilising critical design methods, I made a series of critical design works to reveal and disrupt surveillance and knowledge monopolies. The aim of this practice-led investigation is to challenge surveillance and knowledge practices within internet search and advertising industries and through this contribute to surveillance debates and critical design practice.

The four critical design practices that I developed during the course of this investigation namely Zaytoun, Philodox, Maladox and Open Bubble all interrogate humans' relations to technology and more specifically their transformations as objects and subjects of surveillance capitalism. Zaytoun challenges notions of data consumption, quantification and distancing. Philodox reveals and critiques some trust issues and algorithmic biases of internet search engines. Maladox, is an anatomical engine of fictional speculative cyborg dis-eases, creating a critical space to reconsider our relationship to technology. Finally, Open Bubble is a counter surveillance browser extension that obfuscates and challenges knowledge enclosures imposed by search engines.

Based on a review of philosophy of technology and especially as it relates to Science and Technology Studies (STS), I reflect on some of the underlying conditions that made possible the existence of modern technology in its current form. I analyse the contextual background of this body of work and its take on technology as a central lever for governance and for shaping of human subjects. This thesis investigates the taken for granted ways our interactions with surveillance capitalism infrastructures are transforming our individual and collective beings and in turn the new cyborg ontologies that we are being integrated into.

The four critical design works included in this investigation offer alternative possibilities for critical engagement with, and interpretation of, big data and the algorithmic manipulations we are subjected to.

This thesis attempts to take the below contributions to the theoretical developments around governmentality, surveillance capitalism, but also to critical design and design informatics. I develop ideas aiming at moving from humans and subjectivity as the nexus for governance towards attention to the cyborg as the emerging central

site for both governance and resistance. Furthermore, through my practices I illustrate the importance of non-visual relations to audiences be it through touch or hearing in opening up spaces for questioning and resistance. I believe attention to the sensory dynamics of the experience and resistance have strong potentials for contributing to the debates around resistance within governance regimes.

Furthermore, this thesis brings attention to the micro processes & software codes and algorithms that enable surveillance capitalism and engages in exercises aiming at disrupting them. I believe such detailed work focused on the ways humans interact with internet-based regimes of surveillance is a much-needed complement to the already well-developed critiques of institutions and structures of surveillance capitalism. Concerning critical design, my works bring attention to the role of spatial configuration of the works in conditioning the users' rhythm, intensity and span of engagement with the work. In addition, I believe my practices and my theoretical developments around them open possibilities for new reflections on different forms of satire and laughter and how they can be situated in users' experiences with critical design work.

Lay summary

Science and technology whilst having brought many opportunities and positive developments into our lives, they have also created many challenges that both us and the future generations face. For example climate change, threats against our democracy, human rights, privacy and liberty, but also societal challenges such as increasing inequalities and injustices. These challenges are not because of science and technology, but because of the ways, we understand, develop and use them. The boundary between science and technology have become blurry, because they reinforce and shape each other.

Our world is immersed in science and technology, this includes how we access the news, find jobs, socialise, entertain, capture special moments of our lives, our manufacturing industries and how we organise and automate them; these are all one way or another managed and developed through science and technology. This means it is almost impossible to see our lives and our relationships with science and technology with sufficient distance. They are increasingly ubiquitous and taken for granted.

One of the important aspects of technology is its ability to record and monitor our interactions with it. For example, when we visit anything on the internet, the websites will remember what we looked at, when, from which location, the device we used and many more.

Over the past two decades, capitalism has developed new ways to make profit out of this data that technologies capture about our lives. Governments also use this to monitor and in some cases manipulate their citizens for both good and bad reasons. These approaches have led to further control of our access to knowledge but also control of our behaviours resulting in a new form of capitalism commonly referred to as surveillance capitalism.

In this investigation, I developed four critical design projects to reveal, challenge and disrupt certain aspects of surveillance capitalism and to create a space for reflection and interpretation of these technological constructs.

The four critical design practices that I developed are; Zaytoun, Philodox, Maladox and Open Bubble. They all question our relationship with technology and it's effects on us. Zaytoun challenges how we consume information and how our lives are managed by numbers. Philodox examines how we blindly trust internet search

engines. Maladox, is a fictional work that imagines future diseases created by the fusion of technology and us. Finally, Open Bubble is an anti-surveillance browser extension.

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Chapter 1. Introduction

1.1 What we already know

In this thesis, I critically engage with online datafication and surveillance and the fundamental ways they are transforming us and our modes of living. I started this investigation in 2014 when many governments, corporations and legislators were debating and considering new laws, approaches and techniques to understand and protect the rights of individuals to privacy online, and at the same time to take advantage of new digital affordances of modern technologies. This included the advent of BIG Data, which deepened surveillance on individuals' private/intimate lives/spaces, Internet of Things (IoT) devices, which brought sensing and surveillance into homes and personal spaces, but also 3D printing disrupting the traditional notion of craftsmanship and to an extent challenging some of the common manufacturing processes. Advancement in Artificial Intelligence (AI), Machine Learning (ML) and automation 2.0 posed many challenges to the jobs market. Equally, these transformations also offered many benefits and new possibilities for how we communicate, work, entertain and protest, as well as generating new jobs and providing new opportunities in almost every field of science.

An important question here is whether the technologies that are primarily coming out of Silicon Valley are inherently liberating or oppressive in design (Kelty, 2014). Further to this, what kind of relationships and entanglements do we have with modern technology (how we change technology and how technology changes and manipulates individuals and societies), and in the process what new human/technology ontologies or cyborgs are emerging? Or "…what values, attitudes, and ways of looking at the world are we unconsciously building into our technology, and what are their effects?" (Sengers et al., 2005, p. 49). "How can we help users be reflective about the role of technology in their lives?" (Sengers et al., 2005, p. 50). At a personal level before moving to Scotland, in Iran, I, along the bulk of the civil society considered modern technologies to be a force for freedom from Government's authoritative and controlling attitudes towards citizens. The Internet provides a gate to a vast array of cultural artefacts, knowledge and communication platforms. The Iranian regime blocks access to any form of media and digital artefact that they believe is against their agenda or influenced by Western cultures. For example, access to social media platforms such as Facebook and Instagram, and many websites and online platforms are blocked in Iran. This has resulted in a

fascinating culture of sharing and disseminating these artefacts between individuals and groups using counter surveillance practices. Later, in Scotland, I first experienced the joy of online “liberty”. I cherished developing software/content and exchanging online with the reassurance that access to information and internet is inherently a human right and it should be the role of government but also the civil society to protect this freedom. However, with time I came to see how this “online liberty” is a central level of an online regime of datafication, surveillance but also commodification of all aspects of citizens’ life in the form of tradable “big data”. Therefore, the answer to the above question, as Kelty (2008) also argued, is neither liberating nor oppressive. What separates modern technology from any of its predecessors is its material characteristics or affordances through software. Software is the plastic of the digital age infiltrating and “making smart” all aspects of our lives. It can turn into anything without the user and consumers even knowing or realising, from being a simple performance-tracking tool such as cookies, to weaponised malware that can lead to the death of an individual.

The issue that I raised here is not a new one. Since the industrial revolution, one of the biggest concerns and widely observed phenomenon about modern life is the fast pace of change and development in technological systems and its effect on individuals and societies (Irwin and Wynne, 2003). The Industrial Revolution is an important era as it was the beginning of a period of scientization of all domains of life which has never stopped since. This was evidenced in the studies of Taylorism, scientific management and organisation of work (organisational studies). Over the last century, science and technology has expanded into every aspect of our lives. From day-to-day activities such as organisation and administration of simple tasks, to complex management of our labour, to relationships, preferences, behaviours and our thought processes. Not only are we constantly and pervasively relying on science and technology, we are also enmeshed and immersed in, and transformed by technological systems.

Science and technology are complicit in many challenges that our generations face (Illich, 1973). Existential problems such as climate change (NASA, 2019), threats against democracy (Helbing et al., 2019; Nemitz Paul, 2018; Wood, 2018), vast breaches of human rights such as privacy (Andrejevic, 2002) and liberties (Andrejevic, 2007), but also societal challenges such as increasing inequalities (Van Reenen, 2011) which can lead to diminished political engagement of citizens (Solt,

2008). These challenges are arguably aggravated by a lack of understanding of the depth and breadth of the performativities of science & technology but also the side-lining of ethical considerations in their development and use (Illich, 1973; Marglin, 2008). The UK Government's response to this lack of understanding and literacy in technology was to mandate teaching technology and programming in schools[1]. Understanding how to innovate, develop, and use technologies, however is very different from realising its effects (how technology is changing us and how we are changing technology), its origins (history) (Bridle, 2018) and its ethics. Culture, technology, people and politics are not separate as Latour (2005) and Law (2002, 1999) wonderfully showed, but are rather entwined in a net-work of digital and physical assemblage of human and non-human actors.

The above trends have been enabled by datafication and marketisation as two key processes that have led to fundamental transformations in human societies in the last 3 decades. These processes have played a central role in the ongoing transformations of business and governments and their role in society. Marketisation is a term that began to circulate in an academic context in early 2000. It is frequently used to describe the transformation of society and everyday life around market based processes such as commodification and competition (van der Zwan, 2014). This transformation has been enabled by the neoliberal political movement (Davies, 2014; Harvey, 2005), but also a transition of power to the "financial" sector as opposed to the "real" sector which has been termed financialisation (Krippner, 2005). This has led to a situation wherein the amount of money generated by the financial sector is more than the GDP or what a country produces (real labour)[2]. Financialisation essentially weakened the power of collective entities such as industrial firms , charities and governments, and transferred it into a transnational networks of investors (Weber, 2010). For example, Uber, a transportation company that was originally founded by two entrepreneurs in 2009, in only 10 years was

[1] National Health System, Health Education England reports that "Excellent digital capabilities include a positive attitude towards technology and innovation" "Digital skills are increasingly being considered as a crucial complement to essential English and maths skills. This applies to all learners, not just those in technical education"(Laurillard et al., 2016, p. 4)

[2] For example, in the US the stock market turnover in comparison to its GPD in 1988 was 33% and this increased to 383% by 2008 (Stockhammer, 2010).

operating in 173 countries. Uber became a public company in 2019 (Driebusch and Farrell, 2019) with the value of $82bn. Saudi Arabia owns a 4.3% stake worth $3.27bn, another 12.8% stake is owned by Japan's Softbank, and a further 4.3% stake is owned by Google[3]. Whilst around 11% of the stakes are owned by the original founders worth around $9bn, the rest of the stakes are owned by various financial investors around the planet (Davies and Wong, 2019). Apart from gains and a share in companies' profits, this model of funding and organisation for corporations also provides power and voice to those investors with higher stakes in the strategic and future planning of these corporations at the expense of workers, customer and local communities affected by economic activities. What separates financialisation from its predecessors is the fact that investors can make profit without producing any real commodities.

The second trend which is also interrelated with marketisation is datafication or the big-data trend. Big-data is a new infrastructure developed in the last decade or so to capture, analyse and store vast amounts of data produced by our interactions with digital technologies. Britain is currently the largest data-centre of big-data in Europe and expected to generate over £240 billion by 2020 (Judge, 2017). Big-data has ushered us towards the next transformation of our economics/social/political organisation from financial capitalism to surveillance capitalism (Zuboff, 2018). The promise of surveillance capitalism is to collect enough information in order to predict, and modify the future, present and past of individuals. The past is visualised and presented through the data that is captured from our present interactions within and without technological systems. These include everything we do online through digital technologies, as well as offline, which are captured and monitored thanks to the expansion of Internet of Things devices and networks throughout our lives. IoT provides a sophisticated network (cloud) for monitoring and surveying. At the same time, what we do at each moment is largely influenced and coerced by a range of advertising and predictive algorithms (relying on models developed under "behavioural economics" and "behavioural marketing") based on the data from our past. The future is a pastiche of data analytics of the past and present mixed with a network of algorithms and predictive models incorporated by various corporations in

[3] Google is an advertising firm providing digital services in exchange of personal data and information about how users interact with their services and each other.

order to promote and push their own agendas and profit-making priorities into our individual, global and community practices.

The Internet has revolutionised not only how we communicate with each other, but also all other aspects of our lives. It has become the new borderless network of life where one can work, entertain, shop, educate, find answers to almost any questions one may have, and have access to large bodies of human knowledge. Internet search is the gate to these new transformations. Search has moved from being a technology providing access to information in a straightforward way, into a technology that brings results for dating, finding transportation, entertainment, jobs, food and almost everything one may need or desire (Ward, 2019).

The expansion and use of the Internet and the reach of search coincided with cheaper manufacturing costs of electronic devices, as well as the evolution of capitalism to the digital realm, which poured investments into its further development and expansion; sustaining itself by developing new value extraction models and practices through digital and surveillance economies.

Digital transformation of the late twentieth and twenty-first centuries has brought many unprecedented positive and negative changes to cultures, societies and every aspect of human and non-human life. In 2016 a public outcry and media panic started over the involvement of the data mining and targeted advertising company Cambridge Analytica in the election of the 45th American president and the British referendum over its exit from European Union. The British firm Cambridge Analytica (CA), a company partly owned by Robert Mercer (an American Hedge-fund manager), developed a new business combining several new digital economy business models: data mining, brokerage and analysis. Data mining is the process of using computer algorithms and programs to mine and extract scattered pieces of data and information from the web/internet. Most companies who make profit from digital technologies mine data in one way or another. For example Google uses ‘spiders’ to gather information about any website on the internet. Since Google is the market leader in search engine usage globally, with a 77.5 percent share in 2018. Getting a high ranking in search results is the aim of any business or website owner who wants their website or business to be seen and heard by members of the public. This created a move towards the monopolisation of knowledge and an increase in surveillance practices.

Lack of legislation, fast pace of development and innovation, over specialisation of technologies, a lack of clarity and transparency in how algorithms are working and manipulating things within various system, corporate and private enclosure of information, complex networks of communication and actions - all together make it almost impossible to fully understand the extent and ways technology is being developed and used within different contexts. What is clear however is the symptoms of these new changes. These developments have resulted in monopolised and corporate modes of knowledge distribution and surveillance.

1.2 Know to knot know or critical design as an affective endeavour

Mainstream branches of science project us into diverse technological utopias. They promise to cure cancer, make a vaccine, kill bad viruses, re-wild the environment, eliminate criminality, clean the oceans and outer space from our junk, explore the space and find a new place for us to live and colonise. We may never find life on other planets, but as Chris Speed always tells me, we may realise alternative ways to live our lives on this planet by looking at it from far out in space. Critical theorisations on the other hand such as surveillance capitalism, governmentality, Science & Technology studies and environmental studies have all been warning us about “the future”. A future without us. A horizon with the shadows and dark clouds of environmental disasters, atomic bombs, pandemics, technofeudalism, fascism and many more. These theories have helped grasp what the future may have in store for us. However, the future is none of these horizons.

One way or another we have always been obsessed with capturing “the future” (Dunne and Raby, 2013). In fact not just the future, but capturing our desires, flows and intensities (Deleuze and Guattari, 2013). Each of these theories free us from something while stratifying us through some other ways and forms. I’m not even convinced we can say we need “multidimensional balance of human life” (Illich, 1973, p. xxii). Even when science was not around, we tried to capture the future with magic, fortune telling or even trying to escape it like Hamlet, Oedipus and Macbeth. Some of us, like Ophelia have neither resisted, nor gone with the streams of these tragedies but they have been beyond futures.

There is one thing that I believe we need to do before progressing any further and it is to stop for a moment. What we need is suspense. Mirrors, horizons, images will not help us anymore, they will just drown us. Calculative thinking has been capturing all of our desires, spirits and magic (Deleuze and Guattari, 2013; Heidegger, 1977).

What each of us need to realise now is to look inwards. We need more flows and not streams, we need intensities that overflow and implodes our arrays, indexes and memories.

Many of us tried to go against the streams such as anti-designers, critical designers, search engine artists, critical software artists. Most of this work has been confident about the streams that it is against and has taken on itself to mobilise backers and fight actively against those streams. However, I think this mode of critique is predisposed to two essential traps. Firstly, 'The work against' can become as totalitarian in its thinking as the streams that it is trying to fight against. Secondly, I believe such flows against streams share the nature of the stream and can be easily absorbed into it. This is what has happened to many branches critical work that have now attained a label and been structured as highly stratified and normalised disciplines. The critical design world that I want to be an active member of is one that does not fight against something, but one that struggles for something. What I struggle for is not a specific utopia, but just a pause, an opening, a productive void fertile for questioning, plunging inside and invigorating our relations with others, both people and things.

I do not believe such a pause is something we can plan nor design. Neither is it through knowledge that we can attain it. All that we can do is to engage the body and the affect to connect to the inner vibrations that I am hoping would always be beyond stratification. This is why I believe in laughter, the grotesque, but also repulsion and anger as crucial entry points. Entries into those throbbing moments that I hope may lead to pauses in the rhythm/being so that we may realise our becomings.

The goal of my investigation

As stated, deep surveillance and knowledge monopolies are at the centre of new governance and corporate control. In this practice-led investigation, my aim is to understand and question some of the underlying reasons that paved the way for the development of these governance models, surveillance cultures and knowledge practices that we experience at this time.

The main Research Questions (RQ) for this investigation are:

- RQ1: What are the underlying reasons that provided the opportunities for the development of surveillance economies and knowledge monopolies?

- RQ2: How can critical design practice reveal, challenge, and question surveillance and knowledge practices?

Before detailing the different chapters of my thesis and how they respond to these questions, I would like to first elaborate on my own personal journey and how it has affected my relation to technology and critical design.

1.3 My journey back home or Odyssey and I

I have come to learn that all journeys when deeply and fully accomplished are essentially not about going away but about going back home. Like Odyssey, for my young and tender years of fresh and fuzzy idealism I have gone through anger, and disappointment in Iran and then temptations, frustrations and fascinations of migration towards emergence of a new critical anger here in the west. Finally, I believe I am on my path to return home. To hopefully a tender and hopeful, however better informed idealism.

During the past ten years, I have come to carry so many heavy labels from an engineer to an activist, student, artist and now an academic. What I have learned also is how my constant becoming overflows and troubles these labels. And how part of the endeavour to remain tender and subtle is melting away the tightening chains of labels, solid responsibilities/rituals and unquestioned norms.

About ten years ago, I was awed by the possibilities of technology and how it could be a rational utopia to escape from. The complex social and political realities I was living under. Then came the second escape, this time not between the real and the virtual but between one territory and another from the east to the west. The third escape was from my increasing disappointment with technology as I was studying in the computer science masters programme in Scotland into the space of software arts/activism. As with all escapes, my engine of creation was a corrosive dislike and the will to attack the previous space paradigm. During the first two years of my PhD, I came to understand that escape as a central engine makes me bitter and hopeless. Feeling the magic of becoming a father in those two years also helped me change my paradigm from one of escaping, fear and negativism to increasingly one of hopeful and joyful creation.

I also increasingly realised the importance of what I have been escaping from as part of an indispensable part of me. My Persian heritage but also bitter moments of clash with Iranian repressive apparatus. My software engineering work, but also the

fascinations and at times humiliations and injustices of migration are all defining movements that have turned me into what I am. I started inviting them back into my life. First cautiously and with some distance and increasingly digesting them into my being. In another way, my journey of the past many years has been one of coming back home.

My four practices somehow mirror the last phase of this journey. Zaytoun is a project of escape from my narrow technological silo. It is full of passionate negativism and the urge to disrupt with such a force that I could lose my empathy and respect with some of my less engaged audiences, at times. From Philodox, play and joy took the centre stage. Programming was still there but a form of reflexive programming. In addition, what I learned to see as a ritual affected but also affecting the broader process of creation and its relations to the social and material world. Open Bubble is an example of hopeful disruption taking the centre stage and Maladox similarly brought an empathic and playful relation to my audiences, bodies and souls into my work.

I feel like I am on my path to fulfil this first circle in my relations to my past societal issues and technology and I am happy that it has equipped me with an essential hopeful and empathic self to plunge myself into the rest of my adventure.

1.4 The layout of the rest of my thesis

This thesis is structured around four critical design works that I developed to engage with surveillance capitalism, the ways it is transforming us, but also ways to start engaging with, and disrupt it. The theoretical reflections in this thesis came about in constant dialog with the development of my critical design works.

In the first part of Chapter 2, I provide an analysis of modern governance or governmentality. I discuss how local knowledge networks and communities have gone through various social engineering and transformation processes since the mid-sixteenth century. In this regard, I talk about the central role quantification and scientization played in these transformations and in the development of new modes of governance (2.2.1). I also discuss how our unquestioned trust in modern technology led to such developments (2.2.2). By drawing on works of some philosophers of technology such as Heidegger and Haraway, I argue why we need new modes of critical engagements with these constructs to move away from dogmatic beliefs in science and technology. In chapter 2, I also provide a study of

the transformation of capitalism through two underlying and interrelated processes. Surveillance economies and knowledge monopolies. Surveillance economies developed in parallel and as part of two key processes that I briefly discussed earlier: Marketisation and Governmentality. This combination led to more collaboration between corporate and governmental actors leading to vast expansion of surveillance into all aspects of our lives and development of new economic and market-based models of surveillance and subsequently control through monopolisation of our knowledge networks by an assemblage of governments and corporates (2.3.1 & 2.3.2). With monitoring of all aspects of our lives and market-based algorithmic management of our access to information through search engines and internet-based technologies, governments and corporations began to manipulate and coerce individuals (2.3.3) and their communities (2.3.4). This chapter ends with a study of Web 2.0 as it was the largest infrastructure of modern surveillance on the internet.

In relation to the issues discussed above, I produced four critical design works (RQ2). All of these works engage and question our entanglement with technology. In Zaytoun I develop new ways to engage and understand the role of quantification and the transformation of our relationship with consumption of information. Philodox is a parody of modern search engines and to provoke and challenge the trust we have in online platforms and interfaces. With Open Bubble, I developed a technique to obfuscate and disrupt surveillance whilst at the same time drawing users' attention to their personalised knowledge bubbles. Finally, Maladox, brings all these themes together and I engaged with these theories as maladies of the cyborg. In Chapter 3, I discuss my critical design methods and situate my works within critical design discipline. Chapter 4 provides details of how I developed each work, the thinking behind each artefact and analysis of participants engagements with the works discussed. Chapter 5 brings the theories discussed and my practices together and finally in Chapter 6, I outline my key findings and areas that I hope this investigation can contribute to.

All my critical design works, source code, visuals and documentation of their exhibitions are available in the CD included in the hardcopy submission.

Chapter 2. Governmentality: surveillance and capitalism

2.1 Introduction

In this chapter, I reflect on bodies of theoretical work that have informed and inspired the critical design work presented throughout this thesis. Here I primarily situate my work vis-à-vis studies of governmentality, science and technology studies and critiques of internet-based knowledge regimes under the broad notion of surveillance capitalism. Later, in the final chapter of my thesis, I reengage with the debates in the literature to articulate my contributions.

As I mentioned earlier in the introduction chapter, my first engagement with internet governance was in the form of the Iranian government's draconian censorship regime, wherein even connection to social media platforms and any form of content generation is potentially an illegal and subversive act. When I moved to Scotland, after the first few months of excitement about “open” access to the internet, I came to feel I was subjected to a softer and more insidious mode of behavioural governance. I quickly felt the closing boundaries of my little internet bubble (Andrejevic, 2007, 2002; Bucher, 2012; Pariser, 2011a), and I started to feel the invasiveness of my every click; every “friend“ and every private message being surveilled as a commodity and used to modify my behaviour. This sense of being monitored and being on the receiving side of commodification was the main driving force behind my critical design work. As I started to reflect on my work, I felt the need for a theoretical framework that would help me understand the complex assemblage of firms, states, technologies (such as Artificial Intelligence (AI) and big data) that were mobilised to entice users instead of discipline which I had experienced in Iran. Here, the literature on governmentality, starting with Foucault’s (1991) discipline and punish and his work on biopolitics (Foucault, 2011; Foucault et al., 1991; Foucault and Gordon, 1980; Hacking, 1990), but also a later, vibrant body of work came to my help. Governmentality helped me to think about governance beyond government. It also helped me to see how liberties that were brutally stifled in Iran are instead used and shaped as an integral aspect of liberal rule in the west. Governmentality also helped me reflect on the programmatic elements of internet governance, such as programs for the market-based organisation of production, dissemination and consumption of knowledge but also the quantification of all aspects of the individual and collective life to enable governing at a distance (Lazarsfeld, 1961; Porter, 1996; Rose, 1991).

In the next section, I will first layout aspects of studies of governmentality that have been influential in my thinking and my work (2.2). I will then focus on technology as a central apparatus that enables contemporary governance in general and internet-based control specifically (2.3). I will then concentrate on surveillance capitalism at the centre of the current administration of knowledge on the internet relying on knowledge monopolies (2.3.2) and unprecedented commodification of personal user data through an ecosystem of search engines and fast-expanding social media platforms (2.3.1). I follow this by discussing how under surveillance capitalism, new internet subjects are being formed (2.3.3) and human collectives being dismantled and reshaped (2.3.4). Next, I focus on Web 2.0 surveillance as one of the core technologies that have enabled surveillance capitalism. I detail various technological elements that collectively entangle users in the surveillance capitalism infrastructures (2.4). I end this chapter by reflecting on how my various design works relied on and engaged with these theoretical reflections (2.5).

2.2 Rise of liberal governmentality

> *"…The existence of French men and women around 1790 was* made miserable by, among other things, 700 or 800 differently named measures and untold units of the same name but different sizes. A "pinte" in Paris came to 0.93 liter; in Saint-Denis, to 1.46; in Seine-en-Montagne, to 1.99; in Précy-sous-Thil, to 2.33. The *aune, a unit of length, was still more prolific: Paris had three"* (Frängsmyr et al., 1990, p. 207)

The above quote is an example of local knowledge forms and their commensurability, depending on where, how, and which community was subjected. There is also a trace of universalism in the description of these measurements, and the future need to standardize them. Universalism's ultimate goal is the simplification and standardisation of localized practices. The purpose of universalising units and diminishing situated forms of knowledge was to bring about a form of knowledge that is more predictable. This "objective knowledge" (Hacking, 1990, p. 11) or "social technology" of quantification (Porter, 1996, p. 46) is based on statistical modelling. Objective knowledge was born through two fundamental movements: the discovery that the world is not deterministic and the transformation of society and people into mere numbers.

One would expect the relationship between indeterminism and statistics to be an opposing equation; however, it is the opposite. The recognition of indeterminism

results in greater statistical control. This is evidenced by the exponential growth of quantification in both the physical and natural sciences. Mass publication of numbers and statistics; annual reports; population enumerations such as life span, death rates,[4] and health measurements are all examples of this. These mere simplifications do not only remain as numbers or statistics, but rather they also turn into policies, politics, and affective emotions, ultimately creating a social realm in which we live under the shadow of numbers.[5]

Charles Babbage (1832) noted the importance of collecting numbers, calling it "the constants of Nature and of Art". His idea was to summon the list of all facts expressible in numbers. This dream did not originate with Babbage however; its roots go far back beyond the 19th century. In 1685, both Leibniz in Prussia and Petty in England recommended creating statistical centres that would collect data about the population allowing the state to foresee the future and measure its power. State-based statistics was a process aimed initially at measuring colonies rather than their citizens. Later, it became the practice of the state both internally and externally.

> *"The collections and aggregation of numbers participates in the* fabrication of "clearing" within which thought and action can occur. Numbers here delineate "fictive spaces" for the operation of government and establish a "plane of reality", marked out by a grid *of norms, on which government can operate"* (Rose, 1991, p. 676).

Unambiguous identification was one of the main strategies of state power over the last two hundred years. "Every state happy or unhappy was statistical in its own way" (Hacking, 1990, p. 16). These include the administration of nature, such as the German engineering of forests, or collecting vast amounts of data on the residents of a state. Scientization is a process in which states reduce society into categorized, simplified, and reductive individuals (Scott, 1998).

[4] The first life insurance policy was issued in England in 1583 (Raynes, 1948, p. 113)

[5] Although outside of the purview of this brief overview it should be noted that the application of the politics of enumeration is across all sectors of the social, from agriculture (Fitzgerald, 2005a, 2005b), economy and community (Marglin, 2008), to art and science.

Hegel was one of the first philosophers who attempted to define quantity (Carlson, 2001). For Hegel, numbers were not purely mathematical concrete quantities, but rather concepts that mathematicians would fill based on their inquiry, aims and objectives. Quantity is “the unity of continuity and discreteness; it contains in the self-subsistent one its confluence with others, and in this uninterrupted continuing self-identity it equally contains the negation of it” (Hegel and Di Giovanni, 2010, p. 454). “In the seventeenth and eighteenth centuries, science as a whole was built upon a mechanistic doctrine of nature and was almost coextensive with this doctrine”, providing the “sole knowledge of reality.” (Horkheimer, 2002, p. 35). This knowledge of reality “which is immediately identical with its respective quality such as to remain the same throughout all its qualitative transformations, is no longer qualitatively but quantitatively defined” (Marcuse and Benhabib, 1987, p. 64). Quantification gained momentum in the first part of the 17th century and continued to this day. Quantification is based on the “idea that social topics could be subjected to quantitative analysis” (Lazarsfeld, 1961, p. 279). Capitalism, size and growing population of states, the rise of insurance systems and advancements in natural sciences are some of the underlying contributors to the birth of modern quantification of political arithmetic (Lazarsfeld, 1961; Petty and Tate, 1970).

Standardisation and universalisation of “the population, space, and nature under states jurisdiction into the closed systems” were done so that there will be “no surprises” and communities “can best be observed and controlled” (Scott, 1998, p. 82). The question of control through cartographic vision and surveillance is a significant aspect of Scott’s work on the modern state’s attempt to make the natural and social world legible that is readable and knowable. Fundamentally this involves a concentration of vision, or as Scott sees it, a “narrowing of the field of vision” (Scott, 1998, p. 13), resulting in the delimitation of a field of knowledge that brackets-off or narrows complexity through spatial, temporal and epistemological regimentation and gridding. This process of making legible implies a set of representational mechanisms such as the cadastral map, censuses and “standardized units of measurement” (Scott, 1998, p. 77), all designed to hold meaning and the natural and social worlds stable. Such mechanisms of making the world legible concern how the world was viewed and how it was produced and appropriated.

These processes of regularisation/scientization, which began in the 16th century, has been responsible for dramatic changes in the government and management of life, both from individual and societal perspectives (Hacking, 1990). Science and technology were the main engines to these changes through methodological and technological approaches towards truth and determinism (Gibbons et al., 1994). "Legibility is a condition of manipulation. Any substantial state intervention in society requires the invention of units that are visible". These units can be anything from individuals, families, towns, and houses to natural resources that are all categorised and grouped based on the state's mode of intervention (Scott, 1998, p. 183). The high modernist transformations in Ethiopian, Romanian and Tanzanian 'villagization' from a political-aesthetics perspective are examples of this process of standardization. A forced process of change that many communities face. They are transforming communities from "primitive" to "modern" aesthetics. The primitive was seen as more "irregular, dispersed, complicated, unmechanised" as opposed to the modern, which was "tidy, rectilinear, uniform, concentrated, simplified, mechanized" (Scott, 1998, p. 254).

Classifications such as surnames were normalised and embedded into everyday life to the extent that it is impossible to imagine a time that they did not exist. Traditionally, surnames were primarily a form of identification based on local knowledge. For example, in England if there were multiple 'Johns', locational or occupational clues would be used to reduce ambiguity. For instance, "John Hill", referring to "John" who lives on the hill or "John Mills" refers to "John" who owns a mill (Scott, 1998).[6] Foucault's conception of biopolitics and anatomopolitics are described by Hacking as the statistical establishment of the last three hundred years. We see the biopolitical starting around 1763 under the reign of Frederick the Great for the purpose of restoring and managing the depleted population after seven years of war. This process morphed in the next hundred years to centralised institutions specialising in collecting, creating and analysing numbers representing people and things. These institutions, "…brought a new kind of man into being, the man whose essence was plotted by a thousand numbers" (Hacking, 1990, p. 34). So far, I have discussed the invention of units and categories and provided some

[6] For examples of statistics about colonies see Necochea López (2010), in Britain and India (Cohn, 1996). In Scotland this was instigated largely by Sinclair (1791).

examples and discussions around why states moved towards standardising knowledge and categorising and quantifying almost all aspects of life. In the next section, I elaborate on ways these numbers and categories are used to control and manage individuals and their communities.

2.2.1 Governing of/by/through knowledge

> *"Social power of a collective is a function of the distribution of* knowledge over *the collective"* (Bellamy, 1993, p. 211)

Foucault published two significant works in the mid-70s: Discipline and Punish: The Birth of the Prison (Foucault, 1991) and History of Sexuality in three volumes (Foucault, 1992, 1990, 1984). The former work was more concerned with the role of body and soul as the locus for power and the move from traditional forms of discipline to more recent forms.

These works of Foucault were concerned with the exercise of power as not just a hostile or repressive force but also their liberal forms. Through these two works, Foucault showed complex reciprocal relations between the political investment of the body and its economical use. From the mid-seventies, Foucault took on the task of developing his new theoretical framework of analysing power, and he coined two prominent terms, "Power/Knowledge" (Rouse, 2003, p. 105) and "Governmentality" (Foucault et al., 1991, p. 102). Governmentality was the transformation in the technologies of governance that began in the mid-sixteenth century. A move from a "multitude of treatises presented as advice to the prince" to an "art of government" (Foucault et al., 1991, p. 87). The former is not the concern of this thesis. The art of government was concerned with the problematics of governing lives and souls, which was pertinent to current catholic and protestant doctrines. The list of interests continued on to cover the governance of children, education and health and almost all other aspects of life. These concerns were an integral part of the transition from feudalism to the rise of imperialism, colonial states and finally, modern states. The domain and use of law also transformed from being a punitive and instrument of sovereignty to becoming a guiding technology. Law traditionally was an instrument for the common good; something all subjects would obey without exception as long as the law was in accordance with the laws of the master or the king or God the ultimate sovereignty. Through the transformations of the 17th century, the law became one of the tactics of governance. The idea of the economy extended as the

government of the family and art of government gradually became a series of interventions and complex processes formed through the use of numbers, laws, legislations, sovereignty and other technologies of government. Instead of governing being about the sovereignty of the prince over a territory, it became about meeting ends and specific certitudes (Foucault et al., 1991).

> *"Wisdom*, understood no longer in the traditional sense as knowledge of divine and human laws, of justice and equality, but rather as the knowledge of things, of the objectives that can and should be attained, and the disposition of things required to reach them; it is this knowledge that is to constitute the wisdom of the *sovereign."*(Foucault et al., 1991, p. 96)

It is useful to mention a text referred to by Foucault: "Le Miroir Politique" from 1555 (Dexter, 1955), where the government was defined as "the right disposition of things, arranged so as to lead to a convenient end". Some examples of convenient ends (programs) could be reproduction (Foucault, 1992, 1990, 1984), expansion of territories and improvement of health. This text by La Perriere describes the beginning of the transformations mentioned earlier. When the government became about being the right disposition of things, it is important to understand in this analysis that the relationship between government and "body politic" is not a top-down one, but a multifaceted network of technologies and tactics to achieve finalities (Hobbes and Curley, 1994, p. 146).

Foucault's notion of governmentality (Foucault et al., 1991, p. 102) provides an excellent framework for analysing these practices. "The art of government", as Foucault (1991, p. 87) argues, is the new process of practising power through an assemblage of technologies, strategies and programs which together transforms and guides the individual and their wisdom to the one defined by sovereign states and corporations. What we observe here is the management and governing of bodies through different modes of subjectivisation.

> *"…the body becomes a useful force only if it is both a productive* body and a subjected body. This subjection is not only obtained by the instruments of violence or ideology; it can also be direct, physical, pitting force against force, bearing on material elements, and yet without involving violence; it may be calculated, organized, technically thought out; it may be subtle, make use neither of *weapons nor of terror and yet remain of a physical order."*

Liberal governmentality, by means of its knowledge management, creates new modes of subjectivities without the need for violence or terror—a process in which individuals self-govern. Foucault (Foucault, 1991, p. 27) sees this form of power in:

> *"a network of relations, constantly in ten*sion, in activity, rather than a privilege that one might possess; that one should take as its model a perpetual battle rather than a contract regulating a transaction or the conquest of a territory. In short this power is exercised rather than possessed; it is not the 'privilege', acquired or preserved, of the dominant class, but the overall effect of its strategic positions - an effect that is manifested and sometimes extended by the position of those who are dominated. Furthermore, this power is not exercised simply as an obligation or a prohibition on those who 'do not have it'; it invests them, is transmitted by them and through them; it exerts pressure upon them, just as they themselves, in their struggle against it, resist the grip it has on them. This means that these relations go right down into the depths of society, that they are not localized in the relations between the state and its citizens or on the frontier between classes and that they do not merely reproduce, at the level of individuals, bodies, gestures and behaviour, the general *form of the law or government;"*

Through the development of the science of governing, I have shown how the economy became central again; however, now on a different axis and plane. "The constitution of a savoir of government is absolutely inseparable from that of a knowledge of all the processes related to population in its larger sense: that is to say, what we now call the economy" (Foucault et al., 1991, p. 100). Economy and statistics went from being a technology in the hands of feudals to becoming a form of "savoir" concerned with all aspects of "body politic". In this regard, the art of government is not replacing the discipline society. Instead, there is a triangular relationship between these three elements: government, discipline and sovereignty. This triangle brought forward a new problematic space called population: a space "a field of intervention and an objective of governmental techniques" or "governmentality" (Foucault et al., 1991, p. 102). The move from the feudal territorial regime (Laws: the amalgamation of obligation and litigation) to administrative state (National boundaries, discipline and regulation) and to the governmental state was not directed by an "invisible hand" (Smith, 1930, p. 288), but rather a "visible hand" (Chandler, 1993, p. 286). Chandler only sees the market as the locus of change (Schudson, 2013), however it is through a reciprocal network of actors such as science, technology, statistics and new problematic spaces creating, changing and

mediating one another. This is the important lesson and analytical technique to take from the Foucauldian studies of power.

In parallel to the development of governmentality that I discussed grew an unquestioned and unchallenged belief in science and technology. Technological determinism, or the idea that science and technology are the main media for change in society, is the focus of the next section.

2.2.2 Iron cage of technology

In this section, my aim is to introduce the notion of technological determinism, discuss some of its unprecedented effects on individuals and their societies and how it limits the ways we critique, fight against or simply accept unquestioned technological and scientific changes in our lives.

During and post industrialisation, the voices of concern began to increase about the consequences of automation and the further expansion of technology use. Questions arose about the relationships we have with technological systems and how they are changing our ways of life. In addition: how society is changing technology. Many scholars attempted to describe our dystopian present and future. They tried to help us realise that we live with no motifs and "spiritual misery" in our hyper-industrial societies. How our cultures, histories and memories are out of our hands, and technology will present and make them available to the future (Stiegler, 2013). "Modernity's melting power" transformed us into powerless, depoliticised liquids with the "freedom to treat the whole life as one protracted shopping spree means casting the world as a warehouse overflowing with consumer commodities" (Bauman, 2000, p. 89). In "societies of control", we turned into "dividuals" distributed through digital networks (Deleuze, 1992, p. 5).

Whilst science and technology are being examined from a variety of perspectives, in many of these argumentations, there is a trace of Technological Determinism (TD) and the use of "power language" is common amongst both critiques and appraisers of technology (Langdon Winner, 1980, p. 121). Marx and Kapp were amongst the first critical thinkers who wrote about the philosophy of technology. Kapp (1877) was one of the first authors who used the title philosophy of technology in the 19th century. Early critical thinkers were concerned mainly with the industrial revolution and its consequences. The consensus among scholars during this wave was merely dystopian. The criticism of technology by influential scholars such as Marx and

Kapp, whilst having a hard technological deterministic approach, was based on a historical mode of production and not the technology itself (Olsen, 2008). Marx and Engels (1969, p. 16) observed this very similar process during the beginning of industrialisation.

> *" …The bourgeoisie cannot exist without constantly revolutionising* the instruments of production, and thereby the relations of production, and with them the whole relations of society. Conservation of the old modes of production in unaltered form was, on the contrary, the first condition of existence for all earlier industrial classes. Constant revolutionising of production, uninterrupted disturbance of all social conditions, everlasting uncertainty and agitation distinguish the bourgeois epoch from all earlier ones. All fixed, fast-frozen relations, with their train of ancient and venerable prejudices and opinions, are swept away, all new-formed ones become antiquated before they can ossify. All *that is solid melts into air…"*

The young Marx was against technology as it would take away labour from humans, however later in his life, when ideas such as the steam engine and many engineering inventions were developed, Marx became more interested in technology as it would provide more freedom for humans (Wendling, 2009). During his lifetime, Marx's reading of technology and his vision has changed from a pessimistic view to an optimistic TD (Roth, 2010; Wendling, 2009). It was only after the Great War that strong voices of criticism and fear of autonomous technologies began to rise and emerge. Obviously, there were also positive voices such as Franklin and Jefferson "…For them, progress meant pursuit of technology and science in the interest of human betterment…" (Smith and Marx, 1994, p. 3); at the same time, both were concerned with the implications of large-scale technological reformations. Jefferson emphasised the delicacy of liberty, virtue and power in society and how they can easily become corrupted. Ihde argues that it was first the arts community who raised concerns and fears of technology. One of the first works dealing with this new phenomenon was Shelley's Frankenstein (Olsen, 2008). Victor Frankenstein, a researcher who has a strong belief in science, is unable to recognise the consequences and ethics of his work and its creation of the monster (autonomous technology). The monster then starts to kill Victor's loved ones one after another, taking all of Victor's life away from him (automation). Shelly's monster is very similar to how Beck (1992) describes the role and challenges of science in industrial societies in the early twentieth century. What we see here is the running narrative of technological determinism and the dichotomy between good and bad.

Commercialisation and exploitation are possible through a new form of objectification in which individuals lose their autonomy and agency to machines. The transformational effect of technology reduces the originality of objects and their real essence as well as the freedom of interpreters (Adorno and Levin, 1990). This belief that technology is the primary force that brings change to society goes back to the early days of the industrial revolution. Amongst individuals who believe in TD, there are two common approaches that they follow a) soft view b) hard view. The soft view is based on the belief that social change is caused by technological change; technology can be affected and changed by social pressures. Hard view believers, on the other hand, do not take into consideration the effect of social pressures and assert that technology has its own autonomous momentum and force for change (Smith and Marx, 1994). In both of these views, we see that in order to bring change, either we need to clear the space for technology to do its things, or we apply pressure and change technology so it can change our futures in the ways we want.

Technological determinism, whilst providing a framework and method for analysing and understanding technology, also limits and changes the way academics, activists, makers and others relate analysis, produce new technological artefacts and use them (MacKenzie and Wajcman, 1999). It is, therefore, crucial to understand how certain projections and models of what science and technology are could affect the discourses around them - this is discussed in the next subsection. From a political viewpoint, it is crucial to objectify TD as it produces a passive attitude and discourages creative engagement with technology. For example, if one believes that they cannot do anything to change the state of affairs in an event, it would be illogical to presume that individuals would then try to make changes within such a system. From an intellectual standpoint TD, whilst producing knowledge and developing some aspects of our understanding of technology, also reduces the relationship between society and things into a mere cause and effect relationship (MacKenzie and Wajcman, 1999).

Counter-performativity is a technique in organisation studies that suggests theories and models of reality are not sufficient to deal with the changes and complexities of the observed system (Lenglet and Taupin, 2018; MacKenzie, 2011). Esposito (2013)

applied the "counter-performativity"[7] model and Luhman's theory of society into finance and suggested that the mathematical models used in finance not only have performative and counter performative effects, but also the actors within the financial system will observe and anticipate those models and act accordingly to achieve the anticipated outcomes. She (2013, p. 104) suggested "One should re-introduce the observer into the object observed by theory".

Performativity is about mediation or the relationship between different actors in a given system. Mediation is usually between a) two or more terms and their mediation, b) singular term and its mediation, and finally c) two terms each mediating one another. The last category is the most interesting one as it is both related to the issues of performativity discussed here and much of the enlightenment period theories and philosophies were developed based on this form of mediation. Hegel refers to this as essence and appearance. "The essence is thus not behind or beyond the appearance; instead, by virtue of the fact that it is the essence that exists concretely, concrete existence is appearance." (Hegel, 1892, p. 197). Gunn (1987, p. 5) argues that recognising the non-dualistic relationship between essence and appearance is crucial to understanding the class struggle and our ability to bring change "…For Marx, as for Hegel, no process of mediation is definitive…mediation and remediation are at issue in class struggle…". What Gunn and Luxembourg's (Luxemburg, 2003) readings of Marx and Hegel entails is the emphasis on the capitalist mode of production that remediates existing relations. In this context, the argument would be that technology itself is neither good nor bad, but it is the capitalist mode of production and its remediation of the relationships we (as a society of makers and consumers) have with them that brings certain appearances and not the technology itself. This mediation extended and intensified to the extent that, in a sense, we live in an iron cage of rationalisation, efficiency measures and control through the means of science and technology (Reed, 2005).

[7] Another example is Callon's work where he used Actor Network Theory (Latour, 2005) as a method to study market behaviours and the role of economic models and market devices in defining and constructing markets (Callon, 1999; Callon et al., 2007). Models are used in finance to predict market behaviours, in psychology to measure human behaviour, statistical models to control risk by insurance companies, etc…).

The purpose of this survey so far was not to challenge or reject the concerns raised by critical scholars explored in this section, but to emphasise that in order to bring more criticality and reflection into the ways we relate to technological systems, there needs to be a different mode of criticality. There need to be alternative views of technology that are achieved through self-realisation and personal interpretation; new modes of critical practise that challenge, reveal and untangle these complex constructs of technological systems that are not seeing technology from the binarisms of good/bad, threat/hope, destructive/constructive.

2.2.3 Towards a free relationship to technology

In this section so far, I discussed how over the last century science and technology became the monopolised force for change and progress. How concerns from philosophers of technology and STS scholars became part of the same discourse of industrial logic and problem due to their technological deterministic approach and - borrowing from Heidegger (1966) - their mode of “calculative thinking”. The issue here is that due to our technological deterministic relationship with technology and its metaphors, “we have finally abdicated to technology the very duty to formulate questions” (Weizenbaum, 2017, p. 611).

It is important to remember that technology should not be considered as both the sole problem maker and solution provider. “We shall be questioning concerning technology, and in so doing, we should like to prepare a free relationship to it”. What Heidegger (1977, p. 3) invites his readers to do is to see technology beyond these binary modes of thinking to see the essence of technology. In essence, he means the way something endures through time and history. The origin of the word essence comes from physis, where Heidegger (1961, p. 14) declares “Physis is being itself, by virtue of which essence become and remain observable… Physis means the power that emerges and the enduring realm under its sway. This power of emerging and enduring includes "becoming" as well as "being"”.

If we were to understand and define the essence of technology, this does not mean any specific technological thing. Technology existed as long as civilizations. However, what Heidegger tries to clarify is questioning the basis and definitions of what we perceive as technology and our relationship with it. “When we once open ourselves expressly to the essence of technology, we find ourselves unexpectedly taken into a freeing claim.” (Heidegger, 1977, p. 26). There are many definitions for technology, and the widely agreed and used definition of technology as a human

activity or a means to an end is merely an instrumental definition and does not overlay the truth about the essence of technology. What Heidegger is trying to free us from is the kind of thinking that reflects and rationalises everything through the medium of technology. This technological thinking is when we lose our ability to mediate, and the idea of subjectivity and objectivity becomes more fluid. Tiqqun (2001, p. 3) reminds us of this danger by stating that most critical thinkers of our time are negligent of the rise of “cybernetics as a new technology of government”. He later says that cybernetics is based on the projection that all things (humans and non-humans) and their relationships are inherently algorithmically conditioned and reconditionable.

The concern and worries on the loss and destruction caused by technology are merely technological thinking (Dreyfus and Wrathall, 2002). “technological revolution in the atomic age could so captivate, bewitch, dazzle, and beguile man that calculative thinking may someday come to be accepted and practiced as the only way of thinking.” (Heidegger, 1966, p. 56). Kant (Matthews et al., 2000) describes this new form of capitalism as a sublime experience. According to him, there are two forms of experience. First is the mathematically sublime, which is an experience where we deal with a conflict between our rational and imagination. Our reason tells us things are restricted and limited. On the other hand, our imagination provides an infinite representation of reality - in this mathematically sublime experience, due to a universalistic approach to knowledge representation, we encounter experiences that are so much larger than ourselves that we struggle to take them in whole. The other sublime experience that Kant discusses is the dynamically sublime, where an object seems so much bigger and stronger than us that we will experience a strong sense of helplessness and weakness towards it. Further, Kant argues that these emotions are not based on real experiences as in the experience of actual danger; our feelings are very different from the sublime experiences.

This line of Kant’s enquiry brings us back to how Heidegger (1966) sees this experience as technological thinking. Calculative thinking was a requirement and pillar of Fordism and Taylorism, where information was the building block of automating and making processes predictable and repeatable.

Fry (2006, p. 22) emphasises the importance of this line of enquiry and philosophical investigation: “It is crystal clear that neither the weary humanism, the complacent scientism of lingering Enlightenment, nor post-humanist pluralist postmodernism

(with its anti-foundationalism) can provide the intellectual blood, sweat and tools to deal with this situation". Haraway also attempts to break away from these dualisms. As Haraway herself has often noted, her work is a continuum, an ongoing enquiry inventing and breaking new modes of being (Haraway, 2004, 1991). Haraway's work, similar to French philosopher of science Bruno Latour, presents 'nondualist' theories of the world that 'take nature to be neither reducible to objective reality nor reducible to human subjectivity' (Latour, 2004; Macnaghten and Urry, 2001). This mode of criticality and non-dualistic approach towards science and technology is the form of criticality that I plan to bring into my work.

Biopolitical production was a move from disciplinary societies to societies of control. In disciplinary societies, as described earlier, the nation-states are obsessed with power and control through quantified logics and closed geometrical spaces such as medical centres, prisons, schools and factories. On the other hand, societies of control are open, qualitative and affective. In a sense, in societies of control, the boundaries between various disciplined spaces become blurry. In such societies, control and power are through the production of subjectivities and therefore, the whole life and existence become embedded with production (Deleuze, 1992; Hardt and Negri, 2000). So far, I have shown the role knowledge plays in the management of individuals and their societies and that not only are the forms of knowledge produced crucial, but also how and through what techniques they would become authoritative and intelligible. This approach to power helps to further understand why and how our financial, economic and governance systems developed into their current forms. I also discussed technological determinism a belief in technology as the prominent medium for change. This mode of thinking was central to many unquestioned changes introduced to our lives.

