

Device Shifting

A Process For Applied Critical Design

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I. Abstract

Device¹ Shifting - shift the behaviour of how a human relates to a device by either occupying it, lowering its level of required or possible engagement or transforming its input or output with a mass produceable accessory.

This research takes a **critical design** approach as defined by Anthony Dunne and Fiona Raby (2005)(1) to explore our evolving interrelationships and interdependencies with devices. Critical design uses speculative design proposals to challenge narrow assumptions, preconceptions and givens about the role products play in everyday life. Accepting that our interrelationships and interdependencies will only intensify as we become more connected to each other and to cyberspace² through devices, we will require a more intimate and humanly experience of connection.

The architected experience is a primary quality of modern life, prevalent in our home, office, transportation and social environments. Much of this experience is driven by computing and today's computing is everywhere—but nowhere to be seen. The world is already filled with well over 30 computer chips for every man, woman, and child on the planet (Thackara, 2001)(2).

The internet has shaped and been shaped by four devices since it gained momentum in the 1990s - the mobile/smartphone, portable computer, digital camera and MP3 player³. They have blurred the boundaries between public and private spaces, office and home environments, real and cyberspaces and shifted the value, creation and distribution of media⁴.

¹ The term device is defined in this thesis as portable digital technology.

² Cyberspace is the electronic medium of computer networks, in which online communication takes place.

³ Web 2.0 requires users to generate, contribute and distribute content. Much of the content in Web 2.0 is facilitated by devices that can record video and audio, upload text directly to the internet, and that are location aware. The survey conducted as part of this research also concluded that these devices are near ubiquity.

⁴ This thesis aims to produce mass produceable outcomes for mass produced devices. The research therefore focuses solely on the history of consumer experiences with mass produced devices and not industrial, experimental or professional devices

Accepting that powerful corporate interests will inevitably drive our experiences with technology serves to motivate the production of accessories that subvert, reinforce, extend, augment or diminish such experiences. By applying the process of Device Shifting, accessories are designed that proffer ludic, poetic and human experiences over function and inherent potential. Opposed to designing entirely new products as critical design, Device Shifting seeks to retain the established interrelationships and interdependencies we already have with devices. Only then is it possible to directly intervene between people and devices - making us think, raising awareness, exposing assumptions, provoking action and sparking debate.

A Sort of A Song

Let the snake wait under
his weed
and the writing
be of words, slow and quick, sharp
to strike, quiet to wait,
sleepless.
-- through metaphor to reconcile
the people and the stones.
Compose. (No ideas
but in things) Invent!
Saxifrage is my flower that splits
the rocks.

- *William Carlos Williams*

2. Introduction

As new technical developments alter the object and make it “intelligent,” they also set the object on a plane with no prior cultural references . . . although the physical aspects of these objects are still within the world of materials, their operation and their very state of being is well beyond the manipulation of matter and has more to do with information exchange than with form.

— E. Manzini, *The Material Of Invention* (3)

In 2010 our pockets are home to refined aesthetic mobile devices, rich with acute sensors and actuators. They are automatic, fast, small, light, mobile, connected, fashionable and ubiquitous. Each bearing countless new constructs by which to relate to an object: the button, slider and the dial are no longer the lead abstractions by which to engage with a device. Our devices are seductively tangible. The hammering of keys and clicking of mouses is shared with swift gestures over surfaces or through the air: even our smiles are quantifiable.

We have an empirical sense of where we are on the planet viewable on maps with ever increasing detail and perspectives. Our devices are so sensitive to our location and environments they can reveal the layer of data that shrouds our major cities, offering retail, culinary, social and historical information. Over 50 of the major languages are easily translated online, continuously growing in accuracy as people collaborate over the internet.

Many of us microblog⁵ our experiences with text, photos and movies every day on shared platforms creating large social networks in cyberspace. Such networks often relay news as it unfolds at the scene offering first hand accounts long before traditional media channels. We feel more connected to our friends, families and loved ones over great distances, often simply sharing the banalities of our everyday. We accumulate incredible amounts of data - much of it accessible

⁵ Microblogging is different to web logging (blogging) as it is limited to shorter pieces of text and usually updated at more regular intervals. Twitter is a microblogging service that allows only 140 characters per tweet.

anywhere on the planet. Most devices have a camera built in allowing us to log our moments without the need to process films or edit footage. Our lives are beginning to revolve around searching. The ability to search through the perpetually increasing juggernaut of data is paramount. Complex data analysis systems provide services to aid us in the selection of products based on our, 'search history' and our likes and dislikes relative to other peoples preferences. Cyberspace and real space flow into each other creating a truly augmented reality.

THE DEVICE BECOMES A NEXUS

As Nicolas Carr wrote recently, 'The deeper a technology is woven into the patterns of everyday life, the less choice we have about whether and how we use that technology(4).'

Neuroscientists seek to understand the impact of heavy technology use on the brain; at a time when use is perpetually increasing. Such research may be as significant as when scientists investigated the effects of consuming too much meat or alcohol. Devices are good at leading us to multitask which has been shown to effect performance. Being engaged in multitasking may not even be necessary, researchers suggest attention and focus can take a hit when people merely anticipate the arrival of more digital stimulation (Richter, 2010)(5). People place their brains in a heightened state of stress when paying partial continuous attention. This results in less time to reflect, contemplate or make thoughtful decisions. They exist in a state of constant tension — anticipating a new contact or item of news or information at any moment. Once people get used to it, they tend to thrive on the perpetual connectivity. It becomes irresistible (Small, 2010)(7). Russell A. Poldrack a Professor of Psychology and Neurobiology believes the same brain systems are probably involved in the drive towards compulsive use of our electronic devices that are involved in other kinds of addiction.

Our brains are wonderfully adaptive systems, and they adjust their expectations to the world around them. The constant stream of novel information provided by electronic devices creates an expectation of continued novelty, and when this is missing the brain issues signals that causes us to seek it out, just as a drug addict will seek out drugs (Poldrack,2010)(8).

Further still the expectation of e-mail seems to be taking up our working memory⁶. Working memory is a precious resource in the brain. Neuroscientists hypothesize that a fraction of brain power is tied up in anticipating e-mail and other new information.

Our homes, the traditional shelter from the crowd, have been invaded to the point where we may be in danger of no longer connecting deeply with our families, our books and our thoughts (Winer, 2010)(10). Mobile devices are being used in the home. While this is not especially peculiar it could be considered a side effect of their mobility. This will be amplified as devices become **personified objects**⁷. Shrouding us in data clouds⁸ of our personal profiles and other information, augmenting the real space with ‘cyber ghosts’, that shadow us wherever we go⁹; wherever they are. Invariably having a significant impact on how we interrelate with devices, space and each other.

The device was truly born as technology became pocket-sized. The speed, capacity and size of electronic components, mass production techniques, manufacturing costs and the internet attributes to their current abilities. Manufacture and distribution of these devices requires a web of advanced logistics drawing on human and mineral resources from around the planet. Some devices are manufactured at incredible rates - at over 100,000 units per day. The technology necessary to machine and assemble them is incredibly precise, frequently working at the nano scale.

The ‘consumer want’ is so informed there are cases where devices have been designed and discussed on forums by consumers that closely resemble the resulting mass produced product before it is even launched, let alone sold.

6 To the extent where you have less working memory, you have less space for storing and integrating ideas and therefore less to do the reasoning you need to do (Richter,2010)(5).

7 Devices will become personified as they become more location aware and store more information about the person that uses and carries them. As devices become constantly connected to the internet, services such as Facebook will augment the real space with our personal information viewable by others in the local area.

8 In this context data clouds are locally broadcast chunks of digital information that together form clouds of digital information accessible by others in the local area.

9 The concept of cyber ghosts denotes the ethereal nature of digital information as it begins to surround devices and the people that carry them.

In the near future cloud computing will have an enormous impact on the functionality of devices. Shared resources, software, and information will be provided to computers and other devices (such as smartphones) on demand over the internet. Devices will no longer need large amounts of processing power or disk space as it will all be processed and stored on the internet.

Devices are now an integral part of modern life and will continue to suffuse with our everyday, in developed and developing nations, urban and rural environments, and private and public spaces. The following research and projects focuses on our interdependencies and interrelations with the device. Furthermore, it proposes Device Shifting as a process of applied critical design to subvert, neutralise or enhance any exposed interdependencies and interrelationships with a device.

3. Four Influential Devices of The Past Decade

If you have plenty of money, the best consequence (so they say) is that you no longer need to think about money. In the future we will have plenty of technology — and the best consequence will be that we will no longer have to think about technology.

-- David Gelernter(11)

It all starts with the embedded microprocessor. All sorts of thing have a chip in them. The pocket radio of the 1960s, that first truly widespread instance of portable consumer electronics, was named for its embedded processor, which if not yet truly a chip, was at least ‘solid state.’ A beachgoer could listen to his or her ‘transistor (McCullough,2004)(12)’

Devices are updated and new improved versions are released at enormous rates. Apple updated the iPod family more than twice a year over the past decade. Nokia alone released 223 different phone models over the last five years(13). There are currently 81 different models of Canon cameras available on the market(14). The world of organised artifice is transforming in ways that are poorly understood and little explored. The production methods currently used are not sustainable. They are large in scale, have long histories, and have been extensively researched and developed but they can't go on in their present form. The status quo uses archaic forms of energy and materials which are finite and toxic. They wreck the climate, poison the populace and foment resource wars. They have no future (Sterling, 2005)(15).

The smartphone and portable computer easily access most content on the web. Tablet computers such as the Samsung Galaxy Tab or the Apple iPad are the first devices specifically designed to access and experience the internet. Digital cameras made the internet rich with content, produceable on any budget: given that most devices have a camera built in. MP3 players are constantly emptied and filled with music, podcasts, vodcasts and films often sourced from the internet. For many of us these devices have become a major part of our lives. As they continue to transform our relationship to the real and virtual environments they directly or indirectly impact on our decisions, relationships, prosperity, communication and memories. Not only affecting multiple aspects of our lives on a deep, abstract and often personal level, but many of our experiences with devices affect us on a surface level simply by the sound, movement and light they produce.

3.1. The Mobile & Smartphone

The mobile phone changed telephony from a place > place experience to a person > person experience. It was the first device that dramatically changed our relationships, communication and public spaces. It was pervasive, rapidly changing the soundscape and experience of our urban environments. Not only did it provide mobile telephony but also a new communication service known as Simple Messaging System or SMS. As of 2009 Americans are sending more SMS than making calls on their mobile phones⁽¹⁶⁾. These short chunks of text information based on the average length of a postcard changed how, when and where we meet each other, they gave rise to new intimacies such as 'sext messaging', and aided in the mass organisation of people for events like flash mobs.

There are now 5 billion mobile phone connections throughout the world which is more than three times as many phones as personal computers (17). Mobile phones are ubiquitous in many areas of the world. There are now more mobile subscribers in developing countries than in developed countries. Most mobile phones sold in developing countries are primarily used for voice calls and text messaging. However, "Moore's Law" (the ability of the semiconductor industry to double the number of transistors on a computer chip every 12 to 18 months) means that the capabilities of today's "smartphones" (e.g., an Apple iPhone or Nokia N95) will be more affordable over time. Smartphones¹⁰ have a variety of different capabilities, including operating systems that can support sophisticated applications, e-mail, miniature keyboards, full-fledged Internet access, touch screens, accelerometers, built-in cameras, GPS, media software for playing or recording audio and video, secure electronic commerce, barcode readers, WiFi connectivity, and the ability to display information on a television screen (Wood, 2010)(17).

Smartphone applications have become a lucrative business in the smartphone market with companies putting forward different business models. Speaking at Apple's annual developers conference chief executive Steve Jobs said his company's industry-leading App Store has generated developers more than \$1 billion in revenues while serving up over 5 billion app downloads since its inception two years ago. There are currently 275,000 apps in total on the Apple App Store alone.

¹⁰ Smartphones require sufficient hardware to run an operating system similar to standard desktop operating systems such as Microsoft's Windows or Apple's OS X.

Increasing mobile phone penetration is linked to rising Gross Domestic Product (GDP). Over half the businesses in South Africa and Egypt attribute increased profits to mobile phones. Last year more than ten percent of Kenya's Gross Domestic Product passed through the cell phone based M-Pesa financial service tool. That number will double in 2010. And, the gender gap that results in 300 million fewer female subscribers to mobile services, is estimated as a \$13 billion market. But the real mobile revolution is in the innovative services that are delivered on this platform (Hendricks, 2010)(18).

In the future your phone is likely to be situationally and contextually aware, and present information to you accordingly. The phone — and the cloud-based server side intelligence behind it — will know you, your location, your social networks, and your preferences in food, media, and communication. It will predict your next moves. The multi-trillion dollar question is who enables it and controls the sources and uses of information (Mokey, 2010)(19). Location awareness will further lead to several other innovations. Phones in 2015 will know when you are near a McDonald's or Starbucks and offer to pay your bill. Augmented reality – an emerging trend in 2009 – will become a social-awareness tool in the next five years as users link their phones. For example, connected devices could form into an ad hoc broadcast terminal at sporting events where you can view a video feed from a guy in the second row or up in the nose-bleed seats. The smartphone of 2015 may go even further: You might be able to link phones together to form a cluster where a group of phones provides PC-like processing capability. Gamers will be able to connect with each other for multiplayer shootouts, albeit with not just one or two players, but rather a roomful of 32 gamers all at once (Brandon, 2010) (20).



Figure 1 - Typical Smartphone(21)

The smartphone is yet to reach ubiquity but as it does it will pervade more and more aspects of our lives. It is certainly no longer simply phone - it is an alternative to portable and desktop computing.

3.2. The Portable Computer¹¹

A "personal, portable information manipulator" was imagined by Alan Kay at Xerox PARC in 1968 and described in his 1972 paper as the "Dynabook"(22).

The Grid Compass was arguably the first laptop computer, when the initial model, the 1101 was introduced in April 1982. The 'luggable' computer or notebook computer was designed with the form of a briefcase in mind. Alan Kay had the vision of kids carrying devices that would replace textbooks. It is now not only the vessel for documents but the whole office. It is possible to work anywhere you feel comfortable. Where once you would work with a note pad in a café you can now communicate with clients, manage and design products and services or edit a film. Some cafes are even designed on the premise that people will do this. Music is also often performed behind or with the assistance of portable computers.

The future of the portable computer lies in tablets for the casual user, high-end notebooks for the professional and all the others in between: netbooks, smartbooks and whatever else can squeeze into the market. Tablets are the first device designed for experiencing the internet, there is little motivation to work on tablets outside of email and sketching. Many companies such as Google, Dell, Intel, Motorola, Samsung and LG are releasing their own hardware that is compatible with the Open Handset Alliance which will expand the market of tablets greatly in the coming years.



Figure 2 - Portable Computer(23)

¹¹ The form and definition of a computer will change as technology develops. A portable computer as defined in this context represents the range from 17" laptops to 8" tablets. Smartphones are quickly becoming powerful enough for many of the tasks we might need a computer for although as yet they have not outdated laptops and tablets.

3.3. The Digital Camera

The camera has enabled us to capture moments of our lives to share with each other and pass down through the generations. With the advent of digital photography we can capture as many such moments as we care to. With virtually limitless storage, it is debatable whether the value of the image is affected. Still our culture thrives on images. Both our culture and science has benefited immeasurably from this relatively simple form of abstraction. Research estimates that eighty to eighty-five percent of our perception, learning, cognition and activities are mediated through vision (Politzer, 2010)(24).