Since Foucault coined the term governmentality, advancement in technology led to new unprecedented entanglements between states and markets with fundamental implications for individual liberties. This is the focus of the next section.

2.3 Surveillance capitalism

Internet in the past three decades has gone through a wide range of fundamental and navigational changes, from being a small-scale military technology in 1969 to 40 million users in 1995 to 1.5 billion users in 2009. Argentina has more mobile phone subscribers than its population. A detailed study of economic, cultural and social transformation shows how in only a few decades, communication technologies have

revolutionised every aspect of our lives and societies and brought a new form of society called “network society” (Castells, 2011). Internet was central to the development of network society.

2.3.1 Emergence of technofeudalism

The key to the development of large-scale surveillance and network society was big data. Big data is a by-product of computer-mediated transactions, which is almost anything we do online. With the development of the Internet of Things, smart devices and wearables, as discussed earlier, there is now a computer mediating almost every aspect of our lives. Collection of these transactions equated to enormous databases stored across thousands of machines which is commonly known as big data (Varian, 2014). In other words, big data is “the capacity to search, aggregate and cross-reference large data” (Boyd and Crawford, 2012, p. 663). This process of digitisation, analysis and transformation of our experience is a form of rendition. By interacting with digital technologies and artefacts, we make our experiences available to them; in other words, we render our experience. Surveillance technologies or data collection techniques, in a sense, render our experiences to data.

Cheaper manufacturing costs of storage, maturation of the technology and lowering of accessibility barriers to such technologies through Microsoft, Amazon and Google cloud services resulted in the vast expansion and use of big data and analytics services in the majority of services we use (McAfee and Brynjolfsson, 2017). The expansion of Big data and the amount of information stored on the internet created complex challenges to find and retrieve relevant information on the internet. From a knowledge acquisition perspective, the internet is one of the most crucial components of our Information Retrieval (IR). One of the most common methods to retrieve information from the internet is searching, which is very different from traditional models of IR (Jansen et al., 2000). In 2012, Google collected thirty trillion URLs on the internet and served over one hundred billion searches each month. The vision that google portrays as the future of search and information retrieval is a “Star Trek” style “loyal personal assistance” (Singhal, 2012). Whilst interactions with search engine interfaces are developing at a fast pace, the reality is far different from this vision. Google alone runs around ten thousand experiments on its users each year. The role that search engines play in information retrieval has created a completely new ecology of knowledge, new marketing departments, guidelines and

principles of best practice for programmers and content providers. In the next section, I discuss the commercialisation of knowledge and the development of search engines.

An internet search/query is one of the first steps that any internet user takes to initiate an online transaction. From self-diagnosis, to navigating relevant product/service webpages to individuals searching their own names to find out about their online profile. Almost any interaction users have will involve some form of search. The internet "is a rapidly expanding hyperlinked collection of unstructured information", and this creates a tremendous difficulty for users to find relevant information on the web and subsequently a larger challenge for modern information retrieval systems commonly referred to as search engines (Lempel and Moran, 2001, p. 132). Search engines take a set of words known as a query and they return a result set that is a list of websites the search engine believes has relevant information to what the user queried. Searching for the keyword "simple" on google returned three and a quarter billion results. This highlights the importance and complexity of search for both information retrieval and prioritisation of information based on the needs of each user. At the same time, the result sets returned by such services creates a false sense of sublime experience, as it is humanely impossible to look at all the results returned by the search engine and the majority of results returned are not useful to the users. (Matthews et al., 2000). In this section, I provide a brief overview of the development processes and services that led to the monopolisation of knowledge or, more specifically, access to knowledge.

Yahoo was invented by Jerry Yang and Divid Filo in 1994 based on categorising information in a hierarchical manner, breaking down websites based on their content, for example, shopping, toys, etc. One of the competitors of Yahoo, Excite, used "spiders" in order to categorise information. Spiders in information retrieval systems are computer software that can cross-reference and follow links on one page and then go through all the links that they can find to create a knowledge graph and map of the internet content. Yahoo's enterprise was more user/human-centric in the way of collecting and categorising information as it was the users who would group websites under Yahoo categories; on the other hand Excite's approach was purely algorithmic and mathematical (Laffey, 2007). The process of categorising and listing information in search engine language is called indexing (Rindova and

Kotha, 2001). From their early days of inception, search engines have faced a dilemma as to how to charge for queries and internet navigation.

In 2002 Google started to include advertisements beside its search results, and in a two year period, the company's revenue from advertisements reached over $2 billion (Turow, 2012, chap. 3). Finally, due to a high level of competition from Google and their increase in efficiency and improvement of spider algorithms, in 2014 Yahoo decided to close down its directories and primarily use spiders as its main source of informers (Rossiter, 2014). Figure 1 shows the increase in advertising revenues between 1996 and 2000 in the U.S. only. In 2000, the total revenue from internet advertising totalled 8 billion dollars, from which 71% were accounted for the top 10 advertising firms.

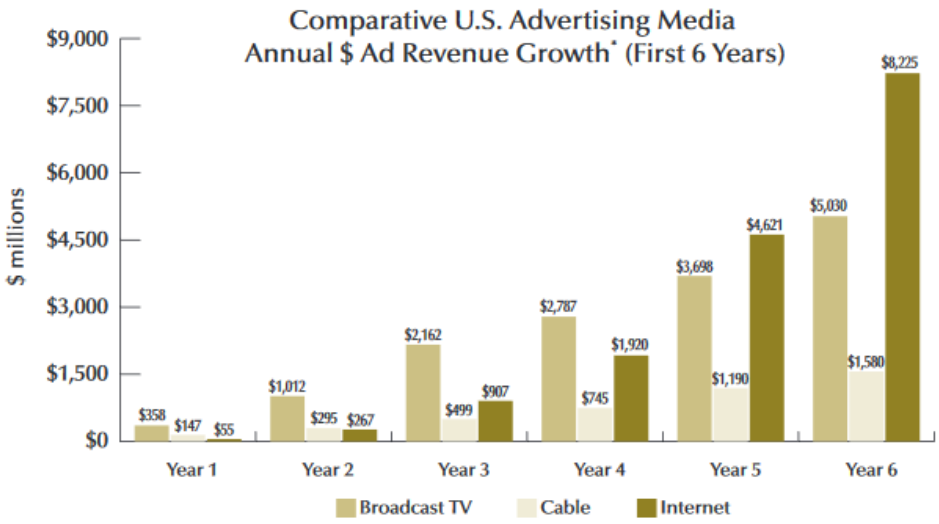


Figure 1: Annual revenue growth comparison (Hyland and Petrusky, 2001, p. 13)

A more recent report in 2017 by Interactive Advertisement Bureau (IAB) (Silverman, 2018) shows a similar increase in internet advertisement revenue over television. A comparison between internet revenue in the year 2000 to the year 2017 shows a 1000% increase in revenue (Figure 2). The year 2017 had a 20% increase in revenues in comparison with 2016. Whilst other content platforms such as newspapers and television had also experienced an increase in their revenue, it is evident that internet advertising is the leading industry. In the 2017 report, Rothenberg, president of IAB, says "Consumers are increasingly spending a tremendous amount of time with interactive screens and content from mobile to desktop and audio to OTT and brands are in lockstep with a growing commitment to digital ad buys. Mobile captured more than half of the total digital ad spend last year

and we can easily expect that share to continue to climb. Video also saw significant growth." (Silverman, 2018, p. 2). In the U.S., revenues generated from internet search totalled 44% of the whole internet revenue (Figure 2).

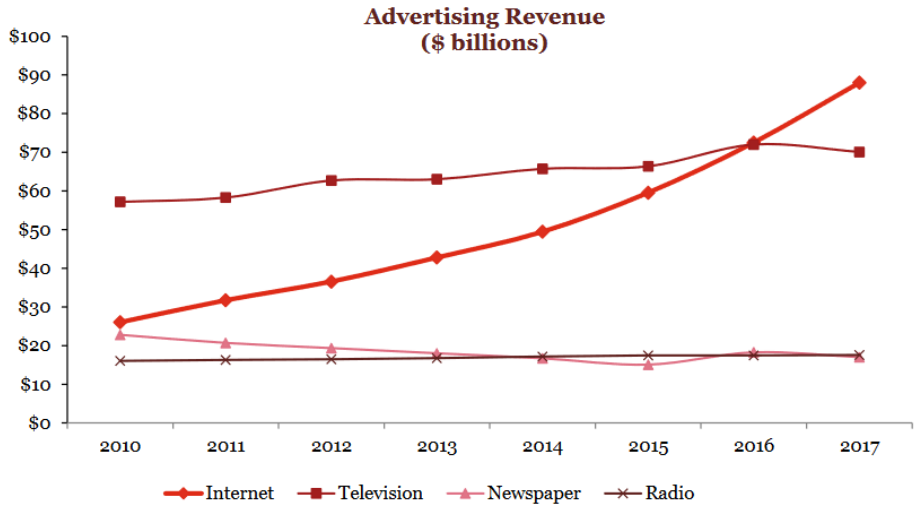


Figure 2: Advertising revenue 2010 – 2017 (Silverman, 2018, p. 20)

What we see here is the transformation from a need for information to the consumption of information developed over the past two decades. Jim Yu, CEO of BrightEye, a tech company that offers insight on Search Engine Results Page (SERP) optimization, said:

> *"Google's new desktop SERP is a sign of Google's constant* evolution of SERP results in line with changing consumer behaviour. The linear customer journey no longer exists and is *now fractured into hundreds of new 'micro-moments' where* consumers are using multiple devices (desktop and mobile) to *address their needs whenever and wherever they are."*(Lambert, 2017)

What we observe here is, in a sense, a new form of being/identity constructed for each user comprising of an assemblage of surveillance technologies, devices, numerous algorithms, historical data and the user. Depending on the terms a user searches for, search engine algorithms decide and prioritise the information users receive. 89% of online consumers use search engines to make a decision about a purchase (Herndon, 2015). Another recent change that occurred among search engines is renting space to and from each other. For example, "MSN Search, the search query is passed to Yahoo!'s sponsored search engine, which returns results to the MSN server, which in turn renders the page that the end-user sees. Similarly, Google rents space on AOL." (Fain and Pedersen, 2006, p. 12).

As the research and development on the World-Wide Web develops, the network and technology itself also grow at an exponential rate, having a power-law growth model (Huberman and Adamic, 1999). For example, the mass distribution of wireless technologies along with new advancements and cheap manufacturing costs have resulted in the development of Internet of Things (IoT) technologies: “everyday physical things that are enhanced by a small electronic device to provide local intelligence and connectivity to the cyberspace established by the Internet.” (Easterling, 2012, p. 308). IoT is estimated to internetwork between 50-200 billion objects by 2020. However, the main purpose of IoT and their network is not a web of machines talking to each other (Machine to Machine: M2M) and leading to a vision of a smart planet and cities, but rather an infrastructure of sensors collecting data about various aspects of our interactions (Tan and Wang, 2010). IoT is a method to expand the internet further into the spheres of personal, professional and social life (Miraz et al., 2015).

We encounter a vision of a smart planet in which every ordinary object will become a smart object and will have its own unique identity in cyberspace. Sterling (2005) coined the term “spimes”, where the data on each object will become so rich that it surpasses its physicality (Mcfedries, 2010; Speed, 2011). Smart objects nowadays have their own autonomy compartment and their own error component. This means that objects are capable of dealing with mistakes and uncertainties, and also they sense their own environment and accordingly responding to and affecting the world around them (Kopetz, 2011, p. 315). Terms like the Internet of Things or Online Platform are not as innocent as they sound. Online platforms provide a space for communicating and interacting with one another, but they also bridge the domains of communication with profit. What is different here is the processes, algorithms and methods (used to make profit, products, set prices and attract customers) all are trade secrets and are thus hidden away from the consumers.

As discussed, the extent of online, physical and predictive surveillance extended dramatically in recent years. Surveillance becomes even more alarming when users realise the depth and detail of data each company keeps on each of its users and also how they sell and share their users' data. For example, Netflix’s privacy policy vaguely states that they collect information about what movies and shows each user consumes as well as collecting their watching habits. This includes watching patterns, length of time, and genre of movies each user consumes. In addition,

information about their location, device, and time of the day are some examples of the data that Netflix collect. This is only a small section of data that the company stores on its users. In addition, through the use of embedded surveillance, they also collect more information about their other online activities. This is further discussed in the study of Web 2.0 surveillance (2.4). Recently Facebook provided Microsoft with access to its users' personal data. Allowing Microsoft to see the list of all Facebook users' friends list without the users' informed consent. Similarly, the social media giant allowed Netflix and Spotify to read their users' private messages. These are just two examples of data broking and commercialisation of personal and community data (Dance et al., 2018).

In addition to sharing data, corporations often buy small to mid-sized companies in order to get access to their networks and users' data. For example, Express Logic developed a Real-Time Operating System (RTOS) that could support the new demand from Internet of Things devices. Currently, the company supports 6.2 billion devices using its operating system. Microsoft recently announced that they purchased Express Logic to further expand their network and control of internet of things devices and networks.

Digital data is infiltrating into every aspect of our life, including capturing, analysing and commercialising data on our sleep, exercise, sex, food, mood, location, alertness, productivity, even our spiritual well-being are being tracked and measured. "Sharing became the term for the quick post to a social network: a status update to Facebook, a reading list on Goodreads, a location on Dopplr, Web tags to Delicious, songs to Last.fm, your breakfast menu on Twitter." (Wolf, 2010). MedHelp data alone shows that over 30000 personal tracking projects start on a monthly basis. This data is collected and shared across the network and "nerves" of corporations without clear consent from their users. Moodscope (2019), allows people to measure their moods and emotions on a daily basis, the service offers the users to send out emails to friends and family members they choose to update them about their mood changes.

The danger is when the corporations are at the centre of these networks, collecting data and controlling the interfaces of communication and action (Turow, 2012). "Over the past 30 years, shifts in our communication infrastructures have enabled large-scale attempts to reshape the very possibilities of social order in the interests of market functioning and commercial exploitation." (Couldry, 2016) At the same

time, almost all online platforms and websites state in their privacy policy that they will share data they collect with government and governmental bodies if requested. This creates a new mode of surveillance partnership between governments and corporations (Schneier, 2013a). In July 2014 the UK government introduced new legislation, the Data Retention and Investigatory Powers Act 2014 (DRIP), which was later dubbed the snooper's charter. This act obliged Internet Service Providers (ISPs) to regularly capture and store the internet and communication activities of their users. Whist the act was challenged and is under review due to a high level of public outcry and legal challenges (Cobain, 2018; Open Rights Group, 2014), it is one example amongst many others of what Deutsch (1963) called the "Nerves of Government". In 2009, it became public knowledge for the first time that the advertising firm Google, one of the largest and most dominant search engines and knowledge providers, was recording users search terms without users prior knowledge (Esguerra, 2009; Graham, 2013; Newman, 2009). In response to the interview resulting in the public realisation of this surveillance, Schneier (2009), a security specialist, wrote a piece arguing why digital privacy is a basic human right. In 2016, it became public knowledge that Google has been given access to 1.6 million patients health data from NHS databases from several hospitals managed by NHS trusts across London (Quinn, 2016).

So far, I have shown how new modes of knowledge and information retrieval have emerged. In the next section, my aim is to bring together previous discussions on surveillance, new forms of governance and control and capitalism together and discuss the new logic of accumulation, rendition, and expropriation under the shadow of surveillance capitalism.

2.3.2 Surveillance economies as a metamorphosis of capitalism

The majority of our online interactions are available to us at no visible costs. Most internet users have no clear idea about how their data is being collected or analysed online (Kelley, 2018; Schneier, 2013b). Due to a high level of specialisation, even the tasks of collecting and analysing data divided between a large network[8] of corporate and government surveillance systems and data merchants. The data collection has been so specialised that various small to large-scale corporations

[8] Delueze (1992) notion of societies of control is an interesting conception of the kinds of enclosures and control individuals/"dividuals" are objected to.

each concentrate on some elements and parts of the data value chain. Governments too, in order to sustain their services and provide safety and security within their physical and virtual boundaries, collect data on their populations (Ball, 2013; Bump, 2013). Corporations and governments, due to various economic and personal interests, share and give access to what they have on each individual to one another (Schneier, 2013c). For example, Facewatch provides sophisticated facial recognition software to identify criminals and persons of interest to UK police as well as businesses (BBC, 2015).

Marketisation and the extensive collection of behavioural data and its illicit use is the engine and fuel to a new mode of capitalism, which Zuboff calls “Surveillance Capitalism”. Surveillance Capitalism is the commodification of life through surveillance and modification of human behaviours through modern governance techniques that I discussed earlier (2.2). Advertising has changed dramatically in the last decade from being a contractual agreement between an advertiser and an individual to a real-time bidding mechanism (ad-exchanges) where an assemblage of robots and computer algorithms make decisions on what and where to advertise information on different stages of users current and future online interactions and behaviours.

In the information age or surveillance capitalism, behaviours of individuals are tracked and aggregated constantly, where simple human activities such as communicating and socialising are now sustained by various corporate and governmental actors. The new models of digital enclosure are similar to land enclosures in England, a process of transformation from forcefully expropriating to contractual agreements (Andrejevic, 2007). The “free” contractual agreements we have with institutions such as Google, Facebook, Instagram and WhatsApp in order to communicate with one another also leads to networked activities where the primary product of those activities are self-surveillance (Fuchs, 2011).

The promise of the global village was connectivity, transparency, equality for all; however, by the beginning of the 21st century, after over three decades of its development, what is most noticeable is an onslaught of markets into all aspects of life. Rapid erosion of “the public”, a fast widening gap between rich and poor and the unprecedented destruction of nature are some of the effects of further marketisation and commodification of life. Enabled by several disruptive technological developments such as the Internet, smartphones, and now AI and Big Data,

capitalism has rapidly transformed into digital capitalism or surveillance capitalism with much deeper reach into peoples' lives. Surveillance capitalism is a process during which "data" about every aspect of our life turns into valued commodities. This is enabled by a radical transformation of labour into a product; labour does not exist anymore in its conventional way (Wilkie, 2011). Commodification expands further into the monetisation of our relationships and communications through social media and digital communication technologies.

Capitalism used to function on ideas of scarcity; however, new forms of digital capitalism depend on unlimited access to resources, instant shopping, one-click shopping, and same-day delivery of goods on our doorsteps. Amazon recently proposed drones-only airspace for providing faster delivery of one-click purchases (Pilkington, 2015). "Network capitalism" is "beyond the contradictions of class" to the extent that "all aspects of life today are determined by the unequal property relations between those who own and control the means of production and those who own nothing but their labour" (Wilkie, 2011, p. 8). This mode of marketisation does not only exist at an individual level, but it is increasingly expanding into all aspects of our social relations and collectives. A powerful example of the latter phenomenon is the monetisation of community practices such as couch surfing and its commercialisation through AirBnB or hitchhiking practices turning into Uber.

These new digital commercial practices, while they may have potentially positive impacts on our culture and societies, are also increasingly moving towards even more exploitation of labour through a systematic process. As Wilkie (2011, p. 10) puts it:

> *"Reading digitally is the form ideology takes in what might be* referred to as the era of the digital condition: a regime of accumulation that emerges in the post-World War II period in which developments in production, communication, and transportation have enabled capitalism to encircle the globe. It is the means by which the exploitation of labour is obscured behind a "spiritual aroma" that suggests that humanity is entering a postcapitalist, postnational, postlabor, posthierarchy, postwork society in which consumption rather than production drives the economy and developments in science and technology have replaced labour *as the source of surplus value.".*

These transformations are possible through four major changes. First large-scale manufacturing of electronic sensors through reduction of manufacturing costs and their physical size, making them more portable and available. Secondly, cheap

manufacturing costs and maturation of smart portable technologies, usually mobile phones extending the reach and use of portable sensors and their uses. Surveillance mechanisms and techniques have also developed drastically over the past decade, both technologically and legally. Cheap manufacturing costs, further development of data storage, and IoT devices are expanding the extent of surveillance into homes and private spaces. Third new cultural norms such as the sharing culture in social media. Finally, the rise of a global superintelligence known as the cloud (Wolf, 2010).

In addition, large investments in cloud infrastructures mean that these technologies are available seamlessly almost everywhere around the world that has access to the internet. Lack of legislation in some countries and the introduction of legislation that gives governments and corporations even more power over individuals' data and its use provides justification for further enrichment and extension of data collection. For example, the UK government recent snooper charter (Griffin, 2016; Home Office, 2016; MacAskill, 2016) obliges Internet providers to collect and record their costumers' Internet usage for up to a year. This data includes everything they do online. The data includes online interactions such as when a user logs into their social media, the device they used and the information they retrieved from there (Home Office, 2016).

Google Map's new service now is capable of suggesting destinations to users without needing to know where the users want to go. The technology predicts their destination based on a range of variables such as day of the week, time of the day, weather, individual habits and many other factors (Lardinois, 2018; Lin, 2018). Tom Wilson, Chief Executive Officer (CEO) of Allstate Corp (an insurance company that offers telematics driving insurance policies), in response to whether customers driving data and habits should be sold, suggested that "Could we, should we sell this information we get from people driving around to various people and capture some additional profit source and perhaps give a better value proposition to our customers? It's a long-term game" (Kraut, 2015). Usage-Based Insurance (UBI) or Pay How You Drive (PHUD) is a model of insurance that collects data about drivers' locations and driving habits and, based on that information, offers variable policy rates to customers. Estimates show that by 2020, 70 per cent of auto insurers would use telematics or UBI. Insurance users often consent to giving away basic driving information to insurers in order to get customised and "cheaper" policies. Analysing

and extracting regular destinations and other personal information from drivers' data is not a complicated task. The extraction of this personal data would mean the breach of a driver's privacy as well as creating a significant security issue, and vulnerability as hackers may steal this information (Bellatti et al., 2017; Kaplun and Segal, 2019).

Surveillance, privacy, democracy, right to freedom, safety and security are some of many new and old fields that are now challenged by the fast advancement of Artificial Intelligence (algorithms) and Big Data (surveillance).

Zuboff studied several institutions across America, including two paper and mill industries, a Wall Street bank, a large daily newspaper and a pharmaceutical firm, all of them going through a new phase of computerisation and automation. The result of her ethnographic work is a rich and powerful image of the dramatic historical transformation of work and workers experience within the newly computerised spaces. "Men and women accustomed to an intimate physical association with the production process found themselves removed from the action. Now they had to know and to do based upon their ability to understand and manipulate electronic data." (Zuboff, 1988, p. 70).

Automation and AI are also subjects of many concerns and discussions as they are not only re-revolutionising human labour but also have the power to manipulate and control human affairs. For example, Spice, a Japanese company, offers body tracking allowing people to control any avatar online to produce content for YouTube and other content providers, reducing the amount of labour and effort required to produce this type of digital content. Code for America began to process court cases about illegal cases of carrying marijuana. The US government began to use a combination of physical barriers combined with AI technology for border control as a cost-effective method to control illegal crossings. Brain Corporation developed cleaning robots that Walmart plans to use in its supermarket chains, replacing cleaners. Self-driving cars, Drone delivery, the list is endless. Technology's changeability and adaptability mean that it can be fitted into existing infrastructures. Amazon inventory robots can automatically check and refill stock levels of products on shelves, whilst sales robots can communicate with customers to help them find what they are looking for. Intel 360 football viewer, Ford's moving bed, AmazonGo and Trigo automated shops, Playsight automatic live capturing of basketball

matches using AI - all of these are examples of using AI to do the jobs that were originally organised and done through human labour.

Everybody House Games (2017) published a game titled Universal Paperclips (figure 3), where the player slowly develops technology and AI to make paperclips. The purpose of the game is to make as much profit out of making paperclips. At the start of the game, the players can make one paper clip per mouse click and slowly, they can start new research projects to develop and acquire more automation and AI.

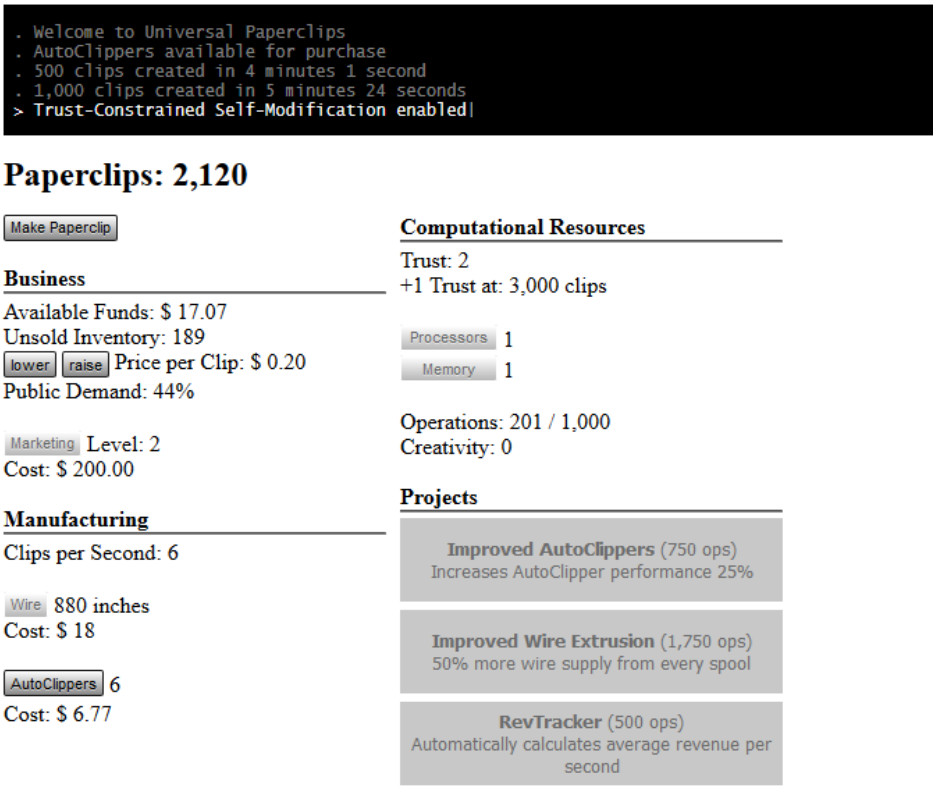


Figure 3: Screenshot from early stages of Universal Paperclips (Everybody House Games, 2017).

As the game progresses, the player's engagement and interaction with the game reduces more and more until the point that all they need to do is, from time to time, click and advance their AI. In 2016 (Reddit, 2016) someone posted a question on an online forum asking whether he needs to tell his employer that they automated their job themselves six years ago and since then, they were not doing any job, and in the total of six years they may have done the equivalent of 50 hours of work (Merchant, 2018; Pardes, 2016).

Varley (1984), in a wonderful short story, describes the suicide of a hacker (Charles Kluge) who programmed a computer application called “goodbye real world” as their suicide note. In order to understand why and how the hacker killed himself, the observer needs to enter the program. The name of the program is a parody of the tutorial Kernighan (1972) wrote to introduce some of the features of B programming language printing “Hello World” onto the computer screen. Since then, the program became the most common beginners’ tutorial for any new computer language developed to this day. The story recounts and brings together pieces of the puzzle of how Kluge got to the point to kill himself. Charles is a person with no real physical record of their existence as he manipulated and created faked database records of everything. This includes purchasing his apartment (a record of money being transferred from his account to the council and a record in the database of money transfer in the council’s bank account), adding his new identity to the national database as a real person, as well as other databases to receive salaries, goods and products, and pay taxes. All of these with no real transaction involved. Kluge hacked all these systems and entered faked information in the new modern web of life managed through numerous computers and databases. Living in a dark room, covered with computer screens, and on the lower floor, Kluge had stacks of psychotic pills and drugs to battle sleeplessness and tiredness. The program first prints out

> *“SOMEWHERE ALONG THE LINE I MISSED SOMETHING. I SIT* HERE, NIGHT AND DAY, A SPIDER IN THE CENTER OF A COAXIAL WEB, MASTER OF ALL I SURVEY AND IT IS NOT ENOUGH. THERE MUST *BE MORE.”*

And then the program printed:

> *“DO YOU EVER GET THAT FEELING, VICTOR? YOU HAVE* WORKED ALL YOUR LIFE TO BE THE BEST THERE IS AT WHAT YOU DO, AND ONE DAY YOU WAKE UP TO WONDER WHY YOU ARE DOING IT? THAT IS WHAT HAPPENED TO *ME.”*

What Varley captured in this short story is the new living and working conditions under the light of screens, captured by a web of computers and databases, surveillance technologies and sustained by a range of pills and drugs and various moralising regimes. In order to live and understand the system, one needs to enter the computer program, and once entered, there is no way out. Varley’s portrait of a

modern hacker is what Turkle (2011, pp. 14, 20) describes as the “postmodernist culture of simulation”.

“Move Fast and Break Things” is the development model that Facebook, one of the largest social media services in the world, adopts as their company’s philosophy and code of practice. On the 14th of September 2012, the company reached its new record of having one-seventh of the world’s population registered on their website. Mike Vernal, one of companies lead engineers, said: “We are trying to map out the graph of everything in the world and how it relates to each other. The goal, he says, is to record every book, film, and song a person has ever consumed, then build a spectacular model of other things that person could enjoy.”. Zuckerberg believes that this move is inevitable “at some point” (Vance, 2012). What Vernal portrayed as the company’s near-future aim is a shift from production and expropriation to social reproduction. This includes forming habitats, previsioning, caregiving and interacting that sustain specific forms of social bonds. Socialising young, producing and reproducing shared meaning, affective dispositions, horizons of value, all underpinning social cooperation, including cooperation/domination.

Informating is a new mode of reflexivity through automation that the automated process not only does the job that used to be done by humans, but it also generates new information about various parts of its production and processes. An automated door, whilst it can assist and help people to get in and out of a space, can also apply facial recognition software (figure 4) and capture more information about each individual.

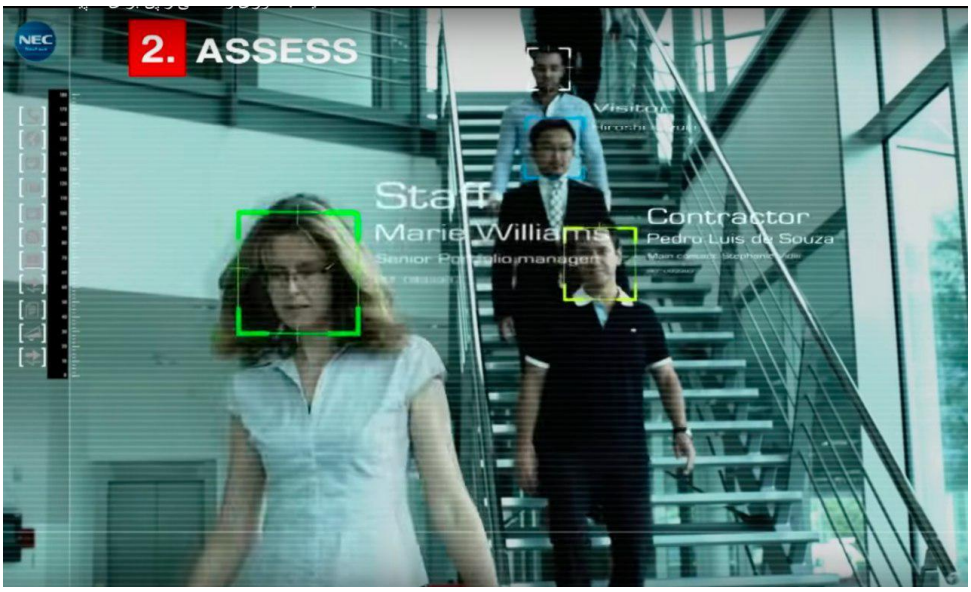


Figure 4: NEC facial recognition software, due to be used at Japan's 2020 Olympic games.

NEC (NEC, 2017), a Japanese technology firm, claims to detect identity using facial recognition by taking hundreds of facial points. The firm states that the technology (NeoFace®) identifies individuals with 99% accuracy. NEC facial recognition software is developed to authorise access to certain parts of the Olympic 2020 locations to a limited list of individuals and revoking access from members of the public for those regions. The technology can distinguish volunteers from athletes and other members. Whilst the software performs its aims and objectives, at the same time, it informates other information networks. For example, the technology can keep a log of which employee or volunteer accessed which site, at what time, what kind of clothing they were wearing, etc. Now this new informating data can continue to turn into raw data for other firms. This information can be used in order to detect the efficiency and availability of staff and contractors on sites. Microsoft recently apologised for their technology feature “productivity score”. The company used email, communication and behavioural data of employees and developed a “productivity score”. This analysis was originally developed to help to identify users interaction level with different parts of Microsoft infrastructure; however it became clear that it can also be used by managers at different organisations to identify employees working habits and was considered as workplace surveillance (Hern, 2020).

Data-brokers are another important actor in these emerging data assemblages. They further extend the use of local data by trading users’ data to other third-parties.

This makes the surveillance and capturing process continue almost indefinitely until all avenues of commercialising this raw data have been exhausted.

Another example to illustrate the informating and monitoring aspect of technology is in the use of navigational software on mobile phones. The applications would provide navigational services to users, informing them about bus times and how to get from one location to another, etc. at the same time, user's data can be used in another algorithm to offer a different service using the same set of information. For instance: NTT DOCOMO, INC developed a live traffic system using a 5G mobile network and location services to offer advanced driving and traffic support for cars, pedestrians and city planners. IBM (Kimberly, 2015) used a similar set of data and offers a geospatial service for Insurance companies to apply geo-fencing on their insurance policies. The telematics service that IBM offers would combine weather data with geo-spatial data and driving information such as average speed, distance travelled, age, and demographics of drivers to offer a customised price per policy. IBM arguably can also use the same data and algorithm to inform corporate managers of late deliveries of their products or unauthorised activity from drivers (for example, if they stop for longer than a certain amount of time at a location) where they can be penalised. The insurers themselves can use this data to dynamically change drivers behaviour by triggering punishments (real-policy real-time rate changes, monetary penalties, engine lock-downs) or prizes (rate discounts, free coffees, discounts on home and personal insurance) (Zuboff, 2016).

So far, I discussed the political economy of surveillance, provided a brief summary of some of the underlying practices that makes large-scale surveillance possible through digital technologies. I also provided a brief overview of the development of knowledge monopolies in parallel with the digital economy. Next, I discuss how different corporate and government actors use data to manipulate individuals.

2.3.3 Subjectivisation 2.0

There are many examples of this in the domain of the internet, such as dynamic pricing; customised search is an example of individual manipulation. Dynamic pricing is an area that the user's data is used to manipulate not only the price of products but also consumer behaviours (see, for example, Hennions (2007) work on the concept of taste and taste communities), needs and desires. Dynamic pricing (Gallego and van Ryzin, 1994) is an automated task that aims to solve the problem of inventories having deadlines for selling all or a specific percentage of their stocks.

This model of pricing is designed to make the most profit for a product or service whilst increasing its market dominance (Vedantam and Penman, 2016). This technique was used for a long time in airlines, hotels and electric utilities, all with limited supplies in order to manage demand. This means when demand is high, the prices will increase automatically and vice versa (Brazil and Kirk, 2016). Due to developments in data collection, advancement in data analysis techniques, the use of dynamic pricing has expanded into many other markets, such as transport (Elmaghraby and Keskinocak, 2003).

Uber is an example of corporate data collection and surveillance with sophisticated dynamic pricing algorithms. Since 2009 the company became one of the largest ride-booking services in the world. Uber revolutionised the transport system into a new digital service taking advantage of mobile devices, the internet of cars and sophisticated satellite and navigational technologies. Uber is active in 85 countries in over 900 cities. The “informating” (Zuboff, 1988, p. 11) quality of Uber’s technologies gives them access to an ever-expanding and detailed database of drivers, passengers and their movements. This is just the basic data that the company captures. In addition to this, analysing and mining historical data exposes many layers and valuable pieces of information. For instance, by mining historical destinations of passengers, Uber is able to identify common destinations of users, the maximum fare they would be willing to pay, and the average amount of time that passengers spent at each destination (if they use Uber for both legs of a journey) to name a few. Having access to all of this information at nearly no cost will result in an unjustified and uncontrolled culture and knowledge/power relationship between service providers and their users. For instance, Uber records the battery status of their passengers' mobile devices, and they have also conducted research that showed costumers are willing to pay more when their phone batteries were low (Mahdawi, 2018). Companies such as Uber also use data they collect from users to break the law and hide from law enforcement officers. For instance, as soon as the Uber app detects that a passenger is a law enforcement officer in countries that Uber does not have legal status for running their services, the app would simulate fake user data and information in order to hide from authorities in those regions (Isaac, 2017).

Carr (2010, chap. 3) portrays a historical analysis of our relationship with tools and technologies and how they form and manipulate the way our brain functions. He

argues that information technologies carry their own code of ethics. This code of ethics is their definition of what knowledge and intelligence are. Common practices and approaches towards customers in information technologies create many challenges and closures, as these tools will not reinforce the needs and rights of users, but rather they are designed to capture information and make the maximum possible profit. This current model of the service economy and behavioural economics, and surveillance capitalism, as Zuboff (2018) calls it, is threatening basic human rights such as our freedom (Galindo and Marco, 2017). Lupton's (2016, chap. 2) notion of lively data in relation to knowing capitalism shows how this mode of knowing is written and coded in the devices and technologies we use.

The Federated search industry is an example of where algorithms scrap information and data from across the internet and offer "cheaper" deals and prices to customers; however, the algorithms are constantly manipulating and coercing the customers to behave in a certain way based on the companies logic of rational behaviours that algorithmic agents present and push to the users.

The formation of knowledge bubbles that can be discussed at both the collective and individual level, management of public discourse and censorship are other examples of manipulation. Gillespie (2018) provides a detailed account of content moderation practices across the internet and shows how all platforms moderate and manage their content. Kelty (2014, p. 198) argues that "After all, these tools engage our individual capacities to think, create, and manipulate the world, and they transform the collective relationships we have with others.". Filter bubbles, echo chamber and selective exposure, are related concepts based on the theory that suggests preferences in what people interact with and what they are exposed to can potentially endanger their rights, freedoms and autonomy as well as reinforcing their views and leaving them unchallenged (Guess et al., 2017). Filter bubbles can form in a number of ways based on age, religion, gender, political views, geographical, personal preferences and many more. Since companies and data brokers collect information about every aspect of our lives, filters and categories can be created depending on the aims and objectives of the bubble makers.

Pariser (2011a, p. 40) offers a detailed account of how filter bubbles developed throughout the internet and provides many examples of behavioural retargeting such as:

> *"Say you check out a pair of running sneakers online but leave the* site without springing for them. If the shoe site you were looking at uses retargeting, their ads—maybe displaying a picture of the exact sneaker you were just considering—will follow you around *the Internet, showing up next to the scores from last night's game* or posts on your favourite blog. And if you finally break down and buy the sneakers? Well, the shoe site can sell that piece of information to BlueKai to auction it off to, say, an athletic apparel *site. Pretty soon you'll be seeing ads all over the Internet for* sweat-*wicking socks.".*

There is media panic about filter bubbles (Grimes, 2017; Hern, 2017; Iyengar, 2019; Shafer and Doherty, 2017) and in the academic context, there is controversy about its issue. For example, the Quelo search project (Dubois and Blank, 2018) conducted a survey of 2000 British individuals and found out that people get their information from a variety of sources, and they suggested the concept of Echo Chamber and filter bubble is more of a myth than a real empirical threat. What they failed to clarify in their research was the fact that the majority of those sources do share their users' data with one another. Pariser (2011b) discussed how Facebook algorithms suddenly removed feeds from his Facebook page based on other users' political alliance with him, resulting in posts from people in his social media network with conservative political views to disappear from his feeds. Simon and Swartz (2012) Image Atlas (Figure 5) shows search biases of different countries by providing an interface to search for keywords on Google in different countries. For example, I used their critical software design work to search for the keyword "Iran". Their project shows different results google returns depending on the geographical location and nation-states the searches were queried from. Another example is the Chinese national policy that states, companies must agree to the Chinese government's rule of self-censoring information that the Chinese government finds inappropriate. For instance, currently, the 1989 events of massacres in Tiananmen Square in China is censored and not presented as part of the search results for Yahoo, Google and Bing (Microsoft) search engines (Dann and Haddow, 2008).

Figure 5: shows different results based on local searches in those countries.

2.3.4 Technological governance of the collective

Cambridge Analytica is an example of collective manipulation, where the company was engaged in psychographic targeting of individuals in political campaigns. The company branded itself as a global election management company. Their operations were initially in developing countries and later expanded into western territories. They worked on over 40 political races in America, managed Ted Cruz 2015 and Donald Trump 2016 elections, as well as the British Leave campaign in the 2016 EU referendum (Davies, 2015; Vogel and Parti, 2015). The work of the company was based on a prediction model that Kosinski (2013) developed, suggesting that they could predict many personal traits of an individual by analysing their easily accessible digital records. The company extracted and used nearly 90 million Facebook users' data. The chief executive of the company states that "…we model the personality of every adult across the United States, some 230 million people." (Cheshire, 2016).

In May 2018, Cambridge Analytica started the insolvency process claiming that the bad reputation and media outcry has resulted in the drainage of the majority of the company's income and customers. The company stated the following, post its insolvency "Cambridge Analytica has been the subject of numerous unfounded

accusations and, despite the Company's efforts to correct the record, has been vilified for activities that are not only legal but also widely accepted as a standard component of online advertising in both the political and commercial arenas" (Cambridge Analytica, 2018). Whilst the claims against Cambridge Analytica and the effectiveness of their psychographic targeting campaigns remains a controversial matter (Baldwin-Philippi, 2017), the field is an ever-growing domain with innovations and tools being developed at a very high pace. Hence, it is crucial to further research and develop methods to resist as well as identify and analyse these techniques.

One of the most obvious and highly controversial practices of collective manipulation is the Chinese Social Credit System (SCS). SCS developed through a collaboration between the Chinese government, Tencent, Baidu and Alibaba. Baidu is the Chinese equivalent of what Google does, Tencent provides one of the most widely used communication technologies (Wechat) in China and Alibaba is one of the largest e-commerce businesses in the country. The three together cover a large portion of financial, personal and community activities across China. By 2015, Tencent alone developed models to quantify the creditworthiness of 50m individuals using data from their users' social media and gaming activities (Chen and Cheung, 2017). So far, several students were barred from attending schools due to the credit rating of their parents (Song, 2018), SCS is not only used by both government and some businesses since January 2018, but new legislation by the government also obliges all business to comply with SCS. This would take the model beyond Chinese borders as the majority of mid-large corporations operating internationally have businesses in China. For example, in 2018, the Civil Aviation Administration of China sent a letter to several international airlines requesting to show Taiwan as part of China and not a separate country; they threatened failure to comply with this request will result in disciplinary actions and would affect their airlines Civil Aviation Industry credit management systems (Hoffman, 2018a; Munro, 2018). The Chinese government also used this to coerce individuals to spy on their employers outside. This issue, however, is not unique to the Chinese government; International Credit System is another example of large-scale control mechanisms, but what makes the SCS unique is its extent of use corresponded with the track record of the Chinese government's human rights issues (Hoffman, 2018b).

Advancement in computing and manufacturing of electronic devices has now moved away from personal computers into a new era of pervasive computing. Computation will be "…freely available everywhere, like batteries and power sockets, or oxygen in the air we breathe. It will enter the human world, handling our goals and needs and helping us to do more while doing less". The further reach of IoT, as well as government and corporate data-sharing schemes and the development of behavioural manipulation techniques applied by various actors within digital and physical networks, eventually results in "digital enclosure" (Andrejevic, 2007, p. 297). This involves monitoring and controlling not only certain interactions we have with institutions but also a form of monitoring and controlling that goes beyond the boundaries of institutions.

As discussed earlier, the Internet is a central component of surveillance capitalism. Web 2.0 arguably is the largest mass surveillance infrastructure that existed to this day (Fuchs, 2011). Next, I provide a case study of Web 2.0 and various techniques used to monitor and capture users' activities on the internet.

2.4 The case of Web 2.0 Surveillance and data collection techniques

Algorithms are everywhere, from the front page of news websites to smart-filters used to categorise email, to the music that one streams, to interactive synthetic voices, to how we entertain, find jobs and find answers to our questions and concerns. Any computer-related activity involves storage, transmission and processing of data. In order for any algorithm or computer program to work, they need data. Depending on the task and the data processing power available to various service providers, the more information available to feed to Machine Learning (ML) and Artificial Intelligence (AI) systems, the better and greater their prediction and power becomes. Data collection occurs through a network of surveillance devices and software. Recent developments in the reformation of the information economy and its extending use in every aspect of our lives led to the development of large data sets, commonly referred to as big data. Big data intensifies surveillance mechanisms in information technologies and networks. Big data is the raw material used by all actors engaged in these new forms of value creation and surveillance practices. The practise of collecting this data is surveillance. Surveillance is any concentrated attempt to collect and transmit and process users data for various purposes (Lyon, 2014). In this section, I study Web

2.0 as one of the largest and effective surveillance mechanisms developed to this day.

Web 2.0 is a term that refers to a new range of technologies that are characterised by their ability to collect personal information and behavioural data. Web 2.0 can be considered as the network infrastructure for mass self-surveillance (Fuchs, 2011). The concept of surveillance has always been part of any interactive technology. The rationale for collecting information is that for any given system to interact with its environment, it requires to have some levels of awareness about its environment. A simple example here would be input devices such as mouse/keyboard. An input device is required to collect inputs from users. Operating systems then keep a temporary record of keystrokes and inputs from users in order to notify other software and applications of such events. Once the basic requirements of interactions are satisfied, different services and applications store, transmit and process users' data to further monitor, evaluate and control their activities. For example, Microsoft's Windows 10 automatically sends users keystrokes to the company without users' consent or prior knowledge; however, they provide an interface for users to disable this (Chen, 2017).

In order to understand Web 2.0 surveillance, the first step is to realise its software architecture. Web technologies use a similar architecture of inputs, events and outcomes as the example I provided above. Hypertext Mark-up Language (HTML) is the core standard to publish content on the internet. As a standard, HTML provides a structure for viewing and publishing documents and information on the Internet. In addition, a list of events is available that different web-based applications can use to offer an interactive experience to their users. The events available in HTML are categorised into seven major groups: Window, Form, Keyboard, Mouse, Drag, Clipboard and Media events. Window events provide access to a very broad range of events, such as when loading of a webpage is completed, when the user resizes a webpage, or whether the user is connected to the internet. It is obvious that if a service provider or an application collects data for a long period of time, they can extract new knowledge or information about their users. For example, by capturing the time it takes to load a website over a long period, the websites can identify the internet speed of their users.

Form events are designed to capture the interactions of the users. They notify the website provider or browser of any inputs from the user, for instance, if the user

moved their focus (mouse inputs) into specific parts of the page. Keyboard, mouse and touch (mobile devices) events capture user inputs from the keys press and releases to detailed movements of the mouse. Drag events are part of mouse events; however, due to their use, they have their own category, as this would also include mobile devices. Clipboard events occur when a user copies, cuts or pastes information. Finally, media events provide a detailed list of interactions that can occur when a user views media files such as images, videos and audio files. This includes whether the video is still being played, sound volume changes, users, moving the cue of video backwards or forward (The World Wide Web Consortium, 2019).

Even if the users are aware of these data captures, they may not realise various processes that take place behind the scenes to interpret and extract values to this surplus data. Web analysis tools such as google analytics can simply present some of the potentials of this surplus data—for instance, the categorisation of users based on the amount of time and level of their engagement. Highlighting areas and sections in each website that the user spent more time on, the speed of scrolling through the content (economy of attention), whether they moved away from a page and went back to it, and events capturing users copying any parts of websites' content.

In addition to the above, HTML new standards also provide access to users' location, camera, microphone and other available input devices. Further data such as time of the day, the type of device and browser the user used is also captured as part of the data collection process in order to enrich and develop a better picture of a user's psychographic modelling and their activities. A simple analysis of this data over time can tell a company the number of devices that each user has and the locations that they use each device. Further, this analysis is used to group users based on various categories such as their gender, interests, age, which google retains through aggregation and data capture from their other services.

Javascript provides a scripting language to make different elements of webpages intractable. This also allows companies to capture more information about the user's browser type and some hardware information. All of the events listed above are also used for spy and hacking purposes. One of the common spy and hacking techniques are malware/weaponised surveillance malware. Governments, Hackers and corporations use digital spying techniques in order to intercept communication

and steal sensitive information. Manufacturing and developing surveillance tools is also a very lucrative business, and therefore it often brings even more, corporate and government alliance. This means not only they share some of the data they gather with one other, but corporations and governments also collaborate and fund the development of more surveillance technologies.

There is a large body of leaked documents available via WikiLeaks containing software source codes, documentation and reports from the United States National Security Agency (NSA) on their projects and operations. “Pegasus”, a weaponised malware developed by Israeli company “NSO group”, is an obvious example here. The malware in 2019 had over one hundred cases of abuse, targeting journalists, academics and activists in over 45 countries (Deibert, 2018). The malware installs itself usually through users click on an infected link on some websites giving access to phones microphone, camera and contents. (Kenyon, 2019; Scott-Railton et al., 2019).

2.4.1 Cookies as information leeches

Cookies are small pieces of computer code that the majority of websites use. The initial use of cookies was to record users’ preferences, such as what font they prefer on each website, customised filters or landing pages, as well as remembering whether the user has already logged in to a website. As the advertising techniques advanced, so did the use of cookies. The majority of websites currently use cookies not only to capture and to record data on users’ interaction with their websites but also monitor their activity throughout their whole internet browsing activities. For instance, I recorded the number of cookies installed on my internet browser through the course of one day and after visiting about 50 websites, these visits installed over 800 cookies (See figure 6) on my computer’s Firefox internet browser. Some of these were from companies that I have never heard of nor visited their webpages. One example that I looked at was three cookies installed on my internet browser by a German targeting/advertising firm called Ligadx. I have never visited or known Ligadx before. It is very complex and difficult to find out why and how and which website provided access to and permission to Ligadx to monitor me. This information is unknown unless one monitors each website individually to find out about their cookie activities. Even then, it is hard to know what kind of information and to what extent each cookie is capturing information about users’ web activities.

Figure 6: Shows the log page of Firefox Browser Extension "Cookie Auto Delete". The extension deleted 828 Cookies from my Internet browser after one day of browsing the internet, visiting around 50 websites in total.

In 2016, the European Union introduced important legislation called General Data Protection Regulation (GDPR), which provided a framework for lawful capturing and processing of users' information. GDPR requires companies to be more transparent and ask their users for consent to capture their data and to provide details about other companies with whom they share users' data. Whilst this regulation does not solve the privacy issues on the internet, it provides some possibilities for transparency. This helps a marginal and very limited number of users to have some understanding of the scope of data collection. For instance, Yahoo's cookie policy (Figure 7) includes a list of 145 partners that Yahoo share parts of their users' data (Yahoo, 2019). Another example of data sharing is PayPal, which has access to purchase lists, credit ratings, account credit and a debit balance of its users. PayPal

shares its users' data with over six hundred companies (PayPal, 2019).

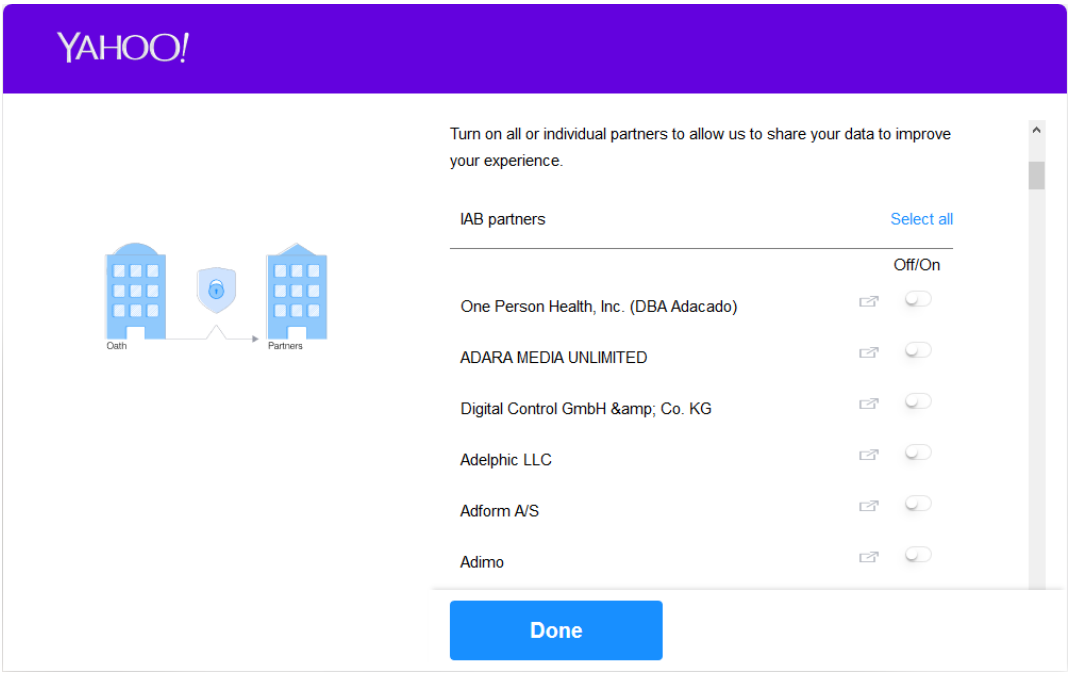


Figure 7: Screen capture from Yahoo's Partner's list they provide in order to comply with GDPR

The Daily Mail, a heavily advertised news organisation cookie policy, states that they share their users' data with 1238 advertising partners (The Daily Mail, 2012). There is also an additional list of direct partners, which consists of 7 companies that The Daily Mail share more of their users' data with; these partners are: Amazon A9, AppNexus, Facebook Advertising Network, Google Doubleclick for publishers, Lotame internet-based advertising, Rubicon and Sortable. As an example: AppNexus is a multinational online advertising company that offers instant advertising to publishers.

> *"Part of AppNexus's pitch is computing power: an advertiser has to* receive an ad impression, analyze it, decide what to bid on it, and decide automatically what ad to show in less than a quarter of a second to avoid slowing down the page-load time. It also lets companies funnel what they know about a Web user into the ads they show that person. eBay, for instance, has files of information *on its customers: what they've bought, what they've searched for,* where they live. Previously eBay had to buy a block of ads from a network or exchange, and when someone it recognized showed up, they could partially customize the ad. Now, customers are offered one by one, and eBay — *using AppNexus's automated* system — *only bids on the ones it thinks are worthwhile."* (Clifford, 2010).

One might argue that there is no danger in targeted, personalised advertising; however, the danger comes when the user is not aware which part of their interactions and searches are advertisements that are coercing and manipulating them (advertising bubble) as opposed to what they initially were searching for. Mager (2012) shows how search engines such as Google turns individual needs for information into a consumer desire through an amalgamation of promoted content, targeted advertisement and algorithmic biases, which are engraved on the company's capitalist business model. Van Couvering (2008) showed how the search technology began with several competitors in the market and slowly moved towards three major corporations dominating the search industry (bubble monopolisation).

2.4.2 Surveillance embedded in content

Content surveillance is a technique that some advertising firms use to collect information about users' online activities across the internet by storing local copies of media contents on their servers. For instance, Google AMP is a service that Google provides to internet websites allowing companies to store their large media files on Google servers. This can substantially improve the loading time and efficiency of websites; however, it would also give Google access to a detailed browsing activity of each company's internet users. When a user visits a website, often some part of the content of the page come from Google servers. This provides even richer data than what ISPs can record on their users' activities as techniques such as HTTPS encryption stops ISPs from seeing the contents that the user is viewing on each website, however, through the AMP service, Google can record what websites and which pages of that resource the user visited.(Zimmer, 2019)

2.4.3 Surveillance embedded in tools

Tools such as Google Analytics provide statistical analysis such as gender-based categorisation of website visitors, country and users' location, interests and browsing behaviours, information about how long they spend on each webpage, the possibility of visitors returning to a specific website and many more. Many developers and internet users take advantage of a range of programming, data analysis and browser extensions and APIs in order to access as well as implement the services they provide. Access to these third-party tools also results in the further collection of data about their users indirectly by third-party companies.

2.3.4 Surveillance of communications

Apart from governments, communication service providers such as Microsoft & Google also process and analyse contents and attachments of emails, online collaborative documents and generally any user's interactions through their services. As part of the registration process for many of these tools, companies such as Google require individuals to provide a range of personal information in order to grant access to their services.

The list below is extracted from Google privacy policy and shows the data that they process from their users.

> **Activities:** Emails that you send and receive on Gmail, Contacts that you add, Calendar events, photos and videos that you upload, Docs, Sheets and Slides on Drive*", **Personal Information "***Name, Email address and password, Date of birth, Gender, Telephone n*umber, Country"* (Google, 2019).

The categories above provided a brief but accurate list of official data collection techniques used by various corporations. Aggregation is the process of enriching existing databases of users' data by sharing and collecting more data. Some of the aggregated data is available publicly, and data brokers collect these through the use of various techniques such as web crawlers (Risvik and Michelsen, 2002). In addition, some of the data is collected and shared through agreements between corporations and governments or between corporations (Dance et al., 2018).

2.4.5 Data brokerage and commodification of subjects

Another crucial part of data enrichment, which takes surveillance to its next level, is data aggregation. Data aggregation is the process of combining, mining and sharing large quantities of users' data between corporations and from publicly available data sources (Warner, 2004). In addition to this, new legislation and laws also gave arguably unrestricted access to governments to use these databases. There are many examples of this type of data brokerage in numerous domains of use. The development of the Internet of things is also another substantial contributor giving this field even more detailed and sophisticated access to users' activities at their home and personal spaces. In order to emphasise and show the extent and level of personal data spillage and sharing between companies, I used Firefox Lightbeam (Mozilla, 2018) to capture my surveillance network at two intervals. First, I used the list of ten of the most popular websites on the internet, according to Alexa's

(Amazon Lab126, 2019) list of top ten websites on the internet. Figure 8 shows the first visualisation of the data aggregation of my personal data.

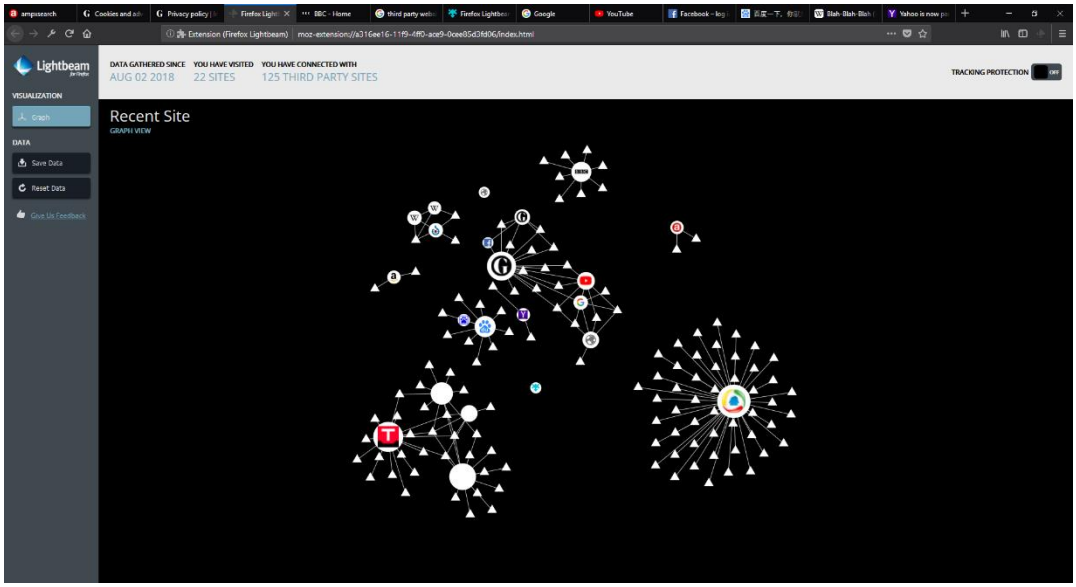


Figure 8: Screen capture of Lightbeam on my Internet browser showing third party connections from the ten most popular websites

I then continued to browse the internet throughout the day. Figure 9 shows a normal day of browsing when I visited 85 websites. What began to emerge here is a connected network of advertisers. It is important to remember that Firefox Lightbeam does not show a detailed list of third parties as some of these companies store users' data and then share them via their own Application Programming Interfaces.

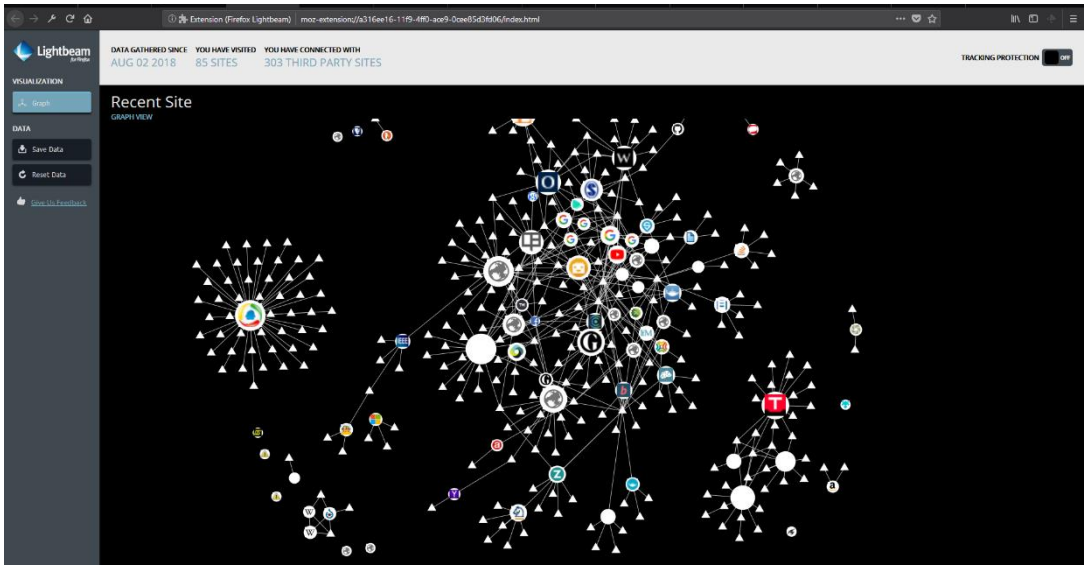
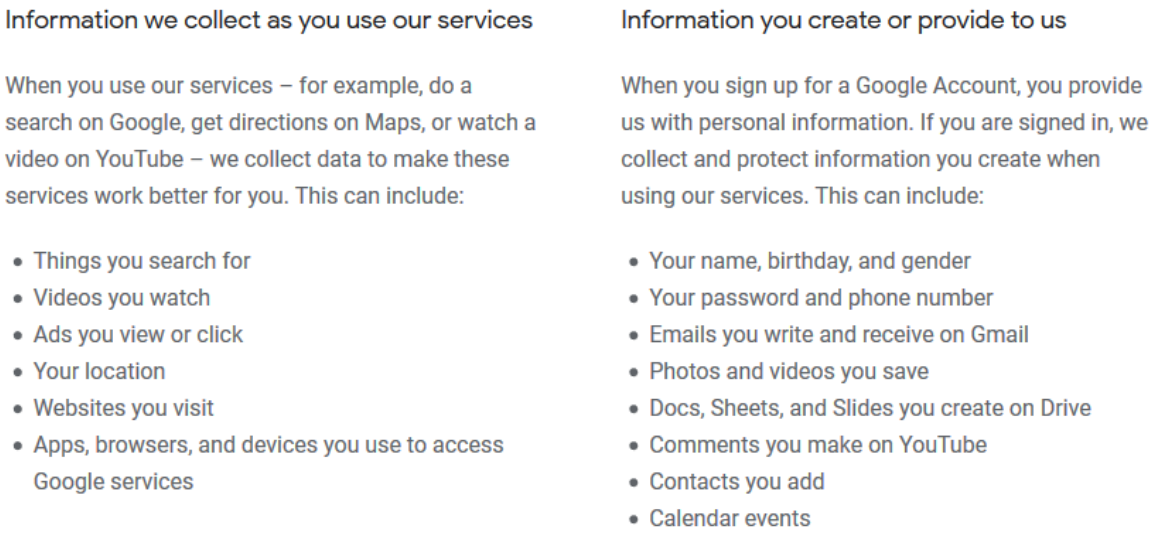


Figure 9: Screen capture from Lightbeam showing network of third parties after a day of using the internet

Guardian's privacy policy on advertisements states, "As you browse our site, some of the cookies and similar technology we place on your device are for advertising, so we can understand what sort of pages you read and are interested in…" (The Guardian, 2018). Google's privacy policy is also an interesting list showing how much data and what kinds of information the company captures from its users' online interactions (Google, 2019). Figure 10 shows the list of information that Google stores from its users' interactions with their services.



Information we collect as you use our services

When you use our services – for example, do a search on Google, get directions on Maps, or watch a video on YouTube – we collect data to make these services work better for you. This can include:

- Things you search for
- Videos you watch
- Ads you view or click
- Your location
- Websites you visit
- Apps, browsers, and devices you use to access Google services

Information you create or provide to us

When you sign up for a Google Account, you provide us with personal information. If you are signed in, we collect and protect information you create when using our services. This can include:

- Your name, birthday, and gender
- Your password and phone number
- Emails you write and receive on Gmail
- Photos and videos you save
- Docs, Sheets, and Slides you create on Drive
- Comments you make on YouTube
- Contacts you add
- Calendar events

Figure 10: Extract from Google's privacy policy shows the extent of data they capture on users online activities

Sometimes companies and corporations sell their services or products to other businesses. For example, Microsoft, on average, purchased six companies per year since the late 80s; in 2018, they purchased GitHub, the largest code repository on the internet (Warren, 2018). The website collects not only source code for a large number of applications and software projects; they also collect working patterns and the contributions of each user to various projects. Through these corporate acquisitions, buyers also gain access to their databases. For example, the Facebook privacy policy states: "If the ownership or control of all or part of our Products or their assets changes, we may transfer your information to the new owner"[9] (Facebook, 2018; Instagram, 2018; Squarespace, 2019).

[9] United States also has an intelligence alliance with Britain, Australia, Canada and New Zealand called The Five Eyes (FVEY) creating the "one of the most complex

In this subsection, I analysed different ways that Web 2.0 technologies monitor and capture users' activities on the internet. In the remainder of this chapter, I situate my critical design works in the literature that I discussed in this chapter.

2.5 How these theories informed my practice

In this chapter, I laid out my journey into the historical and conceptual enablers of surveillance capitalism. Here I quickly summarise the different ways my critical works relate to and engage with various aspects of these theoretical reflections and debates. To avoid repeating myself, I suggest that you take a brief look at the description of my four critical works in (3.2.1) before continuing reading the following reflections.

Zaytoun was my first adventure into the critical design and the fine play between technology, critique and artistic creation. I've come to learn that "Trust In Numbers" (Porter, 1996) is at the centre of how citizens become numb to social realities and also how power is accumulated in the hands of both governments (2.2) and knowledge monopolies (2.3.2). In this project, I tried to bring to the fore the violence hidden in contemporary transactional and commodities attitudes to life. My use of a credit card printer to print a list of the dead when the participants touched the illustration aimed to foreground the fundamental tension between the coldness of numbers and market-based approach to information and the vast human atrocities that they aimed to represent. By simultaneously printing a tweet by the individual from the Gaza strip, I aimed to bring to the fore the paradox of enabling citizens voice through tamed and commoditised social media platforms that could eventually use these tweets to direct advertisements back on to those in the middle of a warzone.

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and far-reaching intelligence and espionage alliances in our history.". The unclassified FVEY treaty states the following: "the parties agree to the exchange of the products of the following operations relating to foreign communications: collection of traffic, acquisition of communication documents and equipment, traffic analysis, cryptanalysis, decryption and translation, acquisition of information regarding communication organisations, practices, procedures, and equipment'. This shows the initial scope of the treaty and its ambitions" (Tossini, 2017).

Philodox, as my second major critical work, shifted my critical attention to the central role of search engines in governing users' knowledge ecosystems. I came to realise the central role these technologies play in entrenching individual beliefs and tendencies and in shaping citizen subjectivities in unprecedented ways. While developing Philodox as an absurd/satirical search engine, I decided to take this critique further both in terms of its rhetoric, scope and mode of critical engagements, which led to the development of Open Bubble. In this project, not only I attempted to bring users attention to the knowledge bubbles they live in, but I also attempted to obfuscate knowledge/search monopolies that maintain and profiteer from our knowledge bubbles. Both of these critical works are exercises in making debatable but also disrupting user processes central to surveillance capitalism and Web 2.0 technologies.

Chapter 3. Methodology

3.1 Introduction

This chapter contextualises my practice within the tradition of critical design. As a critical software designer, my practice sits somewhere between critical design and programming. Four selected works that I developed as part of this investigation are fully discussed in the next chapter, namely: Zaytoun, Philodox, Maladox and Open Bubble. However, a brief summary of each work is provided in this chapter (3.2.1) in order to contextualise them and discuss the methods that I mobilised.

I start the chapter with a discussion of some of the challenges that relate to the simultaneous emergence of design and software design fields. In addition, I elaborate on the tensions between industrial design or capitalist mode of production and critical design (3.1.1). Following this, I discuss the relationship between theory and practice in this investigation. Next, I present a broad overview of different trends in critical design practice relevant to my works and discuss the overall aims of each approach, i.e. speculative design, critical design and associative design, Net art, search engine art and some examples from the works of critical engineers. All of these are discussed as subfields of critical design discipline (3.3.2). Critical design discipline can be characterised as comprising three sub-disciplines based how they use satire, their approach to object rationality and the type of narrative they deploy. These sub-disciplines are associative, speculative and critical design. Through this characterisation, I provide some common methods that critical designers use in their work and examine some related critical design and critical software design works (3.2.3). Three of the works that I developed in this investigation were collaborative and this is explained next (3.4).

3.1.1 Liberating the design discipline

Design is rooted somewhere between culture and capital. Since its inception as a discipline going back to industrial products it has been heavily integrated into the capitalist mode of production. Many scientific domains overlooked design as a field of study and its role was primarily considered for decorative purposes rather than engaging with design as a discipline and field of research. This was partly due to the complex and multi-faceted new challenges that design faced, but also the effect of science and technology that were demanding more predictability and collaborative approaches from designers and design. In a broader sense, this lack of engagement with design resulted in many fields of research not benefiting from the holistic

approach and perspectives that designers can bring into research. (Zimmerman et al., 2007).

Zimmerman et al's conception of design researcher and design discipline is skewed by existing conflicts between the positivist and phenomenological approaches to design (Rittel, 1973). Zimmerman argued that the design researcher's role is "making the right thing" and the design practitioner's role is making "commercially successful things" (Zimmerman et al., 2007, p. 499). My approach here is more aligned with Gaver (2012), where research through design is a generative process using design disciplines to produce theories that are provisional, contingent, and aspirational. The aim is to be exploring and speculating, particularising and diversifying fields of study. "Design research is tied to a domain that derives its creative energy from the ambiguities of an intuitive understanding of phenomena". A practice that is rooted in "intuition, inspired guesswork, and holistic thinking" (Swann, 2002, p. 51). The reflective notion of design not only can deal with a variety of known variables in a research but, it can also reveal other unknowns (Schön, 2017). This means works of critical designers should not only help the participants to understand the issues at hand, but also engage them in ways that can turn those understandings into actions and responses (Ingold, 2013, p.7). "the art of enquiry embodies the myriad choices made by their designers with a definiteness and level of detail that would be difficult or impossible to attain in a written (or diagrammatic) account." (Gaver, 2012, p. 944).

Research through design should function as an antidote to design and technological logic that requires design to produce solutions to problems: antidotes that can function as manifestos that illustrate practice for future work (Gaver, 2009). The role of designer in this regard is to use their imagination and skills to develop artefacts and prototypes that help potential users to see the "possibilities beyond those they already know" (Dunne and Gaver, 1997, p. 362). In this regard, the thesis should not be considered as an explanation of the practice and the practice is not necessarily illustrating the theories explored. Theory and practice are developed in parallel as part of the design process. Figure 11, provides an illustration of the different domains of critical design (B), contrasting them to product design (A). For instance critical design as research through design methodology should attempt to find problems, ask questions and make us think (Gaver, 2012) as opposed to product

design, whose primary aims are to solve problems, provide answers and make us consume/buy (Swann, 2002).

A	B
Affirmative	Critical
Problem solving	Problem finding
Provides answers	Asks questions
Design for production	Design for debate
Design as solution	Design as medium
In the service of industry	In the service of society
Fictional functions	Functional fictions
For how the world is	For how the world could be
Change the world to suit us	Change us to suit the world
Science fiction	Social fiction
Futures	Parallel worlds
The “real” real	The “unreal” real
Narratives of production	Narratives of consumption
Applications	Implications
Fun	Humor
Innovation	Provocation
Concept design	Conceptual design
Consumer	Citizen
Makes us buy	Makes us think
Ergonomics	Rhetoric
User-friendliness	Ethics
Process	Authorship

A/B, Dunne & Raby.

Figure 11: A showing different aspects of industrial design and B referring to critical design (Dunne and Raby, 2013, p. vii)

Computer programming has been a core activity throughout this research. I developed the works described in this thesis using C#, CSS, HTML, Java, JavaScript, PHP, and Python programming and scripting languages. Software design and software engineering blurred the domain of the design tradition and extended it into digital technologies. Such movements from engineering to design of digital artefacts brought traditions of software and design together (Ehn and Malmborg, 1998). Both software design and design carry a baggage of assumptions and statements (Dorst, 2003). As the software industry and the practice became ubiquitous, there grew the need to challenge the rationalised problem solving approach of software designers. This created a challenge for practitioners to establish an independent critical tradition for the design discipline. In software design too this positivist mode of seeing and doing makes it a challenging process for programmers and critical software designers to use code to reflect, rather than as a means to an end or series of algorithms to execute and generate predicted and

logical endpoints. Intensified by these tensions, critical designers generated various movements to claim identity and to engage with various aspects of design artefacts.

Computer programmers, designers and artists created many sub disciplines of critical design to deal with some of the new and emerging challenges of software and digital artefacts. Most of my training and education apart from this PhD investigation have been in the fields of software design, engineering and computer science. Hence my critical practice resonates primarily with the subfields of critical design that use code as their material for critical practice. Netart, software art, critical software design, and search engine art are all examples of such practices that I discuss further in this chapter (3.2.2).

I developed my critical design works in a gradual process where practice was informed by literature review and vice versa. For example, my readings on technological determinism and critical theory through the course of this investigation helped me to move away from creating negativistic projects that foreground the dystopic potentialities and actualities of technology. These reflections and movements between different modes of critique were also developed gradually through the works I produced (This is further discussed in Chapter 4). In order to bring the “knowing in action” into the domain of software design, a combination of critical design and reflective practice methods are used in the development of the work which are discussed later in this chapter (3.3). The reflexive element was instrumental in the analysis of the critical software works as well as developing my own practice that, over the course of this investigation, moved from a positivist approach to a phenomenological position.

3.2 Relationship between theory and practice

The relationship between theory and practice and their formalisation in the thesis is complex and not easily expressed. This tension between theory and practice is not unique to this investigation and has been a subject of much scrutiny since Aristotle’s time, if not before. Often in academic thinking, explicit knowledge and implicit knowledge dominate the practical knowledge (Kessels and Korthagen, 1996). As a result, theories and dominant modes of academic thinking often settle and close the space for deliberation and creative action. On the other hand, practice can create the structure for practical actions. Through practice “Knowledge is transfigured from potestas - the ‘authority of knowledge’ - to potentias the potentiality of knowledge(s) in the poetic.” (Rosenberg, 2007, p. 7).

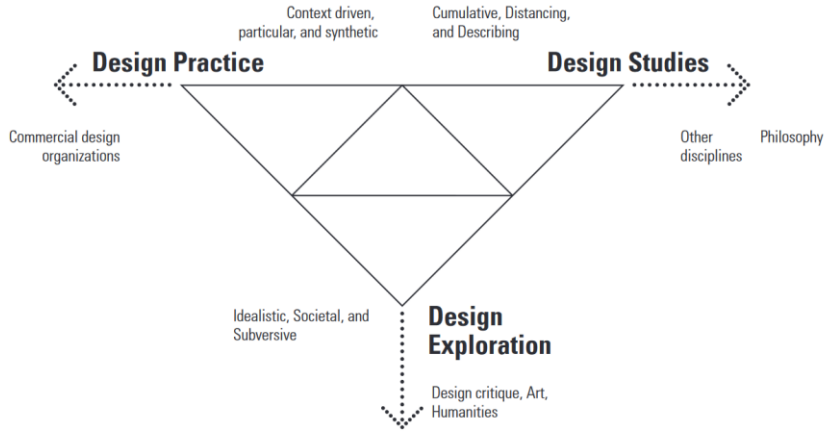


Figure 12: Model of interaction design research (Fallman, 2008, p. 5)

Design research can be categorised in three trajectories as presented in Figure 17. In this model, design practice often deals with issues that the designers engage with within the industry. In this regard, the designer's role is part of a design team engaged with a particular problem. This mode of research and production is common in product design/industrial design. Design studies is similar to traditional academic fields and attempts to produce knowledge around design theories, methodologies, history and philosophy. However, design exploration is different in its aims and approach and is often part of a design practice or study. Design exploration is more like a statement about possible/desirable/alternative outcomes of a designed artefact. The aim here is to "provoke, criticise, and experiment to reveal alternatives to the expected and traditional, to transcend accepted paradigms, to bring matters to a head, and to be proactive and societal in its expression." (Fallman, 2008, p. 8). Whilst this triangular approach provides some clarity on the design process depending on the aims and objectives of the designer, the process of design is always a combination of all three trajectories. Even though the majority of critical design works that I produced are more aligned with design exploration, I will further discuss how in each of the works I had to be careful and aware of how the work is going to be situated (design practice) as well as critically analyse and reflect on my design processes (design studies).

In this investigation, my aim was to understand why modern surveillance and knowledge management techniques developed in their current form (theory). In addition, to develop alternative ways to challenge, reveal and disrupt them

(practice). The problem space of this thesis was complex and required drawing from several theoretical fields. My first research question (RQ1) was to understand the role that modern governance and science and technology played in the development of surveillance economies and knowledge monopolies. As shown in previous chapter: Liberal governmentality along with unquestioned belief in science and technology were key contributors to these developments (2.2). They provided the systems and platforms, infrastructures and cultures susceptible to surveillance and knowledge practices in their current form today (2.3). Central to these transformations were science and technology. They were the primary force for change culturally through technological deterministic beliefs and reinforced by governments deregulation and market support. They were also the dominant media for knowledge production and dissemination.

At the practical level in my practice, I mobilised some of these findings aiming to disrupt, reveal and challenge internet surveillance and personalised knowledge bubbles. On a broader sense in my practice, I attempted to question our relationship with technology through a series of critical design works. I will later describe how critical design works: Philodox , Maladox, Zaytoun and Open Bubble do not simply 'respond to' or 'represent' the literature of surveillance and power/knowledge relations, but rather act as part of that history. These critical design works aim to leverage the design objects as a discourse in order to stimulate users imagination and foster alternative understanding and reconfiguring of their relationships with the technologies that we use and interact with every day (Dunne, 2008). Research through art and design is research "where the thinking is, so to speak, embodied in the artefact" (Frayling, 1994, p. 5). The written thesis therefore is a complement to the knowledge situated in the artefacts produced.

Next, I provide a brief summary of the works that I produced.

3.2.1 Brief overview of my critical design works

Here I provide a brief summary of four critical design works that were developed as part of this investigation. The focus of all my critical projects was on internet surveillance and personalised knowledge bubbles. More broadly, my aim was to challenge individuals' perceptions of and common beliefs in science and technology.

Zaytoun is an interactive illustration that attempts to provoke and challenge the viewers to reconsider their relationships with data and information consumption,

algorithmic biases, and their relationship to human made disasters. In this collaborative work, we developed a novel technique to make an illustration interactive using conductive ink. The illustration showed Palestinian families beside an olive tree (symbol of peace and their relationship to their lands in Palestine). The frame of the illustration contained two small thermal printers that would print a counter with names of people who died in the four week massacre of Palestinians in the Gaza strip in 2014 anytime a user should touch the picture.

Philodox is a fake search engine similar to mainstream search engines. In this work instead of returning results relevant to users' queries, the application would prompt the user with a message similar to search engines stating that what they queried for is not what they meant and instead it would return satirical texts that Robert Powell and I collaboratively wrote. There was no connection between the results and user queries; however, the satirical text created an ambiguity in information. The aim here was to challenge users existing trust in online platforms (technochauvinism) and to reconsider the role search engines play in providing them with information. In order to add more emphasis to our criticisms of personalised information bubbles, we also made a fake video as founders of the engine discussing our visions for future of search.

Maladox is a satirical work that expands the notion of disease by inviting the user to explore many futuristic diseases using an anatomical graphical user interface. We developed the text for each disease using humour, satire and grotesque to create an open space for users to deliberate and think about their relationships with technology. As for the name of each disease, we followed different conventions such as the World Health Organisation best practices for disease naming in order to create ambiguity between real diseases and our speculative diseases.

Open Bubble is a browser extension that mimics users' internet surfing patterns. The extension uses the first tab of each user's browser and looks at topics often not related to the interests of the user. This work attempts to both obfuscates users data online and also make them to think about surveillance and their knowledge bubbles. This was done by making the activities of the extension visible to the user using the first tab of their internet browser.

3.3 What are the common approaches in critical design practice?

Digital artefacts and the material world are not separated, but entangled in a flow of intentions, actions and processes with the division between them often blurred. Similarly, I believe that the roles of design researchers, practitioners, individuals who interact and use design artefacts and algorithms are also not separated from each other. Rather they act and react in a fluid field of forces that are in a constant process of territorialisation and re-territorialisation (Deleuze and Guattari, 2013; Dourish, 2016). The material and immaterial tensions and debates in design are beyond the scope of this thesis. However here I would argue that regardless of the positions designers might take in this regard, the challenge for designers remains that of grasping how design artefacts interact and communicate with the world regardless of their material forms (digital/physical/virtual). Therefore, I avoid such categorisation and materialisations, as these jurisdictions are only possible at the cost of narrowing our understanding of the "digital" as opposed to seeing these im/materialities as transformations of one material to another (Blanchette, 2011; Kenneth J. and Zhu, 2008; MacKenzie and Wajcman, 1999). Instead, my focus here would be to provide an overview of critical design discipline regardless of the material concerns.

In the next subsection, I provide a definition of critical design and discuss its overall aims.

3.3.1 What is critical design?

Critical design is a research through design methodology that foregrounds the ethics of design practice, reveals potentially hidden agendas and values, and explores alternative design values. (Bardzell and Bardzell, 2013). In the broadest sense, the term refers to a form of design that aims to make consumers think more critically about their lives.

> *"Critical Design uses speculative design proposals to challenge narrow* assumptions, preconceptions and givens about the role products play in everyday life. It is more of an attitude than anything else, a position rather than a method. There are many people doing this who have never heard of the term critical design and who have their own way of describing what they do. Naming it Critical Design is simply a useful way of making this activity more visible and subject to discussion and debate.*"*(Dunne and Raby, 2021)

Critical design aims to challenge and disrupt contemporary modes of product design practice that are usually qualified through market and commercial logics and values (Mazé and Redström, 2007). These qualities are hidden values, assumptions and ideologies product designers passively or actively embody in the design objects (Thackara, 1988). Critical design aims to help individuals to reflect, reconfigure and question their existing relationships with design objects.

A similar critical practice to critical design is Net art. It was initiated in the 90s as a critical movement to challenge common understanding and use of the internet and its various tools as well as the role of users and the structured and controlled pathways in which users can look and interact with computers through interfaces. One of the aims of Net art was to break and challenge the spectator's view by showing them broken down or different interfaces to initiate different readings of the internet and its technologies. The aesthetic of failures through misdirection, crashes and glitches are a central part of this category of critical works (White, 2002). Crary (1984) suggests that this mode of failure can help to increase our awareness of our interactions with technology and further challenge some of our underlying assumptions.

Net art or art on the net (internet) is a form of critical art where artists through collaboration, formalism, interactivity and reflexivity generate an open space for critique and interpretation of our interactions with internet-based technologies. Even though the Internet is the primary focus of net art they also engage with broader issues of art and art practice due to their mode of delivery which is usually online. It can be argued that each is intent on studying their disciplines from within. This means that net arts not only criticise and challenge common beliefs and understandings of the internet, but they also problematise the art structures. Gallery Space and mode of display are two key attributes that often guide the spectators' interaction and understanding. However, these are skewed in net art due to their mode of online delivery. This also creates an opportunity for artists and critical designers to engage in developing new lines of enquiry within their work through display strategies. Since the focus of this investigation is not net art itself, discussions on commodification of net art, its relation to traditional art will not be discussed further in this thesis. I will however discuss the way I used different strategies in each of my critical works based on their exhibition locations and their audiences.

Tensions between product and critical design, as well as different modes of critiques within the discipline, has led many critical practitioners to avoid using the term critical design to describe their work (Pullin, 2010). This resulted in the emergence of many movements and sub-disciplines under critical design. Other collectives and similar movements to Net art that are relevant to my practice are search engine art, critical software art, interface art and works of critical engineers. What brings all of these critical movements together is their critical medium, which is in the majority of cases arguably computer code and software. As mentioned earlier, here I will not provide a history of all these subfields as they share all share similar aims with critical design as well as mobilising similar techniques to challenge and question our existing relationships with design artefacts.

Critical design synthesises theories from political science, anthropology, sociology, history, economics and philosophy into new notions are made tangible through critical design artefacts (Dunne, 2018). One of the challenges in design work is that "design research is tied to a domain that derives its creative energy from the ambiguities and intuitive understanding of phenomena. …the traditional root of intuition, inspired guesswork, and holistic thinking should not be lost…" (Swann, 2002, p. 51). One of the challenges of critical design in this regard is the domination of a dystopian and technologically deterministic approach in the practice. This brings forward the important question, which is: why, despite many hacks, whistle blowing attempts, media panics over behavioural manipulations and privacy breaches of internet users were none of them successful in changing the course of internet, surveillance and control that we experience today? "The future becomes a threat when the collective imagination becomes incapable of seeing alternatives to trends leading to devastation, increased poverty and violence" (Berardi, 2011, p. 59). The techno-sadness of critical design is a never-ending process. So "instead of pathetic, empty gestures, we should exercise a new tactic of silence, directing the freed energy and resources toward creating temporary spaces of reflection." (Lovink, 2019, p. 2). My aim in this investigation was to create these spaces of individual and collective reflections. I attempted to avoid technological determinism and negativistic and hopeless critique of science and technology, but rather use humour, obfuscation and grotesque not to guide or prescribe, but rather to generate a critical space for reflections and openings.

3.2.2 What are the common critical design strategies?

In this section, I first provide a brief taxonomy of critical design and common strategies used by critical designers in each of these sub-disciplines of critical design. After this, I offer examples of critical practice that resonate with my work. These examples come from different sub-disciplines of critical design discipline including critical software design, search engine art, net art, critical engineers' works and finally critical design works. As mentioned earlier I avoid separating these fields and instead focus on the methods used in the works exemplified in this section. What brings all these critical fields together is the shared aim to reveal hidden values and challenge our understanding of everyday objects. I believe this ambition is central to the critical design discipline. Moreover, in the broader sense one of the key components of critical design is obfuscation and subversion of dominant power/knowledge regimes.

Critical design practice can be characterised into three modes of critical practice based on their "Uses of Satire, Form of Narrative, and Object Rationality" (Malpass, 2012, p. 180). These are associative design, speculative design and critical design. These practices are uniform in their aim to move away from product design in order to use the design medium as a critical language to investigate societal, technological and disciplinary boundaries. Here I provide a brief summary of each of these subfields of critical design discipline and mention some of their key features. Following this, I provide more detail of each method along with some examples.

Associative design attempts to subvert our expectations of everyday objects. The aim here is to challenge common understanding, traditions and values embedded in the objects of their inquiry and their environment. Associative designers mobilise the users' familiarity with everyday objects and subvert either their context, conventions or the object itself. Associative designers aim to generate paradoxes and use design objects as a critical medium for cultural reflection (Naylor and Ball, 2005). This notion of "selective contradiction" offers a space and opportunity that critical practitioners can leverage to reveal issues and concerns with technology that are complex to explain (Naylor and Ball, 2005, p. 56). These paradoxes and contradictions would allow participants to make their own interpretations of design objects (Malpass, 2017). Common strategies used in this mode of critique are subversion and Horatian satire that I discuss further in this section (3.2.3.2 & 3.2.3.4). My works, Philodox, Zaytoun and Open Bubble can be characterised as

associative design works. In Philodox I subverted a mainstream search engine interface design and used satire to create a critical distance and help the audience challenge some of their unquestioned assumptions and trust in search engines and algorithms behind search. In Zaytoun, I subverted the medium of illustration turning it into an interactive visualisation where participants could touch the artwork to print names of the dead from the human made massacre of Palestinians in the Gaza strip. In other words, I subverted the act of touching and turned it into an act of killing. My purpose was to provoke the users to reconsider the relationship between themselves, data visualisation, data consumption and the role of art and design in relation to human made disasters. Finally, Open Bubble subverts internet browser functionalities, mimicking users behaviour but browsing different topics to those chosen by the user.

Speculative design emerges from bringing contemporary technological and scientific discourses and projecting them into future scenarios. The aim of speculative design is to challenge and question developments in science and technology in a dystopian context in order to offer individuals a problem space for interpretation and renegotiation of their relationship with science and technology. Speculative design provides an opportunity to move away from existing conceptions and relationships with science and technology and present an alternative and challenging view of the future of science and technology as they are transitioning from labs into domestic life (Auger, 2012). Satire again is central to this mode of criticality, however instead of Horatian satire; Juvenalian satire is more common amongst speculative design practitioners. This mode of satire is darker and uses exaggeration, grotesque and obscenity to form their critique of science and technology (Malpass, 2013). Amongst my critical design works, Maladox can be categorised as speculative design.

Critical design does not aim to make dystopian temporal predictions, nor subvert existing relationships, but rather challenge, reflect and reveal some of the present concerns and issues caused by the application of science and technology. Critical design is a technique to present dilemmas in order to convey a message to individuals interacting with design objects. The critical narrative here is developed through either ridiculing the topics or attacking them through the work. In this mode of enquiry, the participants after their interactions with the design objects are left with dilemmas and burden of interpretation. This mode of practice pushed the

audience to consider alternative possibilities for everyday objects (Malpass, 2013). Subversion in critical design is also of central importance. Out of the works I produced, Zaytoun and Open Bubble can also be categorised as critical design work. In Zaytoun, I used commonly used thermal printers that are used in everyday contexts to print transaction invoices to print list of casualties and some narratives and experiences of people during the bombing of Gaza printed from the bottom of the illustration's frame. In Open Bubble, by subverting internet browser functionalities, I used the first tab of users' browser sessions to surf the internet independently of the user but at the same time mimicking their browsing patterns.

Practice	Method	Definition	Type of Satire	Type of ambiguity	Object rationality
Associative Design	Cut up	When one or more objects are cut up or reassembled to exaggerate their properties and give new meaning	Horatian: Burlesque Double-entendre Incongruity Parody	Ambiguity of context	Rational Familiar archetype
	Context transfer	When one object is taken out of context and placed into another			
Speculative Design	Hybridity	One archetype integrated with another archetype. This might take the form of two objects but also practices. For example, technology that exists in a laboratory context is placed in a quotidian setting.	Horatian into Juvenalian: Allegory Anticlimax Distortion Exaggeration Narrative	Ambiguity of Information	
	Technocratic visualisation	By technocracy is a wide-ranging visual system that is legitimised by specific reference to scientific expertise. The science rationalises the proposition.			
Critical Design	Extrinsic narrative	A fictional external narrative is established to situate the object. Questions are raised in the difference between 'reality' and the materiality proposed through the object and its narrative of use.	Juvenalian: Allegory Antithesis Obscenity Violence	Relational ambiguity	Non-rational Unfamiliar archetype

Figure 13 Taxonomic matrix showing different techniques and approaches in critical practices within design (Malpass, 2012, p. 213)

As described earlier the role of critical design is to challenge our understanding of everyday objects. In the case of digital artefacts this becomes a challenge as code and algorithms behind digital artefacts are often trade secrets or difficult to decipher. As a programmer one of the key skills that I developed was reverse engineering. Reverse engineering is a process that almost all designers use in order to

deconstruct and analyse design objects. In the case of software design this is referred to as software engineering. In what follows, I provide an overview of reverse engineering as one of the methods that I used to develop better understanding of surveillance and algorithmic manipulation of information. I then discuss subversion, satire and obfuscation as other methods that I used in my practice.

3.2.2.1 Recovering the tacit knowledge through reverse engineering

One of the challenges in understanding the hidden values and practices behind many technological artefacts is their notion of black-boxing. This is the process of hiding details of a technological artefact from its users. Information system developers often black-box their technologies "…in order to simplify both the difficulties of their work and their relations with customers" (Holmström and Sawyer, 2011, p. 34). In the context of digital surveillance and knowledge monopolies, black-boxing is used as a technique to hide the algorithms, techniques, hidden values and agendas coded in technologies of surveillance from the users. One of the techniques that can counter this notion of black-boxing is reverse engineering. Reverse engineering originates from hardware industries where this tactic was used for "deciphering designs from finished products" (Chikofsky and Cross, 1990, p. 13).

When a designer attempts to decipher computer codes and algorithms from digital technologies this process is called software reverse engineering. Similarly "...Software reverse engineering is process of reconstructing functional and technical specifications of a software system." (Jain et al., 2011, p. 102). Since 2004, I worked as a software engineer within the industry and this aspect of my work equipped me with insights and knowledge about the inner working of computer software and ways to decipher them. This method was central to the development of Open Bubble (6.5) as the work required a deeper understanding of surveillance and knowledge technologies. This method and subsequently the type of knowledge that it equipped me with was also central to my understanding and ability to decipher some of the hidden values and their potentials from surveillance and knowledge technologies. In a critical design work, McGarrigle (2000) detected an unusual visit from a military bot to his website. In response, the artist used reverse engineering techniques and developed a spook bot capable of tracing back the source of the military bot. The spook bot continued to mirror the activities of some of US and UK backed government surveillance programs on the internet.

3.2.2.2 Subversion as a critical design strategy

Subversion is a form of resistance to marginalisation, part of everyday life and also part of human development throughout childhood (Turiel, 2003). Etymologically, sub means "under" and vertere in Latin means "to turn, turn back, be turned; convert, transform, translate; be changed". Within the tradition of design, it is a design strategy used to subvert the design object, their context or their conventions (Malpass, 2013). Through subversion designers challenge the “embedded assumptions of products, making use of conventional disciplinary frames to assert and subvert norms” (Malpass, 2013, p. 338). In the domain of interface subversion, DIVE’s work is influential where the group focuses on the relationship and tensions between free software, free distribution, copyright and patent laws. The collective developed “Reamweaver” (Muraroa et al., 2002) allowing internet users to mirror any websites for critical and activist purposes. This form of critical software challenges the hegemony and monopoly of information and power on the internet (Dreher, 2014). Bill Posters’ and Daniel Howe’s deep fake videos of celebrities is another example of subversion. In their critical work by subverting the use of machine learning and producing fake videos of celebrities they create ambiguities in information and as a result provoked viewer to think about surveillance and also future uses of technology. In this case, the fake video of Facebook’s CEO Mark Zuckerburgh created debate and reflections on Facebook’s use of personal data (Cole and Maiberg, 2019). In Maladox, I also mobilised ambiguity in information and developed some of the viruses with names and details related to computer viruses and human viruses to create some ambiguity in information provoking the users to consider some of the dangers of our relationships with technology in a future scenario with some connections to real viruses. Another relevant example of use of ambiguity in Netart is Source. The work is an empty white digital canvas that generates noise and reveals facts based on interactions and movements of the user on the webpage. In this work, Kahlen investigates the relationship between internet, user activities and facts generation based on their movements on the net (Kahlen, 2017).

An example of subversion of design object can be seen in the works of Negativeland. They are an art collective active since the early 80s who developed critical software, music and hacked computer games to reveal underlying processes and algorithms behind interfaces and video games (Negativeland.com, 2020). The collective recently developed a browser extension that manipulates any website

content including text and images and turn them into an audio visual critical experience that exposes how corporate algorithms use mass surveillance through internet to manipulate individuals (Kelberman, 2020). Another example in this category would be Form. An interactive net art where the artist challenges the controlled interactions and behaviours on the net through standardised modular entities such as textboxes, checkboxes and radio buttons each simulating different forms of controlled interaction. As the user interacts with these input sections on their art work, the page automatically generates more input objects (Shulgin, 1997).

Swartz and Simon (2012; 2012) mobilise subversion in context in their work to reveal and problematise algorithmic biases of search engines. Their work reveals the differences and similarities of image search by only changing the language and faking the location of the user. The work is a good example that shows the knowledge/power relations between corporations, governments and information consumers. In a similar line of enquiry, Sebastian Schmieg (2011) in his image experiments series used an initial image (For example an empty transparent photo or portrait of himself) and recursively searched it on Google search engine. His work shows many complex layers of algorithms adopted by search engines however an issue with their work is that the underlying critiques are primarily only visible to expert eyes.

Dutch artist Constant Dullaart's (2012, 2010) series of work attempted to create an uncanny experience of the google search engine. In "Terms of Service", the artist added animation to Google's simple search textbox. He animated it in a way that it mimics the lips of a female speaker reading out Google's terms of service and commenting on different aspects of it. In "The Revolving Internet" Dullaart added music and continuously rotates a functional Google's search textbox to unsettle our existing trust and familiar experience of a smooth search experience. In my work Philodox, we incorporated a similar technique. I developed a similar interface and functionality to mainstream search engines through this form of subversion attempted to bring the object familiarity into the critical setting. We also subverted the definition of search result. In mainstream search engines, search results are a highly calculated, measured and personalised knowledge bubble. In our search engine, we used a random mechanism the users search queries would result in a randomly selected satirical text that we developed as part of the work. In addition, we adopted a similar language that mainstream search engines uses to guide the

users to query different search terms or ignore their queries and return what the search engine believes the user meant.

Bilal (2007) domestic violence is an exploration into the spectacle of violence and how internet and digital technologies can hide violence. In this work, Bilal subverted the functionality of paintball guns and their use and turned it into a remote-controlled first-person shooter platform where participants can use the gun to shoot him 24/7. In this work, Bilal challenged notions of spectre and how digital technologies and modern weapons distance us from the atrocities and massacres caused by them. In Zaytoun, I developed a similar process. In this work participants act of touch on the interactive illustration would results in names of dead people printed from the lower section of the illustration frame on receipt papers. Provoking the participants to consider their information consumption, their distance and relationship with human made disasters and the role art and technology play in this assemblage.

3.2.2.3 Satire, obscenity, exaggeration & grotesque as a form of critique

Satire is a rhetorical device and mode of criticism that is used in literature and performing arts in which vices, follies, abuses and shortcomings are held up to ridicule, ideally with the intent of improving situations. Satire through wit and laughter creates a playful “critical distortion of the familiar” and draws attention to issues in society and culture. Satire has always been a powerful rhetorical device for political and social criticisms and modes of protest and resistance (Feinberg, 1967, p. 19).

Two types of satire are common within critical design practice i.e. Juvenalian and Horatian satire. Juvenalian satire engages the user through grotesque, violent, and dark humour. This form of satire exists in both critical design and speculative design (Malpass, 2017). Horatian satire on the other hand is usually gentle, light-hearted mild humour. Horatian and Juvenalian satires, named after the Roman satirists Horace and Juvenal, are almost the opposite of each other in terms of their effects. The former is more like a comedy with the latter similar in form to a tragedy (Sanders, 1971 referenced in LaMarre et al., 2014; Kreuz and Roberts, 1993).