The digital camera brought many new features, notably the ability to edit photos on a computer without needing to develop and print films, and the ability to instantly review the captured image on a screen at the back of the camera. The memory card gave every photograph a new quality. A photo was no longer a permanent chemical exposure on film but an infinitely copiable, inconsequential and erasable piece of data: inconsequential being the key difference. It is possible to take 1000 photographs, erase them all and have only used the power of a rechargeable battery. Prior to this the film and processing for 1000 shots would have cost in the vicinity of €500. Not only do we now have the ability to take as many pictures as we like, we can also see a preview of the images immediately after they are taken: taking a picture has no consequence.



Figure 3 - Digital Camera(25)

Jane Fulton Suri, a psychologist, led a human factors study and research at Kodak. Her research resulted in a framework that summed up the opportunities for consumer digital photography under five headings:

1. Readiness to capture

The professional photographer travels with cases full of lenses, camera bodies, tripods, and lighting equipment. The team predicted that when digital photography is adopted by the general public, cameras will include a broad range of devices, from the traditional professional kit at the top end, through simple cameras with built-in lenses, to devices such as cell phones, or wearable cameras that would look like jewelry.

Suri does not mention the effect of flash memory. As mentioned earlier the possibility to take photos without consequence significantly changes the value to the photograph.

2. Information at capture

The real-time feedback of the screen on the back of the camera would emerge as a highly valued feature of the digital camera, so you could see immediately if the shot looked promising or disappointing. Information about when a picture was taken could also be recorded, along with the technical details of the image, and perhaps a voice annotation. In a future where GPS is inexpensive enough to be integrated into the camera, the information about where the shot was taken could make browsing and sorting a lot easier.

3. Creative control

In traditional photography, the composition of the shot and the choice of lighting happens in the camera, but there is another set of opportunities for creative control that happens later in processing and printing. The team realized that digital photography is not so sequential. Any time during the process, you can apply filters, pixilate, choose sepia, add picture frames, text, and so on. This realization led to this framework, expressed as five balloons around the user, rather than a linear journey through the experience.

4. Organization

There are well-organized albums of photographs that people use to remember an event or a trip, or to recount the story to their friends, but there are also countless boxes full of unsorted photographs in almost every home. Digital photography offers the opportunity to sort using the “information at capture,” but also to recognize images from small thumbnails. iPhoto from Apple has made excellent use of our ability to scan tiny versions of images to recognize the one we are looking for, leveraging the fact that we remember images best by a visual representation rather than by which shoe box we put it in.

In 2009 Apple's iPhoto introduced the possibility to search your photos by a particular persons face¹².

5. Ways to display

Pictures mean very little unless you can see them, so one of the great potentials of digital photography is to increase the diversity of means of display. Prints and transparencies are still valuable, and indeed a whole industry has grown up around printing, but there are also many new possibilities. Electronic displays include the television, computer screen, the electronic picture frame, the e-wallet, fridge door display, and cell phone, as well as others that will emerge in time. As digital images become more ubiquitous, it is interesting to see how we use them more habitually to illustrate a point in a conversation with a friend or to remember a piece of information. When the images are displayed electronically, they can be captured and shown at no incremental cost, so they spread into all sorts of unexpected places(26).

Each of Suri's points highlights the way digital cameras change the entire process of photography: from before the photo is taken, when the photo is taken, to where it ends up. Most digital cameras are capable of not only still photographs but also very high quality video modes, broadening their context of use. Digital cameras will continue to play a significant role in our everyday experiences with technology, creating rich content for a diversity of media in the future.

3.4. The MP3 Player¹³

Announced in October 2001, the iPod represented Apple's first strike into the digital music market. The iPod was a hard disk based digital music player that was smaller than most portable tape decks. Hard disk MP3 players had been in the marketplace for several years, but Apple distinguished the iPod from these players in several ways. The iPod could compete with both flash-based and hard disk based players: By using a 1.8" hard disk, Apple was able to make the

¹² <http://www.apple.com/ilife/iphoto/what-is.html#organize-photos>

¹³ In 2009 Apple claimed the iPod had a 73.8 percent share of the market, followed by 18 percent held by "other", SanDisk at 7.2 percent and Microsoft at 1.1 percent share. Moreover since the iPod has at times held up to 92.8 percent of the market share I will focus on the history of the iPod as reflective of the history of MP3 players in general.

iPod smaller than most other hard disk MP3 players, small enough to go up against flash-based players, whose capacity was more than an order of magnitude less than the 5 GB available on the iPod. Apple believed the iPod represented the perfect compromise between size and storage capacity(27).



Figure 4 - MP3 player(28)

MP3 players not only changed the way we listen to, create or sell music, radio or new forms of media such as podcasts. They also changed our relationship to each other in our public environments. They provoked the issue of copyrighting in the music industry fueling discourse on the fundamental qualities of a data file with DRM (data rights management). We are sold fitness routines and personal trainers heard through our headphones as we run through our environments. Professional sport has seen the use of MP3 players during the Olympics and other high profile events. Before Cindy Farrow won the 2010 half-pipe gold medal at the Vancouver Winter Olympics she plugged in her ear buds and dropped in.



Figure 5 - Nike Sports Kit, an accessory that transforms an iPod into an 'in-ear' personal trainer(29)

iPod culture represents a desire for uninterrupted and continuous experience as a central facet of the users urban experience. This desire for a subjectively empowered sense of continuousness is enabled by, and facilitated through, iPod use. Which enables users to link disparate places and moods through the temporal immediacy of iPod sounds.

Non mediated experience creates a sense of vulnerability in many users. This sense of vulnerability refers to the perceived uncontrollable nature of their own stream of consciousness and the cognitive states associated with it. Cognitive control comes with technological mediation in iPod culture. iPod use permits users to saturate periods of 'non-communication' with their own intimate, familiar and comforting sounds.

Through the power of a privatized sound world the world becomes intimate, known, and possessed. Imagination is mediated by the sounds of the iPod becoming an essential component in the ability of users to imagine at all. Users are often unable to aestheticize experience without the existence of their own individual soundtrack acting as a spur to the imaginatior.

In the totally mediated world of the iPod user lies the dream of unmediated experience - of direct access to the world and one's emotions. Mediated immediacy becomes second nature to the user, their iPods functioning as digital Sherpa's accompanying them securely through the spaces and time of everyday life. The toxic pleasures of iPod use resonate through our understanding of what it is to live in an urban setting - historically a place that is shared with others - now increasingly a site of the pleasurable withdrawal from others (Bull, 2010)(30).

The MP3 player changed not only the contexts we listen to music, but also the way it is mastered and easily consumed. This is not all due to the device itself but also in part to the MP3 format developed at the Fraunhofer Institute in Germany.

4. The Effect Of Devices On Our Everyday

The following chapter highlights how devices have changed the way we view and experience the world. MP3 players containing **weeks** of music can function for hours under almost any conditions resulting in a seemingly endless soundtrack for our lives. Previously, portable cassette and CD players were limited by quantity of music, length of battery life, size and susceptibility to rough conditions, thus the experience of an MP3 player is markedly different. Commercial music recordings are often mixed and mastered more toward a headphone or computer speaker experience than a HiFi system. The engineers have to "dumb down" the recordings to sound passably good on headphones, car systems or plastic computer speakers (Guttenberg, 2010)(31).

Smartphones can show us what and who surround us in urban environments. The combination of geo-locative hardware, detailed mapping and geo-locative social networks amounts to a substantial resource of information. As Julian Bleecker stated in 2006 - 'Locative media [is] made by those who create experiences that take into account the geographic locale of interest, typically by elevating that geographic locale beyond its instrumentalized status as a 'latitude longitude coordinated point on earth' to the level of **existential, inhabited, experienced and lived place** (Elmer, 2010)(32).'

Digital cameras are often held in the air at concerts, creating a field of LCD screens suspended above the audience. It is possible to view most of the concert the next day on YouTube. The music video for the live version of Daft Punks, "Harder, Better, Faster, Stronger", directed by Olivier Gondry, features footage shot by 250 audience members at Daft Punk's Brooklyn appearance at KeySpan Park, Coney Island. Our experience of a concert is changed by our desire and ability to capture and remember it.