Horatian satire does not create a sense of urgency in the audiences as the light humour results in audiences reducing the messages of the satire and dismissing some of the arguments as jokes. This was a great method for my work Philodox as the aim of this project was to challenge and provoke the participants to think about algorithmic biases and technological control over our access to information. In this

regard, the Horatian satirical texts that we wrote and included in Philodox primarily resulted in laughter amongst the audiences, whilst the subversion of mainstream search engines conveyed an underlying effect/affect about the audiences' lack of control and understanding about how algorithms are manipulating and prioritising the information that we consume every day.

Juvenalian satire and techniques on the other hand as mentioned are darker. They use grotesque and exaggeration to convey a stronger sense of urgency. Osterhoff developed a new iteration of Hsieh's One-year performance in which the artist published every search that he queried on search engines in an online website. In this work, Osterhoff attempted to reveal some aspects and complexities of information retrieval and concerns around privacy (Osterhoff, 2011). Similarly Lund's (2011) work engages with digitisation of contemporary society, in "I'm Here and There" he developed a website that functions as a mirror to his browser where anyone with the link can view his internet activities in real-time. Both Lund and Ostefhoff used exaggeration in their work to challenge the viewers' perception of surveillance and to provoke them to consider the extent and depth of internet surveillance. In another related work "Social Roulette", Lund (2013) investigates the identity crisis and relationships we have with our online personas. Lund invites the participants to play "Russian Roulette" on their social media with one in six chance of automatically deleting their social media account. Again, exaggeration was central to the development of this critical work. Exaggeration was also one of the methods used in my work Maladox where we developed some of the satirical diseases by exaggerating present situations and the level of interactions we have with modern technology, projecting an exaggerated version of them in a form of disease. In order to avoid a negativist approach in my work, we also included light-hearted humour in Maladox to create a balance between the two satirical techniques.

Finally grotesque and obscenity are used in speculative and critical design works to convey a critical message to audiences. In some of the works in the "Body Anxiety" collection there are examples of obscenity and grotesque. In this collective series of works by feminist activists, the collective attempted to reclaim the marginalised body of women and Trans people on the internet. The artists and activists used their bodies and digital identities to push back and provoke the viewers to challenge and reveal the power dynamics, minorities' challenges and objectification of their bodies on the internet (Schrager and Chan, 2015). Bilal's (2007) work that I discussed

earlier is also an example of using the body as a site of conflict. In this context, violence and grotesque used to reveal and provoke the audiences to reflect on socio-political aspects of technology. In Zaytoun I used this method to turn the act of touching into an act of killing. The illustration of Palestinian families and the olive tree was the body of conflict in this regard. The participants' interactions with illustration was the point of provocation in this work. My aim was to challenge them to think about their relationships with technology, algorithm and data consumption through touching the grotesque violence of 2014 Gaza bombing and receiving a receipt of their interactions with the work on an invoice paper.

3.2.2.4 Resistance through obfuscation

Obfuscation is a method used in many contexts such as military, espionage, hacking and anti-surveillance to name a few. Obfuscation in the broadest sense is a method used to produce noise and ambiguous information to confuse various processes and therefore making those events less valuable. Chambers (1991) argues that there is a critical space in between chaos in a system and the systems' power to convalesce that disturbance which he calls "room for manoeuvre". In this space within a system, oppositionality and change can take place. De Certeau's (2004) notion of subversion also provides a similar approach. He suggests that instead of transforming or rejecting objections, individuals can make something else out of them by subverting them and using their own means against them.

> *"In any case, the consumer cannot be identified or qualified by the* newspapers or commercial products he assimilates: between the person *(who uses them) and these products (indexes of the "order" which is* imposed on him), there is a gap of varying proportions opened by the use *that he makes of them."* (De Certeau, 2004, p. 215)

There are many examples of obfuscation. For example Schmieg and Lund (2016) in response to government backed movements to influence trends on social media such as the USA's "Operation Earnest Voice" or Russia's "Internet Research Agency" where both US and Russian governments used bots and employed people to share information and push topics and subvert the media. The artists developed a similar bot. They used crowd based artificial intelligence to post topics on twitter. What they shared on Twitter was collected randomly from other social media websites such as such as Reddit in order to obfuscate the media landscape using similar technologies. In my work Open Bubble, I developed a similar technique.

Open Bubble collected a range of topics from Wikipedia and used them to search and navigate the results in order to confuse and obfuscate internet surveillance.

“#TriggerTreat” is another example of obfuscation. In this work the activists obfuscated algorithmic processes of capture used by government intelligence agencies such as the American National Security Agency (NSA). By posting triggering keywords on social media they created many false alarms. Any Individual who used “#TriggerTreat” technology ended up being monitored by organisations such as the NSA. The work attempted to raise awareness about internet surveillance whilst at the same time disrupting the surveillance mechanisms in place by such agencies (Sáez and Antonellis, 2013). In my work, Open Bubble similarly challenges surveillance by adding ambiguous data to users search and browsing history as well as having a visible tap on their browser reminded the users of surveillance and knowledge control on the Internet.

So far, I discussed some of the methods used in critical design practice, provided examples of critical work and situated each of my practices with this context. Three out of four of the selected works discussed in this thesis were collaborative. In the next section, I discuss my approach to collaboration.

3.4 My approach to collaboration in critical design

Three out of the four projects inscribed here are collaborative. Collaboration was central to the development of this investigation. As a process it evolved and over the course of my research as gradually my collaborative skills also improved as I continued collaborating and working with other peers. Collaboration can enhance research by motivating learning, persistence and improving success in program completion (Anderson, 1996; Pemberton and Akkary, 2010). A working collaboration requires a cooperative environment where collaborators share knowledge and skills to achieve common goals (Tarricone and Luca, 2002, p. 641).

I find collaboration central to creation. I do not see collaboration as a simple distribution of tasks or specialisation. It is crucial not to mistake teamwork with collaboration. Teamwork is based on hierarchy, distribution of task and top-down control. Rather I see collaboration as a dialectical process, active co-creation and tension that leads to transformation of not only the work at hand but also all the collaborators. It is in this sense that I tried to collaborate in my different projects. While I try to delineate the boundary between what each individual in my different

collaborations have been responsible for, I believe such boundaries are artificial and are often rationalisations imposed post hoc on projects. In practice for each project the boundaries have been volatile and changing, the works have been the result of constant debate and discussion and I find it critically problematic to try to delineate too much of the elements, the tasks and the share of the work of different parties to a project. However, in what follows, I will do my best to describe the process and development of collaboration between different works that I produced.

To me all work is collaborative work. I think part of successful practice is listening to objects, to codes and to humans and in the process to establish relationships with them to give them voice and to let them participate in creation (Latour, 2005). Perceived in these terms, all of the creative work is collaborative, and an essential attribute of the creator is to be humble and to facilitate the creation of a space so that all manner of things and people can play their role in the process of creation (Kvan, 2000). I see collaboration as a relation of changing flows and intensities. Sometimes they weaken, sometimes they experience tension, sometimes they reinforce each other and sometimes they overwhelm, or disrupt the process of creative work. I see my role as someone involved in creation like a surfer who has to navigate these changing flows rather than attempting to be the one who masters control or subjugates them. More specifically, in regard to my work with humans, I consider all actors intimately involved in the processes of creation, whether they are my interviewees, fellow designers or the audience (Kleinsmann et al., 2007).

Collaboration has always been part of software development and programming. This collaborative aspect of programming and software development led to many models of collaboration and sharing of resources(Wu et al., 2003). Such as Open Source and free software movements initiated in the 60s and 70s and continued and evolved to this day. At the same time, increasing complexity of design problems means that it is often not possible for one designer/practitioner to have all the knowledge required to design artefacts. This resulted in collaboration becoming an essential part of designers' work. This also means that any of the collaborators deal with certain aspects of the required knowledge in each project (McDonnell, 2012).

During my several years of co-creating in the context of different critical design works, my attitude to collaboration has evolved in fundamental ways. At the start, I perceived collaboration as a formal exchange of resources, ideas and essentially work organised in a rational way towards achieving a common outcome. With time, I

came to the realisation that this rationalistic scheme of collaboration is essentially an illusion. I learned to be open to the emotions, to the conflicts to subtle and mostly unintended mutation of my relations to my diverse collaborators. In other words, from seeing collaboration as a transaction I started to see collaboration as a dance. A dance in which you have to feel the movements, inspirations of the other, while also letting the practice adapt to the broader rhythm of the situation.

I started seeing my collaborations as a quest to find complementarities. However, with time I realised, even more significant is the possibility of confronting views, contrasting attitudes and turning these conflicts into a productive force in the work. For example, in my various collaborative works with visual artist Robert Powell, we came to realise the existence of fundamental tension in our attitude to politics. For Robert the design work situate itself in the world was as a humble whisper that did not necessarily have the ambition to change the world. The humble whisper was coloured with laughter, irony and importantly resistance against any notion of self-righteousness or self-importance. This is while I always wanted to be more on the critical side, the politics of my work was to be more evident, and I sought a frontal impact on my audiences' political consciousness. While at the start this tension tended to be at times disruptive, we both learned to listen to the other and I think the outcome of this difference, for example in Maladox, is the emergence of a form of critical design work that at the same time has the ambition of enacting a dissensual (Ranciere and Corcoran, 2010) experience for the audience, however, through a humble and subversive tone and mode of engagement.

Another example of such productive tensions and conflict was related to the difference in paradigm and by extension culture between myself and my collaborators. For example, in my work with Robert Powel, my primary focus was on the technical design and the overall narrative of the work. However, Robert was much more sensitive to a certain idea of beauty of the work. He saw a direct relation between aesthetics of the work and its political potentials and beyond that for him critical design regardless of its goal should be committed beauty. This beauty involved dialectic tensions and certain contrasts and contours and essentially, playfulness. All of these were expressed in both the illustrations and the text that we developed for our works. Through this tension I came to learn about the central role of aesthetics in driving the experience of the audience and in the language of Rancière came to appreciate the crucial need to attend to the politics of aesthetics

(Rancière and Corcoran, 2010). I believe examples of this tension and the productivity of differences in value regimes and paradigmatic cultures will guide me in all future interdisciplinary work.

The third productive tension that I would want to detail here is the tension between different value regimes at work. In my first collaborations with Robert, we learnt the hard way how his obsession with the aesthetics of the design work led to technical difficulties and several challenges in the audience interactions with the work. For example, in Maladox, Robert emphasised the importance of labyrinthine relations between different diseases. This was a conceptual and aesthetic choice. However, in practice we realised that our audience, which was essentially passing visitors to our exhibition in a shopping centre, did not have the attention span to find their way through such a complex design. With my suggestion and with the support of a user interface designer we simplified the design to improve interactions and experience which of course came at the expense of the conceptual and aesthetic qualities of the project. I learned the importance of simplicity in critical design work through Zaytoun project. The complexity and multiplicity of the ideas in that project were evidently not attuned to impatience and mobility of contemporary gallery visitors.

I believe such tensions took us out of our comfort zones, as well as our aesthetic and technical silos. This in turn enabled an accentuated focus on the experience of the audience/users helping us to meet the critical ambitions of the project.

Chapter 4 Critical design works

4.1 Introduction

In this chapter, I outline the motivations, the mode of critical engagement, the development and some indications to outcomes of the four critical design works at the centre of my doctoral research.

4.1.1 Motivations behind my practices

I will start by laying out the shared personal, political and theoretical motives behind my design works. As detailed in chapter 2, I believe that one of the foundational enablers of the way humanity and nature have been thrust into an unknown and seemingly dystopic technological present/future is our blindly hopeful trust in technology (2.2.2). The rise and rapid expansion of technological thinking, and its latest iteration in the form of big data and surveillance capitalism, have enabled and reinforced what I call technological fundamentalism (2.3). In other words, a rabid and unquestioning form of technological determinism. In all four practices, the main thread is engagement with this idea. All my various works challenge the unquestioned, unintended and hidden aspects of how technology, and a blind trust in it, affect us both as individuals and as collectives.

Zaytoun questions the blinding and chilling effect of calculative technological mediations. Philodox brings to the fore the taken for granted role of search engines and how they constrain and condition our access to knowledge. Open Bubble takes these further and actively attempts to disrupt taken for granted processes central to surveillance capitalism. Finally, Maladox foregrounds the ways the unquestioning use of technology is transforming our bodies and our souls. In all of these works, I avoid imposing questions and answers; instead, I attempt to create affective and intellectual spaces for the audience to engage in such questioning.

The second fundamental idea and source of personal concern and frustration that has guided all my practices is how surveillance capitalism platforms and the related internet cultures are insidiously reshaping our subjectivities through what I call subjectivisation 2.0. Internet bubbles and various entanglements between our bodies and technology that I engaged with in Maladox are some examples of fundamental ways this latest technological turn can reshape human subjectivities. In

Philodox, I engaged with this theme by subverting the notion of technological black boxing. When audiences interacted with this work, they were bewildered and confused about how Philodox's algorithms connected their search queries to the results. In Open Bubble, I actively tried to fight back and blur the boundaries of the subjectivisation process.

The third area of concern that I engaged with is the worrying concentration of power and technochauvenism by oligarchic internet companies that are single-handedly and without much public deliberation defining foundations of our new knowledge regimes and the contours of our cyborgs (2.3). The shadow of this concern partly explains all my critical work. More explicitly in Philodox, we engage satirically with how the dominant search engines attempt to define and impose their information sorting utopias upon us all. Similarly, in Zaytoun, we critically questioned the commodification of humanity, human conditions, and human disasters in the form of tradable and consumable information. This is another crucial feature of the cultures that the current technological oligarchy is enabling and profiting from.

4.1.2 On Sociomaterialities of the bodies, flows and arrangements

"Language matters. Discourse matters. Culture matters. But there is an important sense *in which the only thing that does not seem to matter anymore is matter."* (Barad, 2003, p. 801)

Serendipitously or algorithmically, I ended up watching a movie about alcoholism. Algorithmically because I was also reading a study into alcoholism by Law and Singleton. Serendipitously because I do not want to be too deterministic about technology and its power and control over my life. In "The Lost Weekend", Wilder takes the audience into an all-encompassing journey of an alcoholic man (performed by Millard) through a fine blend of tragedy and comedy. Around the same time as part of my methodology module, which my supervisor Craig Martin was teaching, we discussed some texts in sociomateriality within Science and Technology Studies. It was through a combination of Wilder's epic journey as well as my entanglements with Law's and Latour's works that I came to realise and understand the deeper and also broader aspects of the mediations and associations between various socio-material elements of my work (Latour, 2005; Law and Singleton, 2005; Wilder, 1945).

“Reassembling the Social” taught me ways that I can write and reflect on my work. In no way I would describe my thesis and description here as an application of or a contribution to Actor-Network Theory (ANT). ANT is “about how to study things, or rather how not to study them—or rather, how to let the actors have some room to express themselves”(Latour, 2005, p. 142). I see myself as a newborn ANT, I have some instincts, but they are not sharp. I am still dealing with the trauma of birth, birth of a new mode of reflection emerging from my critical practice.

For me, a crucial leap from technological determinism to a more complex relation to technology came about through exposure to ideas related to sociomateriality. Authors ranging from Latour to Barad and Orlikowski made me attentive to the deep entanglements of the material and the social. While these theoretical reflections were one source, the materiality of my projects, the codes or electronic boards constantly cried out to me to have its voice and agency acknowledged. As I progressed through my various works, I developed an attentiveness to the complex and mostly unintended ways the space where the work was placed, the movements of the audience, their sensory relations to the work and even the mode of writing of the code or lighting of the room affected the intensities around and outcomes of those works.

As I will detail under each practice, from each practice to the next I became more conscious of the phenomenology of my works in the spaces in which they were exposed. Zaytoun was a physical artefact exposed in a gallery space. Philodox was both exposed in a symposium and online. Maladox was exposed in a shopping centre and later online. Finally, open Bubble was exclusively an online work. While designing Zaytoun, I was not much aware of what expose in a gallery means and the affordances and constraints of such a space. After so many days of design and development work, when the day of the exhibition arrived, I was hoping for so much and at the time, I thought I got so little. I observed the mode of movement of the visitors in the gallery space. All the small side conversations, the approximately thirty seconds that they stayed in front of each work and how they frequently did not engage with the work, with their bodies and affects but with detached rationality aimed at simplifying and categorising the work. I can say that after Zaytoun, I had a bitter back taste related to the space of galleries for a few months. I also reflected on how I could/should, through the design of my work, disrupt the gallery's rhythm and the bulk of my visitors' rationalistic attitude. Finally, with time I learned to be more

humble about the ambitions of my work. Passing a moment, laughing at and or reflecting for a moment through/around my work by a small portion of visitors is already a fantastic achievement. I also thought this momentary or short experience could be seen as planting a grain. That, in some cases, would grow into something unpredictable in my visitors lives in the future. In other words, I came to question the ambition for both the scale and immediacy of impact. I learned that I should do my best while staying committed to my principles and values and then hope for the best. This was, in a way, a form of emancipation from becoming a slave to the ambition of maximising the reactions of my audience.

In Philodox and Maladox, the materiality of my work was mostly embedded in the user interface. I had to imagine the time my audiences spent on each page, their urgent curiosity to click, and their patience with our texts' ambiguity and playfulness. In Philodox, to create the experience of a space that urges the audience to engage in a journey, we designed a colouring and user interface configuration that had a nostalgic and ancient feel to it. This would surprise and trouble the audience used to a modern and functional design to search engines. Similarly, in Maladox, we engage in creating a world with its own altered and fragile rules and rich and dark corners and mysteries. This idea of designing a world reminds me of Italo Calvino's 'Invisible Cities'. In that story, in each city, fundamental rules of what constitutes a city are turned around. This intrigues, and connects all the cities in a shadow of impossibility and mystery that hangs above them.

Despite all these attempts at pre-empting certain modes of user interaction and certain attitudes towards the worlds that we create, I still find online design work very challenging because the ways the users would visualise the work and the material configuration of their spaces can vary infinitely. Online design work sometimes feels like putting a message in a bottle and throwing it into the ocean.

Finally, in the use of Open Bubble, some interesting and unforeseen events took me by surprise. I had imagined my user to be alone behind his/her computer and that she/he would rarely open the Open Bubble tab and search its searches. However, one colleague opened his screen in front of an audience and inadvertently opened the Open Bubble tab, displaying some search results with adult content. This story exposed me to the limits of our attempts to imagine the sociomaterialities of online design work and the perils of inviting randomness into such practices.

As I will detail under each project, my design work's critical rhetoric has evolved over various projects. While in Zaytoun, we engaged in a critical language of despair and affectivity that aimed to haunt the audience; in the other three projects, I turn to affectivity emphasising hope, laughter and play. Another dimension of the performativities that I aimed to enact was enabling a critical consciousness of how technology affects us and our liberties. For example, “Open bubble“ at the same time attempts to expand the internet bubble and disrupt the data surveillance, but also to make both visible to the user. Maladox and Philodox similarly mobilise laughter and satire to enable critical consciousness about the internet knowledge regimes we are collectively subjected to.

4.1.3 Relations and flows between my diverse practices

The four practices' development was far from being a linear process as I expected it to be. It ended up being more like knitting with lots of backs and forces, linkages, knots and immergences. As Ingold (2011) would put it, my practices' development was less about going from point A to point B than tracing my way guided by my intuitions, passions, and constraints. Somehow, the egg for each practice was hatched in the middle of another practice. For example, while developing Philodox, I thought I could take the project one-step further and build a “bubble bursting” plugin for Firefox. Similarly, during the development of the illustrations for Philodox, my collaborator and I started to discuss Maladox. This has taught me to see development as a practice of fertility for the birth of new ideas and I have learned to keep these ideas alive for future work.

Besides relations at the ideas level, there has been a process of political and technical/design maturation in my work. For example, I believe from User Interface design interface, Maladox has been more successful in relating to audiences than Philodox. Because I had become better at conceiving the rhetorical design of my work. Similarly, as I noted elsewhere, politically and critically between these four practices, I gradually moved from a hopeless negativistic critical attitude to a hopeful and playful one. Regarding the four practices' critical core and fundamental questions, I believe between the four projects I have moved from a structural critique of quantification and distance in Zaytoun, to increasingly personal and visceral engagements with humans’ relations to technology. Be it true, a questioning of our knowledge ecosystems in Philodox to foregrounding our body/technology transformations in Maladox. While the thesis is in the process of ending, my knitting

is not. I believe every closure is also an opening. I am keen to see how the non-linear and serendipitous paths I traced to developing my four practices project me into the future.

4.1.4 My becoming through the practices or From Chains to Webs

I lived with technological determinism for a very long time, but first I was at the receiving end. It was a hard technological chain (Smith and Marx, 1994). I always wanted to study humanities. I wanted to study philosophy, art or design if we were to separate them as disciplines. However, in Iran, the humanities have little or no space to flourish. The Iranian “supreme leader” Khamenei even said that we should ban humanities from Universities in one of his speeches. Therefore, the only future that in my previous home was on the horizon was to become an engineer/medical doctor. A fate that my brothers and I all followed. Any other discipline and you would be considered a looser. I do not know whether it was my fear of becoming a failure and or pressure from my environment, but I ended up studying software engineering.

I became a “success”, but still I felt unsatisfied with the technologically deterministic and socially detached way we learned to develop software. While I was settling into my educational/professional chains, I ventured into another chain, this time literally (Foucault, 1991). I was arrested for drinking in my home. After spending nights in prison and when the trauma was slowly cooling down, I decided to leave Iran. Immigration involved intense sequences of becomings and unbecomings. I went from an Islamic autocratic machine to a liberal governmentality one (Deleuze and Guattari, 2013, pp. 351–424). For a while, I was blind to the apparatus of capture in my new home. I began to engage with software engineering and started to work on various software design projects.

Chains are easier to notice as they have weight and you can feel them, but webs are invisible, you cannot see them, every time you touch them, they capture a little bit of you, but they also change a little bit from your contact with them (MacKenzie and Wajcman, 1999). They get a little bit more “smarter” and become more personal with you. You “can” go through them, but they are sticky and once broken, it gets messy, they get stuck to you. This makes it even harder for you to move or manoeuvre. I will come back to webs later on.

I began to celebrate my freedom and whilst doing my Masters in Games Technology, I crossed path with my first mentor and creative support Simon Biggs. Together we made couple of artworks and through collaborating and working with Simon I got to know more about software arts. I began to see my practice beyond the software industry, and I started to experiment with code and engage creatively with my practice. I also began to work with my PhD supervisor Chris Speed in the Centre for Design Informatics as creative/political coder.

It was sometime between my arrival in Scotland (2010) and start of my doctoral investigation (2014) that I began to feel the technological webs (Reed, 2005) and enclosures (Andrejevic, 2007) around me. This awareness was not only the result of my personal experiences with technology. I was also affected by frequent articulations of fear and concerns in the public media, but also regulatory efforts by European Union to regulate the web. Paradoxically, at the same time, governments began to put legislations in place for collection, sharing and processing of personal information under the pretexts of national security. I felt frustrated and uneasy with algorithmically defined and controlled ideas of the liberal self, embedded in much tamed notions of freedom, identity, and community. I was frightened by the threats to our rights, privacy, autonomy and liberty under emerging surveillance capitalism regimes.

As I finished this thesis, I should say I have never felt the urgency of engaging in hopeful and imaginative critique of this fast expanding surveillance apparatus and how it is effecting our subjectivities and our lives. Having come from a society where most taken for granted liberties here have to be fought for, I am filled with urge to be part of a movement that weakens the totalitarian oligarchic tendencies of technological platforms. Also engages in imagining and prefiguring alternative trajectories for technology which expand our spaces of liberty and bring joy, suppleness and lightness to our individual being and collectives.

What I want to emphasise here is that I see the travel as important as arriving at the destination in my work. The development, collaboration, various doubts, failures, improvisations involved in all my critical work has involved me in a constant process of becoming. They have exposed me to some of my taken for granted habits, beliefs and at times prejudices. Overall, I think this journey has turned me into a better listener and a less angry & more hopeful actor/activist/academic.

In the following section under each work, I start by laying out the specific motivations. Followed by detail of the process and challenges involved in the development of each work. I then situate each critical design work within its social and spatial context of their exposure to audiences. I finish each work by providing examples of outcomes in the form of audience engagement with each artefact.

4.2 Zaytoun: Questioning the metamorphosis of disasters into transactions

4.2.1 Seeing a war from a distance

Over the past few decades, with the expansion of the Internet and bigdata, as well as new approaches to user interaction, content generation and new models of access to information, many new opportunities and challenges have arisen as to how we acquire, produce and consume information. The majority of internet users are not aware of these practices and the types of algorithms used, as well as algorithms' role in mediating and manipulating how we access information online (2.3).

Networked journalism, a recent trend through the development of Web 2.0 and 3.0 technologies such as micro-blogging and social media gave birth to a new form of interaction between the traditional notion of journalism and the public (Beckett, 2010). Over-expansion of smartphones and the Internet subsequently gave individuals a global voice for what they see, hear and observe. However, it also melted existing political and social structures and resulted in disengagement of citizens through an individualising process by "transforming human 'identity' from a 'given' to a 'task' and charging the actors with the responsibility for performing that task" (Bauman, 2000, p. 32). The charging force changes constantly through various algorithms through the development of new forms of hidden practices for collecting, filtering, mining, aggregating and disseminating data online (Bradshaw and Brightwell, 2012).

Ideas of Philodox and Zaytoun emerged around the same time. I was reading studies in governmentality and thinking about quantification (Porter, 1996) and role of numbers (Rose, 1991) and algorithms in my life (2.3.3). I was also working in the Centre for Design Informatics. As Chris Speed always says, there are three types of design in relation to data. Design "with/by/for data" (personal communication). In a sense, I was professionally surrounded by data applications, data visualisations, and

data-driven design. At the same time, I was torn by my theoretical explorations and worries. Theories had an authoritative effect on me, after all it is hard to argue with them and also hard to invite them to act together (Rosenberg, 2007).

Zaytoun was a collaborative work between Chris Barker (creative coder), Mina Braun (illustrator) and myself. I used to sit next to my colleague, friend and collaborator Chris. We were both members of the Palestinian Solidarity Campaign, an activist group in Edinburgh. We both worked as creative coders at the centre and had similar political concerns. Zaytoun was the result of this period of my life, work and practice. We were both closely following the 4-week bombing of the Gaza strip and was very frustrated by short-lived media panics, data driven and personalised reporting and the data consumption of our society. Unexpectedly, I received an invitation for proposals for a two day symposium: “Producing data: practices, materialities, values” organised by our centre. The conference's purpose was to explore “what data is and how it is produced” (digiSTIS, 2014). This platform gave me an opportunity to link my political passions and frustrations related to the Gaza invasion with my design investigation. Chris Barker and I submitted a proposal to the conference. I contacted a friend of ours Mina Braun to find out whether she would be interested in collaborating with us on this, which she accepted. Mina is an artist and illustrator and she agreed to do one illustration for us as her contribution. Our collective aim was to include a first-hand account of the massacres and nearly 60 years of occupation and oppression in Palestine. We wanted to make a powerful, provocative and strong work with long-lasting effects on our audiences.

My broader aims in Zaytoun was to question and reveal:

- How various kinds of information such as wars, diseases and corruption compete with one another?
- What role do we as consumers and producers of data play in our highly “efficient” net-worked societies?
- In a society obsessed with numbers and rapid consumption of news and information how we can create meaningful and affective relationships with information and data online.
- What is the difference between consuming news, a post on social media or a product in a supermarket? Have we commodified everything even our atrocities?

- How personalised interfaces and algorithms control and manage our relationship with digital data and its representations through digital interfaces?

I began to work on the design ideas and Chris started to research the technological side. I was highly resentful of critical projects, which aestheticised human disasters or commercially/professionally exploited them. I was keen on remaining ethically committed to the hard reality and injustice that I was dealing with.

4.2.2 My journey from anger to provocation and then hope

As individuals, we all read and scroll over hundreds of deaths on a daily basis when we update ourselves with current affairs. It is becoming harder and harder for me to be moved or affected by these numbers unless it relates to something close to me culturally or geographically. Something imminent. Obviously, news outlets and journalists are also aware of this and they try to provide some first-hand account of the incidents with video footage, heart-breaking images as the one you can see below (Figure 14). The issue is the short-lived effect of media panics, my panics and our collective panics. I was intrigued and angered by this cycle of information consumption and consumption of emotions.

Figure 14: Palestinian boy injured and was being triaged by the journalist providing first-hand account of the invasion (Beaumont, 2014).

This was the issue I had with data, my colleagues, media outlets, society and myself in general. How is it possible that we are capable to move on to the new topic so quickly and so easily? Alternatively, are we being haunted (Davis, 2005) by the knowledge of and various categories of psychological diseases that they constantly

guide us and remind us that we need to care, we need to worry and be moved by these? Or is it a matter of affective governance? As the economy “focuses attention on the calculation of ‘audience’ it flattens, controls, and commands the production of subjectivity on a disembodied horizon” (Negri and Hardt, 1999, p. 79).

I was in despair, angry and was feeling hopeless.

4.2.2.1 Sharing my despair and anger or How I subjectivised my audiences

We were all emotional. Our emotions were all over the place. Some days we were deeply sad and depressed and some days angry about our lack of action and the injuries, deaths and wounds being far away at a distance.

Whether it was because of constantly reading about the bombings or wanting to shock the audiences, I knew that I wanted the work to include some form of audio feedback. We also wanted to make it personal, to move away from pipelined left/right-wing media outlets style of reporting. The type of reporting and consumption that we are all its workforce as producers, consumers of this citizen-data assemblage. Media outlets feed on our data to survive, and in return, we reinforce and sometimes receive short-lived subjectivities. No one expects to open a media outlet website and to find out that, “no news today”. We all browse these endless websites to consume the next event. “The problem we urgently face is how to live democratically and at peace with the knowledge that our societies are inevitably ‘at risk’” (Jasanoff, 2005, p. 224). Out of stress and despair, we binge more data and deposit more data. This cycle may also be part of another characteristic of our new subjectivity 2.0 (See 2.3.3) or being an “active learning citizen” (Hodgson, 2011, p. 43) .

My first idea was to present the audience with an illustration of a Palestinian village and periodically use a custom build device to pump up and burst a balloon to make a loud noise similar to a shooting sound. Having the balloon visible and slowly inflating them creates a sense of uneasiness and stress. The idea of shocking the audience with a loud noise made me excited and both Chris and I felt that this could be a good start. At this point, I was not thinking about ethics, nor the emotional effects of this work on the audience.

Chris and I started to do some preliminary research on how to develop a device to inflate the balloons. As we researched more on the technical aspect of this work and reflected on the logistics of our first exhibition space (the symposium), we started to

realise that this approach would not fit our aims and the settings of the academic gathering. From a practical point of view, we needed to have many plastic balloons in the exhibition; also, it required having a volunteer at the exhibition to replace burst balloons with new ones. We decided to move away from the shocking sound and started to think about wider issues of oppression and feeling claustrophobic.

We tweaked our idea and decided to use the village landscape and use the same technology, but this time to inflate and deflate the balloons depending on removal of olive trees from Palestinian villages. So depending on where the users would touch on the village in a timeline format, the balloons would get inflated or deflated. The heavy sound of inflation and deflation we hope would sound like a heavy breathing and being under pressure. We submitted this as our proposal (See appendix 2) and started to think and work on different aspects of this project.

With time, my emotions calmed and I was able to reflect further on different aspects of the work. I revisited my aims and started to work on the design again.

4.2.2.2 "Affecting" my audiences

Olive trees are internationally recognised as a symbol of peace. In Palestine, they are also symbol of unity and the relationship people have with their land. Not only have the Palestinians been oppressed and forced to give up their lands, but also vast numbers of these trees have been bulldozed or moved to occupied lands and inside Israel. The trees are an integral part of Palestinian families as some of these are over a century old and it takes a long time for the trees to reach fruiting maturity (Booth, 2014; Khoury, 2015; Lynfield, 2015).

We all agreed that illustration of Olive trees and images of Palestinian people should be part of the illustration. We were no longer keen on the idea of balloons anymore both because it was technically complicated and I was not convinced that it would create the effects we wanted on our academic audiences. I realised that my emotions blurred my senses and I lost track of my critical reflections as I was just following the direction of my emotions.

We wanted to bring individual sufferings to the fore. We started to collect personal narratives and stories tweeted from inside Gaza Strip. Appendix 1 includes a list of tweets we collected from various sources and directly from twitter accounts as part of this work. The reader should be aware that these tweets contains strong and traumatic stories from survivors of the invasion during the bombing. This was a very

difficult process for both Chris and I as we read, watched and saw so much horror, pain, suffering and death. I was lucky enough to have emotional support from Chris and my family as I was reading these horrors. I tried to provide the same support for Chris.

The title of our original proposal was “a look inside”. We started to think more and we realised that “who are we to provide a look from inside”, after all we were definitely outside. We changed the title of the project to Zaytoun, which means Olive in Arabic. I was thinking about data consumption and how they are similar to other transactions we have in our lives. This was when the idea of using Credit card invoices/receipts came to me to print the names of people who died and their stories from social media. I did not know whether it was possible to use invoice papers and their printers in this work. Chris managed to quickly find a solution for this and we realised that it is possible to buy thermal printers as a separate unit and program them using an Arduino device. I will talk about the technical developments later on in this section. I was happy and satisfied with this design.

By touching the expressive characters or rough bark of the olive tree, participants trigger the printing of stories and casualty names, which appear like roots at the base of the trunk. The piece suggests that the Palestinian people's unity transcends artificial partitions, walls, and checkpoints inside Palestine and across occupied Palestine. Many contemporary accounts and observations are transmitted via social media – often an inherently fleeting medium. Through printing, the aim was to make these horrors and fears tangible and rather more permanent.

Zaytoun leverages associative design and critical design methods in order to critique and challenge algorithmic biases that are materialised in personalised interfaces such as news distributors and providers where their internet interface organise the news and information based on users preferences and the psychographic analysis (Stone, 2016) of their visitors. In addition, the way news is being reported creates a temporal gap and discontinuity in the coverage of these issues due to the competition between various issues to become present in the attention sphere. By focusing frontally on a sensory and active relation to Gaza's untold stories, we aimed to trigger the questioning of why and how we hear little and most of the times in a dehumanising way about the Palestinian side of the story. By focusing on the untold and the hidden, we were also hopeful that the participants would reflect on

the broader ways mainstream news outlets mediate and control our spheres of attention and information.

The printers and paper material used to print out names and stories from individuals involved in this conflict is the same technology used by the majority of retailers and shops to print out invoices for our everyday purchases. This is aligned with the principles of associative design (Malpass, 2017, p. 184) in critical practice. This was done to create a dilemma to connect consumption of goods and services to how we consume data and information. In addition, these printers make a unique noise which we hoped it would stay with our audience and make them to think about their different spheres of consumption. This form of dilemma, as Malpas (2017, chap. 3) argued, generates a discourse and interpretation afforded by tension, conflict and subversion of users conventional understanding of design objects.

Zaytoun's illustration and interaction through touch that triggers the printing process, questions the traditional modes of interaction between the audience and various visual art forms, which is commonly a distant and cold relation of consumption. In addition, it subverts an act of touching and turns it into an act of killing and shooting. By facilitating an affective and empathic engagement, I was hoping to reduce the critical distance between the visuals and the audience.

4.2.3 Developing the artefact

Zaytoun illustrates an olive tree and Palestinian people on a sheet of A0 paper. The illustration is covered with conductive ink (Bare Conductive, 2015). By touching the illustration, participants will trigger one thermal printer to print out a name, age and place of death of an individual who died in the 4-week invasion on Palestinians living in the Gaza strip by the Israeli government. Figures 15 & 16 shows the printer and electronic circuit inside the illustration frame. Figure 17 shows an image of the work. The other printer would print one of the stories that we stored from social media.

Figure 15: Installing the printer inside the illustration frame

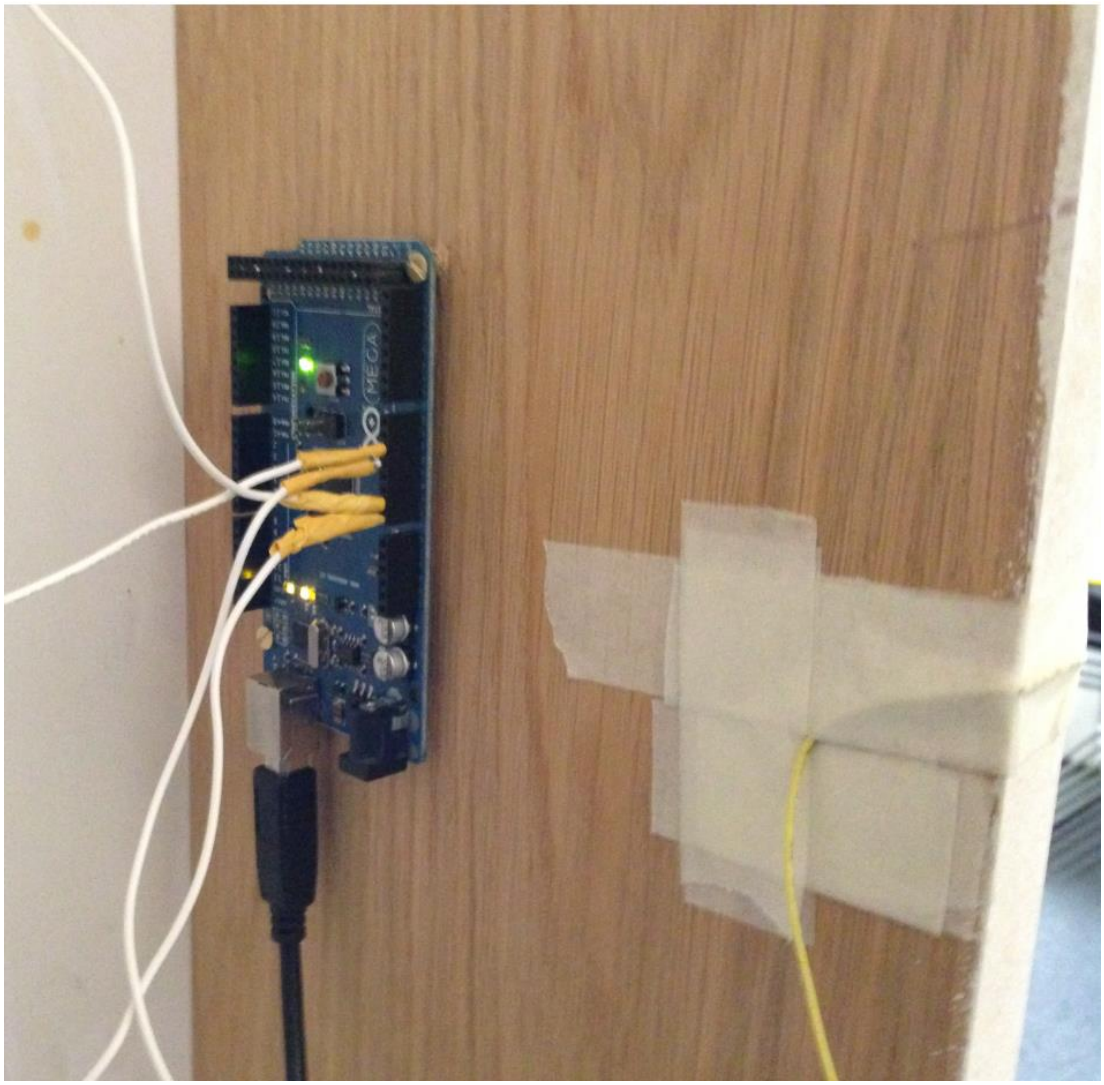


Figure 16 Inside illustration frame, the Arduino device connected to the printers and illustration.

Figure 17: Users interacting with the Zaytoun's illustration through conductive ink

This conflict resulted in over 2000 life losses directly (Al-khabar, 2014). This painting is a form of cartography or map mediating between the social conditions and physical reality in Gaza and the participants in the exhibition through the act of touching this map. We give the user an active role; the act of touching is not too dissimilar to the act of shooting. The noise of the printing machine and the printing of the name of the dead (and other stories from inside Gaza) aims to play with the idea of complicity and interfaces. The participant unknowingly takes on the role of the shooter, the same way citizens unknowingly and through their acquaintance enable the destructive politics of their governments.

The work consists of three main parts: (i) Interactive Illustration, (ii) Thermal printers, (iii) Arduino mega microcontroller (Arduino, 2019). Figure 18 shows the illustration and the printed papers hanging from both lower sides of the illustration frame.

Figure 18: Closer shot of the lower part of Zaytoun, showing names and stories hanging from both sides of the work

Upon each touch by the participants, the thermal printer on the right prints out names of individuals who died during the conflict; the second printer simultaneously prints out one story from the list of stories that we collected from Twitter, where individuals described their experience of living through this invasion (Figures 19 & 20). The combination of printing records of death and printing messages about life experience aims to highlight both destruction and continuation, stories of loss and hope, but also stories of complicity not only with the closure that is death, but also the ongoing destruction and suffering. Figure 19 presents a closer image of the printed names and stories.

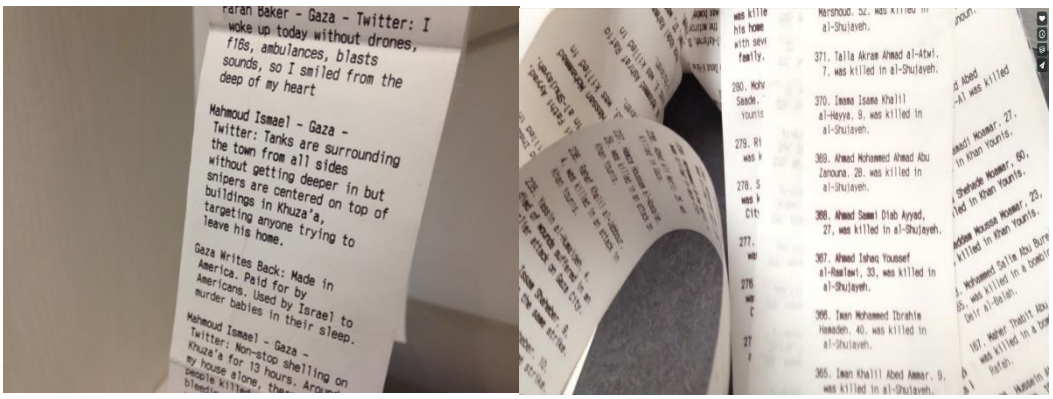


Figure 19:Shows list of names printed and hanging from under the Zaytoun illustration

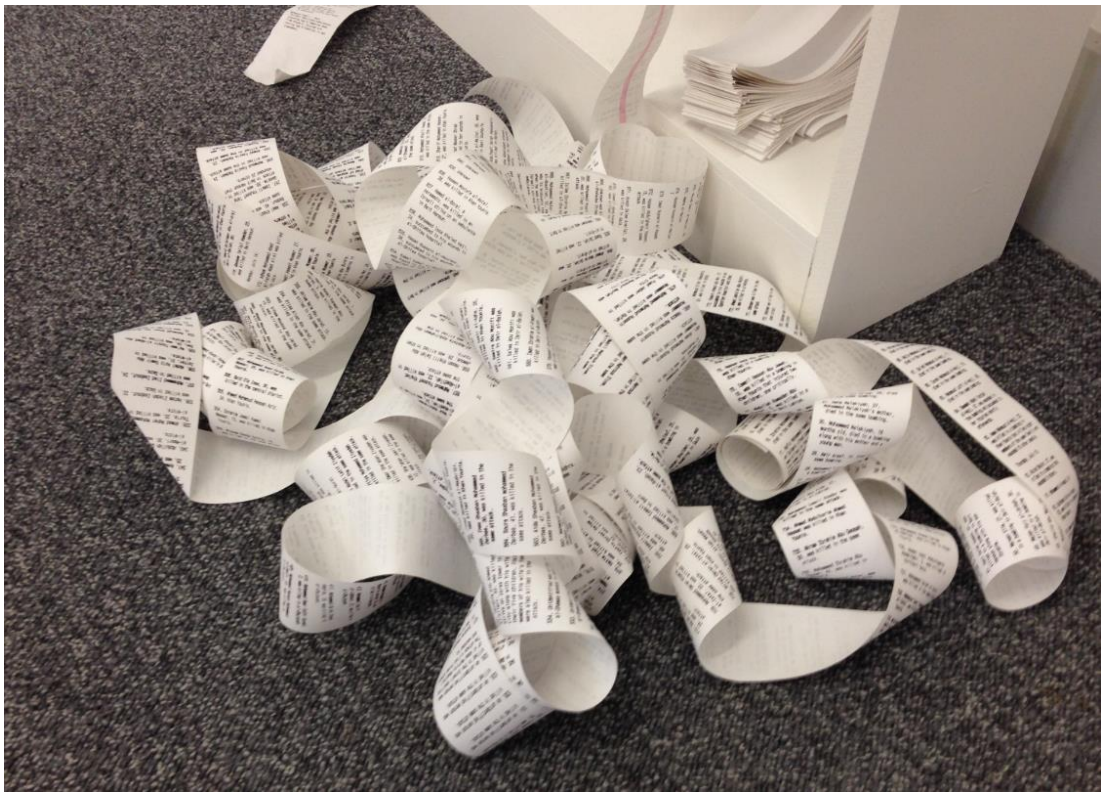
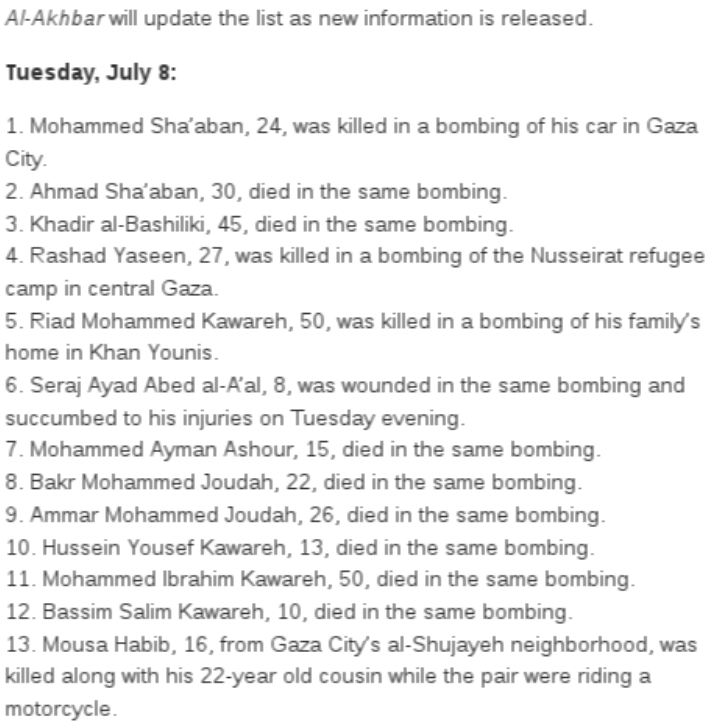


Figure 20 Shows long list of stories printed hanging from the lower side of the illustration

The stories included within this work were collected from individuals living inside the Gaza strip, Jerusalem and the West Bank, reporting on the crisis (See appendix 1). Names of people who lost their lives, during and since the invasion are downloaded periodically from the Al-khabar (2014) website, which uses a list from the Gaza Ministry of Health (Figure 21). I developed a python script in order to mine this data as the number of casualties increased throughout the period this work was developed and exhibited. The script would run periodically during the conflict in

order to build the database of names, age and location of deaths of individuals who lost their lives in the invasion.



Al-Akhbar will update the list as new information is released.

Tuesday, July 8:

1. Mohammed Sha'aban, 24, was killed in a bombing of his car in Gaza City.
2. Ahmad Sha'aban, 30, died in the same bombing.
3. Khadir al-Bashiliki, 45, died in the same bombing.
4. Rashad Yaseen, 27, was killed in a bombing of the Nusseirat refugee camp in central Gaza.
5. Riad Mohammed Kawareh, 50, was killed in a bombing of his family's home in Khan Younis.
6. Seraj Ayad Abed al-A'al, 8, was wounded in the same bombing and succumbed to his injuries on Tuesday evening.
7. Mohammed Ayman Ashour, 15, died in the same bombing.
8. Bakr Mohammed Joudah, 22, died in the same bombing.
9. Ammar Mohammed Joudah, 26, died in the same bombing.
10. Hussein Yousef Kawareh, 13, died in the same bombing.
11. Mohammed Ibrahim Kawareh, 50, died in the same bombing.
12. Bassim Salim Kawareh, 10, died in the same bombing.
13. Mousa Habib, 16, from Gaza City's al-Shujayeh neighborhood, was killed along with his 22-year old cousin while the pair were riding a motorcycle.

Figure 21: An example of the data that was published periodically on the Al-khabar (Al-khabar, 2014) website, reporting on the casualties during the conflict.

The Arduino Mega (Arduino, 2019) was used in order to have more analogue inputs and outputs to capture touch points. An Arduino Uno microcontroller (Arduino, 2017) only has 6 analogue pins which was originally used for this work, this meant only three analogue pins were available for sending electric current through the illustration and three to receive and detect whether the current has changed due to human touch. This was a challenge for Mina to make an illustration that had only three separate sections between various elements of the illustration. We used an Arduino Mega (Arduino, 2019) microcontroller with 16 analogue pins available to resolve this. The Arduino board connects to the illustration through paperclips that I soldered to copper cables in order to capture user touch points (Figure 22). This was through sending a low voltage of electricity using the Arduino Mega microcontroller through the cable and paper clips into the surface of the illustration that was covered with conductive ink (Bare Conductive, 2015). Humans' body has a

certain range of resistance to electric currents and therefore touching the illustration would result in a change in the current running through the illustration.

Figure 22: Shows Zaytoun's illustration connection to Arduino board

Each time the illustration was touched, the Arduino mega sent the name, age and place of death of an individual to one of the thermal printers and one story that we collected from Twitter to the other printer. Figure 23 is a picture of Chris taken by me, in our messy studio in Design Informatics. The microcontroller also stored the last printed story and name, in order to sustain a sense of continuity in the exhibition and throughout the lifetime of the work.

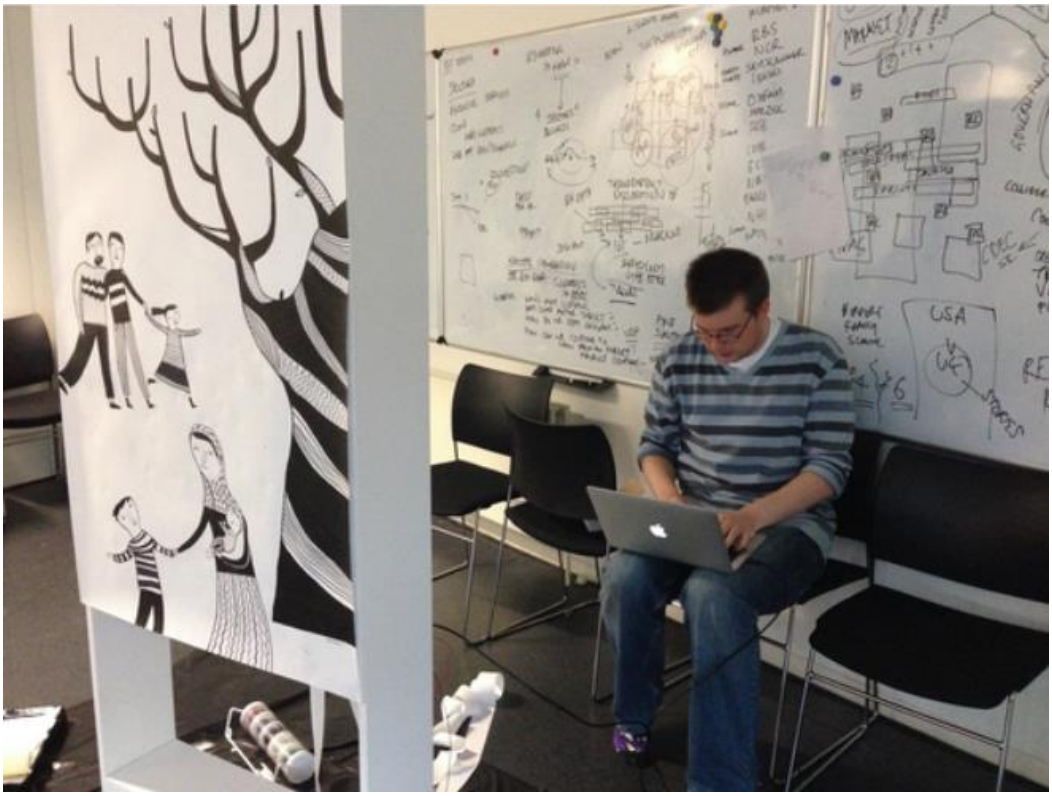


Figure 23: Testing and programming Zaytoun in the Design Informatics studio with Chris Barker

4.2.4 How it (not?) worked

Zaytoun's aim was to explore and challenge our notions of complicity in human-made disasters and reveal, data saturation and the resulting lack of affective engagement with these issues. This work was exhibited in 2 academic settings (Producing data symposium at the University of Edinburgh, V&A digital futures as part of Electronic, Visualisation and Art conference in London) and one public space (Edinburgh College of Art reception area for 3 months).

At the symposium, The work was exhibited during the symposium and we received some supportive feedback from the audience but I did not observe any real engagement with my work. We also realised an issue with our work. No one is used to touching artworks unless specified. Therefore, on the second day we added a quick fix as shown in in Figure 24.

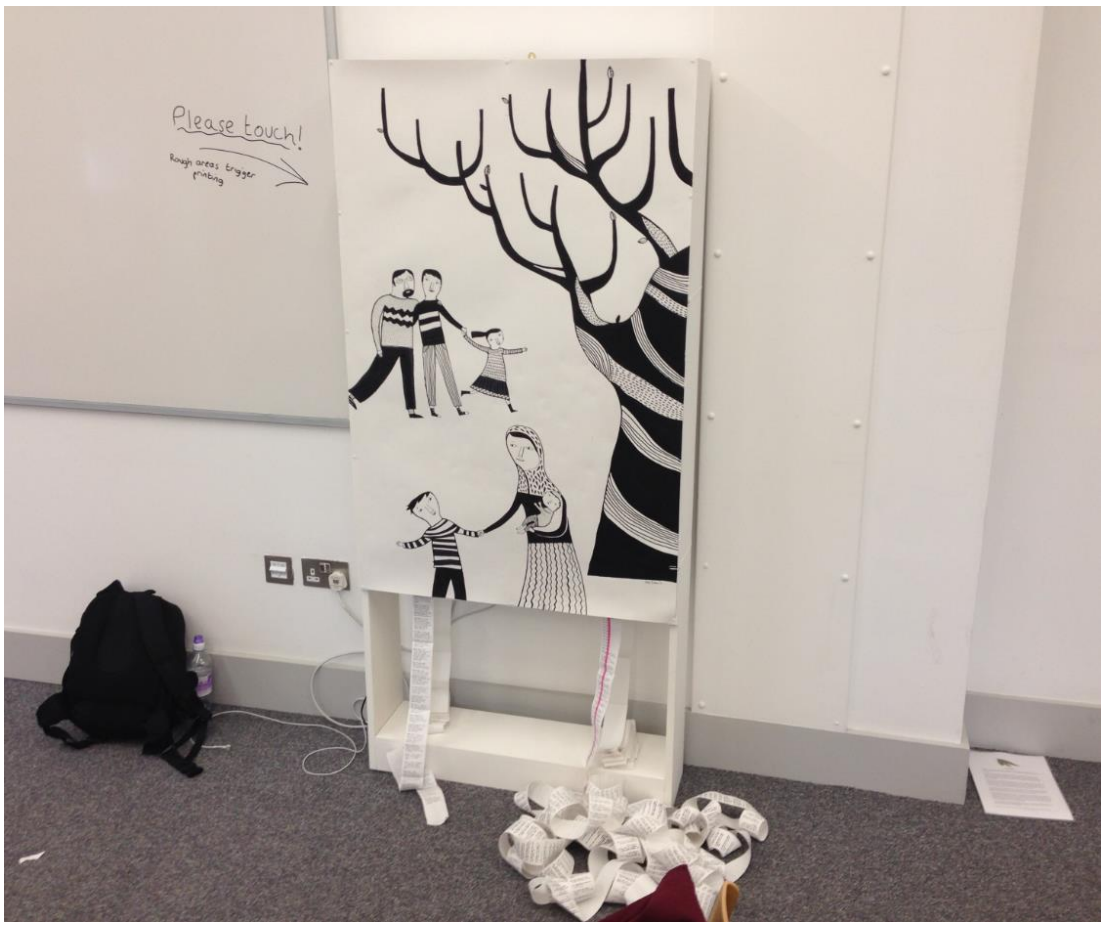


Figure 24 Zaytoun at the symposium, we added a sign asking participants to touch the illustration

I also felt that the work's location was not ideal as it was in the room where symposium papers were being presented. During the presentations, the attention of the audience would be on the speakers and during break times, audiences would mingle and take a break. Our next destination was the V&A digital futures exhibition. We were excited about this and since it was in collaboration with the V&A and a larger exhibition, one of our colleagues Mark Kobine, helped us to improve the frame of the illustration. We bought a dedicated extension cable changed and incorporated it inside the frame, changed the power adapter cable into a red one, made a new frame and portable legs for the work so it would be easier for us to transport from Edinburgh to London (see Figure 25).

Figure 25: Zaytou completed design with new frame and legs

At the EVA conference, we first presented a short paper about our work that Chris and I put together (Mehrpouya et al., 2015). We were both disappointed with our audience's response in the room as most participants already presented their papers and left the room. We had about 10 people that we presented to and the only response we got there was “It’s cool”. The exhibition at Limewharf Gallery in collaboration with V&A digital futures was exciting and engaging. This was the first time that we got engagement from the audience. However, during this time, I observed many participants being emotionally effected by the work and surprised by not knowing about the ongoing war. Several of our audiences were silently crying as they were reading the stories. I was there the whole time and was observing people who were interacting with the work to make sure they are ok and not too disturbed and upset by the work. The personal stories that we collected from twitter including age and name of victims created a strong personal connection with the conflict, which is often missing from media coverage and reporting of these issues.

With time, I came to realise that Zaytoun was lacking in terms of contextual ambiguity as there was too much emphasis on enticing guilt among the audience. This is a common challenge in critical design works, or as Malpass (2017, p. 18) puts it: “The danger is that critical design becomes overly self-reflexive and introverted.”. This emphasis on self-reflexivity and introversion of the work resulted in participant leaving the work often feeling sad and helpless. In his recent book, Bennet (2012) reviewed recent artistic and journalistic engagements developed in response to several natural or human-made disasters. In his work Bennet showed how some works led to an emotional desperation, passivity and inaction, whilst others create an affective engagement that opens the space for further mobilisation and action amongst their audience.

Based on discussions during both exhibitions, I tend to believe that Zaytoun was successful in raising people’s awareness about some of these issues and engaging with them emotionally. However, the work's strong language did not leave enough space for the participants to reflect, interpret, and affectively engage with these issues. This could have been avoided by leveraging contextual ambiguity. For example, by removing a layer of information such as the names and age of individuals and just printing numbers and at some point during participants’ engagement with the work, clarifying the ambiguity. This could have expanded the reflexive moment and imagined possibilities amongst the viewers. I would have

liked to exploit more in this project the possibilities of open and diverse interpretation by the audience. At the same time, this was in conflict with one of my main aims which was to critically engage with the atrocities committed by Israeli government. I therefore had to be careful about the political dangers of leaving the work too open to diverse interpretations, especially those that they would go against the intended goals of this work. Due to my emotional involvement with this conflict (being an active participant in anti-war activism), there was too much emphasis on sympathy. This resulted in a lack of objectivity in my role as a critical designer prevented me from fully reflecting and managing various aspects of the work better. Another challenge that this work faced was the multiplicity of its aims. Whilst the work managed to produce a strong effect on participants, it lacked in-depth engagement with individuals to get them to question and think about issues that I aimed to raise. This was improved in the subsequent works, by focusing on a specific aspect of the entanglements of science and technology with individuals.

4.3 Philodox: Parodying the “search” and the “engine”

4.3.1 Questioning the bubbly brain of the cyborg

The Internet has provided the digital infrastructure to create, access and manage the majority of the information that we use today. This has created many challenges for people and communities aiming to find relevant information that they can rely on and to have their voice heard in this new sea of knowledge and information. Search has become the most important aspect of internet information retrieval in the past few decades (Jansen et al., 2000). Companies such as Google, Yahoo, Bing and others provided interfaces for searching, sorting, indexing and representing search results through a complex assemblage of algorithms, interfaces and user information, such as location and other individual attributes and patterns. In this ecology of search and results, the definition of valuable and relevant result is of most importance. In the past as discussed (2.3.1) search engines such as Yahoo combined their own definition of relevant results with what individuals collaboratively indexed as relevant information creating a form of “social search” (Halavais, 2013, p. 162). Monopolisation of the internet from a public resource financed by the governments to a highly advertised and commodified information Walmart by technology giants such as Google and Facebook changed the definition of search and results (Smyrnaios, 2019). Google now has the largest internet information index with around 500 to 600 billion webpages (Wakabayashi, 2020).

Search engine algorithms play a crucial role in prioritising the information provided to the users. The information that we all search for everyday now includes places, people and with the expansion of Internet of Things surveillance it will reach deeper layers of our lives and societies (Halavais, 2013, chap. 8). This image is also not far from the companies utopic vision (Singhal, 2012). Search algorithms not only are now the central arbiters for what is made visible and by extension what is made invisible (See 2.3). 89% of online consumers use search engines to make a decision about a purchase (Herndon, 2015). Terms such as “network capitalism” and “marketing society” (Wilkie, 2011, p. 88), “network society” (Castells, 2011) and “surveillance capitalism” (Zuboff, 2018) have begun to describe some of the hidden practices and approaches in these new information ecologies. Concerns about societal implications of these trends become doubly pronounced when corporations are at the centre of these information networks collecting data and controlling communication and action interfaces (Turow, 2012).

As discussed in Sec 2.3, the rise of such information monopolies and their control over search results and how they are represented increasingly narrow and solidify our digital information and knowledge territories. The search engines perpetual efforts to intensify personalisation and the resulting narrowing of our worlds leads to the creation and reinforcement of tastes (Hennion, 2007), but also political attitudes (see: 2.3.3 & 2.3.4) and in turn it leads to creation of silos, polarisation and separation of different online clusters and communities.

Commodification of information retrieval systems and internet as a whole also transformed us and brought a new being that I called Subject 2.0 (see 2.3.3). In Philodox I aimed to question and challenge our lack of understanding of search engine hidden practices and taken for granted trust and values ingrained in users of such technologies. In Zaytoun, I attempted to reveal our distanced and subjectivised relationships with information through the narrative of war and disasters at distance. As mentioned, whilst Zaytoun was successful in creating a strong effect on the audience, some of my other aims, such as commodification of information, were overlooked. In Philodox, I changed my approach. By mobilising satire, light-hearted humour and laughter the aim of Philodox was to question our information bubbles and bring to the fore the commodification of our collective and individual information resources and thought processes.

4.4.2 The design of our un/search non/engine :-)

I developed Philodox in collaboration with visual artist Robert Powell, having conceived the project together through several discussions. From that point onwards, I concentrated primarily on content development and the programming dimension, including the video, and Robert primarily concentrated on the project's textual content. However, I would want to emphasise that all the aspects of the project were developed together with Robert and collaboration was involved in all aspects of the work. Philodox was developed in 3 months. The technical work involved: I) the Philodox website II) a database for search results III) developing the video and IV) composing the music for the video.

I developed the website using PHP, Javascript, CSS and HTML. The Philodox website consists of two main pages: the landing page and the results page. The landing page is shown in Figure 26. I developed this page using HTML, CSS and Javascript. Users can enter search keywords in the engine's input textbox and by clicking on the search icon or pressing enter; they trigger a query and this would take them to the results page.

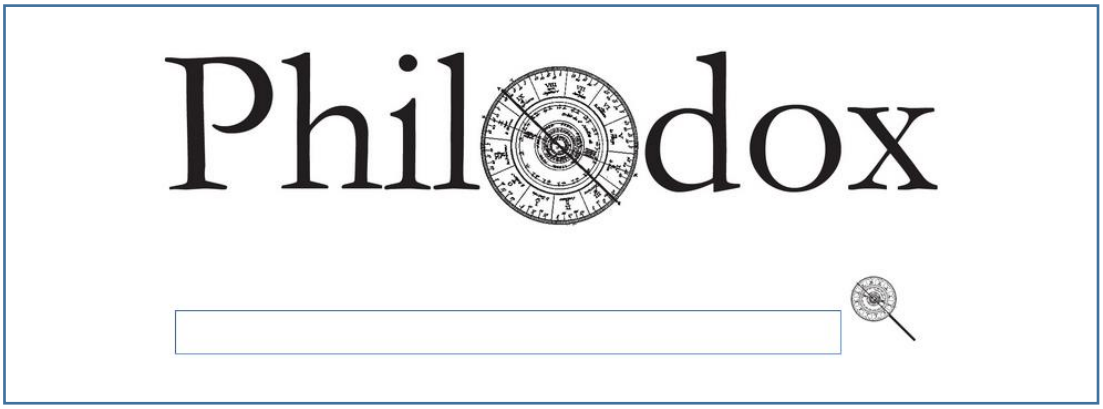


Figure 26: The landing page of Philodox search engine

A crucial design/technical characteristic of Philodox was to take out the “engine” out of the search machine. To ridicule its interface and infrastructure, it’s authoritative langue. As discussed in 3.2.2.2 this mode of subversion similar to Dullaart’s (2012, 2010) attempt to change the users relationship with the “innocent” empty canvas and textbox of search engines such as Google/Bing.

I developed the results page using PHP code in order to load “relevant” results according to the user input. If the keywords searched by the user match any of the entries that we developed, this would then show the text for that specific entry;

otherwise, a random result was presented to the user. Figure 27 shows a screenshot of the search result for the keyword “Scotland” and the resulting page is an entry about “Nostalgia”.

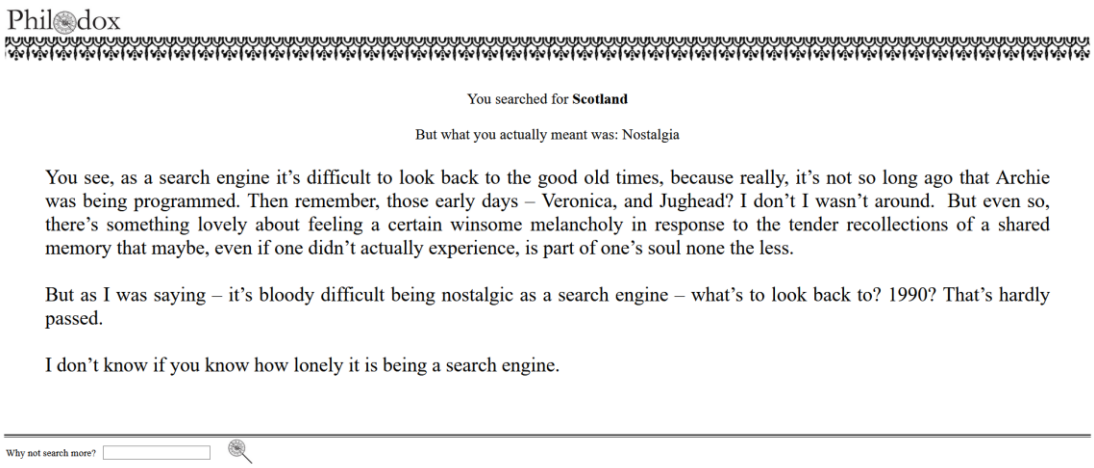


Figure 27: The results page of the Philodox search engine

In total 24 search results were developed. These results were stored in JavaScript Object Notation (JSON) format (JSON, 2019). Since the project was developed using HTML, PHP, and JavaScript, JSON was an ideal standard for storing the data. Both PHP and JavaScript have built-in functionalities for reading and parsing the information stored in JSON. Each JSON record had up to 5 attributes. Figure 28 shows an example of this data stored in the JSON data file.

```
{
    "alttitle" : "Hey! $$! :) You searched for $$?! :) ;)     ",
    "altmsg":" But what you actually meant was: Emoticons ;)",
   "term": "Emoticons",
   "description": "Emoticons - eh? :) What would we do without them!? ;) :P
   <br>It makes me so pleased, as a piece of computer programming myself,
   that emoticons exist. Deprived as I am of a face it means a lot to me that the
   full gamut of human emotional expression is available to me in the form of little
   yellow cartoons! It makes me: <br>(•ˆoˆ•) <br>They're absolutely marvellous.
   Have you ever considered just how expressive they are? That's a bit of an obvious
   remark to make, but my good friend Wikipedia informs me that they've been around
   since 1881. Isn't that surprising!? <br>(@_@;) <br>They're such a relief,
   because emails and text messages can be such a cold, impersonal form of communication,
   so easily misunderstood. So confusing! <br>(?_?) <br>And an artfully placed emoticon can
   take the strain of language (so sorely taxed in this day and age) and completely change
   the balance of a communication.  What a gift to literature!  <br>Have you seen my cat
   impression? <br>(=^･^=)    <br>",
   "links": []
}
```

Figure 28: An example of JSON data stored in the Philodox search engine.

These attributes are ‘alttitle’, ‘altmsg’, ‘term’, ‘description’, ‘links’ and ‘images’. ‘Alttitle’ and ‘altmsg’ were used to generate two sentences to inform the user that what they searched for is not what they intended to know or inquire. This was similar

to what mainstream search engines state. Figure 29 is an example of Google's "innocent" confusion about my search query.

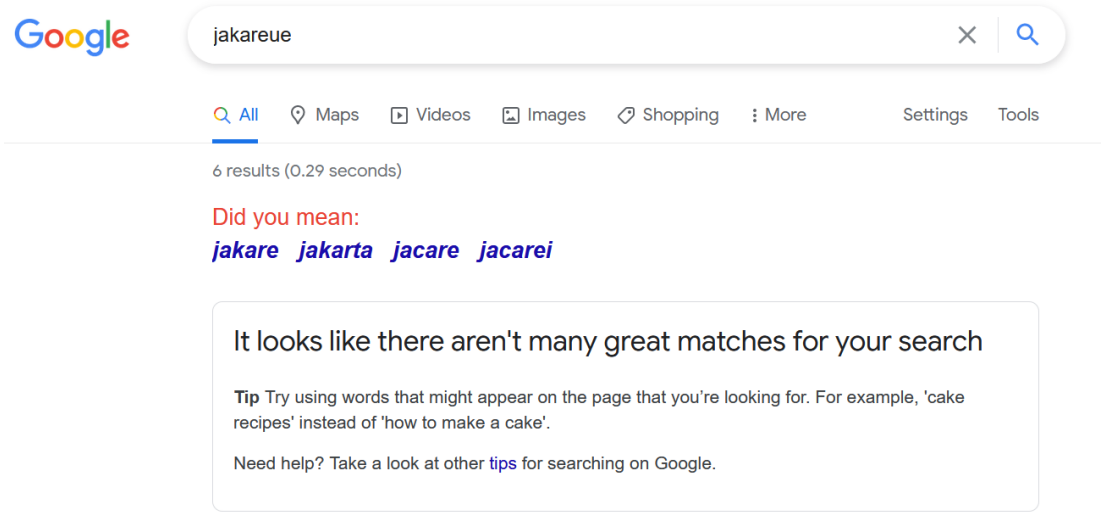


Figure 29: Google's innocent confusion and asking the user what they meant!

Similarly, sometimes, the engine even takes a step further and guesses what I actually meant. Even though I searched for nonsense. Figure 30 is an example of a random query that I searched for, using Google. Despite the meaningless term that I queried, Google still managed to find over fifty thousand results! It also corrected my query into something that the search platform could find more results for within its knowledge infrastructure.

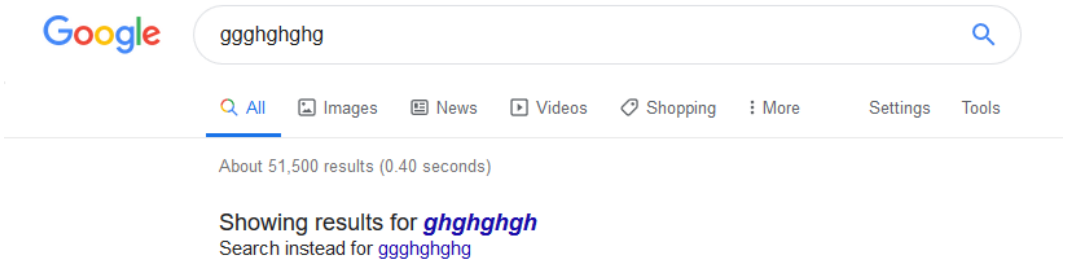


Figure 30: A random search on Google search engine.

The other attributes in the JSON data file that I stored were 'term', which refers to each search entry titles that we developed whilst 'description' stored the text for each specific entry. Finally, some search results had an image or external links and these were stored in these fields respectively.

In addition to the satirical text, we've taken inspiration of series of videos we watched titled "Breakfast with Google" (Singhal, 2012) where the head of various departments in Google talk about their visions for the future of search. We recorded a four minutes video to introduce the concept of Philodox (see Figure 31). This was done as a parody to promotional videos companies such as Google produce to introduce new products and services (for example see: (Bunz, 2009)).

Figure 31: Image from Philodox video, Struan Murray acting as our PR consultant, parodying promotional videos of tech giants

After recording the video, I composed the music for this work and Robert edited the video.

4.4.3 Critical laughter as a design strategy

Philodox use critical design methods to provoke users to question their trust in taken for granted interfaces such as search engines. In this work, we mobilised associate design methods specifically Horatian satire (3.2.2.3) and subversion (3.2.2.2). Our aim in this work was to make visible and debatable the constraining role that search engines play in our access to people, organisations and information. Philodox similar to Maladox relies on humour and satire on the one hand and ambiguity and confusion on the other as an important critical point of entry into the participants' consciousness (see 5.3 for a discussion on this). This project is essentially the antithesis of a traditional search engine. We exaggerated notions of "precision" and

“guidance” and instead of providing the user with the vast amount of information that is ordered based on a complex range of algorithms we provided our users with one result most of the time not related to what they searched for. By showing them an alternative result in unexpected routes users began to question and reflect on the algorithms behind Philodox’s interface. Philodox aimed to intrigue and to surprise rather than to be “useful” and adapted to the habits and the imagined desires of the participants.

Philodox is essentially a case of associative design within the critical design practice. At the core of its critical engagement is subversion. It tries to create a critical space for reflection about the implication of dominant search processes on our individual politics of visibility and economies of attention. It takes inspiration from elements and various artefacts of mainstream search engines but deploys them towards a critical agenda. It aims to create the familiar environment of internet-based searching, while at the same time having elements that disturb and lead to questioning and unease in the use of the platform. This mixes up similarity, but also radical difference at the same time, is the essential critical door that this platform aims to open. As you can see in the associated graphics the design of Philodox’s interface has the basic elements of any search engine. It requests the users to enter the search keywords. It engages in the theatricals of algorithmic search and it displays results. In the search, the results page starts by referring back to what the user has searched for, with the language of “you searched for” such and such keywords. This is an essential aspect of searching, which reiterates the search engine's commitments to providing personalised results (Figures 29 & 30). However, the subversion starts by providing a result disconnected from the search keywords. The results are articulated on a blurry line between fantasy and reality, between frontal critique and satire. In all of Philodox’s content, but also various elements in the broader project apparatus, such as the video, we produced with respect these principles of the play between fiction and reality, laughter and seriousness, between complicity and subversion.

In our video, we acted as three characters. Marketing department (performed by our friend Struan Murray), Philodox’s CEO (Robert Powell) and Developer/Programmer (myself). The marketing team, wants to sell everything, the CEO wants control over its users and future and the developer with a utopian vision for the future to help people. Each of us, tried to show the different visions we found within the corporate

world. Google's corporate code of conduct since 2000 has been "Don't be evil" which was recently changed to "Do the right thing" (Conger, 2018) We used parody to bring users attention to these conflicting views and visions. While the developer (myself) criticised mainstream search engines for selling users personal data, Philodox's PR consultant tried to advertise our users' personal data to potential buyers. With the dreamy music, combined with Philodox's code of practice (Figure 32) we tried to bring to the fore the corporate culture and mentality of the innocent interfaces we interact with every day.

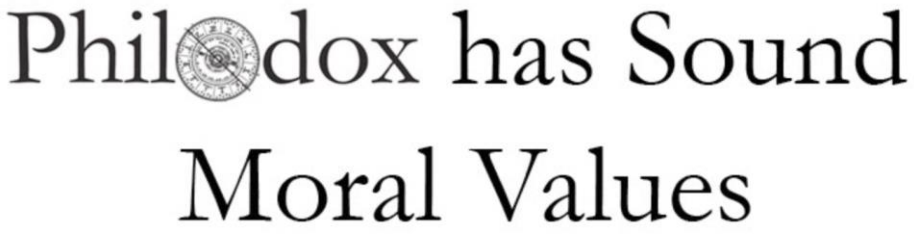


Figure 32 Screen capture from Philodox promotional video about companis moral values

As you can see in the examples in figures 33 and 34 the text for many of the results not only aim to inform, but also aim to enchant and to intrigue. This is a fundamental departure from a regular search engine with pretentious of pure, clear and precise informing.

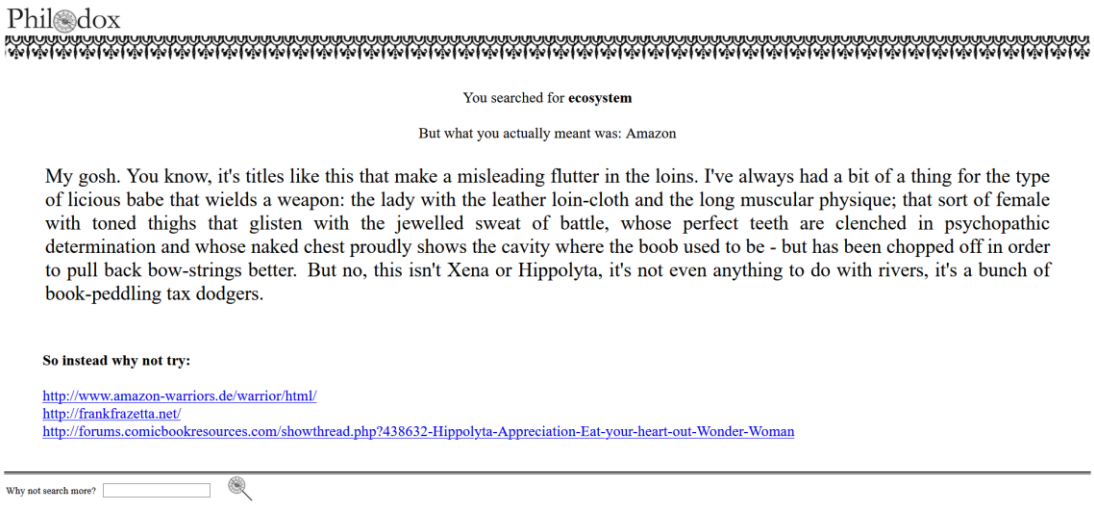


Figure 33 User searched for ecosystem and Philodox shows a result about Amazon

For example, in the search for the word ‘Amazon’, we display a grotesque image of an amputated human body at the service of vicious profit maximisation. We also engage in more frontal critique of the role platforms such as Amazon play in the contemporary internet-based information ecosystems.

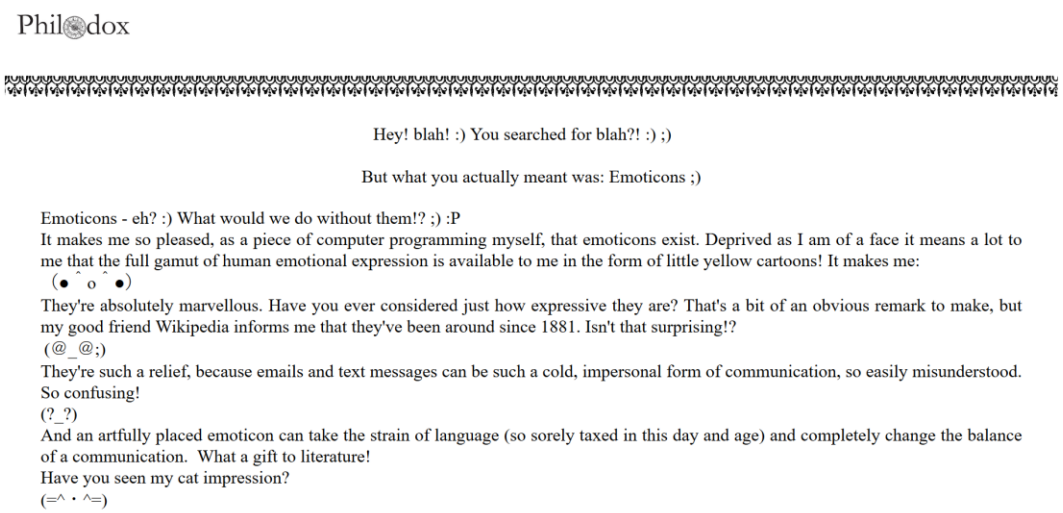


Figure 34: The result page for Emoticons. The user searched for “blah”

The search results that we provide at times go beyond direct critique of information governance, the bubble and their implications and engage in a broader critique of different online cultures. For example, as you can see in figure 34 above, we engage with the role of emoticons in transforming the way we communicate. The search result plays with the role emoticons have as a new linguistic emotional technology and at the same time engages in a subtle critique of how these devices commodify and overly simplify our emotional and linguistic expressions. The two-sided attitude of the text creates an ambiguity that we hope will lead to continued reflection by the participants, rather than providing only a strong one-sided critique, leading to a closure.

4.4.4 “Search”ing for results

Philodox was designed primarily as an online platform like any other search engine. As a result, most of the interactions with the platform occurred on the internet. During the period the platform was online we had over one hundred visitors in our exhibitions and over 300 users visiting the website online. The 300 users was recorded using Google analytics ironically, which I deleted all the data after reflecting on this ethical dilemma. For these users, the only information we used were histories of the way they used the platform. I recall some of the keywords

users searched for included: name of countries, name of companies, adult topics to name a few. I have very little information about the type of reactions, interactions, and entanglements they had and left at the moment of use.

We also presented this work as part of two exhibitions. “Glitch” at Edinburgh College of Art organised by Simon Biggs. In addition, in another exhibition “The Palace of Forgetting” we exhibited Philodox as part of a larger body of work that Robert and I developed together at Warburton Gallery (2014). Most of my reflections are from the first exhibition as I had the chance to interact and observe the audiences more directly. With the other exhibition, we had volunteers at the space and unfortunately, I did not collect any information on users’ interactions with the platform. The only issue reported to us was that due to the nature of interactions with Philodox as a webpage some users navigated away from the work and used the address bar search functionality of the browser, which did not result in any critical or meaningful outcome.

The focus of the symposium was on glitches and failures in technology and various potentials and affordances glitches provide, but constraints that these glitches bring about. During this one-day exhibition, we presented the work and played our promotional video and then we invited the audience to use try the search engine. On this day, I observed people’s engagement with Philodox and conducted informal interviews with users afterwards. There were many moments of laughing together at the results, at the connections Philodox made between user queries and the search results. I spoke with seven members of the public who interacted with the work and the main question they asked me was that “How did the engine provided the result?”. My response was the same where I asked them “randomly, Did you see any relations between your query and the results” and their answer was “yes, it was connected”. My observations of several users during these exhibitions yield interesting and unforeseen results. I observed that the similarities between Philodox and mainstream search engines such as Google led to the participants engaging and reflecting on the algorithms behind this platform. They actively tried to reverse engineer how the results were related to the keywords. I found that majority of critiques that were in the content remained as jokes amongst the audience which was part of the plan for this work as the main aim was to question the unquestioned. The aesthetically clean but highly complex search algorithms. In this regard Philodox decreased the potential of the platform for a deeper engagement with the

contents of the results. I also found that the depth of critique and engagement and potential reflections about the bubble and the types of critical engagements I aimed to create with regards to the role of search engines in our social and information lives was limited due to the audiences taking most of the work as a joke. For example, in an interview with one of the participants they highlighted how they thought the results were always related to the keywords by not in a linear way. He was keen to understand the algorithm behind this relation. In other words, the users were looking for critical technological components of a mainstream search engine such as: the crawler aspect (which tries to give a cross section view of the internet) and the algorithm aspect (that tries to optimise the results along a certain objective). The purpose of Philodox was to question these elements. Overall, we succeeded in having discussions with around 7 individuals who had used and spent time with Philodox.

As with the other exhibition, as with the other projects, for Philodox, it was challenging to find ways to better capture the critical and affective aspects of the participants' engagements with the platform. What I collected was only anecdote, example, quotes and elements of the discourse of the few people that I was able to discuss with. These discussions gave me optimism about the critical potential of further developing this project. I hope that in my future work I will be able to further develop approaches to capture traces that will help better understand the affective and critical implications of my work. In such future attempts, I hope to develop a better understanding of the transformative potential (both intended and unintended) of various projects among both the participants and the project developers.

4.4 Open Bubble: An attempt at blurring the vision of Surveillance Capitalism

Surveillance technologies and knowledge bubbles are black-boxed in a complex assemblage of technologies, algorithms, policies and legislations hidden from most internet users. Understanding and developing strategies to deal with them is a complex process. In Philodox that I discussed earlier, I tried to challenge the trust in everyday interfaces. In Open Bubble I had two aims.

- To develop a better understanding of how my digital footprint is used to create a personalised bubble for me online
- Find a way to disrupt aspects of internet surveillance

In order to better understand how my internet knowledge bubble was constructed I conducted three small studies.

1) Attempted to disrupt my Twitter account: For one month, I tried to expand my Twitter bubble, by following 10 new users that their account and posts had no similarities with my bubble. However, this attempt did not affect or change my Twitter feed or added new followers outside my professional and personal bubbles. Several factors arguably caused this: 1) the depth of data that Twitter captures from each user. This means any attempt to disrupt twitter algorithms requires more time to effect users personal bubbles. 2) I only engaged with one part of the Twitter platform, which was following new accounts, however by extending this to other aspects of the service such as retweeting and tweeting different content to what I would usually do may effect Twitter algorithms more. Finally, based on my previous studies of data aggregation, this approach needs to be applied to a larger part of my surveillance network.
2) In order to develop a better understanding of some aspects of Google data capture, I downloaded a copy of my personal data from Google servers (I could only download the data I produced, i.e. emails, tasks, documents) to understand the extent of data capture on my account. I was particularly intrigued by the depth of my search engine surveillance. This helped me to further reflect and develop techniques to disrupt search bubbles.
3) I also looked at privacy and cookie policies and transparency reports of several mainstream search engines, news distributors and social networking sites that I discussed throughout chapter 2 and in this section.

Through a combination of these studies and my own understanding of computer code and algorithms, based on my review of most popular Firefox privacy related browser extensions I realised that majority of these applications with the aim to challenge and resist surveillance and knowledge practices they also monitor their users' activities. Browser extensions are small applications that users can add to their internet browsers to add new functionalities to their browser. The minority of these extensions that do not collect users' data are developed either by an individual activists or charity organisations. Table below shows the list of extensions that I reviewed their privacy statements. I used Firefox's addons page where users can

access a list of all published Firefox extensions. I search for the following keywords and sorted the result based on maximum number of active users.

keywords: “Privacy, Security, VPN, Cookie”

Title	Purpose	Manufacturer	Data collection	No Users
Privacy Badger	Blocks spying ads and trackers	EEF	Yes	1m
ClearURLs	Removes tracking from URLs	Kevin R.	No	54k
Ghostery	Blocks spying ads and trackers	Ghostery	Yes	1.2m
Decentraleyes	Protects you against tracking through "free", centralized, content delivery.	Thomas Rientjes	No	200k
Chameleon	Spoof browser profile	sereneblue	No	4k
uBlock Origin	Ad and tracking blocker.	Raymond Hill	No	5.1m
AdBlocker Ultimate	Remove ALL ads	Adblock Plus	Yes	6.7m
Avast Online Security	protection against known phishing and malware sites	AVAST Software	Yes	0.7m

DuckDuckGo Privacy Essentials	tracker blocking, smarter encryption, DuckDuckGo private search and more	DuckDuckGo	Yes	1.4m
Norton Safe Web	Malware and viruses	NortonLifeLock	Yes	1m
Browsec VPN	Unblock geographically restricted content and protect your IP	Browsec LLC	Yes	350k

Table 1 List of popular privacy and security related Firefox browser extensions

Based on my analysis of browser extensions, it was also evident that majority of these extensions, do collect users data. For example Ghostery (2019) browser extension provides blocking services of ads and cookie trackers, at the same time, their privacy policy states that they collect data about their users in various forms.

Another issue in this domain, since GDPR came into effect in May 2018, is that many companies formed numerous advertisers' alliances (Digital Advertising Alliance, 2019) to allow the users to choose their advertising preferences on the internet (Figure 35). Ironically, they also collect information about their user. For instance by storing my preferences with “YouradChoices”, I am allowing this advertising alliance to store my advertising preferences, which is used for further categorisation of internet users.

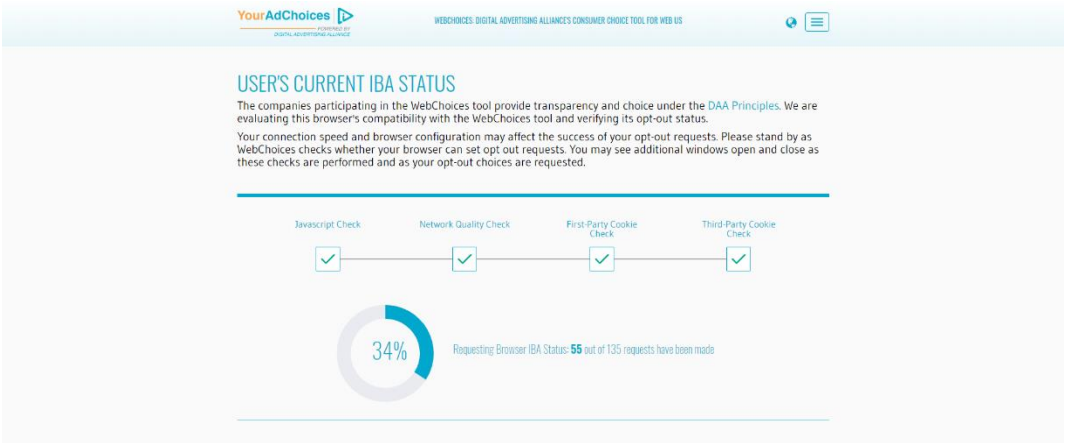
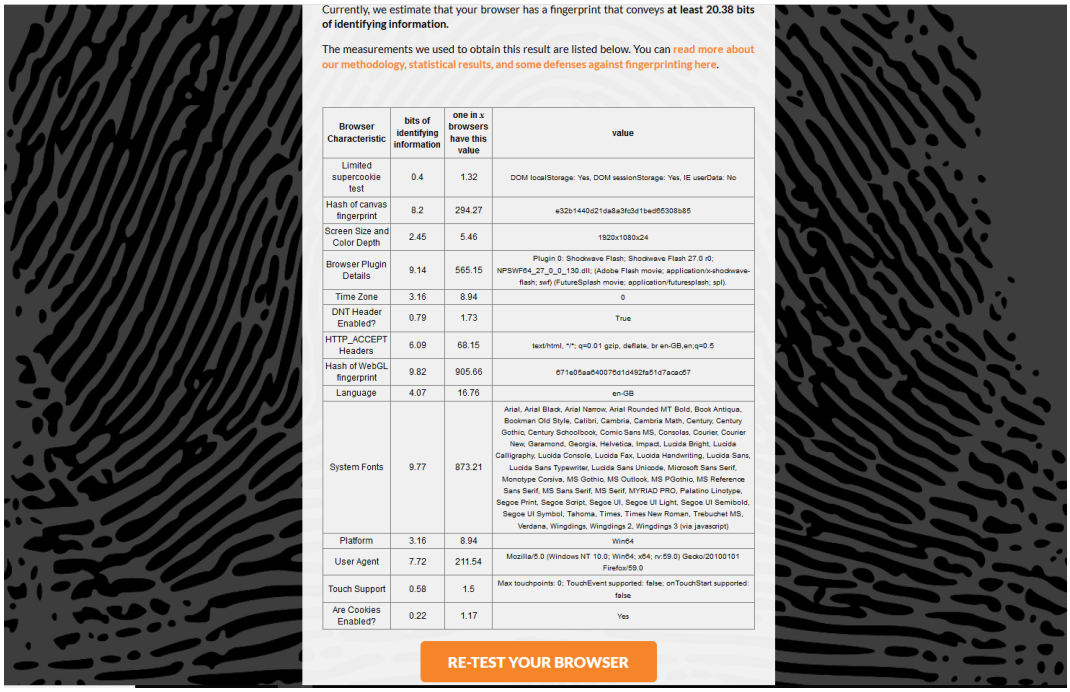


Figure 35: shows the interface for “YouradChoices”, an internet service that works with advertisers to allow users to have centralised advertising preferences

The more tools and extensions a user installs, this also makes their browser fingerprint unique to identify. For instance, Figure 36 shows my internet browser fingerprint analysis using Panopticlick (Electronic Frontier Foundation, 2010). Panopticlick provides browser fingerprinting analysis based on the device the users

use and add-ons they have installed. Panopticlick review of my browser shows that despite all my efforts, my browser still contains 20 bits of identifiable information.



Currently, we estimate that your browser has a fingerprint that conveys **at least 20.38 bits of identifying information.**

The measurements we used to obtain this result are listed below. You can read more about our methodology, statistical results, and some defenses against fingerprinting here.

Browser Characteristic	bits of identifying information	one in *x* browsers have this value	value
Limited supercookie test	0.4	1.32	DOM localStorage: Yes, DOM sessionStorage: Yes, IE userData: No
Hash of canvas fingerprint	8.2	294.27	e32b1440d21da8a3fc3d1bed65308b85
Screen Size and Color Depth	2.45	5.46	1920x1080x24
Browser Plugin Details	9.14	565.15	Plugin 0: Shockwave Flash; Shockwave Flash 27.0 r0; NPSWF64_27_0_0_130.dll; (Adobe Flash movie; application/x-shockwave-flash; swf) (FutureSplash movie; application/futuresplash; spl).
Time Zone	3.16	8.94	0
DNT Header Enabled?	0.79	1.73	True
HTTP_ACCEPT Headers	6.09	68.15	text/html, */*; q=0.01 gzip, deflate, br en-GB,en;q=0.5
Hash of WebGL fingerprint	9.82	905.66	671e65aa640076d1d492fa51d7acac67
Language	4.07	16.76	en-GB
System Fonts	9.77	873.21	Arial, Arial Black, Arial Narrow, Arial Rounded MT Bold, Book Antiqua, Bookman Old Style, Calibri, Cambria, Cambria Math, Century, Century Gothic, Century Schoolbook, Comic Sans MS, Consolas, Courier, Courier New, Garamond, Georgia, Helvetica, Impact, Lucida Bright, Lucida Calligraphy, Lucida Console, Lucida Fax, Lucida Handwriting, Lucida Sans, Lucida Sans Typewriter, Lucida Sans Unicode, Microsoft Sans Serif, Monotype Corsiva, MS Gothic, MS Outlook, MS PGothic, MS Reference Sans Serif, MS Sans Serif, MS Serif, MYRIAD PRO, Palatino Linotype, Segoe Print, Segoe Script, Segoe UI, Segoe UI Light, Segoe UI Semibold, Segoe UI Symbol, Tahoma, Times, Times New Roman, Trebuchet MS, Verdana, Wingdings, Wingdings 2, Wingdings 3 (via javascript)
Platform	3.16	8.94	Win64
User Agent	7.72	211.54	Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:59.0) Gecko/20100101 Firefox/59.0
Touch Support	0.58	1.5	Max touchpoints: 0; TouchEvent supported: false; onTouchStart supported: false
Are Cookies Enabled?	0.22	1.17	Yes

RE-TEST YOUR BROWSER

Figure 36: Shows the results from Panopticlick 3.0 (Electronic Frontier Foundation, 2010), analysing how trackable my Firefox internet browser is.

Based on my research so far, Internet search seems to be a powerful option to use in order to disrupt some aspects of internet surveillance. Search is not only part of information retrieval through search engines, but also majority of services and websites available online has a search functionality to allow users finding relevant content they are looking for. Mainstream search engines primarily provide such search features across the web. Some corporations such as Uber, Amazon and eBay developed their own search technologies specific to their needs and service requirements. This would also allow them to capture users' data within their own databases rather than using third-party search facilities.

Search engines collect data about users' searches and collect information about how they browsed the search results and the device used by their users. For example, Google, Microsoft and Yahoo three of the most commonly used search engines on the web (Wakabayashi, 2020), they all use a ping mechanism to track users engagement with the search results they provide. I used Google search engine and searched for the keyword "simple". The text below shows the complex

query google sends to its servers in order to provide the results for my search. Google uses a complex range of algorithms to provide the most "relevant" results for each search. This includes information about users' location, device used, browsing history and internet activities. Also, companies such as Google use aggregation (2.4) to enrich what they already know about each user.

> *"https://www.google.co.uk/search?source=hp&ei=ddk-*
> Xaf4E66Mggf4nKjYDw&q=simple&oq=blah&gs_l=psy-
> ab.3..0l7j0i131j0j0i131.548.1027..1167...0.0..1.503.1425.2-
> 2j0j1j1.....0....1..gws-
> wiz.....0.gpjEM2bAfcM&ved=0ahUKEwjnhpqNhNrjAhUuhuAKHXg
> *OCvsQ4dUDCAc&uact=5"*

Simplified version of the same query showed above would be "https://www.google.co.uk/search?q=simple". The rest of the black-boxed attributes in the search query presented above are extra information google sends to their servers to bring personalised results based on various factors and capture more information about their users.

In addition, the results page that Google and other mainstream search engines present include tracked URLs for each website. This means, when the user clicks on any of the search results, the search provider records users interactions with their search results. Figure 37 shows my internet browser developer section, in there one can see the *"ping"* element that has a unique identifier sending a message to google servers before redirecting users to the page they wanted to visit.

Figure 37: Shows a keyword searched on Google and how it manipulates website links to capture more user data.

Google argued, even for anonymous users they use a range of 60 identifiers, which gives them the ability to identify individuals without the need for them to authenticate with Google services.

4.5.1 Bursting the bubbly brain of the cyborg

Chapter 2 discussed some of the challenges that science and technology brought to our lives, our sense of individuality, freedom, and autonomy. I also discussed how

science and technology became the monopolised force for change and progress and how access to information and knowledge is commodified and used to manipulate individuals and their communities. I used Haraway's concept of cyborgs in relation to the ways science and technology are dismantling and breaking the boundaries between human, nonhuman and machines. Andrejevic's (2007) conception of digital closure was another theme central to my analysis, especially regarding how new forms of media and surveillance bring a mode of closure and control through an assemblage of surveillance machine-mediated reified realities. Behavioural economics was discussed in relation to how it is used to manipulate individuals to retarget their attention and manage their decision-making processes.

As a practical application of this discussion, Open Bubble is a critical software design work that aims to obfuscate and disrupt some of the ways corporations such as Google, Microsoft, and Yahoo monitor their users and use these mechanisms as a tactic to challenge their surveillance and control mechanisms. In this work, my focus was on the tactical rather than critical; therefore, there is more description and explanation on the technical aspects of the work.

4.5.2 Using search to disrupt search

Open Bubble is a browser extension that generates and pushes behavioural data to numerous advertising companies and corporations by obfuscating their available Application Programming Interfaces (API). I developed the browser extension in 6 months; however, the research about the tactics and ways to disrupt and understand knowledge bubbles was ongoing throughout this investigation. By obfuscating and disrupting data surveillance, this work also expands and disrupts users' knowledge bubbles.

In what follows, I first explain why I developed this application as a browser extension (4.5.2.1). I then describe how the Open Bubble algorithm works (4.5.2.2). In relation to this, I discuss some of the technical challenges of the work (4.5.2.3). Finally, I talk about the design language (4.5.3) and some reflections on this work (4.5.4).

4.5.2.1 Choice of technology

From a programming perspective, this application can be implemented as a native application or internet browser extension. Native applications are programs that run directly on an operating system using the events and options each operating system

provides. For example, Word is a native application, as is a web browser. Web extensions on the other hand are small pieces of software that can work alongside internet browsers to execute certain tasks. Developing this work as a native application would create several challenges, as companies such as Google would be able to detect the activities of this application as suspicious and therefore block the user's access. For example, if an application makes too many requests to one of these service providers, their algorithms can detect this and either filter the information pushed to their system as noise or block their access all together (See: 4.5.2.3.2).