To say that devices have influenced and changed our everyday is obtuse, they are changing our everyday by changing a vast number of experiences within it.

4.1. The Impact Of The Device On Media

With services such as SMS, Twitter, Facebook, YouTube and mobile internet the flow and sources of information have shifted from traditional formats. When previously people used banners and signs out in public spaces as a visible mass to be reported by traditional media it is now often organised and reported using devices.

In January 2001, Philippine President Joseph Estrada was driven from office by hundreds of thousands of angry citizens mobilized by millions of text messages and e-petitions. After 11 pro-Estrada senators voted to block evidence of the corruption in an impeachment trial of the president (Estrada was taking money from an illegal numbers racket), citizens began to circulate messages like 'The 11 senators are pigs! S&@t, Estrada is acquitted! Let's do People Power! Pls. pass.' Text messaging and cell phones become powerful tools for the people organizing demonstrations in the main thoroughfare of Manila, and one carrier reported that the daily volume of text messages increased from 45 million to 70 million. Estrada called it a 'coup de text.'

Organizations such as Witness are enabling human rights activists from around the world to capture video that documents human rights abuses and share it with the world. This footage has been used in advocacy campaigns, for news broadcasts, as evidence in courts, and as a deterrent to future abuses. A cell phone video that showed Egyptian police beating up a prisoner was viewed 112,000 times on YouTube. As a result, two police officers were convicted of torture and sentenced to three years in prison. As one human rights activist observed, "The power of visual images can go along way in making people wake up." (Wood, 2010)(17)

Neda Agha-Soltan on June 20, 2009, drew international attention after she was killed during the 2009 Iranian election protests. Her death was captured on video by bystanders and broadcast over the Internet and the video became a rallying point for the reformist opposition. It was described as 'probably the most widely witnessed death in human history'. Camera is a powerful tool.

A pervasively networked consumer base will let no flaw go unnoticed or unpunished. Last year's "Operation Chokehold," where disgruntled iPhone users threatened to shut down AT&T's network and coordinated the effort via Facebook, is an example of the future. Consumers have more power when they can easily communicate to everyone on the Internet when they are unhappy, putting them on a level playing field with corporate marketers(33).



Figure 6 - Image uploaded to Flickr during the Mumbai attacks by 'Vinu'(34)

First-hand accounts of the deadly Mumbai attacks poured in on Twitter, Flickr and other social media platforms. With more than 6 million members worldwide, an estimated 80 messages, or 'tweets'¹⁴, were being sent to Twitter.com via SMS every five seconds, providing eyewitness accounts and updates. Many Twitter users also sent pleas for blood donors to make their way to specific hospitals in Mumbai where doctors were faced with low stocks and rising casualties. Flickr also proved a useful source of haunting images chronicling the aftermath of the attacks. Journalist Vinukumar Ranganathan's stream of photos were published by CNN and other major broadcasters. A Google Map showing the key locations and buildings with links to news stories and eyewitness accounts, and CNN's iReporters flooded the site with their videos and images of the terror attacks. A rumour that the Indian government was asking tweeters to stop live updates to avoid compromising its security efforts was published and republished on the site. It read simply: "Indian government asks for live Twitter updates from Mumbai to cease immediately. ALL LIVE UPDATES - PLEASE STOP TWEETING." (Busari, 2010)(35)

In summary, the distribution of news and information has changed and this is in part due to mobile devices and the internet. As micro-blogging, social networking and the internet grow in symbiosis with mobile devices it will be even more impacting.

¹⁴ Tweets is the collective noun for the short chunks of text comprised of 140 characters posted to the microblogging site twitter.com

4.2. Communicating In New Contexts

Our means of communication have exploded and abstracted over the past 20 years. Where before we had only non-mobile telephones, public noticeboards and a postal service, now we have email, mobile phones, SMS, chat rooms, forums, internet telephony, augmented reality geo-tagging, blogging, micro-blogging, social networks and massively multiplayer role playing games. For example, calling a landline has a spatial context and calling a mobile has a personal context, irrespective of place. We are communicating in new contexts. Our face to face communication is different when we talk in a restaurant, an office or at home. It is this contextualisation that affects in varying degrees what, how, when, where and why we might say something. Given that simply face to face communication can vary so radically depending on the context, how does a myriad of new communication abstractions change our what, how, when, where and why we communicate?

The various methods of communication each have a different affect associated with them. Talking over Skype might require you to sit at your desk and talk, while using a mobile phone you can walk around, with email you can send it anytime you remember and it is a permanent searchable record of the exchange. Each form of communication is codified, it has a particular inherent quality, affect and narrative.

In the following passage from 'On The Theory of Communication' by Vilém Flusser he outlines the structure of our methods for communication.

The structure of a message reflects the physical character of its symbols more than the structure of the universe it communicates. This explains the famous sentence 'The medium is the message.' We can distinguish, grosso modo, three types of structures: those that order the symbols in linear sequences (the diachronical ones); those that order them in surfaces (the plain synchronical ones); and those that order them in space (the tridimensional synchronical ones). Examples of the first type are spoken languages and alphabets; of the second type, Chinese writing and painting; of the third type, theater and architecture. The three types can be combined variously, the structure of TV, for example, being a complex combination of diachronicity and plain synchronicity (36).

Furthermore, as TV has complex structural definitions then video conferencing over the internet is even more complex. Further still, augmented reality games and services would challenge such a structure. As this thesis is mainly concerned with our relationship to devices I will not explore this further, although it is important to mention how communication had been considered before the internet and mobile devices. As Anthony Dunne quipped in an interview, “It’s quite rude that you can be sent email at any time of the day(37)”. Communication and the methods and media that sustain it are still developing in stride with technology. Devices will naturally play a significant role in how we communicate in the future.

4.3. When Are You Using A Device?

Am I a man or a machine? There is no ambiguity in the traditional relationship between man and machine: the worker is always, in a way, a stranger to the machine he operates, and alienated by it. But at least he retains the precious status of alienated man. The new technologies, with their new machines, new images and interactive screens, do not alienate me. Rather, they form an integrated circuit with me.

— J. Baudrillard, “Xerox and Infinity”(38)

Devices are mobile¹⁵. We can carry them with us. They are with us atop a mountain, at funerals, while riding our bikes or in our beds while we sleep - they are easily with us everywhere.

The question then arises, when are we using a mobile device? The keyword here is **mobile**. Results from a survey about life with devices (Appendix #4) revealed half of the people surveyed would consider they are only using their mobile phone when they are either texting or calling someone when in fact this is a false conception. The key function of a mobile phone is its mobility.

¹⁵ The four devices that are to focus of this thesis are considered both mobile and portable although there is a functional difference in the two terms. A mobile device is one that has mobility as fundamental to its function. A portable computer retains much of its functionality without being mobile or connected to a network. As opposed to a mobile phone which if not connected to a network wherever it goes loses a substantial amount of functionality. This can be seen in network infrastructure for mobile phones as opposed to portable computers.

If for example you owned a hand gun. As you leave the house you take it with you. Unless you are going to the shooting range, you will most likely take it, 'just in case' you encounter a situation when you need it. The gun therefore takes up part of your working memory. Hopefully you may never need to fire it but it is functioning all the while it is on your person. Put simply you are using it by having it on or near your body.

A massively multifunctional smartphone connected to the internet could amount to an arsenal of potential possibilities. In particular contexts digital cameras also take a seat in your working memory. Whenever we take a camera out sightseeing it's ability to take and review nearly limitless numbers of photos is consequential - in the same survey mentioned earlier almost half the people when asked if taking photos takes them out of the moment answered yes. Although this is not necessarily a negative outcome it is an experience in itself. Part of the joy of taking a photo is looking at it with our friends and loved ones shortly after it was taken. Therefore it is simply an additional layer of experience absent in the pre-digital camera era.