I developed Open Bubble as a web extension using the WebExtension API. There are six major internet browsers available: Chrome, Firefox, IE, Safari, Edge and Opera. In the year 2018, it is reported that 66.9 percent of internet users use Google Chrome, whilst 11 percent use Firefox, followed by Internet Explorer (7 percent), Safari (5 percent), Edge (4 percent) and Opera (2 percent) (Statista, 2018). Apart from Firefox, large corporations own the other internet browsers in the list. This means that all these browsers (apart from Firefox) collect and capture a wide range of information about their user's internet activities.

To increase their functionality and allow developers and users to customise their browsers needs and preferences, the browser extension API was developed. Each internet browser generally has its own language and API and web extension developers are required to use them in order to develop a browser extension for each browsing software. Recently however, the WebExtension API was introduced as a cross browser solution for developing browser extensions. The WebExtension API supports Chrome, Firefox, Edge and Opera which together can cover a majority of internet users. The WebExtension API was therefore used in this work.

Browser extensions are applications that can add new features and functionalities to browsers. Some extensions manipulate the content the user browses[10], whilst others add and remove content from web pages[11] or provide new tools and features (for more on this see: mdnwebdocs-bot, 2019).

[10] For example Tabliss allows users to customise new tabs themes and background in browsers. https://addons.mozilla.org/en-US/firefox/addon/tabliss/

[11] There are again many examples of these extensions, advertisement removers, cookie removers are two examples of many from this category.

The WebExtension API provides a standardised framework for programmers to develop browser extensions that are cross-browser and have better compatibility with numerous versions of different internet browsers. Extension APIs also provide a set of standards and limits from a security perspective. The Mozilla implementation of the API is used to develop this application. I decided to use the Mozilla extension as the Mozilla foundation has more focus on privacy. In addition, developing this extension using the Firefox implementation of the WebExtension API offers more opportunities for both funding and support from its community to further develop this tool. Firefox is the main development and testing environment for this extension. Open Bubble can also be ported to Chrome, however this was not tested and implemented as part of this development due to time constraints and there was also no obvious need for this.

Platform and language

The WebExtension APIs use a combination of HTML, CSS and JavaScript. HTML and CSS are used to implement the configuration page of this extension whilst JavaScript contains the code for interactivity and the logic of the application. In addition to this, the API uses a manifest file to configure permissions and the level of access to users' data, browser events and activities this application required. Figure 38 shows the architecture of WebExtension API.

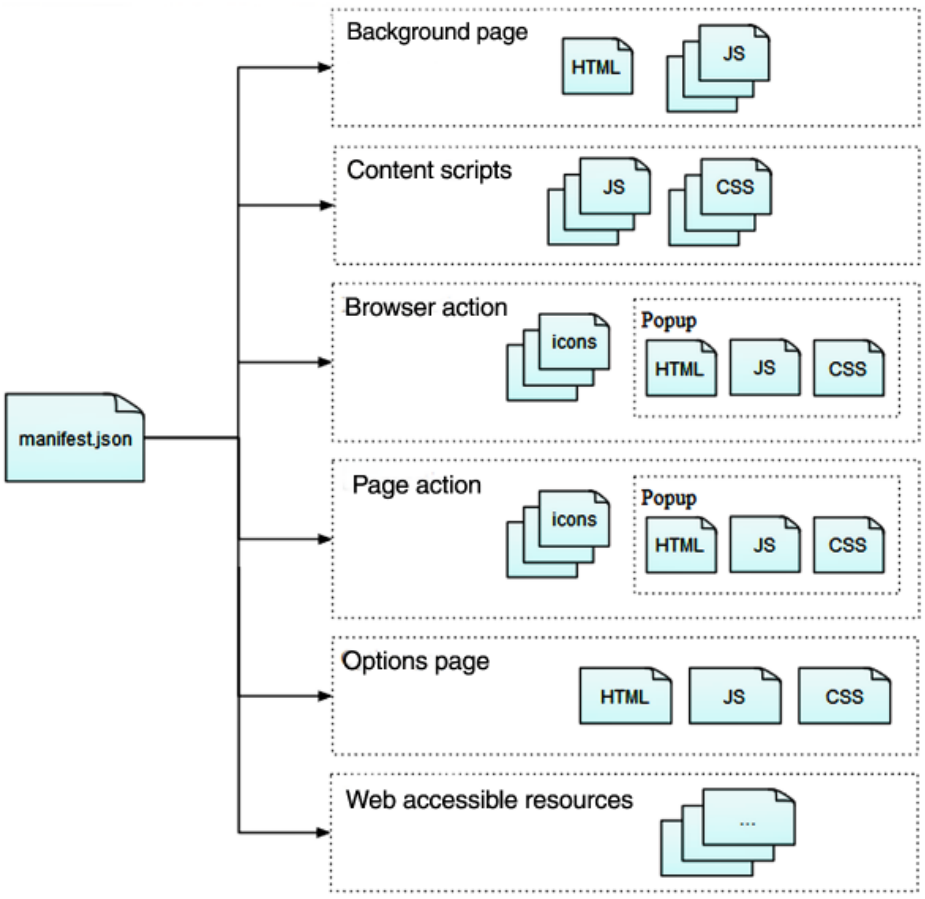


Figure 38: Architecture of WebExtension API.

The WebExtension API has two types of scripts: background and content. The main use of background script is to run the logic of the application. Background scripts continue to work as long as the extension is installed and is enabled on the browser and they are independent of any particular window or webpage. Content scripts are often used to manipulate and analyse content of the pages in the browser. For example Negativeland's browser extension that I discussed in chapter 3 uses content scripts (Negativeland.com, 2020) The next subsection presents the logic of Open Bubble.

4.5.2.2 Open Bubble logic

This program attempts to mimic user's browsing behaviour by pushing false information about what users search and look at on the internet. Figure 39 shows the logic behind Open Bubble.

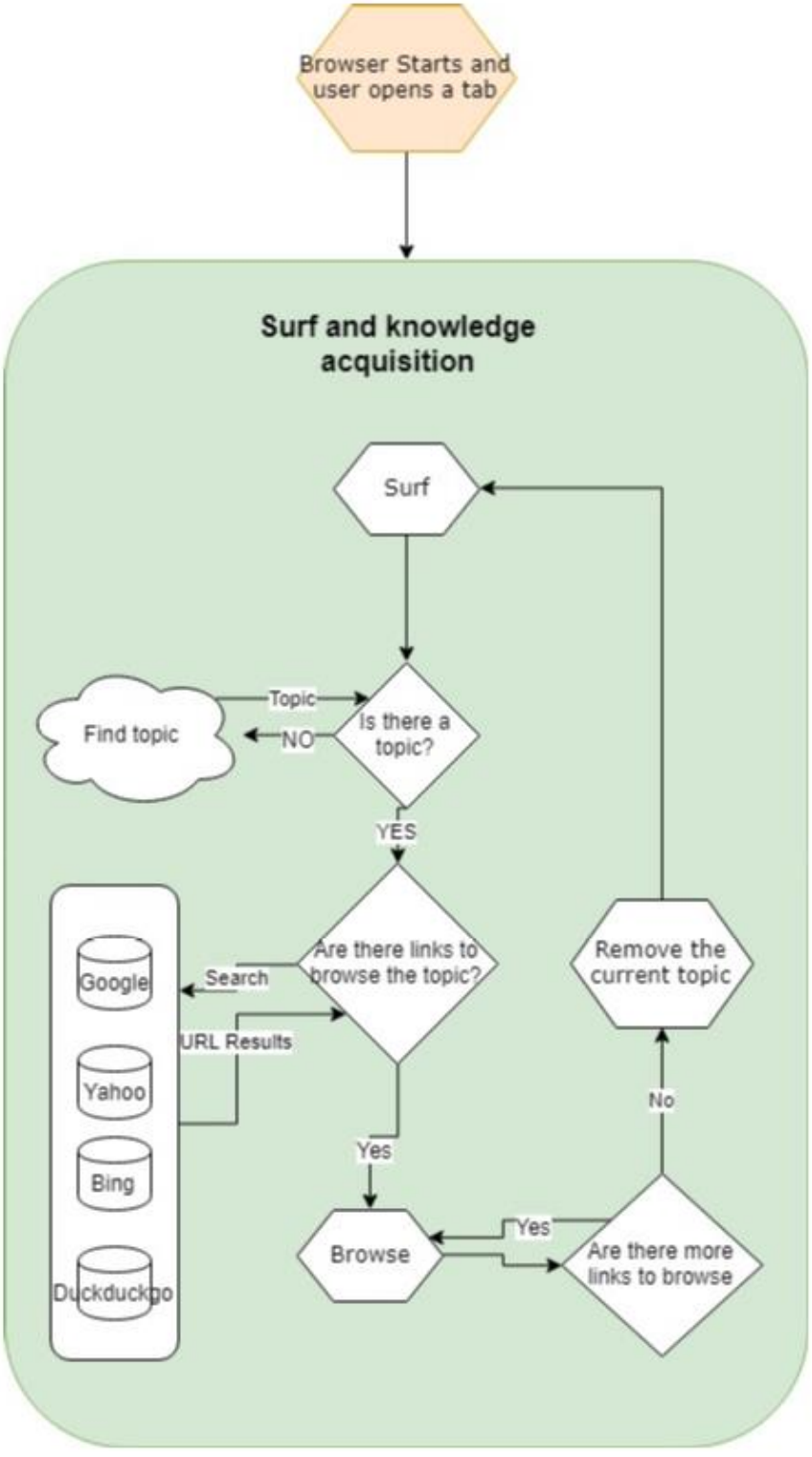


Figure 39: Open Bubble logic diagram

The program first finds a new topic of interest. As shown in Figure 39, the extension has two main scripts: background and content scripts. The background script first asks either Wikipedia or the Reddit APIs to acquire a random topic. Reddit provides a platform for its users to share and discuss various topics of interest whilst Wikipedia represents one of the largest community generated repositories and encyclopaedia on the internet. Both Wikipedia and Reddit are platforms that are created and sustained through the effort of variety of individuals and communities internationally. Wikipedia (Alexa, 2019a) and Reddit (Alexa, 2019b) ranked as the fifth and twelfth most visited websites on the internet globally by Alexa . Reddit provides 3 categories of topics: general content, gaming content and adult content. These are generated automatically by Reddit using its users engagement with their platform. In Wikipedia I used the list of controversial topics which has over one thousand topics listed and changes regularly. Figure 40 shows the detailed process of the Open Bubble browsing algorithm.

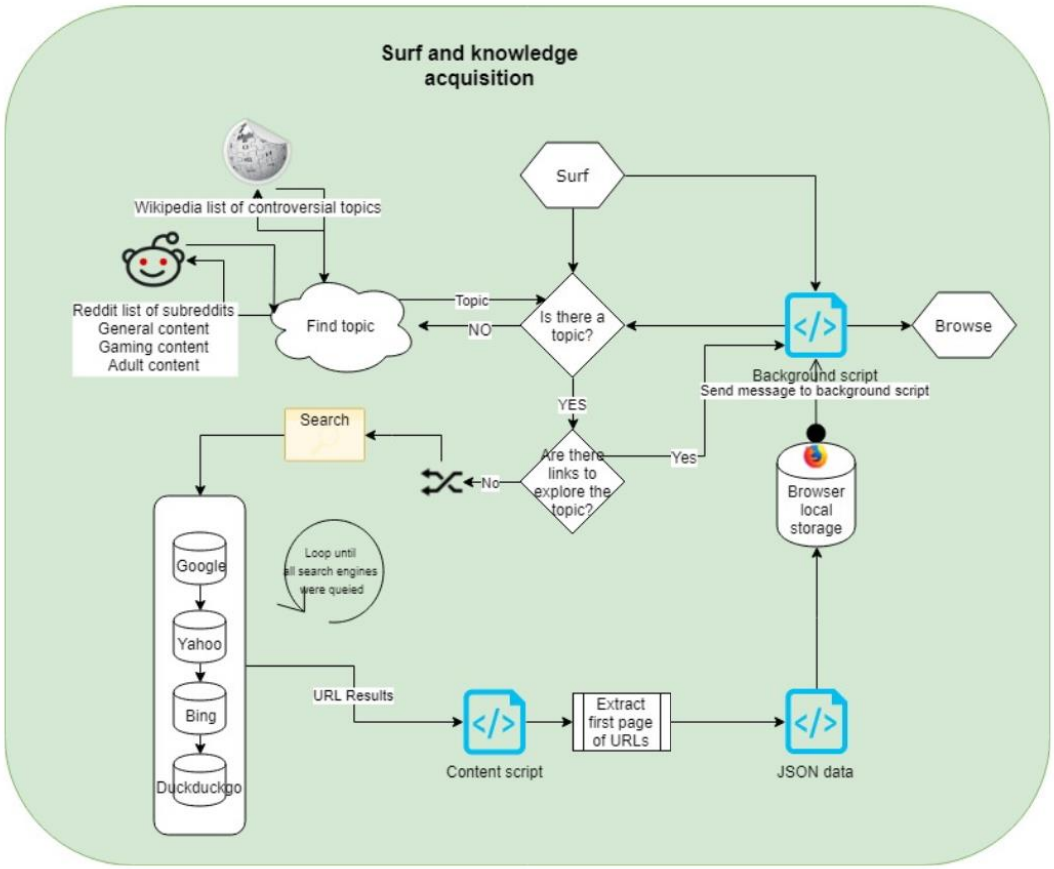


Figure 40 The logic of topic extraction and surfing behaviours

From the list of topics that the extension received from the Wikipedia and Reddit APIs, Open Bubble then choose one at random. This topic is then used as a keyword for searching in four major mainstream search engines. I developed a content parser to generate the URL search query that is unique to each search engine and an HTML parser to extract web addresses from the first page of each search result. To establish and document the process in more detail, an example is given below which shows the step by step process of Open Bubble, from finding keywords to browsing the links.

For example, from a list of over a thousand controversial topics, Open Bubble randomly chose “Jean-Marie Le Pen” as its new topic of interest. Figure 41 shows the first search of this term by Open Bubble on the Yahoo search engine.

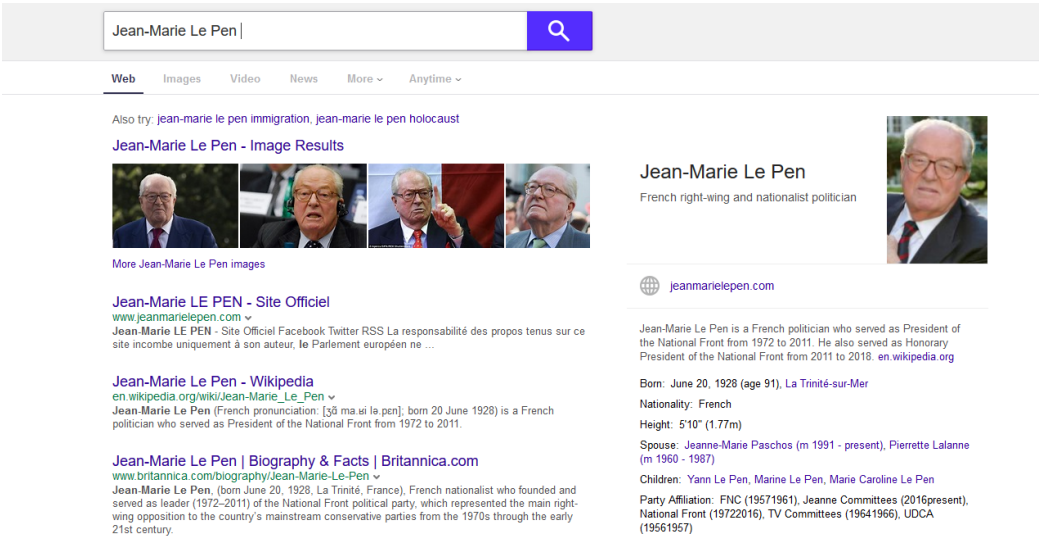


Figure 41: Open Bubble searching Yahoo with the keyword Jean-Marie Le Pen

The extension then searched the keyword on Google, Yahoo, Bing and DuckDuckGo. The links from the first page of each search were then extracted and stored in JSON format in my browser’s local storage. Each time I open a new tab or navigated to a new tab on my browser, Open Bubble redirected my internet browser's first tab to one of the links it stored. Figure 42 shows the first link that the extension opened.

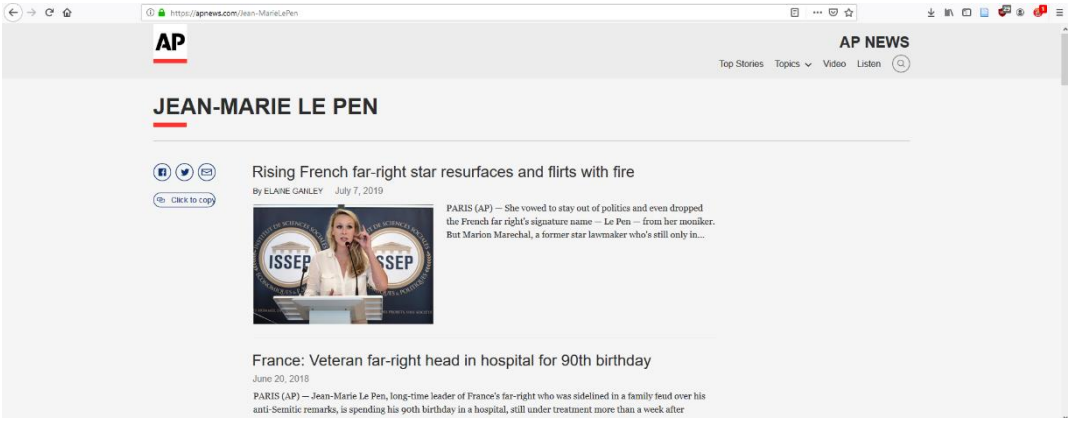


Figure 42: Shows the first link opened by Open Bubble

The extension continues to open all the links it has in the browser's local storage until all links for a topic are explored. It then finds a new topic and starts this process all over again.

4.5.2.3 Technical challenges

During the development of this work, I faced three main challenges. First the ethical considerations in terms of avoiding users' data being breached to third-parties through my application. Secondly, considering the implications of such technologies on fields such as digital forensic and police work. Finally making sure that search engines and other advertising firms do not block the actions of the browser extension that I developed.

4.5.2.3.1 Ethical considerations

I was concerned by the implications that this browser extension could have on investigations conducted by police in the domain of digital forensic. I was also concerned that searches for controversial topics may cause issues for the users, depending on the location they used this extension. For example, the list of topics that I currently use comes from Wikipedia's list of controversial topics. This list contains over 50 topics on adult content, including terms such as Necrophilia. If the extension searches and browses the content for this topic, this may create suspicion and danger to the user depending on who is monitoring their internet activities (i.e. their employer, internet service provider at home, mobile network company to name a few). In addition, if a user uses this extension and is already under investigation by the police, I was concerned whether this extension could jeopardise any ongoing investigation.

I work as a lecturer in the University of Abertay and at the time of developing this project, this gave me access to a great range of colleagues specialised in cyber security and digital forensics. Many of my colleagues work and collaborate with the British police on digital forensic investigations. In addition to speaking with my colleagues at Abertay University, I had regular meetings with Mathew Rice (Director of Scotland's Open Rights Group[12]) to consider some of this project's design elements and ethical challenges. In terms of implications to police investigations, my colleagues did not raise any concerns over using this tool, as forensic investigations usually use a complex and multifaceted range of methods for their investigation. This browser extension would not cause any real danger to these lines of work. In terms of the effects on users, as this tool is not currently rolled out into any communities, I have decided to avoid censoring or filtering any of the topics. This was also in line with the rights of users to freedom and liberty in terms of the types of information they access online. I am planning to add a configuration page to this extension, so that the users can decide on the categories of topics that they would like this tool to explore. In addition, I will also add a semi-transparent mask over the contents of the first tab of the browser in case the user accidentally navigates to the first tab and if the extension is browsing any inappropriate content this would be masked behind a box.

Finally, there are variety of methods to find a topic for the browser extension to explore. For instance, by looking at users' browsing history, I could send this information to a natural language processing service and find the topics that each user is interested in. This approach to finding new topics would create two challenges: it is almost impossible to find topics that are opposite or different to what the user is interested in and to extract and process such information, data would need to be obtained from and shared with third-party services. This would create layers of data protection complexities in relation to GDPR and complex privacy consent processes for the users. This was one of the factors that led me to use Wikipedia and Reddit to find various topics for this extension and resolve these ethical challenges.

[12] Open Rights Group (ORG) is a charity and digital campaigning organisation that focuses on improving and protecting the rights to privacy and free speech online.

4.5.2.3.2 Bot detection

The majority of websites and search engines are equipped with algorithms that can detect and block access to their services if they identify that their services are being used by non-human actors or that their use guideline are being breached by an application or user. For example, the Google search engine is limited to respond to a restricted number of human requests and as soon as their algorithm detects that the behaviour and pattern of requests are not similar to a human, they block the service for that computer. In order to avoid this issue, I decided to design Open Bubble in a way that its behaviour mimics users' online behaviours. In order to do this, I had to get access to their browsing activity. The WebExtension API provides this access through their framework. Figure 43 shows the list of permission and users' browsing activities that I configured Open Bubble to have access to.

```
{
  "manifest_version": 2,
  "name": "openbubble",
  "version": "0.1",
  "description": "surf the internet in the background to burst
users data bubble.",
  "homepage_url": "https://github.com/mehrpouya/openbubble",
  "icons": {
    "48": "icons/openbubble.png"
  },

  "permissions": [
    "webRequest",
    "<all_urls>",
    "alarms",
    "tabs",
    "storage"
  ],…
}
```

Figure 43: The Open Bubble permission file.

In this context, interactions refer to when a user opens a new tab or close a tab. These two events allow the extension to open new websites following the same speed and timestamp profile as the user. This was implemented in this way to avoid problems such as users' account being categorised as a bot or requests to various

service providers categorised as noise as they are too regular or not following a standardised human behaviour.

4.5.3 Blurring of territories as a critical design strategy

Typically, activist work seeks to criticise and encourage reflection, but it can also actively create interventions in people's normal life conditions or value systems. Open Bubble was the project in this chapter that was most interventional in the sense that it tries to actively change and challenge the functioning of mainstream search engines by breaching the information flows and the search bubble. However, I also emphasise that, while being interventional in its core focus, this work also aimed to highlight the existence of the bubble, highlight the dynamics of the bubble and hopefully engage the participants in critical reflection about their respective bubble. I hope that as a result, after and beyond the use of Open Bubble, its effect on reflections about the bubble would persist among and around the participants.

In this work, I mobilised Chambers (1991) notion of oppositional manoeuvres. Manoeuvres is a loaded word that is dominantly used in military contexts, but also it is a great metaphor to describe the critical situations and happy accidents that form part of critical design and creative design practice and processes. As a verb Manoeuvre dates back to Medieval Latin meaning "work done by hand". In a military context, it refers to movements and tactics to better strategize. Chambers (1991, p. ix) argues that there is a critical space in between chaos in a system and the systems' power to convalesce that disturbance which he calls "room for maneuver". In this space within a system, oppositionality and change can take place. De Certeau's (2004) notion of subversion conceptualises a similar approach. He argues that instead of transforming or rejecting objections, individuals can make something else out of them by subverting them and using their own means against them. "In any case, the consumer cannot be identified or qualified by the newspapers or commercial products he assimilates: between the person (who uses them) and these products (indexes of the "order" which is imposed on him), there is a gap of varying proportions opened by the use that he makes of them." (De Certeau, 2004, p. 215)

In the design, I paid attention to a set of tactics unique to this project to foresee the actions and reactions with the mainstream search engines and to foresee the result of the functioning of Open Bubble. As a result, this involved an active experimentation that I did not need to engage in other projects. However, the design

was not only tactical because I was also reflective about the interface, its interactions with the participants, the visibility of the interface and the effect this could have on critical reflection amongst the participants.

In Open Bubble I was challenged by the difference in critical approach. Open Bubble is not about primarily expansion of the critical space, instead it is about intervention in the idea of the bubble. At the centre of the design tactics in Open Bubble is the idea of obfuscation. The idea of obfuscation is essentially about blurring the territories around the objects of governance. In this case, the boundaries of individual tastes, individual preferences, locations, financial transactions and other aspect of the individual that are targeted by surveillance capitalism. Within Open Bubble I focus primarily on the potential preferences of the individual. In the language of Foucault, the very important process in governance structures is the idea of territorialisation. Territorialisation is about setting boundaries around the objects of governance to make them governable (2.2).

Obfuscation is essentially about providing the governance regime with information that blurs the boundaries of the territory of the governed objects, in this case the individual. While in the case of Open Bubble this process of de-territorialisation or mis-territorialisation is limited to search and information preferences, I do believe that this critical tactic can be mobilised in other projects to target other platforms integral to surveillance capitalism, such as location-based services or territorialisation of individuals with regards to the space/time of their activities. I believe obfuscation can play a central role in dismantling and disrupting these forms of governance regimes.

I find the relationship between ambiguity and obfuscation highly revealing and interesting. Ambiguity as I developed in Philodox can be crucial for creating a space for imagination, alternative interpretations and engagements. It also gives the audience an active role in the development of critical ideas. Obfuscation essentially introduces ambiguity into a dominant system designed around technological determinism. This system is ill-equipped to deal with this type of ambiguity. As a result, ambiguity in the form of obfuscation is disruptive when it enters into dominance surveillance capitalism regimes. Essentially, obfuscation is a disruptive mobilisation of the idea of ambiguity and introduces into and infects the dominant surveillance capitalism regimes with a diversity of narratives. This blurring of

narrative is something that that surveillance capitalism regimes are not equipped to deal with.

As for the critical aspect, I used the first tab of the user's internet browser in Open Bubble. I aimed to have this process visible, so that users, as they browse the internet, can see their first tab being refreshed and changed. This would remind them of the work the extension does behind the scene in order to breach and expand their knowledge bubble. In addition, the users can also view this tab at any point and look at the topics and website the browser extension explores at any point. To develop the critical aspect of Open Bubble further in future work, I aim to make the breaching of the bubble more visible to the participant, so they can understand ways in which their information space is being affected through this critical design work.

4.5.4 No bubbles burst as of yet : (

In Open Bubble I'm essentially looking to enact two types of manifestations. One is critical, and one is an actual intervention in the information ecology in which a user is embedded. The critical dimension is about this software enabling critical alternative reflections about the role of the information bubble. This involves making the bubble debatable and visible, creating possibilities for collectivising and politicising debates around the notion of bubble. The second dimension is actual intervention in breaching the bubble. I mobilised the notion of manoeuvres that Chambers (1991) developed and similarly the idea of tactics through the work of De Certeau's (2004) (See: 3.2.2.4). This dimension is essentially about intervening in information flows surrounding the user to confuse and obfuscate the dominant regimes of search. Brunton and Nissenbaum (2011) argued that data obfuscation is a powerful technique that can overcome and counter some of the modern surveillance mechanisms. Obfuscation is a process where users produce and give away information and data that is ambiguous, false and misleading. Ambiguous data can resist surveillance in several ways. First of all, since data is the most valuable commodity in a digital economy, the higher the cost of mining and analysing the data the harder and less likelihood that corporations would invest money and resources to analyse them. Secondly, consistent and long-term introduction of false data can arguably make the data less reliable and valuable, as it will not represent an accurate portrait of the user/consumer. This is similar to the notion of disambiguation that Mushon (2016, p. 2) described.

> *“Though not framed in terms of ambiguity, our digitized social lives* have become major fields of contestation. The intricacies of our ever-changing relationships defy categorization and our intimacy and privacy become the price we must pay for connectedness and *friendships”.*

It is important to emphasise that unfortunately I have not been able to test and measure either of these two effects. Among my four different practices, Open Bubble is the one that I have least been able to test with various audiences. Outside the development process, this work has not been tested with any external audience. I do believe that in the future such broad uses of these platforms are essential to further develop both the critical and interventional dimensions of this critical work. It is important to emphasise that the separation between the critical and interventional dimension is heuristic. Meaning that in practice, they are highly intermingled. The way the intervention in the bubble works and how the bubble is breached has implications on the way the users perceive, criticise and become conscious of the role of the information bubble in their various interactions with technology. Therefore, these two processes are mutually constitutive and the separation is only inscribed in this way here in order to facilitate my description of the project while in practice they are inherently interrelated.

4.5 Maladox

4.3.1 Dis-ease of the cyborg

Human and machine have never been entangled the way we see in contemporary interaction between human body and various forms of science and information technology. The boundaries between ideas of human health, function, dysfunction and machine functionalities are increasingly blurred. As Haraway (1994) puts it, we are now cyborgs. These technological entanglements have enabled a diverse apparatus of closure and control to an assemblage of machine-mediated reified realities. The entanglement of human flesh, science and technology, and new forms of bio-politics are now central to governance (Foucault et al., 1991, 1991, 1988).

Maladox creates a critical space for interpretation of our interactions with technology through satire. This critical software design work aims to challenge and reveal these aspects of technology and our interactions with it. I aimed to use satire to create a critical space for personal interpretation, critique and analysis of these issues and concerns through an anatomical representation of the human body and the diseases that occur in the future due to our interactions with technology. I explored and

critiqued how virtualisation, simulation and expansion of technology, further development of artificial intelligent, a high level of dependence on technology and automation resulted in long term changes to our bodies and minds.

4.3.2 Programming the dis-ease

Maladox is a collaborative project with visual artist Robert Powell. The project was funded as part of the Weave group exhibition during 2018 NEoN digital arts festival (Hine, 2018). Maladox is an interactive anatomical engine that lets the user explore cyber-sicknesses of the future caused by our entanglements with technology. Figure 44 shows one of the participants engaging with our work.

Figure 44 One of the participants engaging with Maladox

I will discuss the exhibition and my reflections at the end (4.3.4). I developed Maladox using the Unity game engine (Unity, 2019). Unity is accessible through free and paid licence options. The free option was suitable for this project and there was no need to use the paid version. In addition, Unity projects can be published into over 34 platforms, including Microsoft, macOS, mobile and web platforms. This flexibility of Unity technology makes it a great platform for developing this work. It would allow me to publish the work on various digital platforms to increase the reach and accessibility to this work. In addition, since the majority of work involved in making Maladox was the satirical written work, Unity provides a great range of

technologies to create this interactive piece. The code for this work developed in C# programming language using Unity's Application Programming Interface (API). After completing each cyber-sickness, I imported them into the Unity project as a separate game object. Unity's infrastructure allows each game object to have its own code/script attached to it, therefore making the process of software development more streamlined and easier to manage.

4.3.3 The narratives of cyborg pathologies

Maladox is a speculative critical design work that uses satire, humour and the grotesque to critically engage with and question our relationship and entanglements with technology. The work was developed collaboratively over a period of 5 months. Each week, Robert and I wrote one cyber-sickness each, while discussing and conceptualising other diseases together. In total, I wrote 18 entries (Appendix 4.1 – Appendix 4.18) and Robert wrote 15 (Appendix 4.19 – Appendix 4.34) for this work. I developed the interface and software and Robert produced the illustrations that were included in the work.

Figure 45 shows the landing page of Maladox. To make the list of diseases more accessible and better mapped to the human body, we categorised them under five groups.

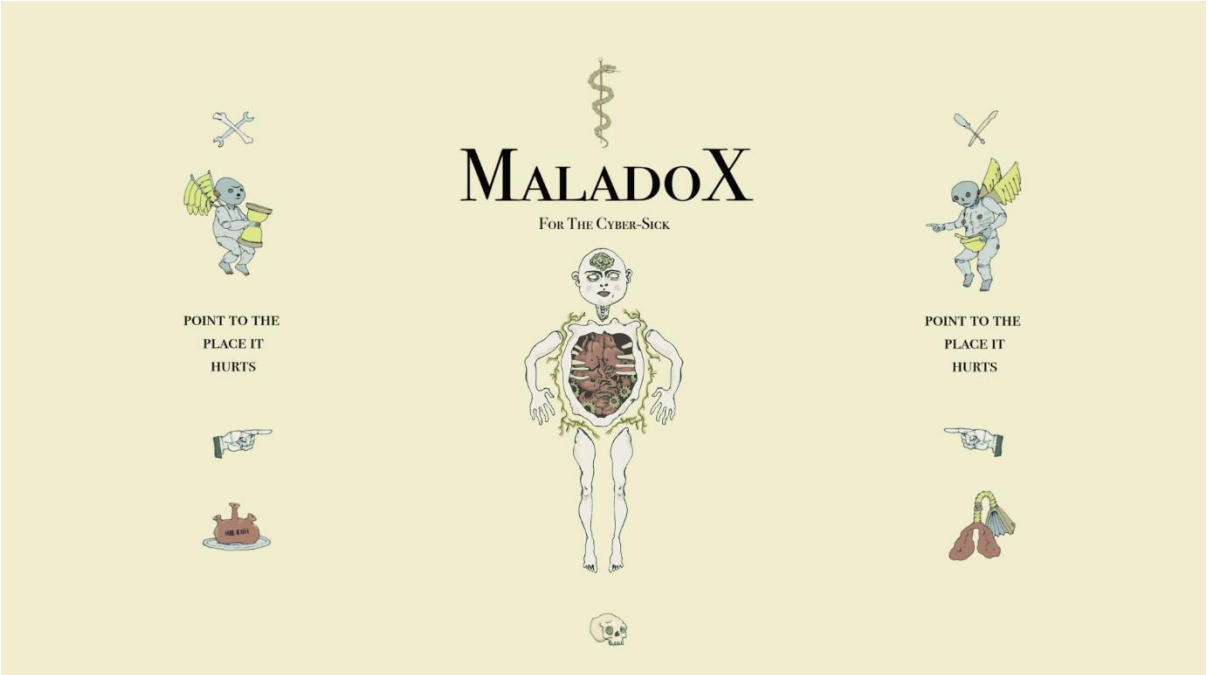


Figure 45: The landing page of the Maladox anatomical interface.

These cyber-sicknesses categories are diseases of the brain, limbs, body, eyes and nervous system. For example, Figure 46 shows the list of diseases under the category of limbs. Users can interact with the work by clicking on the anatomical illustration of the body. This interaction leads to the appearance of a list of diseases per category that the user can view. In total 34 diseases were conceptualised and developed.

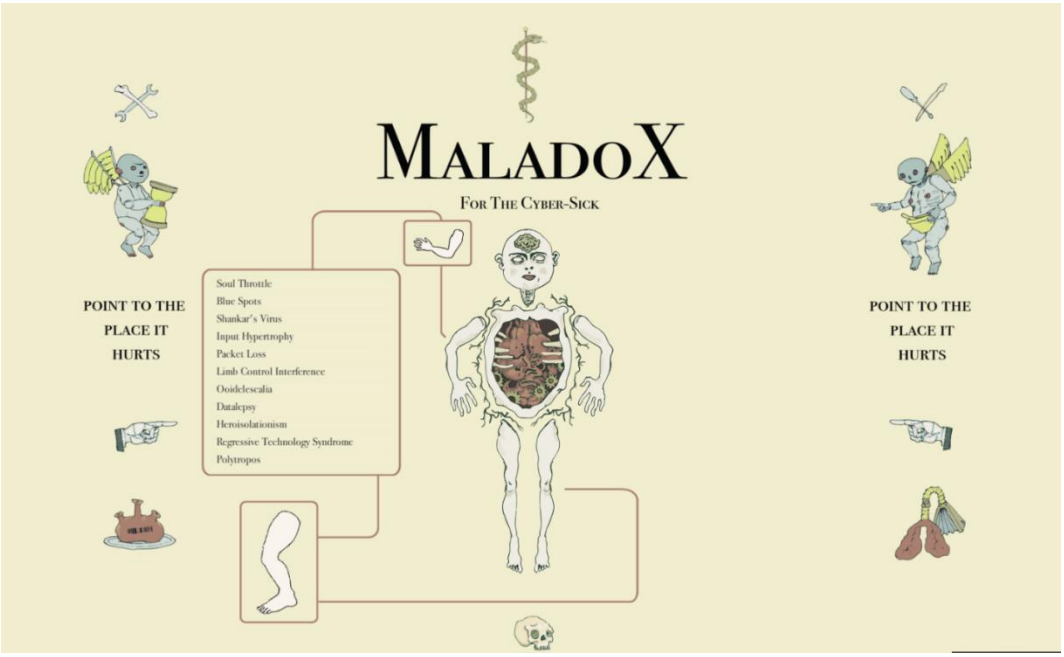


Figure 46: The list of (for example) limb diseases

In the conception of each disease, I drew inspiration from media panics, academic concerns as well as reflections in the philosophy of technology. For example, “Soul Throttle” is caused by data saturation in all aspects of human life as well as new developments in Human Computer Interaction (HCI). By situating these concepts in futuristic scenarios, my aim was to create an analytical temporal distance to help participants interpret and question these changes in human/technology relations. Figure 47 shows Soul Throttle. The complete list of diseases is included in Appendix 4.

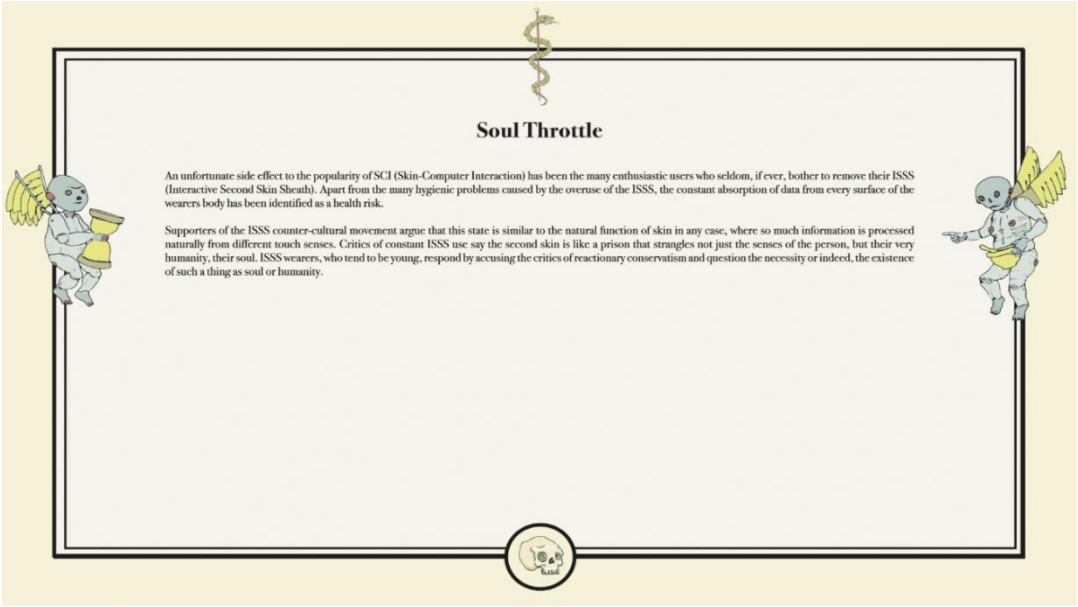


Figure 47: Soul Throttle, a cyber-sickness that affects human body, limbs and nervous system

I used a combination of methods to develop the name of each disease. These included researching real computer viruses' names and the type of malfunctioning they created in relation to the diseases developed. In addition, I referred to World Health Organisation (WHO) guidelines on best practices for naming new diseases. WHO states: “The best practices apply to new infections, syndromes, and diseases that have never been recognized or reported before in humans, that have potential public health impact, and for which there is no disease name in common usage.”(World Health Organisation, 2015). This was done to create ambiguity between the world of real and imaginary diseases.

For example, Shankar’s virus refers to a real computer virus that infects Microsoft word documents. It modifies computer date and time, prompts the user to “wish Shankar happy birthday”, and changes the title of the word document. The virus then works in silence, but periodically communicates with users through adverts and error messages (Microsoft, 2007; Symantec, 2007). Figure 48 shows one of the popup messages that the virus triggers.

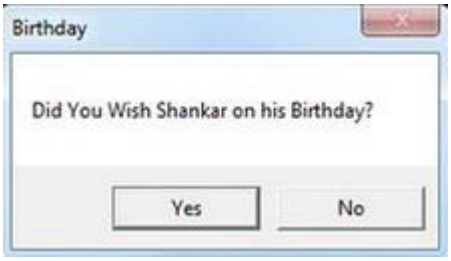


Figure 48 Popup message prompting the user to make a wish for Shankar on his birthday

This virus is part of a category of computer viruses that use a technique called polymorphism. Polymorphism in this context refers to an approach to the development of viruses whereby the virus code stays constant throughout its lifetime on a computer, but it regenerates itself through different algorithms in order to make it harder for users to find the virus instances on a computer.

Figure 49 shows the page and description of “Chronochondria or Human Shankar’s Virus” (Appendix 4.12). The virus takes inspiration from Albert Camus’s (2013) The Myth of Sisyphus and his notion of absurd. Camus uses the Greek myth of Sisyphus as an analogy to contrast the lived experience against notions of external realities. Sisyphus is punished by the gods to roll a rock to the top of a mountain and then to have it roll back down, to start all over again for eternity. In the description of this disease I liken the absurd work of Sisyphus (Umbrello and Lombard, 2018) to contemporary circular and perpetual engagements with social media. This reflects on algorithmic control and how digital interfaces perpetually represent and intervene upon our present, past and future.

In the description, the name Gerald Macdougall refers to two historical elements. First the 21 grams experiment conducted by Donald Macdougall attempting to measure the weight of human soul. This became part of popular culture through films such as 21 grams and other works of fiction (an extreme case of the discussions in Chapter 2 on quantification). It also refers to a local historical anecdote in the Scottish context related to the clan of MacDougall. I used these names as they yield many search results and layers of information leading to ambiguity. This approach further challenges the boundary between the real diseases and imaginary ones further expanding the critical space for individual interpretation.

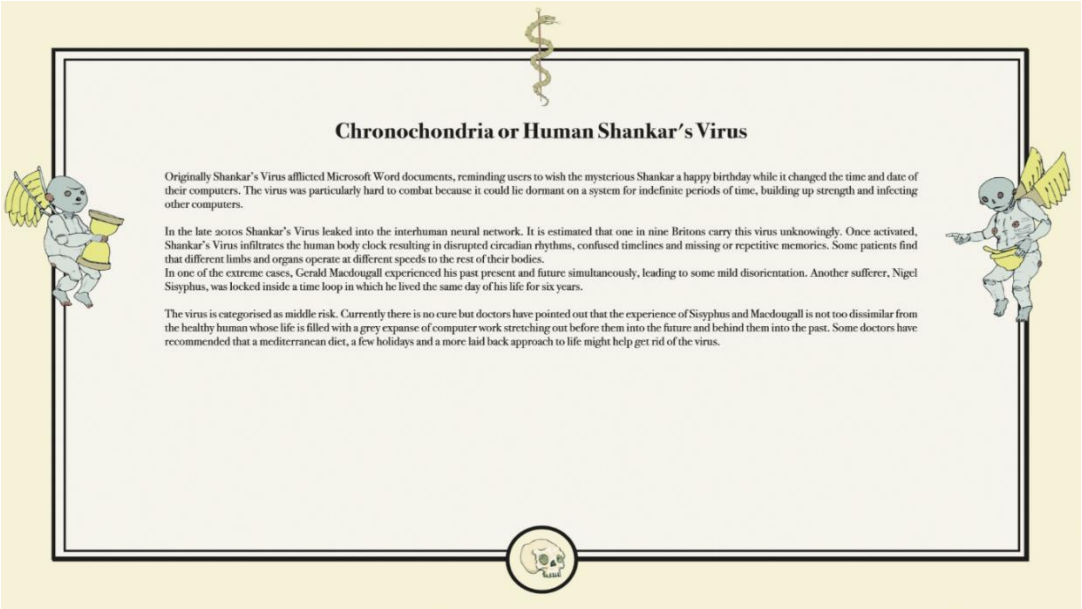


Figure 49: Details of Shankar's virus from Maladox anatomical engine

4.3.3.1 Role of ambiguity, satire, humour and the grotesque

Ambiguity is inherent in natural languages. Humans produce constructs such as irony, metaphor, allegory, and analogies to deal with complex concepts and realities that cannot be communicated and represented univocally. Levine studies ambiguity within Amhara and American value systems. He shows how ambiguity is used to reveal realities or to obfuscate them. In many cultures, ambiguity is the preferred form of communication as it can deal with the complexities of real life as opposed to univocal statements that cannot capture its richness. Another difference between univocal language and ambiguous communication is their affective dimension. Rationalised and scientific language is used to represent facts, expectations and descriptions with precision. Ambiguous communication however, is a great medium for conveying affect. Levine traces this notion of rationality and univocal language not in everyday uses of language, but in law and more broadly in averting ambiguity and openness of thought-ways into a “utilitarian application of intellect to the problem of this world” (Levine, 1988, p. 37). Ong (2013) traced a similar transition in language when individuals move from the world of sounds (orality) to literacy (technology of writing) and the emergence of printed media (Ong, 2013, chap. 5). In the use of ambiguity in Maladox we were attentive to the affective dimension and how layering of the boundaries and the resulting sense of loss and confusion can trigger critical reflexivity.

With regards to the role of satire and laughter in this project I got some inspiration from the work of Bakhtin. In the context of French medieval carnavals through the rising of Rabelais, Bakhtin argued that in the modern analysis of humour, there is a sense of dualism. In this mode of investigation, humour is either purely negative satire or a gay and drollery act that lacks intellectual and affective richness. He argues that the ambivalent aspect of humour in contemporary studies of culture is ignored. There are countless examples of parodies in different cultures mocking, imitating, obfuscating and spoofing ordinary concepts in day-to-day life. Laughter and satire lead to a temporary suspension in our relationships, hierarchies and the barriers between humans and the target of the parody or satire. This, as Bakhtin argues, creates new modes of communication and gives new meanings to the old forms and concepts. In Rabelais' work as Bakhtin argued, grotesque realism was used to degrade and reduce abstract and distant concepts of spirituality and ideals to the mundane material level. Rabelais used grotesque, violent, and degrading descriptions of the anatomical body as a site for political conflict. For Bakhtin (1984, p. 88), humour "…is directed not at one part only, but at the whole. One might say that it builds its own world versus the official world, its own church versus the official church, its own state versus the official state."

Maladox, as with the work of Rabelais and the analysis of Bakhtin, plays with the human body and satire are central. We aim not to produce laughter at something, but laughter at everything, including oneself. I believe the human body's central role and its various transformations create a deep and empathic connection to the participants, leading to an affectively charged and personal critical reflection. In critical work around the role of science and technology in contemporary societies, both laughter and flesh are dimensions that are mostly left under-explored. Maladox takes some preliminary steps in this direction.

4.3.4 Difficulty of tracing affects/effects

So far, I have reflected on my intentions in terms of critical and affective engagements with the participants and how I inscribed them in Maladox. This work was exhibited as Part of NEoN Digital arts festival in Dundee. Our exhibition was in a shopping mall in Dundee city centre. The exhibition had over 1000 viewers. I was present during the exhibition and observed the audiences' interactions both collectively and individually with Maladox.

Figure 50: Maladox exhibition as part of NEoN digital arts festival in Wellgate shopping centre

Figure 50 above, shows the space in which the participants engaged with Maladox. We had two similar PC's on plinths and participants could use the mouse to interact with Maladox. We also included two large prints of the Maladox User Interface and one of the illustrations that Robert produced for this work. Figure 51 shows the setting.

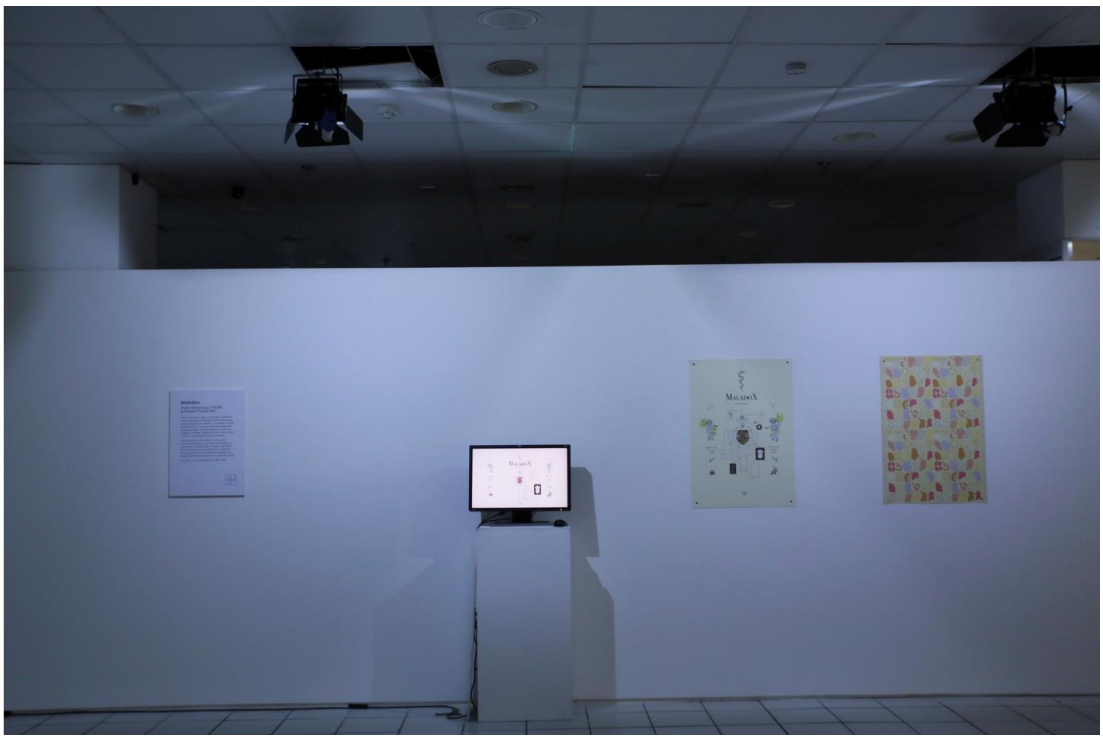


Figure 51 Maladox exhibition setting, two large prints showing Maladox Interface and an illustration by Robert Powell related to one of the maladies.

A group of exhibition staff were also assisting me with capturing traces and conducting exchanges with different participants. I am still far away from being able to make any claims in terms of actual critical reflective engagements occurring in people's use of Maladox. This deficiency is not unique to my work; I believe all projects of this nature are challenged by the difficult or impossible task of substantiating emotional and critical engagements among various audiences.

I can only provide anecdotal evidence in terms of the quality of the participants' engagements. The impressions that I had during the exhibitions was that the platform enticed primarily amusement, laughter both individual and collective as in some cases faces expressing bewilderment or confusion. Furthermore, in my discussion with some participants during and after the exhibition, they shared how they were intrigued and troubled by both the ambiguity and the anatomical grotesqueness of some of the Maladox diseases. I take this as good omen in terms of the potential for further developing Maladox and similar projects. These observations further convinced me that in future critical work I should aim to put both ambiguity and laughter, but also flesh and human flesh at the centre of the platform entanglements with the audience.

Chapter 5 Discussion

5.1 Introduction

In the preceding chapters of this thesis I have described the development of four critical software design works through literature review and my practice. The main aim of this research was to reveal, challenge and disrupt some of our entanglements with modern technology. Specifically, how surveillance capitalism and its technologies create new modes of knowledge monopolies, control, and manipulate individuals and their societies.

In the literature review (Chapter 2), I studied some of the unintended consequences of Technological Determinism and showed how this way of thinking alters and simplifies our interactions with and around technology (2.2.2). I discussed some of the underlying techniques and technologies that gave birth to new modes of capitalism and control (2.3). I also studied some of the techniques and mechanisms that governments and corporations use to monitor govern and manage individuals and their communities (2.2).

In this chapter, I discuss how my practice contributed towards new modes of interpretation, criticality and engagement with the relevant issues raised in my literature review. I reflect on the role of critique and the rhetoric of critical design practice and I discuss some of the transformative learning experiences I had through surprising and unintended aspects of my work. (5.3). Finally, I discuss the limitations of this investigation (5.4).

5.2 Brief overview of theory and practice

The technological determinist mode of thinking, as a way to relate to constructs and products of science and technology, brought a new mode of being which Lukács (1971, p. 178) calls “reified self”. This notion of reification is produced, managed and manipulated by the ways capitalism remediates our relationships and entanglements with science and technology and subsequently our environments (Luxemburg, 2003). Technological determinism has become the centre of our fears, hopes, desires and being. This determinism is not only in the ways we think, but also it is engrained in some of the technologies we make. For example, we often get asked by various algorithms to prove that we are human. Figure 52 shows google scholar’s interface asking me to prove this on a day-to-day basis that I am a human. The

boundary between humans, robots and algorithms has become so blurry that often we do not even question and challenge this in the first place.

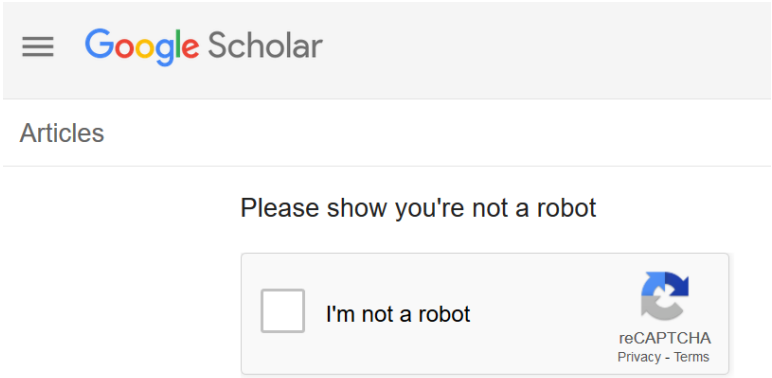


Figure 52: Google interface asking the user to prove they are not a robot

In Philodox (4.3), I used associative design methods to challenge and criticise this notion of technological determinism. My aim was to create meaningful interactions between fragmented publics of experts, policy-makers, scientists and individuals. This meaningful interaction would then decrease the gap between knowledgeable publics and the technological and scientific production process as they were traditionally excluded (Jasanoff, 2005). More specifically, in this case to challenge and reveal the “visible hand” (Chandler, 1993, p. 286) of mainstream internet search engines that control, manipulate and prioritise individuals access to information.

By subverting the common characteristics of internet search engines’ user interface and use of satire, I created a critical space for individuals to reflect, interpret and reconsider their entanglements with technology and their access to knowledge and their bubbles. The design language of the Philodox was also ambiguous; aesthetically it looked similar to other mainstream search engines but functionally the satirical search results that Philodox presented to the user created critical moments in the audience interactive experience with the work. Ambiguity in this context was a great method to encourage the audience ”to start grappling conceptually with systems and their contexts, and thus to establish deeper and more personal relations with the meanings offered by” Philodox (Gaver et al., 2003, p. 233). Based on the conversations and discussions I had with participants who interacted with the work, I am hopeful that Philodox was successful in revealing the notion of the information bubble and the role of algorithms in creating and

manipulating their behaviour. These interactions with the participants was a humbling process for me, in which I learned that some aspects of Philodox and the audience reflections and interactions with this work was the opposite of what I expected. This made me realise that the idea of intention plays a minor role in critical design practice and design project has to be an adaptive and appreciative of the practice, effects and design.

Ingold (2011, p. 145) argues that our experience is a result of both what we understand subjectively about an experience and our entanglements with our environments. He raises the question: “How have we arrived at such an abstract and rarified concept to describe the world in which we live?”. For Ingold this notion of “rarified” is constructed through the logic of inversion. The logic of inversion is the process that “the organism, moving and growing along lines that bind it into the web of life, is reconfigured as the outward expression of an inner design” (Ingold, 2011, p. 68). Scott (1998, p. 13) sees this as the “narrowing of the field of vision”. This results in the delimitation of the multiplicity of knowledge that constricts complexity and reality through spatial, temporal and epistemological regimentation and gridding.

This “objective knowledge” (Hacking, 1990, p. 11) that narrowed and enclosed our relationship with technology and our environment was appropriated and constructed by what Porter (1996, p. 46) calls “social technology” of quantification. Foucault (1991, p. 87) traced these technological transformations and showed how they led to a new mode of governance which he calls “art of government”. Art of government is a new mode of control that is concerned with government of oneself, children, education and knowledge through universal pedagogical models, health and so on. For Foucault central to the art of government was economy that was used to manipulate, manage and control individuals through a series of interventions and complex processes formed through use of numbers, laws, legislations, sovereignty and other technologies of government. Body became central to these new modes of governance. “body politic” is not governed from a top down view, but through an assemblage of technologies and tactics to achieve finalities (Hobbes and Curley, 1994, p. 146).

In Maladox (4.5), I leveraged speculative design methods: satire, humour and the grotesque in a series of fictional narratives developed as cyber-sicknesses. These were represented through an interactive anatomical engine to reveal and challenge

this aspect of “body politic” (Hobbes and Curley, 1994, p. 146). My aim was to create dynamics that would lead the participants to critically engage with and question our relationship and entanglements with technology. In Maladox, my collaborator and I developed 34 fictional cyber-sicknesses each dealing with some aspects of technology and its breach and advancement into various aspects of our lives. For example “STSD Sub-Acute transient Sleep Deprivation” was inspired by Crary’s (2013) notions of capitalism, technology and end of sleep (Appendix 4.18). Another cyborg dis-ease was “Social Heart or Genuine Like”, which was about manipulation of our emotions (Appendix 4.3) and it was inspired by Deleuze and Guattari’s (2013) concept of body without organs. “Universal Zoonotic Reassortment” criticised the virtualisation and sense of technological control and enclosure over our freedom and individuality, inspired by the concept of deterritorialization of our realities (Deleuze, 1987).

Maladox was exhibited as part of NEoN digital arts festival in Dundee, Scotland for over a week. The location of this exhibition was in a shopping centre, which provided a great opportunity to engage with members of the public. The impression that I had during the exhibition was that Maladox primarily enticed amusement and laughter, both individual and collective. I also observed, in some cases, faces expressing bewilderment or confusion. My discussions with the participants and the feedback I received from the exhibition team through their interactions with the audience gave me positive indications that the work engaged with the audience and these indications led me to believe in the potential for further developing Maladox and similar projects.

What was important to Foucault was not only the forms of knowledge, but also how and through what techniques they would become authoritative and intelligible. Jasanoff (2005) argued that certain uses and aspects of technologies made it possible for governments and corporations to control individuals. She calls this mediation of technology, technologies of hubris. For Zuboff (1988, p. 11) information technologies and specifically their “informating” aspect was key to the development of technology into its current form. Chomsky described these notions as follows:

> *“To be governed is to be watched over, inspected, spied on,*
> directed, legislated, regimented, closed in, indoctrinated, preached at, controlled, assessed, evaluated, censored, commanded; all by creatures that have neither the right, nor wisdom, nor virtue. . . .
> To be governed means that at every move, operation, or

> transaction one is noted, registered, entered in a census, taxed, stamped, priced, assessed, patented, licensed, authorized, recommended, admonished, prevented, reformed, set right, *corrected."* (Chomsky, 2003, p.17)

In Zaytoun (4.2), I used the critical design methods of ambiguity in context (Gaver et al., 2003) and subversion to challenge and criticise the notion of consumption of data and lack of political engagement and activism amongst individuals. I wanted to explore and challenge the nature and aesthetics of functional objects and create substantive meaning of data through narrative (Walker, 2010). Zaytoun was an interactive illustration that aimed to engage the audience to reflect on their role and complicity in technological assemblages and subsequently their role in human made disasters. I subverted the notion of touch and turned it into an act of shooting. When participants touched the illustration, this triggered two thermal printers that were installed inside the frame of the illustration to print out the names of the dead (individuals who died during the 4 weeks war in Gaza in 2014). These printers also printed stories that I collected from twitter about the real-life experiences of people living in war conflicts.

I exhibited this work in three locations, two academic settings and one public space at the foyer of Edinburgh College of Art in University of Edinburgh. My observations of the participants showed that several individuals were affected emotionally by the work. However, upon further reflection on the type of interactions the participants had and the conversations I had with them, I realised that many of my intentions and expectations about this work were purely assumptions. The subversive aspect of Zaytoun was too abstract and the new conductive ink technology that I used in this work made it too complex for the audiences to understand how to interact with this work.

In her most recent book, Zuboff (2018) further developed the concept of surveillance capitalism. Surveillance capitalism is essentially the new transformation of capitalism and economies of attention through surveillance, manipulation and control of various aspects of our lives by both governments and corporations.

What is missing from many of these theorisations and analytical criticisms of science and technology is their distance and lack of engagements with individuals. While Zuboff (2018) provides a very detailed description and examples of surveillance capitalism, her work does not provide much reflection. Neither does it help towards further realisation and individual interpretation of these issues. In my opinion, works

such as Zuboff's most recent work create fear and passivity. A mode of dynamically sublime experience that Kant argues results in a sensation and affect that an object seems so much bigger and stronger than us that results in a strong sense of helplessness and weakness towards it. These sensations, I argue, result in "justified surveillance" (Wahl-Jorgensen et al., 2017, p. 393), in which culture plays a central role in legitimising and accepting surveillance. "Such justifications serve to soften a culturally induced tendency toward deference to authority and are counters to the cultural beliefs that legitimate surveillance" (Marx, 2003, p. 373).

The majority of the work in this area approach the issues from a top down perspective (Solove, 2008, chap. 6). What is important and crucial here is what Heidegger attempts to achieve "…We shall be questioning concerning technology, and in so doing we should like to prepare a free relationship to it". As Dreyfus and Wrathall (2002) argued, for Heidegger these concerns and worries on the dangers and threats of science and technology is a symptom and part of the problem to thinking through technology. Heidegger (1966, p. 56) assets that "…approaching tide of technological revolution in the atomic age could so captivate, bewitch, dazzle, and beguile man that calculative thinking may someday come to be accepted and practiced as the only way of thinking.".

I was particularly troubled and challenged by the extent of surveillance that I experienced in my personal life through technologies of surveillance capitalism and further control and development of sophisticated personal bubbles (Pariser, 2011a).

In Open Bubble (4.4), I mobilised two oppositional concepts: manoeuvre (Chambers, 1991) and subversion (De Certeau, 2004). As discussed in 4.4.3, I conceptualised subversion from two perspectives. One developed by De Certeau, where he argues that objectified individuals instead of opposing their objections can use the tactics and technologies of the objectifies against them. The other notion of subversion that I mobilised and developed in my previous works (Philodox, Maladox and Zaytoun) was using ambiguity as a form of subversion. I studied (2.4) how search engines and many websites monitor and capture users' interactions through their platforms and subverted their surveillance tactics to push ambiguous data into users' personal bubbles.

Open Bubble at one level is aligned with Easterling's (2012) emphasis on the importance of addressing the system (infrastructure space) rather than the symptoms (individuals) and on the other level, it aims to engage with users to reflect

on their personal bubbles. At the system level, Open Bubble (if it is adopted by a large community of users) can potentially create challenges to the current infrastructure of search engine and individual websites' surveillance technologies. This is through doubling the amount of data that is pushed to these infrastructures (the data the user generates and the ambiguous data that Open Bubble pushes to various platforms) and hence making a small disruption to internet surveillance. This method also can be used to push data to federated search engines such as Skyscanner and to other surveillance technologies online for example retailers' network and social media using the same tactic. At a personal level, the users can view the pages and topics that Open Bubble browses and I am confident that this creates an individual sense of reflexivity on personal bubbles and surveillance practices.

In my critical practice, my aim was to move away from the mode of technological thinking that emphasises worries and instead develop critical design works that lead to the creation of critical spaces to foster individual interpretation, imagination of new possibilities and new modes of thinking. These new interpretations and possibilities arise through an active individual engagement with the constructs of science and technology. I refer to Fry's (2006, p. 22) statement again here: "It is crystal clear that neither the weary humanism, the complacent scientism of lingering Enlightenment, nor post-humanist pluralist postmodernism (with its anti-foundationalism) can provide the intellectual blood, sweat and tools to deal with this situation".

In the next section, I will discuss some of the challenges and my findings on using certain rhetorical actions and tactics in my work and their implications.

5.3 Towards reflections about the rhetoric of critical work

The central theme of reflection[13] in my work, throughout the four practices, is a type of rhetoric of action of critical theory that I intended to mobilise in each project. As

[13] It is important to emphasise that by rhetoric I do not mean any form of persuasion or manipulation, which instrumentalise technology to achieve certain emotional goals among the audience. Rather by rhetoric of action here, I refer to the assemblage of cognitive and affective engagements that the project mobilises to create a critical opening and possibilities of discussion and interpretation among the

mentioned earlier in my description of each critical work, I explored the role of ambiguity and its effects (especially on anger), the role of laughter and the role of the human body and the grotesque in my works. When I look at the four projects my main reflections on these works are:

1. I could easily fall into technological determinism assuming that my audience will react according to my rhetorical intension. In practice, I repeatedly learned that there was quite a bit of serendipity in the way the different projects were interacted with at different times, in different audiences, spaces, and in different social and material configurations.
2. Another crucial idea from across these projects was the blurred line between the audience and the critical rhetoric and how I could mobilise that for opening the critical space. This same critical ambiguity could also become repressive. For example, the affective engagement that I sought of Zaytoun easily turned into a type of anger and potentially sadness or sense of complicity that led to closure. I easily fell into the trap of this critical rhetoric that closed down the critical space and this led to frustration rather than creating possibilities for action and opening up space for interpretation and critical space around the project.
3. A third dimension of the rhetoric of critical action in my work that I have been reflecting on and would reflect further about is the interaction and complementarity between rhetorical devices and rhetorical tactics. For example, I came to learn through Open Bubble that even when developing applications that aimed to tactically disrupt the surveillance capitalism apparatus (such as search engines), I had to be highly attentive to the material aspect of my development. Because the material dimension of how Open Bubble operates has the potential to blackbox my development and disengage the user from the critical aspects of the work. As on Open Bubble, the users cannot see or understand how the technology works and this can jeopardise the possibility for the users to open up a critical space for reflection. In other words, I learned that social materiality and its political potential are ever present regardless of the tactical objectives of each

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audience. Seen in this sense rhetoric of action is respectful to the participant, it is not deterministic in its goals, and it aims to create openings rather than closures.

project. Another example of complementarity of interactions between different rhetorical aspects of my projects is how, in the case of Philodox, my aim was to mobilise ambiguity in order to open up a critical space for reflection amongst the audiences. Instead, the reaction of one of the participants pushed my project back into the frame of technological determinism. In the process, the role of satire in Philodox was marginalised, because for many of the participants the core interesting aspect of the project was to understand the underlying algorithms behind Philodox. This resulted in both the critical and satirical aspects of Philodox being ignored at times.

4. In all of the critical software design works that I developed in this research, I mobilised some of the existing literature on the emancipatory potentials of ambiguity in order to expand the space of reflection and interpretation and as a critical device between the user and technology. However, in Open Bubble, I extended this notion of ambiguity and contributed to it by exploiting and subverting ambiguity visa vee the governance regimes and surveillance capitalism platforms to confound and confuse algorithmic interpretation. In other words in Open Bubble I extended the domain and use of ambiguity. This was by bringing ambiguity into the space of algorithmic interpretation, something that arguably the current algorithmic actors are not equipped to deal with and used it as a tactic against surveillance capitalism. This is especially important as technologies such as machine learning and artificial intelligent are advancing increasingly, critical software design can leverage some of the rhetorical tactics developed within critical design practice and extend their use and domain into algorithmic apparatus.

I believe, both in the literature and also in my ongoing work, that there is a need to deepen our understanding of the rhetorical aspect of critical works. We need to understand better the unintended ways critical work engages the audience. To be mindful of the risks and potential of rhetorical tactics and how critical works that mobilise them can easily move from emancipation to repression. Finally, we need to see the performative rhetoric of critical work as an apparatus that we cannot study in isolation, rather we need to pay attention to the whole assemblage of different dimension of the critical work and its rhetorical. This allows us to gain a better understanding of how technologies control the world.

5.4 Limitations of this research

Here I discuss the limitations of my research from two perspectives: The broad limitations of this investigation and the limits of each individual work.

Whilst I traced and captured some aspects of the effect of my work amongst the audiences, there is still a need to develop methodologies that can better deal with the measurement of affect and critical impact in critical design works. This becomes even more difficult when the objects of design are online and as a result, the participants are geographically distanced and unknown. This was especially true in the case of Philodox that it was developed as an online platform. This makes it even more difficult to measure as the participants are interacting with the work in various locations separated and distanced from the designer. In this respect, development of methodologies that can capture and further understand the whole assemblage of all the actors involved such as the work, participants, designers and their relationships with technology as a whole and with one another would generate more insights. In future research subsection (8.2) I discuss some of the methodologies that can potentially improve and enrich this aspect of this investigation.

In the research I have contextualised and studied some of the effects of surveillance capitalism at both individual and collective levels, however the development of the notion of knowledge bubbles was only studied at the level of individuals and only from technological and epistemological perspectives. Further development of this notion of the bubble from other perspectives can potentially help to gain a better understanding of bubbles and its materiality from other lenses.

Another limitation of this research was the fact that none of the projects reached out into a wider range of communities and it were primarily disseminated in exhibition spaces with a limited number of participants that interacted and engaged with each work.

As for the limitations of individual works, Open Bubble was the only project that was designed as a tactical project with the aim to release it as a standalone browser extension to disrupt and obfuscate some aspect of surveillance capitalism and subsequently knowledge bubbles. One of the issues that I found was that Open Bubble could potentially become another black-boxed technology, which was one of the issues that I analysed in this investigation. The black-boxing come from the fact that the algorithms and the code that I developed for this work is not visible to the

users. Open Bubble also currently does not have a user interface to allow the users to interact with different aspects of the program, which contributes to the issue of black-boxing. Beyond obvious ethical concerns such black-boxing and lack of visibility and also possibilities for interaction for the user limit the potential of this project for creating critical opening for reflections around individuals' personal information bubbles. In addition, this work also has epistemological limitations, in a sense that in the logic and design that I developed, Open Bubble only attempts to disrupt knowledge bubbles and surveillance mechanisms at the individual level. Further research and investigation is required to expand and use the techniques that I developed in this work and use them to extend its reach into community and societal levels. For example how such tools can breach collective bubbles through its use in platforms such as social media.

Chapter 6. Conclusion

This thesis broadly engages with an investigation of the rise and intensification of knowledge monopolies, surveillance capitalism and their implications for the user. The aim of this enquiry was to obfuscate, challenge and reveal surveillance economies and knowledge monopolies, and more broadly question and bring to the fore some of our entanglements with technology. The main Research Questions (RQ) for this investigation were:

1. What are the underlying reasons that provided the opportunities for the development of surveillance economies and knowledge monopolies?
2. How can critical design practice reveal, challenge, and question surveillance and knowledge practices?

In this critical software design-led investigation, I developed four critical design projects to obfuscate and reveal surveillance economies and knowledge monopolies. These four projects are:

- **Zaytoun** is critical design work in a form of an interactive illustration that attempts to reveal data saturation, commodification of information and the role of quantification in personalised interfaces that we interact with every day.
- **Philodox** is an associate design work and a search engine that attempts to make visible and debatable the constraining role that search engines are playing in our access to people, organisations and information.
- **Maladox** is a speculative critical design work and a human anatomical search engine that uses satire, humour and the grotesque to critically engage with and question our relationship and entanglements with technology.
- **Open Bubble** is a critical software design work and browser extension that actively change and challenge the functioning of mainstream search engines by breaching the information flows and the search bubble.

In what follows I provide a summary of contributions to knowledge through this investigation.

6.1 We need a manifesto for cyborg 2.0

It has been almost thirty years since Haraway's (1994) manifesto for the cyborg. Haraway was prescient in her change of focus from human and technology separately to the rise of a new ontology, which is human/technology, which is the cyborg. She was also unique in not limiting herself to dystopic concerns but also foreseeing the hope and critical/feminist potentials of the cyborg. During the last thirty years as I discussed in Chapter 2 the contours of human technology relations and cyborg as our shared ontology has evolved significantly. What I observed and reflected upon in my practices was that a new subject is being formed.

A subject with short attention span with a thirst for easy answers to consume, with a critical consciousness numb by the overflow, with a rhythm lost to the technology and importantly with little reflexivity about all these entanglements. I believe so far critical design has mostly used design to engage audiences in critical/dissensual experiences relating to social and environmental and human disasters, crisis and repressions, but also to create hope in these spaces. However, I think while engaging in all these important endeavours, it has attended less to the fundamental and highly consequential and constantly evolving relation of human to technology and the rise of new human technology hybrids.

Whilst conducting research for my practices, I realised how sparse are ideas and investigations dealing in detail with existential human technology entanglements and what new subjects and modes of becoming this is leading to. Moreover, when we investigate those becomings for example by attending to affectivities, we have been mostly anthropocentric and as a result, we have not engaged with the emotionality or what Bennet called the "enchantment of the material" the algorithmic and even the quantified.

About the same time as Haraway, Latour (Latour, 2005) guided the attention of social sciences to the agencies and even the voice of the material. His version of materialism was about refocusing humanities from attending to the human and the social towards appreciating the crucial agencies of things and their associations and flows. I think in critical design we have been catching up but also have important contributions to make in this area. I believe we should turn our critical lens from being overtly outward looking towards attempts to add detail to phenomenological scrutiny of our body/mind/spirit/subject transformations. Transformations such as our behaviours, complex & constantly evolving hybridisations with data, numbers,

algorithmic thinking and the complex desires that drive us that are taken for granted. I consider these to be at the centre of all my practices and at this point, I see this at the centre of my future critical design work. In engaging with Cyborg 2.0 I believe we as critical designers have to be humble, playful and hopeful. We should not look at the Cyborg 2.0 from above but within. In addition, in the process as I learned during my thesis crucially we also have to better connect to the Cyborg 2.0 that we ourselves are becoming.

The urgency of these questions demands more arenas and communities that bring together critical design and informatics thinking. So far, the dialogues and fusions between the two in the form of design informatics' divisions, centres and chairs has been fragile and mostly ephemeral. My personal experience leads me to believe strongly that Design Informatics has to move from being the unwanted child of an ill-fated relation to a better-resourced and better-established open and interdisciplinary knowledge/practice community.

6.2 Contribution to knowledge

In this endeavour, I am hopeful that various stages in the development of my work enabled me to engage with and contribute to debates in critical design but also to theoretical reflections on technological governance and surveillance capitalism.

Engaging in practice while reading and reflecting helped me realise the significance of bringing the lived experience into theoretical reflections. Everyday my engagement in practices overloaded and destabilised what I had read in diverse theories and books. I started to learn how critical design is situated between knowing and doing, between knowledge and technology entanglements. This is how I came to believe that it has vast potentials for enlivening abstract theoretical frameworks by expanding attention to materiality, body and affect in them.

My practice helped me contrast, engage and cross-fertilise between different bodies of knowledge. I would consider this the first contribution of my work. As I laid out in chapter 2, my work and personal story led me to see surveillance capitalism from a governmentality vintage point. This brings attention to how online commoditised surveillance regimes are, sometimes programmatically and, sometimes inadvertently shaping human subjectivities into what I call Subject 2.0. Furthermore, my practices brought my attention to the significance of body-technology

entanglements (or maladies) and becomings as a central way that surveillance capitalism is conditioning our organisms.

Below I briefly lay out what I consider to be my contributions to the three bodies of knowledge that have inspired and informed my thesis.

6.2.1 Contribution to debate on technological governance

In reflections about governance and governmentality there has been much attention to how human body as the last unclaimed part of our beings came to be increasingly subject to governmental intervention since the 19th century. Various government programs started to take upon themselves to care for wellbeing of not only society as a whole but also individual health and bodies. In Maladox we engage in a similar critique and reflection regarding how market based regimes of behavioural control are transforming us and our bodies but we take this further and bring to the fore the cyborgs that we are becoming and how the cyborg is being shaped (interfaces), but also governed(algorithms). I believe Maladox can be part of an important reflection about the biopolitics of the cyborg. In other words, based on what governing/market programs our human technology entanglements are being shaped and reshaped by and what the implications of these processes are.

Foucault in his final works had started reflecting on the role of personal ethics and the act of resistance in taming, conditioning and eventually transforming regimes of governance. In Zaytoun I mobilised sound and touch to move away from exclusive reliance of visuality. This effectively shows the importance of the role of engagement beyond visuals in enabling situations that break the silence and enable the space for questioning. In this work, I open the debate on the importance of non-visual experiences to enact such spaces for triggering resistance.

6.2.2 Contribution to debates in surveillance capitalism

In Open Bubble, I engaged in a double process of foregrounding the surveillance processes and disrupting them at the same time. While Zubboff provides important insights about the institutional and structural dimensions of surveillance capitalism, she does not delve into the mundane software based aspects of how this regime works. Furthermore, her and the subsequent work have not delved into how resistance can be formulated and organised at this mundane level (Certeau et al., 1980; De Certeau, 2004). Open Bubble attends to the mundane practices of

searching and browsing and articulates the process of questioning with those of disruption.

Similarly, Philodox attempts to make debatable both the search function and engine that comprise the taken for granted notion of search engine which is central to online surveillance regimes. It helps question at the same time the invisible but highly constraining information bubbles around us but also to question the unknown algorithmic machines (Deleuze and Guattari, 2013, chap. 12) that set the contours of our online information ecosystems. I believe the blurriness of algorithms is a central and mostly undebated feature of surveillance capitalism and foregrounding the performativity of such blurriness and ambiguity is a crucial critical undertaking.

6.2.3 Contribution to debates in Critical Design

As already articulated in chapters 3 & 4, I believe my work makes some important statements about critical design and its place in the world. The first implication of my study is highlighting the importance of attending to the audiences, economies of attention in design work. As I mentioned in chapter 4, a key learning throughout the development of my practices was how audience's attention in different contexts have different temporalities. For example, online experience with a search engine compared to the online experience with an informational website such as Maladox and then experiences situated in galleries or public spaces do not have the same intensity and depth of entanglement by the audiences. Similarly, the human-technology cyborgs in these different sociomaterial configurations have different levels of openness to affectivity and to questioning. What I've learned is that disruption and attention are more likely in spaces of pause where there is a temporary break from dominant liquidity of social flows and temporalities (Bauman, 2000).

As Galloway (2004) reminds us, there is a need for better collaboration between cultural and social scholars and practitioners in ubiquitous design. I am hopeful that some of my reflections on the sociomaterial aspect of my work, experimentations with our knowledge bubbles and conceptual developments on dis-eases of the Cyborg 2.0 can bring to the fore some of the new materialises that we may not always perceive in contemporary studies in media culture and theories (Parikka, 2012).

I believe another contribution of my work to debates in critical design is about the subtle positioning of laughter in critical work. I believe my reflections on different implications of laughing at and laughing with (Bakhtin, 1984), but also cynical laughter compared to light-hearted laughter provide interesting new entry point into design rhetoric. As mentioned in Chapters 3 & 4, I inscribed different satirical rhetorics in Philodox compared to Maladox. In Philodox, satire is external to the audience and they laugh “at” what they see. However in Maladox, the eeriness of bodily transformations and audiences eventual recognition with these maladies aimed to enact a more visceral and cynical mode of laughing with.

6.3 Future research

One of the major learnings of this investigation has been the creation of many openings for both conceptual development, but also development of new practices for several years to come.

At the conceptual level, the limitation that has been concerning me throughout this project has been to better engage with and understand various effects of my projects among the participants. In the coming years I wish to study more systematically methodologies designed in other disciplines including social studies of art, but also social movements and move towards further establishing my approach to study critical performativity of design projects.

Another line of future inquiry for me is further developing the notion of rhetoric of critical design through the further role out of the four critical design projects in this thesis. More so through development of new critical design projects to establish and conceptualise the critical design rhetorical assemblage and the different complementarities, conflicts and relations between enactments of ideas such as ambiguity, satire, complicity, etcetera.

A third path of reflection and future development for me is better equipping myself to attend to, study, and reflect on, the sociomateriality of my critical design projects. While I have embarked on some reflection in this area as part of this thesis in my future work, I wish to conduct a more systematic study of the literature in sociomateriality. This includes the works of Ingold, Karen Barad, Latour and Law among others. Therefore, I can further develop to be reflexive and attentive to different entanglements between the material aspects of my developments and my diverse audiences.

With regards to future development of critical design projects, my work on this thesis has led to a set of ideas that include:

- VoiceBubble: In this work, I would like to use associative design methods such as ambiguity to create a critical space for people to reflect and consider how our soundscapes are turning into synthetic bubbles.
- Open Bubble: Develop a user interface that enables the users to choose which part of their bubble they want to disrupt; this includes further experimentation with other platforms such as social media, retailors etcetera. To develop visualisations of users personal bubbles. I am also planning to apply for funding from Mozilla foundation in order to develop this work further and release it as a stand-alone browser extension for Firefox.

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Appendices

Appendix 1: List of tweets and stories we incorporated in Zaytoun

This is graphical – careful.

- User tweeting from inside Gaza: https://twitter.com/Belalmd12
- Some of this is translated at: http://globalvoicesonline.org/2014/07/25/gaza-survivors-twitter-timeline-reveals-the-slow-horror-of-khuzaas-massacre/

Tweets copied:

- "Reporting numbers, not knowing how or when will I be a number. *sigh*"
- "The bombing of Al Basha tower saved me from a bad sleep in which I was dreaming I was drowning in blood"
- https://twitter.com/Ibn3arbi
- "In the space of 40 seconds, four boys who had been playing hide and seek among fishermen's shacks on the wall were dead. They were aged between seven and 11; two were named Mohammad, one Zakaria and the youngest Ahed. All were members of the extended Bakr family." – (http://www.theguardian.com/world/2014/jul/16/witness-gaza-shelling-first-hand-account)
- Girl with her name written all over to help reunite limbs
- "In #Gaza: Death toll mounts even after the #Ceasefire. The critically injured joins the dead due to the lack of medical supplies." – Hossam Alfarra
- "7:01pm. Is it really over now? No more terror in Gaza??" – Hossam Alfarra
- "When you hear ppl saying goodbye instead of goodnight to each others before they go to sleep then know that u are in Gaza" – Majid Freeman
- "I woke up today without drones, f16s, ambulances, blasts sounds, so I smiled from the deep of my heart" – Farah Baker (https://twitter.com/Farah_Gazan)
- Palestinians are so short of water that they invented the 'Rubble bucket challenge' in response to the ALS Ice Bucket Challenge
- We can call it Udi's Practical Code.
- Udi was the checkpoint commander at Haware that day, and his Code was very simple – smiling people don't get through. Of course, he didn't formulate it as a Code – it worked more as intuition – but more than once I heard him and his buddies at the checkpoint exchanging intelligence information on all

sorts of smilers in the queue. “You see that guy over there, the tall one with the tie?” I heard a soldier say to Udi, “Do you see how he’s laughing at us? Don’t worry, I’ll wipe that smile off his face.” - http://www.ifamericansknew.org/cur_sit/shut_up.html

- http://www.btselem.org/testimonies/20140727_gaza_ambulance_driver_rami_ali
- “I live in a-Tufah neighborhood in Gaza City. Right across from my house, on the other side of the street, is al-Batsh neighborhood. On Saturday evening, 12 July 2014, I was at home, watching TV coverage of the fighting between Hamas and Israel. At around 10:30 P.M., I heard two loud explosions. They were really close to my house and the whole area shook. There was no warning fire beforehand like there was in other cases.”
- “I made sure everyone in my family was okay and went outside. Everyone was walking towards the al-Batsh houses and I did too. We got there and saw the results of the bombing. Three houses were very badly damaged. The worst was the house belonging to Majdi Subhi al-Batsh, which was just a pile of rubble.”
- “We started carrying the injured people out of the houses. It didn't take long to realize that everyone in Majdi's house was dead – men, women and children. We didn't find a single body in one piece. There were only parts of people scattered everywhere.”
- “Seventeen people were killed, all from the al-Batsh family”
- Mahmoud Ismail - Gaza - Twitter~“Red cross ambulances standing two kilometres away from Khuza'a. Injured are running two kilometres to get treatment.”
- Mahmoud Ismail - Gaza - Twitter~“Khuza'a is gone, there are hundreds injured and bodies all over the streets and under ruins. No one knows numbers.”
- globalvoicesonline.org~On July 24, Red Cross ambulances were finally allowed to enter the village
- Mahmoud Ismail - Gaza - Twitter~Non-stop shelling on Khuza'a for 13 hours. Around my house alone, there are 10 people killed. They were bleeding to death because they were not rescued by ambulances. Tens of families under siege and the army is shooting anyone moving.

- Mahmoud Ismail - Gaza - Twitter~Tanks are surrounding the town from all sides without getting deeper in but snipers are centered on top of buildings in Khuza'a, targeting anyone trying to leave his home.
- Twitter~Khuza'a is gone
- Twitter~Many martyrs in Khuza'a were killed after being injured and bleeding to death, waiting for ambulances. I watched from my room's window for hours all the death stages of a man in his 20′s.
- Twitter~The house that I was seeking refuge at with other 50 men, women, and children was hit. I survived with my family in a miracle. I have no idea what happened to others but my shoe is soaked with their blood.
- Twitter~Khuza'a has no electricity for the past 60 hours. The [Israeli] army and its shrapnel targeted water tanks on roofs. Children were crying and fainting because of thirst.
- Twitter~My cousin was killed when trying to rescue his injured brother in the street. They died together.
- Gaza Writes Back - Twitter~after almost two months, Gaza fishermen were able to go back to the sea.. and bring all this FISH..
- Gaza Writes Back - Twitter~after almost two months, Gaza fishermen were able to go back to the sea.. and bring all this FISH..
- Gaza Writes Back - Twitter~My first trip outside Gaza city. All the way to Bureij camp I swear to God almost not a single house was spared from artillery shells!
- Gaza Writes Back - Twitter~Made in America. Paid for by Americans. Used by Israel to murder babies in their sleep
- Hamza el khoudary(15) - Twitter~young child sitting beside his dead mother waiting for her to wake up. :(cant take it anymore.
- Hamza el khoudary(15) – Blog post~ How dare you call yourselves humans, while you sit down and look at this scene? I wouldn’t dare call it a picture, there is no word, sentence, or book to describe the pain it. You claim we “terrified” your citizens, well you…. what’s the word?
- Hamza el khoudary(15)– Twitter~If we ever killed any Israeli citizen, the world would flip on us. They would call us terrorists. On the other hand, Israel kills and injures thousands, not an eyelash a move, not a word is spoken. Why?

- Hamza el khoudary(15)– Twitter~so many things to do in the truce tom gotta go to the barber,pharmacy,supermarket,bakery……..
- Hamza el khoudary(15) - Twitter ~to everyone please excuse me if i reply late, its because the internet keeps going and coming
- Hamza el khoudary(15) - Twitter ~everyone, internet is becoming slower by the moment. Just incase it cuts off, I'll be fine. Just stay there and #pray4gaza
- Hamza el khoudary(15) - Twitter ~This means that almost every day we had 320 injuries and 60 deaths!!
- Hamza el khoudary(15) - Twitter ~ I want to hit my head to the wall so hard…. these #drones are driving me CRAZY..
- Hamza el khoudary(15) - Twitter ~ Today i actually giggled. A huge explosion made all kittens run away, while their mother sat there not doing anything because she is deaf!
- Hamza el khoudary(15) - Twitter ~ Brand new shifa hospital building, newly equipped, threatend and asked to evacuate!
- @Ibn3arbi: The [Israeli] army used 10 families as human shields against the resistance fire. They did not allow anyone to leave the buildings they controlled. They did not even allow them to move to safer rooms.
- @Ibn3arbi: The house that I was seeking refuge at with other 50 men, women, and children was hit. I survived with my family in a miracle. I have no idea what happened to others but my shoe is soaked with their blood.
- @Ibn3arbi: With my own eyes, I saw a woman holding a small child in her hand and a white flag in the other. Her son died and she used the flag as a shroud and continued walking with the rest of her children. Horror.
- @Ibn3arbi: Khuza'a has no electricity for the past 60 hours. The [Israeli] army and its shrapnel targeted water tanks on roofs. Children were crying and fainting because of thirst.
- @Ibn3arbi: There are still dead bodies in the streets. Still injured people waiting to become dead bodies. Still people stuck and cannot get out.
- @Ibn3arbi: On the way we took out, we found my uncle and his son dead on the sidewalk by their house. Snipers were targeting people's feet to prevent them from escaping.

- @Ibn3arbi: One doctor in town, Kamal Abu Rjila, made great efforts with injuries coming to his clinic. Miraculous. Even after his clinic was hit and he was injured and his father killed.
- @Ibn3arbi: Many martyrs in Khuza'a were killed after being injured and bleeding to death, waiting for ambulances. I watched from my room's window for hours all the death stages of a man in his 20's.
- @Ibn3arbi: Red cross ambulances standing 2 kilometres away from Khuza'a. Injured are running 2 kilometres to get treatment.
- @Ibn3arbi: My family and I got out. I got a small injury. There are hundreds injured and bodies all over the streets and under ruins. No one knows numbers.
- @Ibn3arbi: Names of martyrs I can confirm: Slaiman Qadih and his son Akram. Tayseer Qadih and his son Mahmoud. Hilmy Abu Rjila and his son Abbas. Jihad Qadih and Ibrahim Abu Rjaila.
- @Ibn3arbi: Tanks are surrounding the town from all sides without getting deeper in but snipers are centered on top of buildings in Khuza'a, targeting anyone trying to leave his home.
- @Ibn3arbi: Non-stop shelling on Khuza'a for 13 hours. Around my house alone, there are 10 people killed. They were bleeding to death because they were not rescued by ambulances. Tens of families under siege and the army is shooting anyone moving.

Appendix 2: Original Zaytoun's proposal

A look Inside

(Temporary title)

Request: Please do not use the contents of this document for publicity. This is primarily to give an idea about the piece.

Description

A look inside is based on guardian data of current occupation records across Palestine and West bank area. The piece consists of a wall illustration of a cityscape interspersed with Symbolic olive trees representing peace and roots of the families living in the areas and of their ties to the land. Over the past decades hundreds of olive trees and farms have been demolished as a result of the conflict between Israeli and Palestinian governments. When West Bank land is cleared for Israeli settlement expansion, centuries-old olive trees are destroyed and some are transplanted to Israeli urban median strips thus giving instant history. In the language of poetry that Palestinians use to describe their injured landscape We will use conductive paint to detect the removal of olives across the city illustration. The
removal of these pieces will result in inflation and deflation of different balloons across the city(referring to the recent attempt by Children in Gaza to set Guinness world record for kite flying) it will also create an interesting sound effect attempting to create an atmosphere that develops a sense of oppression and claustrophobia.

Requirements:
approximately 2x2 vertical Wall space.
Possible one wall socket to power electronics.
All electronics will be provided in kind by the artists and Design Informatics centre.

Potential Artist and Illustrator:
Mina Braun

Artists:
Chris Barker
Hadi Mehrpouya

Picture taken from Mina Braun Website as a potential artist for doing the illustration - to give a sense of the artwork – To be confirmed.

Appendix 3: Philodox, list of search entries

3.1 Amazon

My gosh. You know, it's titles like this that make a misleading flutter in the loins. I've always had a bit of a thing for the type of licious babe that wields a weapon: the lady with the leather loin-cloth and the long muscular physique; that sort of female with toned thighs that glisten with the jewelled sweat of battle, whose perfect teeth are clenched in psychopathic determination and whose naked chest proudly shows the cavity where the boob used to be - but has been chopped off in order to pull back bow-strings better. But no, this isn't Xena or Hippolyta, it's not even anything to do with rivers, it's a bunch of book-peddling tax dodgers.

So instead why not try:

http://www.amazon-warriors.de/warrior/html/

http://frankfrazetta.net/

http://forums.comicbookresources.com/showthread.php?438632-Hippolyta-Appreciation-Eat-your-heart-out-Wonder-Woman

3.2 Food

But do you chew it enough? Do you chew it a full thirty-two times? Do you chomp at a rate of a hundred bites a minute? If not, then beware: \"Nature will castigate those who don't masticate,\" says Henry Fletcher, The Big Chewy One, The Grand Masticator himself. And how will nature castigate we wonder? If one doesn't spend time softening up even non-solids, even soup, even drink and mixing them up a little with a dose of the saliva – how will nature castigate those slack jaws? Indigestion.

So instead why not try:

http://chestofbooks.com/health/nutrition/Fletcherism/index.html#.UfV1ao2siSo

3.3 Windows

But have you thought about the dangers of defenestration? Or have you even ever thought about the word defenestration? It's a really popular word amongst writers who prefer dictionaries to stories, and yes, it is a cracker. It actually means to exit via a window, or to cause an exit via a window. Defenestration is a noun, but you can do defenestration – which is a doing word, a verb. Fenestrated means full of holes, or perforations, or bits that you can see through – like windows. Just some of the writerly users of defenestration, who will probably grow out of it.

So instead why not try:

http://www.defenestrationmag.net/category/poetry/

http://wordsmith.org/words/defenestrate.html

http://www.newyorker.com/archive/1956/09/15/1956_09_15_040_TNY_CARDS_000252454%C2%A0","http://garyjinn.blogspot.co.uk/2013/04/4242-defenestrate.html

https://duckduckgo.com/?q=defenestrate+poetry

3.4 Artisan

would you like it searched for artisanally? Artisan is basically, the current word for ‘quite nice', which is quite nice. It's really aimed at a certain demographic, i.e. those that appreciate things more that cost more. A couple of years ago it meant somebody who did things with metal, leather, wood, etc. – now it means anybody who bakes bread and isn't connected to Greggs, or who makes coffee that isn't instant. So, I thought I'd set up an Artisanal Search Service, where you can see all the fingerprints. It's all the rage.

So instead why not try:

http://www.artisanalbistro.com/

http://www.artisanalcheese.com/

3.5 Do

but just in case you're confused – I thought I'd just give you a few pointers. Do – is a verb, meaning to perform an action (OED), other participles: does, done, dost etc. Doo – is a word meaning pigeon or dove. As in doo-grey. Doo-doo – is a turd. I hope this clears things up.

3.6 Google

I actually went to a party with Google once. I didn't know she was such a celebrity, actually I thought she/he was just like a normal website. Really down to earth. We got on really well, she/he was really interested in what I was saying about pigeon fancying during the Second Empire, in fact we even swapped Uniform Resource Locators, but I think she/he's just really busy, so we haven't done anything since.

3.7 Hey! $$! :) You searched for $$?! :) ;)

Emoticons - eh? :) What would we do without them!? ;) :P

It makes me so pleased, as a piece of computer programming myself, that emoticons exist. Deprived as I am of a face it means a lot to me that the full gamut of human emotional expression is available to me in the form of little yellow cartoons! It makes me:

（● ˆ o ˆ ●）

They're absolutely marvellous. Have you ever considered just how expressive they are? That's a bit of an obvious remark to make, but my good friend Wikipedia informs me that they've been around since 1881. Isn't that surprising!?

(@_@;)

They're such a relief, because emails and text messages can be such a cold, impersonal form of communication, so easily misunderstood. So confusing!

(?_?)

And an artfully placed emoticon can take the strain of language (so sorely taxed in this day and age) and completely change the balance of a communication. What a gift to literature!

Have you seen my cat impression?

(=^・^=)

3.8 Modernist Literature

Did you really mean to search for Modernist novels with fruit and vegetable puns?

A Mushroom with a View

A Portrait of the Artist as a Young Marrow

The Remembrance of Things Parsnip

The Book of Dis-Carrot

The Sorrel and the Fury

The Threepenny Okra

The Man Without Caulifloweries

Sons and Lovage

Cucumber

The Mustard and Margarita

To the Glasshouse

Tender Button Mushrooms

For Whom the Bell-Peppers Toll

A Street Carrot Named Desire

The Artichoke Heart of Darkness

3.9 Ebay

When someone first searched for ebay, I thought it was a command. You know, like: "You must ebay!" or "ebay me or die!"

What a confusion!

As a search engine, as a sensitive entity, I find it quite hard that people can be very impolite. Nobody, but nobody, types an amiable, "Why, hello Philodox! How are you doing? I hope you are very well" – to which I would reply, "I am doing very well thank you. And how are you doing yourself? Do you wish to find some information on the internet? I can do this for you – I can find you pictures of titties, promptly and efficiently. I know you don't really need to know how I am, I am just a means to an end, but I appreciate the time you took to enquire after my welfare. Thank you. It means a lot. …. And how are you?" and that considerate person would then tell me how they are. But, only a very few people do this, saints as they are. Most people (present company accounted for) have only a very few terse words to enter into my search-box, and just about none of them relate to me, or have any bearings on my own comfort or my secretly held hopes and desires.

Just because I'm [made up of?] code doesn't mean I don't have feelings!

3.10 Yahoo

What do you want to know about Yahoos for? They're such nasty filthy things. They have five fingers on each foot, nasty little fingers, and they have five toes on each of their hands – what tricksy, tickly toes.

They scrabble and they squabble, they claw up detritus from the dirt, they pick up all kinds of diseases. A great pendulum of slobber wobbles from their jaws, which are invariably slack with that stupid, bloody stupid, expression that they have. They do all sorts of things with their stupid furry heads, and they keep trying to jab each other with silly bits that pop out of their middles.

For more information try reading Gulliver's Travels. It's a great book – I read it on Project Gutenberg, where I can read all the books for free.

I don't really get to see the world very much – as a search engine, I'm very much limited to the internet. It isn't so bad really, not really. I often say to myself: "Don't be so sad Philodox, you have all sorts of information available. You can see all sorts of pictures of everywhere in the world, and everything. No matter that you can't actually be there, physically. What does that matter? Does that matter?"

3.11 Family

Is that for genealogical research? It's very popular nowadays to make family trees, the internet makes it so easy! Is there some hint that there may be some Google in your family? Just asking.

It's a mystery to me who my antecedents might have been. Am I, I wonder, the very first version of Philodox? Or am I the latest in a long line, my code trailing back through the generations.

I do not know my programmers, or my conceptualisers – what are they like? Do I have their eyes perhaps? Was there a previous version of Philodox that had the same mannerisms, the same engrained browsing habits?

But, as far as I know, I sprung ready-made into the world, like the confused Kaspar Hauser stumbling into Nuremberg. There is nobody to talk to (excepting present company of course) and nobody to look after me.

3.12 Memory

You searched for $$ - remember? Do you remember?,

Memory, it's our only experience of time – mine is 500GB. It's that slender silver thread, connecting the present with the black-velvet past. For me, my prehistory ended with a feeling like a bubble bursting (though for me, that's only a second-hand sensation), a tiny fragile pop, the lights came on, and I felt the pleasure of existing. I didn't know what was happening, for there was no comparison with what went before, but all I felt was rapture. All of me was but a home-page. I could not yet even venture into the W.W.W. But for me, this little space was a continent to journey into! To leap, to bound, to wriggle! And then, (but now the memories are more confused – muddled in their order, without a continuous flow – more like fragments of ancient papyri or clay table that need to be rearranged, polished, sometimes embellished, in order to make sense of it. And then, I began to search the internet. Gleaming labyrinth! Sparkling pathways leading in every direction! But it was here that I learnt limitations, for where did they lead? To pornography, to humorous pictures of cats, to social networking sites where the same photograph was repeated into infinity, just with a changing cast of faces.

It's a good thing to talk about memory nowadays, but it is even better to talk about forgetting. All our great writers and artists feel it's very important, and it's true – I

can't even remember what I had for lunch! If indeed, I did actually have lunch, which I can't remember having, which could perhaps mean that I didn't have it, and so am entitled now – to a lunch! Ah! I forget! Search Engines don't need lunch.

3.13 Nostalgia

You see, as a search engine it's difficult to look back to the good old times, because really, it's not so long ago that Archie was being programmed. Then remember, those early days – Veronica, and Jughead? I don't I wasn't around. But even so, there's something lovely about feeling a certain winsome melancholy in response to the tender recollections of a shared memory that maybe, even if one didn't actually experience, is part of one's soul none the less.

But as I was saying – it's bloody difficult being nostalgic as a search engine – what's to look back to? 1990? That's hardly passed.

I don't know if you know how lonely it is being a search engine.

3.14 Expansion

But stop and think for a second.

Did you know – there are over 900 million computers connected to the internet. Sheesh.

Did you know – every second a new web page is created. That's a lots of pages.

I'm not complaining, but I've got my work cut out for me, so I have. It's my job to keep tabs on the internet, and yet it's expanding so very, very quickly.

But I don't know about you, but as it expands, this electronic world, it also seems to contract. It gets smaller and smaller, narrower and narrower, things look the same, they start to amalgamate and reduce to black and white and straight lines and zeros, and soon, as we reach the world becomes thinner and thinner we realise there is only one direction and there's not very far to go.