Personal phones, computers and internet based services blur the work/not work boundaries. Our email contains a myriad of relationships from friends, work, banking statements, school and family. Such devices act as nexus' that harvest and distribute all our communications. People carry handsets with them as they move from place to place and between social situations. By enabling and strengthening social and economic relationships at a distance, mobiles shift time and place, and complicate contexts and roles to an even greater degree than the landlines that preceded them. Carrying a mobile invites consideration or even reconfiguration of being 'at work,' 'in transit,' 'at home,' or 'at play.'(39)

Gerhard M. Buurman summarises the path that lead to a culture of use:

The designed artefact can only be understood as the icon of an entire culture that changes our thinking, perception, and behaviour through technology. It is important to see technology and design as the structuring elements of our cultures. If technology becomes a defining factor for social conditions, culture, perception, education, knowledge, thought and play, it is no longer to be understood as a mediator or a means of structural force. For this reason, technology (design) is not the result of socially formulated needs or utilised functions. On the contrary, it permeates our environment and becomes a precondition for individuality and our self-conception, since it produces use(40).

In addition to Buurman's statements, results from the survey also revealed that almost all people who owned a mobile phone carried it with them often, if not very often and 80% believed it was important in their everyday. The survey, Buurman and Baudrillard all support the idea that devices produce use.

4.4. Spatial Relationships With Devices

Devices will become personified objects. Shrouding us in data clouds of personal profiles and other information, augmenting the real space with 'cyber ghosts'¹⁶, that shadow us wherever we go. Invariably having a significant impact on how we interrelate with devices. We will embody our cybernalities wherever we carry our devices.

At present we are tethered to our devices. Mobile phones serve little purpose if they are not near us or on our body. When you take a camera with you on holiday you are of course inclined to take pictures. We take our phones with us, 'just in case', we receive a phone call or sms. MP3 players are commonplace in transitional spaces such as busses or trains. The MP3 player changes our relationship to space and others. While inside a train if you keep your head down and eyes staring out the window, your music in your ears, you are almost completely disconnected from the environment inside the train, aside from touch and smell. Not only are you disconnected, but the other passengers are also disconnected from you. The simplicity with which we can carry these devices, (pocket) means there is no reason not to. Although what we are tethered to is not only a phone network, but the internet, GPS information, all other forms of communication such as email and twitter, and entertainment such as games and movies. This subconscious noise of possibility has an effect on our connection to these devices.

Thackara suggests it is the role of the interaction designer to improve the quality of these tethered experiences.

In this new design space, the real and the virtual, matter and information, co-exist. The Spanish economist Manuel Castells calls this space the 'space of flows.' This is not to say that interaction design is immaterial. But as computing migrates from ugly boxes on our desks and suffuses everything around us, a new relationship is

¹⁶ The concept of cyber ghosts denotes the ethereal nature of digital information as it begins to surround devices and the people that carry them.

emerging between the real and the virtual, the artificial and the natural, the mental and the material. Interaction design improves the quality of these in between zones (Thackara, 2001)(2).

Designers and corporations have been aware of the need to distinguish between home, office and social spaces for some time. I find the following example interesting as it undertaken in 1998 and we are still yet to see such designs in the home. This may be due to several other reasons be it too much of a niche market or the lack of desire to print photos in the home. It is a good example of an attempt to (re)define our spaces.

'Printables' was commissioned by Epson as a conceptual design project in 1998. The examples below demonstrate an aesthetic for the domestic environment rather than the conventional appearance of printers as extensions of business computers.

“Drawer for Drawings,” designed by Shoichi Ishizawa

The printer is built into a simple piece of wooden furniture, made of cherry veneer on particleboard. The top can be used as a general-purpose surface or to support a connected laptop. The paper is inserted into a slot on the top, and the print is delivered into a drawer, which can also be used to store supplies of paper for printing.

“Kinetic Deliverance,” designed by Mugio Kawasaki

A delicate paper tray, made as a wire frame rolling on tiny wheels, supports the print as it emerges from the simple block form of the printer. The tray moves with the image, celebrating its arrival and enhancing the transition between start and finish.

“Mysterious Thoughts,” designed by Hirokazu Yamano

Draped in a white cloth, the printer appears to be alive as the print head moves back and forth, gently disturbing the surface of the cloth, with the subtle sound of the mechanism enhancing the mystery. The image gradually appears from under the edge of the cloth, as if from a slow motion version of a magician's handkerchief.

“Memory Developing,” designed by Sam Hecht

This design harks back to the days of photographic development using liquid chemicals. The paper tray that receives the digital print is shaped like a traditional developing tray, lending a sentimental familiarity to the characteristics of the design.

“Imperfect Perfection,” designed by Naoto Fukasawa

In contrast to the predictions of the paperless office, digital printing has caused dramatic increases in the consumption of paper, mostly due to the fact that it is easy to print out a proof and then improve the on-screen original before trying another version. This printer is designed to support this pattern of use by mounting the printer on top of a recycling bin, so the user can inspect the proof and conveniently drop it in the bin if they are not satisfied with the result.(26)



Figure 7 - Printables - design concepts for printing photographs in the home(26)

Devices have the capacity like no other object in history to (re)define space¹⁷. It is certain that the internet and mobile telephony play a major part in this. The internet in itself is difficult to define as a space, and devices enable the internet to pervade the real space. Global positioning systems, compasses and software applications all contribute to the power of a device to change a space.

¹⁷ Ananda Mitra supports this in a paper about Cybernetic Space (2003)(69)

4.5. Massively Multifunctional Devices

The devices we carry with us are different to the ones we carried 5 years ago. Many companies have opened their hardware and established functional infrastructure for software development by independent developers paving the way for massively multifunctional devices.

The following list documents the different categories of applications available for an iPhone or iPod Touch.

Books, Games, Entertainment, Education, Lifestyle, Travel, Utilities, Music, Reference, Sport, Business, News, Productivity, Healthcare & Fitness, Navigation, Photography, Social Networking, Finance, Medical, Weather, Arcade, Puzzle, Strategy and Simulation.

The scope of these categories covers a significant spectrum of our everyday activities: even our holidays the traditional break from the everyday are covered. The average smartphone user in the U.S. has 22 applications on their phone. (41) It is expected that 50 billion applications will be downloaded **per year** by 2012. (42) The incredible diversity of applications, from sourcing locally grown seasonal produce, sleep analysis, financial organiser, fitness trainer, influenza alerts or keeping track of your girlfriends menstrual cycle. Digital cameras can take high definition video, photos and tag each moment with GPS information. Basic iPods can store any data, play music, movies, display photos and even serve as a personal trainer. The further our devices extend in functionality the more frequently they enter into our lives.

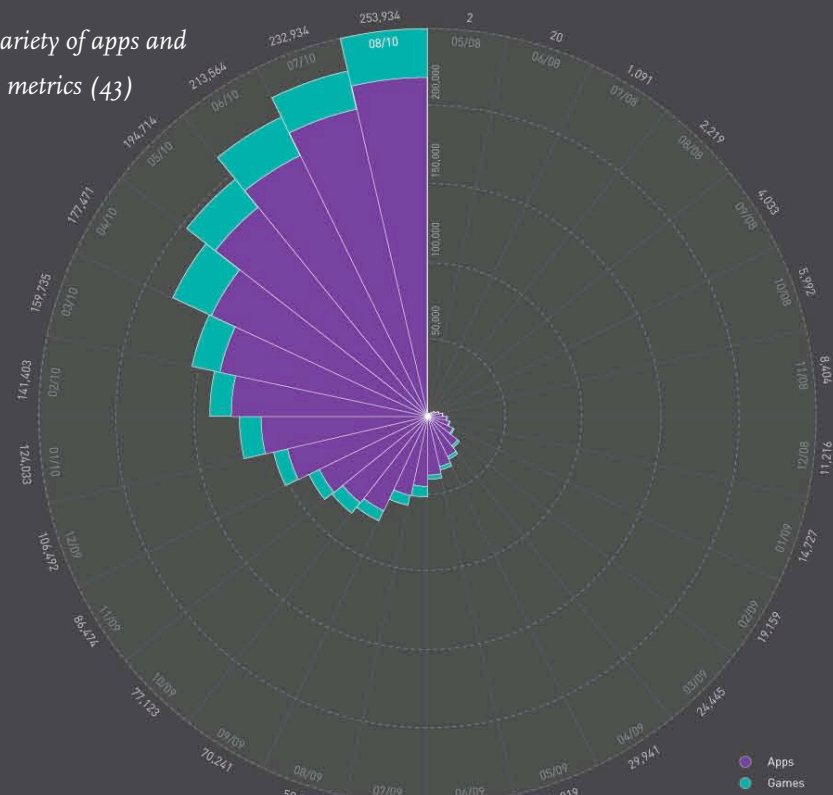
Figure 8 - App Store Metrics - show the variety of apps and increasing creation and distribution metrics (43)

App Store Metrics

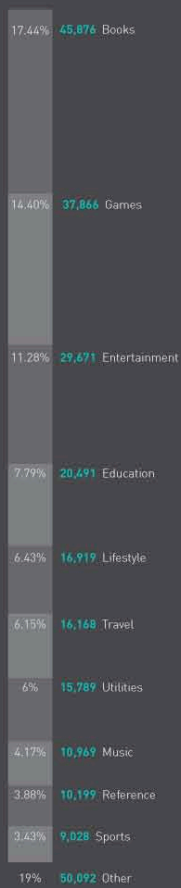
Stumble into Apple's App Store and you are greeted with literally thousands of applications you can download for your iPhone. The reason is simple: in a world of constant mobility and interactivity, both smartphone and app markets have gone stratospheric.



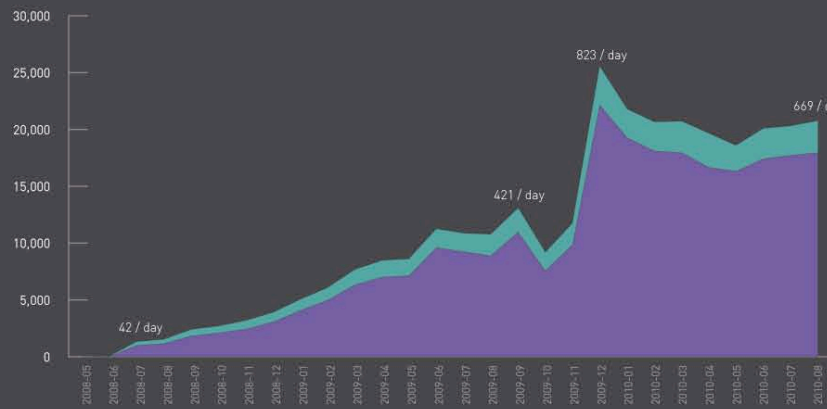
Active vs. Inactive Apps
(as of 20 Sep 2010)



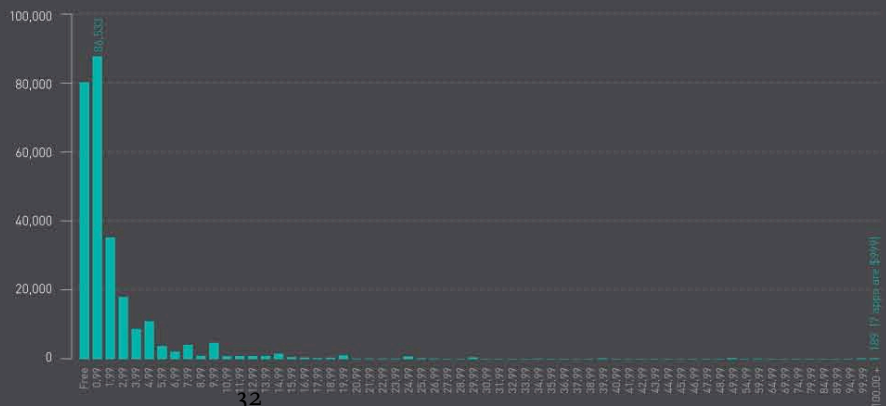
Total Number of Active Apps
(May 2008 - August 2010)



Currently Active Apps by the Top 10 Categories
(as of 20 Sep 2010)



Number of App Submissions to the iTunes Store by Month
(May 2008 - August 2010)



App Price Distribution in USD \$
(as of 21 Sep 2010)

4.6. A Design Paradigm Shift & Internet Appliances

Our devices have become mobile, internet enabled and reached a low price point. It seems unlikely they will be replaced by singular function appliances or communal devices simply because a personal mobile device has a far greater scope for interaction. IDEO developed 3Com's Audrey Internet Appliance which is heralded as an example of an information appliance. What is also interesting about this appliance was the paradigm shift from, 'This is the function of this software or device', to 'What do people want to do?' The following text is relevant as it documents the paradigm shift and traces the path that led to the development of the information appliance.

In the early days of Silicon Valley, we had a lot of design of screens and input devices, and they were mostly general-purpose things. It got real exciting when the hardware and the software came together and we were really making products. Now you're talking about special-purpose things where you can design the controls, you don't have to use a general-purpose solution. This allowed things like the Palm Pilot, cell phones, and so forth to be quite exciting from a design point of view. You can make the displays of a size that were enough to do interesting graphics but were small enough to fit in your pocket. Things became more personal as they became more product-like, opening up a whole new explosion of possible products for us to design. **Then behaviors really came into it.**

Before, we had the approach of, 'Word processing exists, spreadsheets exist, we're going to teach you that. You're going to conform to the way we, the software designers, expect it to happen.'

As you got to products, we went the other way. We were looking at "What do people want to do? What's people's behavior like around telephones or their phone lists or other things that they normally use now?" so we could design the product to meet the behavior and the need rather than expecting that we're going to teach them a software program.

With hardware manufacturers opening their platforms to developers this mindset had exploded. Software developers for mobile devices are asking these exact questions, 'What do people want to do?' and 'What contexts will people encounter with their devices?' the difference now is that it all happens on a personal mobile device not a shared stationary information appliance.

A heralded example of an information appliance that IDEO designed was 3Com's Audrey Internet Appliance, (released in 1996). It was an Internet-access computer designed to be used in a communal area of the home, perhaps the kitchen, and the navigation was simplified to a single control akin to a radio tuning knob, with a push function to select. The simple controls, personalization for individual family members, and an "always on" approach to the Internet connectivity, made it convenient to gain access to weather, traffic, sports, and a unified family calendar. Audrey periodically updated its information in the background, so it was available the moment you woke it up, without having to wait for the PC's long boot-up-and-connect process. It was launched with great fanfare at Comdex, just in time for the end of the dot-com boom, but was too expensive to survive the downturn(26).

This is an example of a device that came at a time when devices with internet functionality were not portable and were too expensive for each person in the family. Interestingly one of the main design features of this device was that it was always connected to the internet. This led to a very different user experience at the time and one that is more akin to our experiences with mobiles today. The Audrey is a good example to also put into context how quickly devices and the internet have developed over the past 14 years.

5. The Design Process

“Design is the conception and planning of the artificial” — Richard Buchanan 1995

5.1. Corporations, Mass Production & Globalization¹⁸

The devices we use in our everyday are designed, produced, distributed, and are the result of, a globalized and consumer capitalist economy. The advent of mass production allowed the evolution of consumerism by lowering the unit cost of many products. Globalization further enhanced the power of mass production by, for example, designing in California and manufacturing in China, as is the case with Apple products. This model not only effects our direct experiences with technology but also brings with it a chain of production that also weighs on the consumer. How is a product manufactured? Are the minerals necessary for the device ethically sourced - socially, environmentally and politically? Are employees manufacturing devices in acceptable working conditions? The reality is that minerals used in high-end devices such as tantalum, or ‘blood tantalum’, as it is known in the Democratic Republic of Congo, help finance civil war (70). Foxconn is said to be the world's largest contract manufacturer of electronics. It supplies global brands including Apple, Dell, Nokia and Hewlett Packard. To date 11 employees have committed suicide in 2010. Foxconn's mostly migrant workers are vulnerable because of their 10-hour working days and the monotony of their jobs. Many feel isolated and pressured by a strict regime that bans them from speaking on the production line and takes them far away from their families (71). Used electronics or E-Waste continues to grow with rapid changes in technology, low initial cost, and planned obsolescence (72). Corporations in a globalized consumer capitalist economy have the power to decide if the devices we use are ethical and environmentally sustainable throughout the supply chain. Furthermore, they rely on consumption and thus continue to develop and evolve devices at incredible rates, as stated earlier, Apple updated its iPod range on average twice a year over the past decade. Making them smaller, faster, increased storage, designed new form factors, added sensors, cameras, a multitouch surface, and wireless connectivity, and improved the screen resolution. In summary, corporations control how our devices are designed, produced and distributed, and how they function, it is the bottom line that matters in the end to many.