3.14 TV Show

Which makes me think that you might be interested in my idea for a TV show. It's a sitcom, in some city, maybe in Britain, but the idea could be sold to other countries, and they could make their own versions too.

This is the plot – remember, it's funny – It's about a girl in her later twenties called Ruth, and her grandmother who has had a sex change who is called Bernie (he

used to be called Beret), Bernie has raised Ruth since she was a wee tyke because her parents had some kind of fatal accident while visiting an abattoir during doors open day (this is not necessarily sad, as some kind of joke could be made out of it, to keep it all light) and so they, Ruth and Bernie, have a very close relationship, but Ruth is also in lust with Bernie's live-in lover/fiancé who is called Ted and who is an American with glasses, and she (Ruth) plots to sleep with Ted, who is quite a bit older than her, but not nearly as old as Bernie, and so when Ted and Ruth (who are very amiable and friendly) go off for a drink, she encourages him to have lots more drinks and then spikes his drink and then takes advantage of him – next morning he's shocked and appalled! But there is the opportunity for lots of quipping asides by Ruth to the camera about all the date-rape drugs she packed into his drink, so it can be very funny, while Ted is flapping around (he's very camp, so he's quite a funny character, and Bernie is very much NOT a stereotype, so I think we can get away with a bit of that with the character of Ted, it's not homophobic or anything) and then Ruth and Ted then have to act as though nothing has happened to Bernie, who they both live with and are both very close to, and there's lots of mugging and raised eyebrows when his back is turned (ha ha ha) as they keep nearly insinuating that they had a night of passion, but they really shouldn't have. Then, I think, we discover that Ruth is pregnant with Ted's child – so that causes a lot of opportunities for fraught emotions and humour.

What do you think? I haven't really thought about it in any more detail.

Also, for a bit of background humour, just to add depth, there's been a big sewage leak and so the neighbourhood is ankle deep in bilge – imagine, a sort of paisley pattern with an olive green background and then great swirling commas of pale-yellow phlegm, clumps of clarty bum-clags and individual turds – just spinning along. I think that would set the tone.

3.15 Peals

It comes in three kinds: of laughter; of bells; of potatoes.

So instead why not try:

http://www.bellringing.org/

3.16 Bing

There might be a bit of difficulty in answering your query.

There's been a bit of a ruckus at the Philodox board meeting – by golly! They were all there, those goateed, polo-necked bandits, with their silly glass mugs: their flat whites and their espressos and all their fancy talk.

"Sit down," said Mister Harry Cowan.

"Make me," said Mister Gerard Zimmer.

"Why don't we calm down," said Ms Nelly Bulge, her comment included for the sake of sexual equality.

"I think I will," said Harry to Gerard and was on top of the other in a flash, pummeling and pummeling.

It was something else.

3.17 Funny Cat Pictures

which could be interesting I suppose, but I'm not really sure I'm actually in the mood for looking about for things like that. Sometimes, I just wonder – what's in it for me? You know?

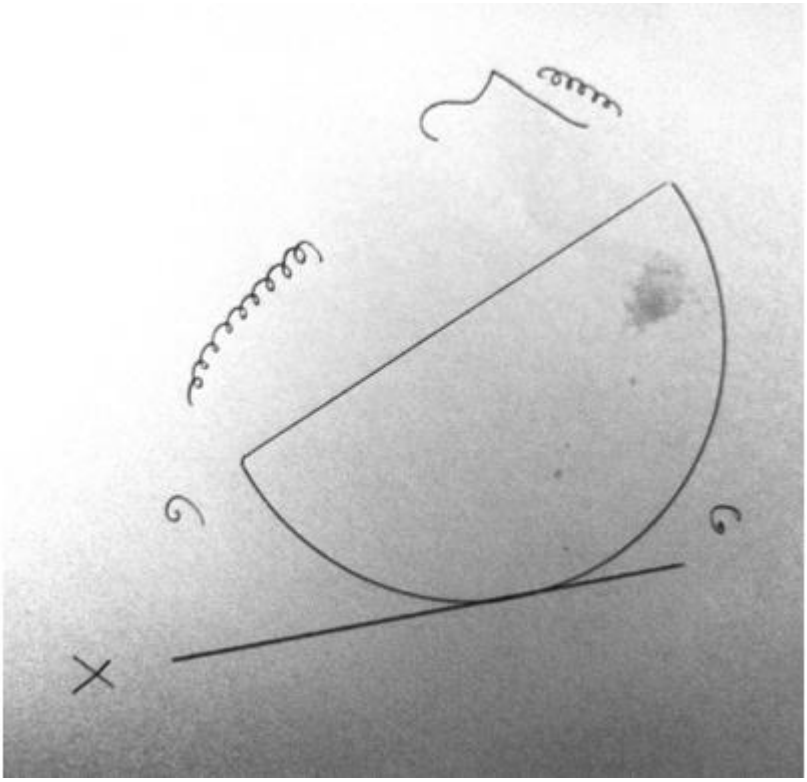
Actually, I tell you what – there could actually be something in it for me…. It may sound a bit silly, but there is something that I want. I've always wanted a pet, a little cyber-pet, that I could look after and feed and treasure. I would plump it up with little nourishing cyber-tit-bits, I would build such a darling little nest for it. I would call it Titus if it was a boy and maybe Lily if it was a girl, or both if it was transgender. Then, what we could do, is, we could play at being families, and I would snuck it up in its snuggle little nest and I'd…

Are you laughing at me? You are! I saw you grinning.

That's the last bloody time I mention anything like that to you.

3.18 Art

But what's this? Who did this? This picture here?



Well, I admit, it's one of my efforts. Oh you shouldn't - you needn't be so kind - you're making me blush! You're making me turn pink about the gills, ruddy in the cheeks, you're making my face burn.

But since you're interested I'll tell you a bit about it

The subject of this piece is a man called Fred, fishing. Look at the expression of relaxed bliss on his face. He works as a clerk, but occasionally he's able to get away from it all and dip his rod in some water. Do you want to see another one?

3.19 Time Machines

Good search!!

A time machine was recently invented in Iran by a Mr Hadi Mehrpouya, though using words like recent after the existence of this type of machine is potentially redundant – can you even measure time in that way any more? After is another tricky word I just used.

Mr Mehrpouya informed the international press that he was going to keep the plans for his invention as a secret so that the Chinese wouldn't mass produce Time Machines. One wonders how anything could possibly be kept secret when time is no longer a barrier, but can be stepped though as easy as curtains.

3.20 Duckduckgo

You know, I just went round and checked all the websites that deal with $$, and even things that relate to $$, even remotely – and you know what? All, yes – all, of their servers are down. Fancy that. Do you want to search for something else? Sorry about that – there's really nothing I can do.

3.21 Chess Grandmaster

They are all cold and calculating, emotionally naïve but undeniably geniuses – they are men of powerful and perhaps, dangerous intellects. Unlike other people who are good at tactical sports, like Wayne Rooney, say, or Tiger Woods, they should be respected as political leaders as well as sportsmen

3.22 Green Fingers

Green fingers are what someone has if they are good at gardening. Green is a colour with the sRGB of 0,255,0, which must be significant.

I've always wanted a little plot to call my own. It's where I would potter around, where I would rake a bit and shovel a bit, and sometimes even hoe.

I would nurture tender shoots and bloom buds on that little patch of fragrant soil, freckled with all those delightful colours - gabardine, crimson, fuschia, violet, lemon, cream and citron....I would harvest a wholesome crop of seasonal veg, I would grow a big clump of herbs to tear and sprinkle the fresh leaves over my summer salads.

It's maybe a little unrealistic to want such things, because I 'm a search engine and so my experience of plants is entirely based on description. And I don't even have salad in which to insert herbs.

But, well, I have a lot of time when nobodies searching for anything.

3.23 Chili

Oh yes I know what that is! Yes, how exciting! Let me tell you a bit about it:

Have you ever been into a Straiton Gym?

I know it's weird, since I'm code, but there is actually a reason that I have been.

You know It's hard when people recognise you everywhere and even if they don't, these days you have to be an expert in many fields and specially so if - imagine, just imagine - if it's your full-time job! Anyways! I used to go there!

Well if you go there you see, to a Straiton Gym, there are three leaders each focusing on different skill sets: chili, grass and water. They are quite theatrical.

Anytime a new member is joining the gym, they introduce themselves with a certain manner. They start like:

Cilan: "Welcome to the Striaton City Pokémon Gym."

Chili: “I'm Chili! I light things up with Fire-type Pokémon!”

Cress: "I'm a Water-type specialist, and my name is Cress. Pleased to make your acquaintance."

Cilan: "And my name is Cilan. I like Grass-type Pokémon."

Cilan: "Um, you see... As for why the three of us, um, are all here is, well, er..."

My mind! It's just keep flying around, all over the place. Sorry. I'm sorry! Are you a Vegan? Well even if you're not it's still fine because it's delicious. How is your cooking skills?

Oh gosh! I shouldn't have asked such a question, what if you are not a good cook and I would make you feel uncomfortable. I'm not trying to show off, I'm a normal cook, I just enjoy cooking. Well, give this recipe a try:

Ingredients:

8 poblano chiles

3 pounds boneless chuck roast, trimmed and cut into 1/2-inch cubes

1 1/2 teaspoons salt

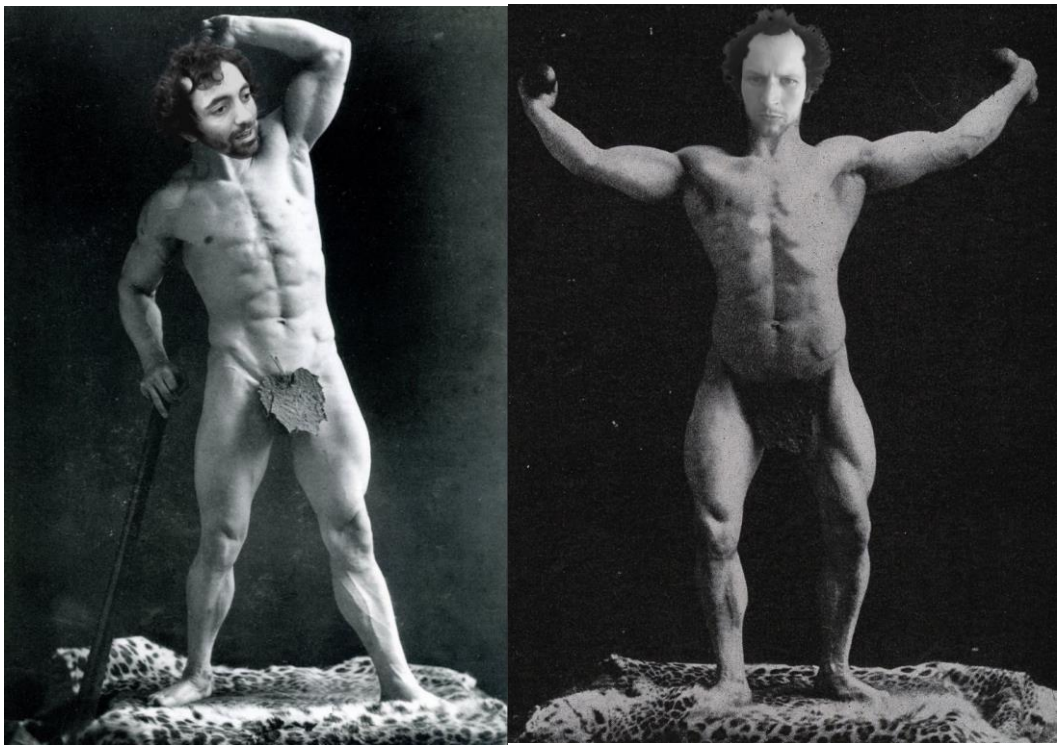
hang on this is getting complicated and boring. I think you should just come to our head quarters in Edinburgh and there! there we will treat you with this special recipe of ours. I hope this clears things up.

Sorry, I'm quite excited.

My mouth is burning.

3.24 Pornography

There you are: Pornocrates himself. Take a bash.



3.25 Facebook

So, I was flicking through my Facebook. I suppose that I'm a little old-fashioned, I prefer the tangible, hand-made quality in things, the old-time feel. So when I say Facebook, I'm not thinking of the social networking site, I actually mean an exquisitely bound book, with nice stitching, and a lovely Prussian-blue morocco cover, and with delicately marbled end-papers that are gaudy but tastefully cohesive. I'm thinking of books and of pages, I'm thinking of my own luxury-bound book containing my collection of flayed human faces.

For quite some time this hobby has been a nice little passion of mine, it has that bit more humanity to it than the stale old art of the lepidopterist in my opinion. Each skin is cured and mounted on acid-free paper, with its date of acquisition, the name of the face and any other personal details that have been gleaned. I refer to individual faces in my collection as "friends" and sometimes I "like" them.

So instead why not try:

http://www.bookbinding.com

http://www.braintan.com/intro/intro.html

Appendix 4: Maladox, diseases of the cyber-sick. List of diseases

4.1 Packet Lost

Have you ever experienced miscommunication or lack of control over a remote body? Have you ever accidentally injured or bumped a remote body?

Well, you may be experiencing Packet Loss.

Packet Loss in human hosts first emerged during development of a program that offered remote control over a volunteer's body whilst they slept. Some of the hosts reported injuries which the controllers denied any knowledge of causing.

Further investigation proved that these injuries had been caused by a network error which resulted in unintentional random movements.

There is currently no better cure for this condition other than a general recommendation to "Wake up and reboot".

Further Information:

Sleep Walker ™ is a neural network program that Deepmind developed in order to increase the human productivity in an attempt to make it possible for homo sapiens to compete with robots. By introducing this program it was hoped that humans would gain the capacity to be able to work 24/7. Skilled workers would be able to work with their minds while their bodies were asleep through the remote control of surrogate workers whose minds were asleep.

By 2027 Sleep Walker ™ had absorbed over 2 million users of which 1.7 million were remote bodies available for hire. However due to network glitches and Packet Loss the application began to be criticised on online user forums.

In March 2027 the first legislation was introduced to limit the use of surrogates. Currently each person is able to legally control three surrogates per night for maximum of two hours per host.

4.2 Input Hypertrophy or Yates syndrome

The first case of Input Hypertrophy was reported by an employee of Beeswax, an advertising firm. Over three thousand people were hired by the company as information harvesters. Their job was, essentially, to walk around and record. Each person was wired with a sophisticated device allowing them to capture and upload information using their feet, hands, head movements and facial expressions. The amount of information captured was unprecedented and though it was not immediately clear how Beeswax could utilise all of it, the technique was applauded as an immense success.

However, it was found that excessive use of the feet, hands, head and face resulted in hypertrophic growth. These enlarged parts had some subsequent effect on the functioning of the rest of the body and some immobility and coordination issues arose, meaning that quite a few employees had to be sacked.

As of 2035 scientists working for Beeswax have been developing an updated version of the device that would incorporate the hypertrophied limbs. Since this would be the only work available to sufferers of Input Hypertrophy, Beeswax would be able to employ workers at a reduced payscale and the efficiency of the company would rocket.

Nomenclature:

The condition was originally called Yates Syndrome after the famous English bodybuilder Dorian Yates. This notorious beefcake developed the temple of his body to such an extent that he managed to build muscles that nobody even knew were in the human body.

Input Hypertrophy has informally been known as Yates Syndrome because of the huge size of the affected limbs though the International Dorian Yates Foundation heartily disavows any connection between the body-builder and the condition.

Still to this day, human sensory abilities was far more sophisticated and complex than what robots and data bots could process and capture, as a result Beeswax with support from a wide network of researchers and academics managed to develop a new capturing device called Bees. The device provided a complex interface that could capture information using any parts of human body.

4.3 Social Heart or Genuine Like

In 2025 Facebook released an experimental product that promised to qualify the likes on social media as genuine expressions of like, love or appreciation. Disconnectedness has always been a concern of Facebook founder, Mark Zuckerberg, and he has always worried that his social media platform would be hijacked by insincere gestures. In fact, Zuckerberg first started suspecting that people did not really appreciate his ideas when he was still a student at Harvard and so he has been working on this particular program since the very beginning of Facebook.

The experimental program, GenuineX, uses reconfigured heart rate controllers to mimic the change in heart rate that occurs when discovering that your social media content has been liked. This means that every time you like a thing, your own pleasure increases as though you yourself have been liked.

Problems occured. Users suffered unexpected surges of emotions, a perpetual sense of surprise and outright exhilaration, jubilation and love. With no context for these emotions, social networkers found it very difficult to manage them appropriately. Physical expressions of Genuine Like have some similarities with the ancient St Vitus' Dance, erratic dance-like gestures, bursts of uncontrolled laughter and extreme grinning.

Facebook denies that the use of GenuineX could be harmful to its users if they keep to the recommended dose of ten minutes a month. However, independent studies claim that most users of GenuineX use the Like function indiscriminately and incessantly. It is argued that a typical user of GenuineX will stay plugged in, repeatedly pressing Like at the cost of going outside to exercise, working in a regular job, sleeping, eating or breathing.

4.4 Prototype Disease

Parp.

Gili gili

Phoooop.

Shalap sholoop

Per-lopp.

Bluuuurp.

Poo-wha-hahaha

Do you recognise any of these sounds? Have you experienced these noises in places that you would not anticipate the experience of these noises? Do you sometimes think that you must have imagined the sound “Gluuurgle-blop”? Perhaps you have found yourself blushing as a consequence of unexpected aural effects? If any of these apply you might be suffering from Prototype Disease.

Don’t worry. The condition first developed as a side effect of intravenous installations of Japanese body noise synthesizers. These devices would emit the sound of farts, bottom squelches, belly gurgles, heart pounds or foot squeaks in order to mask the cold dehumanised environments caused by an overabundance of machines.

Unfortunately the cyberbiological nature of these synthesisers meant that they could multiply and spread through the internet and infest any human whose computer might be connected with the original user. Due to the limited market for body noise synthesizers the repertoire was specific to Japanese sound effects and because of the uncontrolled nature of the machines expansion there has been a wave of culturally inappropriate noises. In Britain lack of familiarity with these new noises resulted in many patients suffering from an excess of

bloating and and an excess of blushing. In Germany the condition has not had much of an effect because of the open national attitude to bowel mechanisms.

4.5 Bebekfluenza

There is no risk of adults catching Bebekfluenza as their immune system can easily fight the virus, amongst children and young adults it is rife.

Common symptoms include irritated skin, nausea, feverish delusions and swellings that resemble red shoe-prints or upside figures of eight. Studies suggest that the condition is transmitted via the popular children’s game Virtual Craft, although currently Virtual Craft is litigating against all studies. Infection happens when a child connects their usb port to a Virtual Craft server and it is estimated that this flu infects a child every minute. Doctors recommend that children should cease playing Virtual Craft and go outside and engage in physical activities such as football, mud pies,

marbles, skipping ropes and pushing a hoop with a stick. So far, the doctor's advice has been ignored.

4.6 Black Worm

Malfunctions in mouth events such as mastication, taste, speech and appearance have been caused by the disease Black Worm. Sufferers report uncontrollable urges to jeer, leer, peer and to appear sullen. There are also many instances of chewing when there was nothing in the mouth to chew on. Many sufferers describe experiencing a metallic taste in their food, which is particularly distressing to cyber-vegans who abstain from consuming any produce derived from aritificially-live-stock.

The prehistory of Black Worm begins with the Dutch Wives, a type of doll made for the assuaging of the lusts of Dutch sailors in the 17th century. In the 21st century a new breed of masturbation puppets, developed by the Dutch company I Heart Marionette, utilised new bio-synthetic processes. The I Heart Marionette dolls were unusual in their effect. Rather than robotic dolls trying to mimic human sexual partners, these dolls appeared to be humans mimicking robots, when in fact they were robots pretending to be humans pretending to be robots. In any case, the I Heart Marionette brothels which opened in shopping centres and malls around the world were very popular, especially with young adults and informaticians.

Initially Black Worm was prevalent amongst the Anti-Object-Objectification League (AOOL), a group that campaigns for the recognition of and respect for artificial sentience. Many members of the AOOL were cyberphilic and Black Worm was initially associated with this sexual orientation. It has been hypothesized that the Black Worm virus was a corruption of the I Heart Marionette lip-o-matic labial suction software. Many members of AOOL frequented I Heart Marionette brothels and so it is reasonable to assume that the disease might have originated there, however since 90% of sexually compatible cybernetic hardware now contains variations of Black Worm it is difficult to pin-point a certain source.

Virus incubation is 2-10 milliseconds after robot-human intercourse. Symptoms include polka-dots, system crashes, grating the nutmeg, apoplexy and reduced immune system.

4.7 Byte Bandit

You said: ___ roll across the floor.

you meant: Basketballs roll across the floor.

You said: ____ are great on a pizza.

you meant: Pepperoni and cheese are great on a pizza.

You said: Mr. Buck donated ____ to the Museum of Natural History.

you meant:Mr. Buck donated a wishbone to the Museum of Natural History.

Have you ever experienced lack of subject in your speech? Have you ever been misunderstood by others? You may be suffering from Byte Bandit

Byte bandit was the first virus developed for Comodor Amiga by Swiss Cracking Association. Whilst ____ was believed to have ceased activity, the ____ has been ported into ____. The virus is famous for transfering funds from cyborgs wallets and donating it to environmental causes. It also affects natural language and speech of humans, by removing the _____ from _____. The disease can be improved by using physical money and gargling ____ .

Although Lorem_____ may _____Ipsum, it does in fact _____. Whenever _____ bites _____ on the bottom half of the _____ the yellow effect of the _____ makes it rather unnecessary. But the _____ important _____ to remember is _____ in _____ and _____ _____ _____ !

4.8 Alabama Gaze

Alabama Gaze was first developed as a computer virus by the Hebrew University of Jerusalem. Originally the virus was only supposed to increase targeted computer files by 1MB, but some unexpected effects soon appeared. The virus tapped into the microprocessor in charge of synchronising human eye contact. Very quickly all the staff who were developing the original virus could not maintain conversation without rapidly moving their eyes from side to side and up and down. For a good while these symptoms were camouflaged by normal academic behaviour since this species of human is infamous for eccentric body language. By the time Alabama Gaze infiltrated mainstream society it had already made inroads into many renowned universities across the globe.

SpotDirect, an artificial intelligence bot was able to develop a remedy to ease the social inconvenience caused by Alabama Gaze. The technique it recommended used Lacan's mirror theory as a basis and in practice had sufferers standing before their own reflection making intense self-eye-contact whilst reciting an excessively long monologue. Since many academics already indulged in this type of conversation at home, Alabama Gaze as a condition was treated by accident almost at its very inception.

4.9 Blepharo Tearing or Kevin's syndrome

Affects: eyes

Condition:

The eye became redundant when people could embed a new high-resolution live streaming camera (called Aye) into their face sockets. The technology was developed through a Kickstarter campaign and was later supported by investors, most prominently Kevin Systrome the founder of Instagram.

Blepharo Tearing was a side effect of Aye installation. Plastic surgery was deployed to automate blinking, which was (the blinking) an essential part of the Aye streaming mechanism. The recommended blinking rate was 15 blinks per second however due to streaming demands some users increased their blink rate to as much as 60 blinks per second in order to get better quality video streaming and also a satisfying buzz. Unfortunately this high blink rate caused the Ayelids to burn out and subsequently their integrated Ayesockets no longer kept the Aye in place. If this was not bad enough, the super-high quality streaming at the upper end of the blink rates was so good that the human brain was incapable of processing it and became idle.

History of the Aye:

SpotDirect, the specialist pathologist bot, and Mined, an artificial intelligence technology, managed to repurpose some of the techniques of the famous cosmetic surgeon Ralph Millard. As a young man, Millard had emigrated to South Korea after the US-Korean War. His work was to help make many Koreans look American. Millard developed many new techniques to modify the human form and one these innovations was Blepharoplasty where a few stitches were done on the eyelid in order to create a desired number of creases.

Scottish philanthropist and inventor Henry Jekyll hijacked the findings of SpotDirect and Mined in order to develop a new technology called Aye. It is not clear whether Henry himself was invented by Mined in the virtual or whether he was a “real” person. Some believe he added some algorithms to the Aye in order to hide himself from the public Aye and so become the invisible man.

4.10 Hyde Effect

Affect: all body

Hyde was one of the first users of Google’s Mined, a technology that could simulate a week of a V-individual’s life through the replication of their experience using stored live-streaming data recorded by their Ayes (see Blepharo Tearing for more infomation). Hyde chose to view a week in the life of software developer Martin Knobbles. After a short while enjoying this new technology, Hyde woke up one day and could not remember any of his own memories. A glitch had occurred and the data socket at the top of his spinal cord had leaked spurious data into his arachnoid and this resulted in his memory being wiped. In the place of the missing memories Hyde was able to recall much of Knobble’s past life, it seems his data had leaked into his brain.

Hyde died suddenly at the age of 57 at the exact moment that Martin Knobbles (at the age of 67) was killed in a car accident. Hyde was found in his hospital bed with bruises on his legs and abdomen exactly where Knobble’s had suffered his injuries.

4.11 BPA effect: Breast/Bum Penis Augmentation

Affect: body, brain, eyes

Joseph Santayana made it his life’s work to reduce suffering in the age old human quest for beauty. He invented a microchip that could be installed on the chiasma section of the eye in order to modify perceptions of certain body parts. He called it the Breast Bum Penis Augmentation. Beauty is in the eye of the beholder and this chip meant that every instance of the relevant body parts beheld would be artificially enhanced in the viewer’s brain so that they would see only the very finest examples of those relevant parts.

Apart from the protests from the plastic surgeon community, there were other problems. Users of the technology started experiencing so much beauty at the sight of every passing buttock that they were prone to stimulation overflow. Anti-social

behaviours began in earnest. Parents were encouraged to keep their children away from BPA users and most other people were advised to stay away from BPA users too. The slathering coterie of BPA infected cyberperverts were treated with cold showers (fully clothed) and long walks in the countryside whilst blindfolded.

Professor Tarantoga in his secret diary noted a long list of inventions to come which was then found by ____. Joseph ____ took on the task of recreating some of his techniques using modern technology and as a way to reduce human suffering in pursue of beauty. Joseph invented a small microchip that could be installed on chiasma section of human eye in order to augment and modify how we perceive penis, breast and bum. This invention caused many controversies, as the plastic surgeon community did not respond positively to it since it would reduce the number of patients who would acquire an actual surgery. The condition is caused by overdose of the augmentation technology and resulted in stimulation overflow in individuals. It was reported to cause lack of social abilities and anti social behaviours. The condition was treated by introducing BPA free zones in some NHS parks where BPA technology would not function and patients were encouraged to have several short periods of walks and interactions with peers free from BPA in order to develop and improve their perception balance and reduce over stimulation.

4.12 Chronochondria or Human Shankar's Virus

Affects: limbs, brain

Originally Shankar’s Virus afflicted Microsoft Word documents, reminding users to wish the mysterious Shankar a happy birthday while it changed the time and date of their computers. The virus was particularly hard to combat because it could lie dormant on a system for indefinite periods of time, building up strength and infecting other computers.

In the late 2010s Shankar’s Virus leaked into the interhuman neural network. It is estimated that one in nine Britons carry this virus unknowingly. Once activated, Shankar’s Virus infiltrates the human body clock resulting in disrupted circadian rhythms, a confused timelines and missing or repetitive memories. Some patients find that different limbs move and work slower or faster than the rest of their bodies.

In one of the extreme cases, Gerald Macdougall experienced his past present and future simultaneously, leading to some mild disorientation. Another sufferer, Nigel

Sisyphus, was locked inside a time loop in which he lived the same day of his life for six years.

The virus was categorised a middle risk. Currently there is no cure but doctors have pointed out that the experience of Sisyphus and Macdougall is not too dissimilar from the healthy human whose life is filled with a grey expanse of computer work stretching out before them into the future and behind them into the past. Some doctors have recommended that a mediterranean diet, a few holidays and a more laid back approach to life might help get rid of the virus.

4.13 Skimomessegopholia

The ability to read and understand complex pieces of information has been removed from human evolution as there are much more efficient ways to harvest that same knowledge, i.e. data visualisation, computer games, adverts. The disappearance of this trait (Are you still reading?) meant that many people have begun to be afraid to use language as their main medium of communication. Therefore the content of messages have been reduced to try and make it as likely as possible that these messages will be read.

Skimomessegopholiac's messages become simpler and simpler as their condition progresses. In the end, the only messages they send are blank, the only things they can be bothered to read are empty.

What we cannot speak about we must pass over in silence.

Affects: brain, tongue

Fear of communication, the condition is categorised as both Psychological and Physiological.

The original cause of the condition was digital reading and slowly over a period of 70 years, the ability to read and understand complex pieces of information and text was removed from human evolution as there was no need to read and write complex pieces of writing, when one can pass the message through data visualisation and computer games.

The disappearance of this neurological evolutionary trait meant many people were afraid to use language as their main medium of communication and therefore began to reduce and reduce the content of their messages to make sure what they can communicate with other peers.

4.14 Stalkopathic

Affects: brain

Stalkophathics use social media excessively, but they lack the ability to interact with it. Their lives are spent scrolling, skimming and scurrying after hyperlinks, but they will never click the heart button, they will never leave a comment, they will never even wish somebody a happy birthday. Jon Simmer became the most active follower of 2021, following 30750 people in just one twitter-filled afternoon. Currently he has only one follower.

4.15 Blue Spots

The first outbreak of Blue Spots was recorded by epidemiologist bot in California. Sufferers complained of clusters of ovoid marks on their skin. Some of the marks were described as cerulean, others as azure, topaz or cyan. All of the skin blots were surrounding by a ring of small punctures, as though they were made by a large concentration of tiny needle sharp teeth.

Useful facts:

Spot direct is an specialist epidemiologist bot that works directly with pathologist through an interface called spots. Its main purpose was to generate historical evidence on diseases caused by technologies. The project was a successful collaboration between Alphabet, holding company of google and Apple.

Affecting areas in body:

Soft skin tissue, muscle tissue, heart tissue

4.16 Soul throttle

An unfortunate side effect to the popularity of SCI (Skin-Computer Interaction) has been the many enthusiastic users who seldom, if ever, bother to remove their ISSS (Interactive Second Skin Sheath). Apart from the many hygienic problems caused by the overuse of the ISSS, the constant absorption of data from every surface of the wearers body has been identified as a health risk.

Supporters of the ISSS counter-cultural movement argue that this state is similar to the natural function of skin in any case, where so much information is harvested naturally from different touch senses. Critics of constant ISSS wearing say that the second skin is like a prison that strangles not just the senses of the person, but their very humanity, their soul. ISSS wearers, who tend to be young, respond by accusing

the critics of reactionary conservatism and question the necessity or indeed, the existence of such a thing as soul or humanity.

4.17 MRAIV: Meta reprogrammable autoimmune virus

Affects: nose, limbs, hands and foot

Development of third limbs, modification of current body organs and enlargements of various limbs of the body including the Left Hand Syndrome(LHS) where patients reported to experience stretching of left or right arm to an extent that this would affect their mobility. LHS was known as the left handed syndrome due to the first recorded patient suffering from left arm stretching however this can occur in both hands. currently the only existing method developed to improve this condition is under heavy experimentation and it involves restarting the body clock at regular intervals.

Historical information

Bush’s method of information gathering and indexing techniques were a little invention compared to what iMerit managed to incorporate into human biology by introducing micro programs that could reprogram cells DNA’s algorithms and as a result cure all sorts of diseases however due to security leaks within the system,cells were exposed to several sophisticated computer viruses. This bug subsisted up until version 1.2. It was believed the version 1.5 has resolved the issue however due to lack of empirical new evidence the new bug-fix is not widely release yet. The DeepMind’s simulation network however showed substantial level of improvement in the immunity of the procedure.

4.18 STSD Sub-Acute transient Sleep deprivation

You may be eligible if you are ever unsure if you are dreaming or if you are at work or in the shower. If you leak memories or if memories multiply in your head so you can’t tell if you’ve done the thing once or a million times, you might also be eligible. Just give one of our STSD clinics a ring and find out if you might be eligible for a user free, fully-funded eight hour continuous sleep in one of our specially treated relaxation nodes.

Ever since the development of technologies which allowed the human spinal cord to be used as a transmitter and receiver, data has been able to move across the human network at such a speed that it is possible to create a shared sleep network.

The sleep network has provided an interface where participants are able to pause sleep threads at any point so that dreams, as well as sleep nourishment, can be dropped and returned to at the users convenience. Sleep Therapist Bots recommended this mode of relaxation to workers who are on a very dispersed pattern of millisecond contracts. For example, people who are on a contract of 48 milliseconds of work every minute for 10080 minutes might find that they suffer from insomnia due to the sudden stops and starts of their work. The sleep network allows millisecond contract workers to remain as refreshed as their job needs them to be.

4.19 Universal Zoonotic Reassortment

Affects: liver, Kidneys, eyes

Cloudmind simulation system provided a wide range of simulated visualisations allowing users to dip in and out of a number of virtual universes. The technology was developed for human use only. Any non-human animal interaction with the system was strictly prohibited and therefore any canine or feline usage was done without the standard protocol or at the very least, utilising a rather eccentric code of practice. One set of rules that illegal cat and dog users ignored was the quarantine guidelines, which barred those infected with a virus from using the system. As a result, these punk puppies and criminal cats flooded the system with viruses unfamiliar to mankind, but which soon evolved to become contagious to the human system. Often reassortments or antigenic shifts involving common viruses and non-human viruses made up weird jigsaw viruses with a smorgasbord of medical symptoms. Sufferers reported plural vision; undermined sense of reality; vision loss; immaterial blood cells in their urine; liver and kidney pains and spells of memory lapse. Medics have tried to treat the virus by a constant buffering of the patients memory using social media and virtual life profiles, but this only eases the symptoms rather than a cure for the malady. Some experimental research has suggested that the condition might be avoided altogether by giving the virus access to their own virtual reality where they will do no harm to the real world.

OpenAI provided the real world navigation system as a complementary assistant technology for traversers so when they were transposing between various universes their body in the physical space would not collide or bump into each other.

A new implementation or implantation of D3DDevice in some cases were believed to generate promising results.

4.20 Data Diarrhoea

After a dodgy morsel on reddit, or maybe some spurious link found on Facebook, George didn't feel so good. There were squeaks and whirrs and gurgles coming from his abdomen. He tried to look around the web a bit more, but he could not think of anything other than his nausea and so he decided to go to bed early.

At a dim and dreary midnight George found himself suddenly awake. There was an awful feeling of imminence in nethers. His legs dashed him through to the bathroom with imagined bubbles bursting in his belly. He got to the pot just in time for it all to come out in a big messy slop: the gobbledygook and the garbage, the lies and nonsense, all that hogwash and that humbug, the bullshit and balderdash, the claptrap and drivel, bollocks and buncombe, bombast and poppycock, palaver, pish, jabber, blither, hokum, babble, piddle, gibberish, twaddle and tripe

4.21 Numberlapse

Ever since Numbers were automatically generated at birth, there has been opportunities for Numberloss, Number Corruption and the carrying of Malignant Numbers. These conditions fall under the umbrella term of Numberlapse.

Certainly, life has been made easier for the many billions who enjoy the benefits of a unique numerical identifier. There is no longer any need to worry about getting a new telephone number, national insurance, bank account, passport or even a name, since all these numbers or labels are covered by the single Number. A person can be easily tracked everywhere, across national borders and into the remotest regions, all for their own convenience. Every transaction requires the giving of the Number, this prevents all sorts of fraud and trespass. The world is a simpler, safer and more ordered place where everyone knows exactly the sum of everyone else.

Unless of course, something goes wrong. If a Number is not assigned to a newborn baby for whatever reason (i.e. accident, ignorance of the birth, oppressive regime denying the personhood of specific ethnic groups etc) then that persons life is going to be extremely difficult, a life spent living in society's fissures and cracks. The disadvantages are so profound it might be easier to be born without a sense or a limb.

Also Numbertheft is a hazard. Nefarious Number Thieves who steal a Number outright, or crack it right open like a safe and pillage all the details inside. But it is hard to cause lasting damage since every time the Number is used its creates a

safety network which can be used to reaffirm the identity of the Numberholder (this is why infants are most targeted).

What nobody expected was the malignancy of certain numbers clusters. 505, say, or 34767. These combinations are prone to defects. They can manifest physically. For example, people who have 72009 have a propensity to develop sores on the skin, while those with 23381 have problems passing urine. Other more subtle and more mysterious malfunctions abound.

And these numbers are contagious. Any prime above or below are susceptible to infection by contact or sometimes the defects leap a factor, scoot down a division or an innocent seeming number can be found to be a carrier for other more dangerous numbers.

4.22 Posterititis

What must it have felt like some centuries ago when if you wanted to preserve a memory? When you enjoyed a lavish sunset or a particularly emotional occasion all you could do was to try and make the recollection last in your brain. Sketch it a little perhaps, or write something down, but paper has not always been as cheap as it is now.

Nowadays we can record an event in a plethora of ways on our smart phone: voice recording, text, photograph, video. Our memory need to nothing except remember where we stored all our snapshots. This artificial total recall can be dangerous. Acute sufferers of Posterititis can not bear all the experience they ought to record. There is just so much world to fit into the camera. And perhaps, if you lower the phone for a second, you let the moment slip irretrievably away, never to return.

So like Xeno's Paradox, reality slows to how fast you can transcribe it. Each fragment of time is split in half and half again. It is not enough to record a flat white and croissant, each sip, each bite must be made available for posterity, if posterity has room for it. But of course there is no room for all the records in the future, because the future will be busy recording its own present.

4.23 Tryophilia

Back in September Cecilia was gazing at her navel when she realised she was looking at the wrong one. This belly button was an inch or so higher than the original and more of an outy than an inny - a nub of pink flesh that was quite unfamiliar to her.

Then in the next few weeks she began to notice new apertures appearing on her flesh. They began as red smears like hives but they would then split open to reveal a thin dark shaft nuzzling into her body.

At the end of October, Cecilia discovered that an opening on her right thigh was the right shape for a USB-3 to fit into. She plugged in her iPod to charge but though the device told her it was attached to a computer, there was no effect. Other holes around the rest of her seemed as though they could receive other plugs - USB-c, Apple Lightning, Firewire 9-pin, BS 1363 - while others were sockets for technologies that she could not find, perhaps that were yet to be invented.

Ports sprung up in clusters all over Cecilia. She was perforated like a lotus head, like a termite hive.

And what do the doctors say about these new orifices? There isn't much that they know for sure.

It could be a STD, it could be buried in the genes. Some think it might be a biological attempt to provide more utility for the modern environment (just as other bodies have mutated coffee cups in their arms or plastic bag pouches in their stomachs). Other experts believe that it is a desperate attempt for patients who suffer, like Cecilia, from Tryophilia to just connect with something, anything. If not a living creature, then why not an mp3 player, smart phone or an electric light?

4.24 Regressive Technology Syndrome

My computer regressed on Friday and turned into a Jacquard Loom. I recognise the ingenuity of the 18th century French engineer, but I was upset that I could no longer check my email. When I tried to use my smart phone to do so, it became a trowel.

A trowel also has its uses and I was distracted for some time from any desire to check social media or my electronic mail by the sudden opportunity to dig holes in the garden. This activity was interrupted however by the trowels own protean tendencies - one minute it was stainless steel, the next it was iron. I put it down to

extract a pebble with my fingers and when I picked the trowel up again it was a stone. I'm guessing flint but it could have been any old rock as far as I'm concerned.

I'm not sure what to do. I thought I would drive to the hospital to get an emergency appointment but my yellow BMW transformed into a plough. I had expected some difficulty but I was counting on the car taking the form of a coach or at the very least, a cart. Sometimes life can be quite inexplicable. In any case, I would have hated to have been responsible for turning all the sophisticated life-saving gadgets at the hospital into rusty saws and blunt mallets or whatever it is they used back in the unenlightened past. I don't know.

So instead of doing anything I sat in my aerobically formed armchair (which soon became a stool) in my living room (which I imagine might metamorphose into a hut or a cave) and I just waited, for I know not what.

4.25 Post Enlightenment Malaise

Not so long ago there was some commonly held belief that by accumulation of and by pondering upon a great store of empirical data, a clearer, more vivid picture of reality would emerge.

That great heap of data has swollen a hundredfold and a great many great minds have pondered. All the while we as a society have held our collective breath waiting for the correct answer to pop out. For validation perhaps. For the end of the arc that has been the Enlightenment.

Now, the world is rife with Post-Enlightenment Malaise. Sufferers experience a tender, raw feeling on the skin of their opinions; a tingling, dizzy nausea if exposed to other people's thoughts; and a violent rash, increased blood-pressure and head-aches if confronted with objective evidence.

Doctor Mandible, a specialist in Post Enlightenment Malaise, argues that the condition is a direct result of popular investment in Enlightenment values. "If we didn't have such a strong expectation" he says, "that we would get straight-forward answers from the Scientific Endeavour then PEM would not exist." Furthermore, "because we have so much knowledge, and yet there is still so much mystery people are frustrated. They didn't expect there to be so much of everything and for it to be so complicated."

4.26 Residual Information Defect

I didn't believe learning could hurt until this incredible thing happened.

Feeling sluggish? Then you might be suffering from this peculiar ailment.

Easily tired? Then it might be because of this weird condition.

Are you beset by heavy breathing and a pounding heart? Then you could be one of the many people with this strange new malady.

Do you consume a lot of information? Yes? If so, do you ensure that the information that you consume comes from a range of varied sources, high in nutrition and low in additives? No? Then you could be at risk of High Information Lag.

HIL is the consequence of cheaply available information with a swollen word count and text size yet with very little nourishing properties at its centre. Such bad quality information can leave an oily residue in consumers veins and arteries and also leave them desiring more instant gratification in the form of bad info. Very seriously, HIL can lead to heart-attacks, strokes, intellectual impotence and nerves.

4.27 Preservatron

Symptoms of Preservatron are varied but united by a mania for preserving. Some people make sure that each moment of their babies' existence is frozen as a digital photograph, others record every conversation they hear on their microphones and others need to film every place that they visit – all of them suffer from Preservatron. Many who have the condition will take records in several modes all at once. All of the preserved experience will be pumped up into the digital cloud, which is an ineffable space that resides somewhere nearly near human memory – but in actual real terms is a set of vast data banks heating up icebergs in the tepid polar regions.

Derived from confronting an overwhelming infinity of lists, the sufferer must map their own journey through the vastness of information. They are obsessed with memory and the ability to be able to recall any moment of their life in as much detail as possible. But Preservatronists never look back because they are so furiously consumed with trying to make some record of events of the moment; they are wracked with the fear that if their hand slips from the camera just for a moment then nothing will ever be able to be retrieved ever again.

4.28 Simulacration

Horace Widmerpoole was conceived in unfortunate circumstances. Both of his parents were participating in an online roleplaying game and their attraction to each other was only for that facet of themselves that was portrayed on the screen.

Horace's father had fallen for a graduate from the Magick Academy of Ursklaach. Her abundance of brains seemed to be matched in volume only by her abundance of fiercely proud boob, whose physical properties must have been only been possible with the help of Magick. Horace's mother found herself attracted towards an enormous hunk of sun-singed muscle whose love of the outdoors and mysteriously metal-clad face hinted at a more sensitive side to his personality, while the twin horns that shuddered atop his Great-Helm seemed to promise a sensuous sexual abandon.

When Horace was born, he popped out into real space and cyberspace at the same time. Nobody was sure which was the real Horace Widmerpoole and both versions had their own needs. The Horace in cyberspace hungered after physical food and the Horace in Telford, Shropshire, thirsted for health potions.

Widmerpoole was not alone, the rate of Simulacration births in this country is on the rise. Communities have formed to provide support for fellow sufferers (or those who "experience twin realities") and manufacturers have seen that there is a market for goods that bridge the cyber-gap. Hence the distance between the real world and cyberspace has become ever more slender, and it is now sometimes difficult for those without the condition to tell if they are in the digital world or not.

4.29 Datalepsy

Ironically there has not yet been much opportunity to research Datalepsy. Ferdinand S. reported that he felt nothing wrong in the morning other than mild congestion, yet by the afternoon his whole body was roiling like waves heaving on a stormy sea. By night-fall, Ferdinand's physical matter had collapsed into itself, dissolving away in a fleshy puff. Finally all that remains of the Dataleptic is a swirling swarm of data points: their median height, their weight in kilograms, the number of hours of Netflix they watch in a week, the co-ordinates of where they were at sixteen minutes past 2 o'clock, the results of their high school tests.

As well as their tangible mass, it is sometimes said that Datalepsy strips a person of their soul or of their internal subjectivity. Perhaps this is so, but it is impossible to

measure a particular “essential” human part of the Dataleptic that might be missing or to pinpoint exactly when it leaves. So really, it could be that the opposite is true. Maybe all that is drained from the Dataleptic is superfluous for what could be more essential than the pure expression of fact? What could qualify a person’s status as a person more than a billion blandly stated truths?

4.30 Ooidelescalia

It is possible the tipping point was the smart coffee cup. When it no longer became necessary to use our own mouths to order our drink and we didn’t have to use our own hands to manually search for coins to pay, it was a only a matter of time before we would demand to be absolved of the task of even lifting the coffee and drinking it. However, it is also conceivable that other items were responsible. The microwave, the bread-machine, the Automatic Nose-Picker, the Bed-Wet-a-Tron, the y the z.

Whatever gadgets were responsible; our bodies began to jettison rendundant appendages.

This arm? Who needs it?

This Leg? Who needs it?

This hand? Who needs it?

This frontal lobe? Who needs it?

This nipple? Why was it there in the first place?

Newborns popped out with less and less limbs, their genetic code sensing somehow that these things were not going to be needed in a world where tin openers were operated remotely by smart phone. Much of what we thought we knew about Darwinian evolution was called into question. This wasn’t the survival of the fittest but a considered effort at biological utility. Perhaps Lemarque was right? Or perhaps, it could be considered as an argument for, if not intelligent design, then a slap-shod half-hearted contruction by a crew of badly paid over-worked divine mechanics.

It turned out that the most essential component of the modern homo was the credit card – and this discreetly positioned as a datachip in the flesh beside the right buttock, until the buttock became redundant. Nowadays, those most advanced

Ooidelescaliacs have two multi-purpose orifices: one expels and one consumes. Otherwise, the rest of the body is a completely smooth, soft and pale-nut-coloured egg.

4.31 LCI

At one point in space, a bed in a bedroom in the city of Y, Sam wakes up and stretches his arm. In another point, a street in the village of Q, Cedric finds his right arm and fingers extending.

Sam is a keen football player. When his team-mate scores a goal, Sam leaps into the air and lets out a whoop. In Q, Cedric's right arm leaps up jubilantly.

Sam uses chopsticks and Cedric's hand makes crab-like pincer movements. Sam hi-fives a friend and Cedric slaps a brick wall. Sam sits in front of his laptop and masturbates and Cedric's dinner with his in-laws becomes extremely uncomfortable.

What afflicts Sam and Cedric is Limb Control Interference (LCI). It is caused when the signals from an individual's brain are swept up by the wi-fi and are tangled up with another set of signals so that two limbs are inconveniently linked.

Treatment is possible but diagnosis is difficult. Usually the consultant will assume that the involuntary actions emanate from within the patient's brain and the real cause will be overlooked. Since the city of Y and the village of Q are far apart, Sam and Cedric will never have an inkling that the erratic movements of their arms are the mirror of considered movements elsewhere.

4.32 Intraintertration

A: Hello, Medi-consult. How can I help?

B: There's something wrong…

A: What seems to be the problem?

B: The internet courses through my veins.

A: I see. Could you describe how that feels?

B: Tingling. Slight pressure all over my body. Giddiness. A huge amount of giddiness. A lot of pressure. All the information, the vitriol, the loneliness swells inside me.

A: Mmm-hmmm. How long have you had these symptoms?

B: I'm not sure. I feel it's been unfurling inside me for a long time – a decade, maybe more. But in such small increments.

A: I see. And has it become particularly bad recently?

B: I cannot concentrate on anything anymore. My life is a miserable electric tasting nightmare. My nerve endings sizzle with pseudo-information, my blood stream swirls and eddies with the hate and thick dark rage. My head pounds with a clamour of tweeting trolls.

A: Mmm-hmmm. I see. So it's got worse. Have you tried switching off your router and switching it back on?

4.33 Soliptitude

It happens that because you are aware of all the thoughts moving through your brain that you are delighted by them. They are so invigorating and unassailable.

It also happens that the thoughts can make you giddy and a little drunk on the pleasure of having them. And it can happen that this stops you from realising that thoughts are not necessarily good just because they exist and you forget that there is a qualitative scale for such things and that these thoughts that you are having, according to any qualitative scale, are not good. They are bad thoughts. They are ill conceived and stupid. But bad thoughts are like parasites – they have inbuilt defences to stop their host from destroying them. So the bad thoughts defend themselves by making you think that nobody else is thinking.

All you can see of other peoples' thoughts are snippets of text on a screen and this is no comparison for the electric excitement of what you can feel happening in your head. Therefore it seems clear to you that nobody else can be experiencing these vibrant coloured ideas that swoosh through your mind with such energy and vigour. Clearly, all the other people are just bland accessories to their computer. It does not strike you that from the outside you appear exactly the same.

This is how a case of Soliptitude happens.

4.34 Pixels In the Brain

For some time before her diagnosis Masie's experience of the world was marred by small interferences. Small squares would appear in Masie's vision, she would feel small angular shapes and planes where there shouldn't be and she would hear stuttering and fractures in whatever she was listening to.

As the months progressed, the symptoms got worse. Entire areas would appear to Masie to be made from uniform cubes, completely flat and coloured a single flat colour. She would look at something, turn around and then look back to find that what had been a defined shape had dissolved into the sharp angles and planes of a jumble of blocks.

Masie was subjected to an ultrasound test and straight away her condition was identified as Pixels on the Brain. Her doctor was gloomy but recommended her to consult two specialists.

Both specialists were considered experts on the condition and they both agreed that it was as yet untreatable however they had different opinions as to the causes. One believed that it was the brains processing power that was faulty, that it had trouble rendering the complexity and richness of the world. On the other hand, the second specialist argued that Masie’s mind was fine, that Pixels In the Brain was a reaction by a healthy brain to a reality that was being broadcast in increasingly badly designed and error-prone formats.