¹⁸ Globalization is most closely associated with the term economic globalization: the integration of national economies into the international economy through trade, foreign direct investment, capital flows, migration, the spread of technology, and military presence (73).

5.2. The Materiality & Visual Appearance Of Products

A product's visual and material appearance is a critical determinant of consumer response and how successful a product is. Visual information is often the basis for how consumers judge the elegance, functionality and social significance of a product. Such consumer judgements relate to the perceived attributes of products and regularly centre on the satisfaction of consumer wants and desires, rather than their needs.

The complexities of the consumer's cognitive response, or the judgements that the consumer makes about a product is based on the information perceived by the sense. These judgements can be grouped into three classifications:

Aesthetic impression: or the sensation that results from the perception of attractiveness (or unattractiveness) as a result of viewing a product.

Semantic interpretation: what a product is seen to say about its function, mode-of-use and qualities.

Symbolic association: the perception of what a product says about its owner or user, the personal and social significance attached to the design (Crilly & Clarkson 2006)(46).

Aesthetic possibilities develop in parallel with material and software technology, and advancing production methods. The aesthetic, material and software functionality of devices combine to form powerful salability.

5.3. The Designer's Ultimate Responsibility

Considered as an operator acting in relation to the daily environment, the designer's ultimate responsibility can only be to contribute to the production of a habitable world, a world in which human beings do not merely survive but also express and expand their cultural and spiritual possibilities. The term habitable, referring to the environment, indicates a complex existential condition that cannot be reduced to its functional component. It is a condition arising from the intersection of a multiplicity of questions rooted in the anthropological and social nature of the human race.

— E. Manzini, "Prometheus of the Everyday: The Ecology of the Artificial and the Designer's Responsibility" (44)

Manzini's somewhat idealistic statement seems evermore pertinent almost twenty years on as it relates to the consumer capitalist economy that drives the production of our devices, services and therefore our experiences. The applied critical design outcomes of Device Shifting can compliment our devices with accessories that re-affirm a complex existential condition. Moreover, facilitating the production of objects is becoming more attainable to artists and designers that do not have a corporate foundation to design, develop and distribute. As John Maeda suggests we will witness a return to the integrity of craft, the humanity of authorship, and the rebalancing of our virtual and physical spaces. We'll see a 21st-century renaissance in arts- and design-centered approaches to making things, where you--the individual--will take center stage in culture and commerce(45).

5.4. What is Design? - Charles Eames

In an interview with Charles Eames he discusses the question, 'What is design?' with Madame Amic. His answers are particularly useful for designing interactions and establishing and supporting my position on art and design, especially as he discusses the value of constraints.

Q. What is your definition of "Design?"

A. A plan for arranging elements in such a way as to best accomplish a particular purpose.

Q. Is design a craft for industrial purposes?

A. No—but design may be a solution to some industrial problems.

Q. It is a method of general expression?

A. No— it is a method of action.

Q. Does design imply the idea of products that are necessarily useful?

A. Yes— even though the use might be surely subtle.

Q. What are the boundaries of design?

A. What are the boundaries of problems?

Q. Does the creation of design admit constraint?

A. Design depends largely on constraints.

Q. What constraints?

A. The sum of all constraints. Here is one of the few effective keys to the design problem—the ability of the designer to recognize as many of the constraints as possible—his willingness and enthusiasm for working within these constraints—the constraints of price, of size, of strength, balance, of surface, of time etc.; each problem has its own peculiar list.

Q. Does design obey laws?

A. Aren't constraints enough?(47)

5.5. Product Design Process

Moggridge suggests there are five core skills in design and stresses they are in no particular order. He reiterates Eames following that awareness of the relevant constraints is the key to good outcomes. His five skills are listed below and bare similarity to the manifesto of Device Shifting. It is important to note that Moggridge is talking about design and not critical design.

Five Skills of Design - Bill Moggridge

1. To synthesize a solution from all of the relevant constraints, understanding everything that will make a difference to the result.
2. To frame, or reframe, the problem and objective.
3. To create and envision alternatives.
4. To select from those alternatives, knowing intuitively how to choose the best approach.
5. To visualize and prototype the intended solution.(48)

Although this is very much a pure design approach, it stresses the value in prototyping, creating alternatives and understanding the relevant constraints. Moggridge is co-founder of IDEO, one of the most progressive design agencies over the past twenty years which has also invested in behavioural research with devices and context as outlined later in this thesis.

5.6. Open Design

Mass produced consumable devices have been largely in the hands of corporations but as movements such as open design develop they might afford an alternative. Open design affords a process by which a group can collaboratively design and develop physical products, machines and systems through use of publicly shared design information. Similarly to open source¹⁹ software, the process is generally facilitated by the Internet and often performed without monetary compensation.

¹⁹ Open source software development is peer production by bartering and collaboration, with the end-product, source-material, 'blueprints' and documentation available at no cost to the public.

6. Interaction Design

Experience is subjective. It emerges through situation, objects, people, their interrelationships, and their relationship to the experientor, but it is created and remains in her or his head. Given that, it may not matter how good a product is objectively, its quality must also be experienced to have impact.

— Marc Hazzenzahl (50).

6.1. Interaction Design Paradigm - What Is A Computer?

A paradigm is an example that serves as a pattern for the way people think about something. Moggridge suggests it is the set of questions that a particular community has decided are important. For interaction design there is often some confusion about what paradigm you are working with. The basic question is, What is a computer?

What is a computer?

Intelligence

In the early days, designers thought of computers as people and tried to develop them to become smart, intelligent, and autonomous. The word “smart” is one that we associate with this paradigm, expecting the machine or product to be smart and to know how to do things for the person who uses it.

Tool

Doug Englebart, the inventor of the computer mouse, thought of the computer as a tool. Styles of interaction changed from dialogs, where we talk to a computer and a computer will talk back to us, to direct manipulation, where we grab the tool and use it directly. The ideas of efficiency and empowerment are related to this tool metaphor.

Media

In the nineties, designers thought of computers as media, raising a new set of questions. How expressive is the medium? How compelling is the medium? Here we are not thinking so much about a user interacting with or manipulating the computer, but more about them looking at and browsing in the medium.

Life

Starting in the mid nineties, people have been talking about computer viruses or computer evolution; they are thinking of artificial life. When the program has been written, it is capable of evolving over time—getting better and adapting. The programmer is in a way giving up responsibility, saying that the program is on its own.

Vehicle

Another metaphor is the computer as vehicle, and we have to agree on the rules of the road. There has to be some kind of infrastructure that underlies all computer systems. People spend their careers determining the standards that will define the infrastructures, and hence the limitations and opportunities for design.

Fashion

The media metaphor plays out to computers as fashion. A lot of products are fashion products. People want to be seen with the right computer on. They want to belong to the right in-crowd. Aesthetics can dominate in this world of fashion, as people move from one fashion to another, from one style of interaction to another style(48).

Since Moggridge considered the paradigm ‘What is a computer?’, the computer has shifted to a new paradigm - social.

Social

The computer is now not only a desktop but also mobile devices such as smartphones, tablets and laptops. Web services such as Facebook, Twitter and Foursquare are enabling users to geo-tag themselves and share status updates with their devices. The computer is now a powerful social tool.

This is a significant paradigm shift as it directly affects our behaviour with each other, our spaces and computers themselves. The next paradigm shift will be towards cloud computing which has the power to significantly change how we use and perceive computers. This may then effect our relationships with devices making it possible to access our own files, settings and work

environments on any portable computer or smartphone as it will all be accessible and stored online in the cloud. Thus computers would be seen as secondary to the network, creating possibly the biggest paradigm shift since computers became part of our everyday.

6.2. Augmentation Means

In his 1962 paper “Augmenting the Human Intellect: A Conceptual Framework”, Douglas C. Engelbart puts forward the theory of **augmentation means** to describe the ways in which human capabilities are extended. Stating that our culture has evolved means for us to organize the little things we can do with our basic capabilities so that we can derive comprehension from truly complex situations, and accomplish the processes of deriving and implementing problem solutions. Augmentation means can be defined by four basic classes.

1. **Artifacts** - physical objects designed to provide for human comfort, the manipulation of things of materials, and the manipulation of symbols.
2. **Language** - the way in which the individual classifies the picture of his world into the concepts that his mind uses to model that world, and the symbols that he attaches to those concepts and uses in consciously manipulating the concepts (“thinking”).
3. **Methodology** - the methods, procedures, and strategies with which an individual organizes his **goal centered** (problem-solving) activity.
4. **Training** - the conditioning needed by the individual to bring his skills in using augmentation means 1,2 and 3 to the point where they are operationally effective(51).

This particularly insightful set of classes seems even more pertinent in our current device-centric culture. As Moggridge stated in the previous section the idea of a computer or computing has undergone several paradigm shifts. Augmentation means saw the computer as intelligence or a tool. Now it requires a more human-centric and social perspective of behaviour and use when we position the computer in society. Almost fifty years after Engelbart’s paper both language and training are conditioned shortly after birth. Devices are as common as kettles to children - it is even possible to buy toy portable computers and toy smartphones.

6.3. The Human Capacity For Changes In Design

A considerable portion of our designed experience is driven by a consumer capitalist economy. Most companies release and mass produce products after a great deal of market research and testing. Rarely will a device appear in the market and be successful if it shifts too far from previously established devices.

Brains like familiarity, but they get bored. They are genetically programmed to want to discover new patterns. You don't want it too new because that seems dangerous. You want it somewhat familiar and somewhat new.

Think of music. The best music has some kind of essence of things you can recognize: a normal beat, harmonies, and melodic phrases, but you don't want to hear the same old, same old. You want something that's slightly jarring, and a little bit clever. The newness matters more than any other particular aspect of the aesthetic value. You want newness combined with cleverness.

Somehow new and old at the same time gives the best design. If a design is so new that people can't relate to it, then they reject it, even if they could theoretically learn how to use it because it's very clever. Styles are like this in general; if you have a new style for clothing, generally you don't want it to be too crazy. You want it to be just slightly different, enough that people say, 'Oh, that's cool.'

It's built into the human brain. We want familiarity, we want to be able to learn how to use it, but we also want some newness to it, and that's what makes us excited about it (Hawkings, 2006)(52).

From the perspective of critical design, designing a totally new phone makes no sense as when a user buys a new phone their behaviour with their old phone is lost. Furthermore it is not realistic for most people to design a new phone. By using an accessory type of model it is possible to retain and augment the already established behaviour and achieve functional outcomes.

Looking at the design of many successful disruptive products, a common theme runs through: they're actually quite familiar. This seems counterintuitive – if you come up with an amazing new way of doing something, it seems natural to make some bold design statements about how radically new and different it is. But often the most successful of these products actually take great steps to mask their novelty;

their designs recall a preexisting, well-understood technology. The original cellular phones looked like cordless telephones, which in turn looked like walkie-talkies. Compact discs and laser discs mimic vinyl records to convey that they are media that store entertainment. Interactions with the first Palm Pilot were designed to resemble those of a pen-and-paper organizer in order to fit into people's existing context of use.

Generally speaking, the bigger the behaviour change a technology promises, the more familiar its design should be. Though not a universal requirement for success, familiarity can go some way in avoiding the adoption obstacles common to any discovery that demands people go about their lives in a different way. People are more likely to adopt a new technology if it is presented in a way that connects with the lives they already lead. This insight has profound implications for the design of persuasive technologies.

As Everett Rogers notes in *Diffusion of Innovations*, the key to driving mainstream adoption is fitting into what people already know and do – not emphasizing how different a new offering is. Persuasive technologies that look and feel like existing products are less alien to customers. As a result, they don't depend on customers that are willing to step out of their comfort zones in order to succeed. **They slot into people's existing routines. And they are understood as enhancements to existing activities, not as intentionally life-altering artifacts** (Wai & Mortensen, 2007)(53).

6.4. Multidisciplinary Discourses

The more that artifice permeates life, the more design becomes an essential liberal art. Because technology affects so much of what we do, even who we think we are, its design involves judgment and appreciation. Thus interaction design increasingly takes the form of a practice(12).

As a practice, design means more than making things look pretty, although good form is usually welcome. It also means more than making things usable, since something is quite usable might nevertheless be useless. It does not flood the world with all technically possible gadgets and distractions. What we choose to build matters just as much as how it looks, or well we can make it operate. This choice is largely a social process; proposing what to do involves negotiation. Part advocacy, part virtuosos authorship, part ethnography, part engineering science, and part architecture to live by, interaction design needs conscientious multidisciplinary discourses (McCullough, 2004)(12). The process of Device Shifting requires a multidisciplinary approach to take an accessory from concept to a mass produceable outcome.

7. Critical Design and Art Theory

Traditionally, the term art was used to refer to any skill or mastery. This conception changed during the Romantic period, when art came to be seen as "a special faculty of the human mind to be classified with religion and science"(37).

7.1. Critical Design

Below is a selection of frequently asked questions regarding critical design - written and answered by Anthony Dunne & Fiona Raby. Critical design provides foundation to the ideas and context of Device Shifting.

1. What is Critical Design?

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.

Its opposite is affirmative design: design that reinforces the status quo.

Device Shifting seeks to provide a set of constraints and contexts by which to design for mass produced, designed and everyday objects. Device Shifting is applied critical design.

3. What is it for?

Mainly to make us think. But also raising awareness, exposing assumptions, provoking action, sparking debate, even entertaining in an intellectual sort of way, like literature or film.

4. Why is it happening now?

The world we live in today is incredibly complex, our social relations, desires, fantasies, hopes and fears are very different from those at the beginning of the 20c. Yet many key ideas informing mainstream design stem from the early 20c.

Society has moved on but design has not, Critical Design is one of many mutations design is undergoing in an effort to remain relevant to the complex technological, political, economic and social changes we are experiencing at the beginning of the 21c.

The architected or designed experience has pervaded even the most personal and intimate areas of our lives. Many of the devices and technologies we use centre around communication in its various forms.

5. What role does humour play?

Humour is important but often misused. Satire is the goal. But often only parody and pastiche are achieved. These reduce the effectiveness in a number of ways. They are lazy and borrow existing formats, and they signal too clearly that it is ironic and so relieve some burden from the viewer. The viewer should experience a dilemma, is it serious or not? Real or not? For Critical design to be successful they need to make up their own mind.

Also, it would be very easy to preach, a skillful use of satire and irony can engage the audience in a more constructive way by appealing to its imagination as well as engaging the intellect. Good political comedians achieve this well. Deadpan and black humour work best.

6. Is it a movement?

No. It's not really a field that can be neatly defined. It's more about values and an attitude, a way of looking at design and imagining its possibilities beyond the narrow definitions of what is presented through media and in the shops.

By engaging with the same system of mass production and designing around and for the designed, Device Shifting can be impactful as accessories. Rather than offering a new product that reflects or imagines new possibilities, Device Shifting retains and uses the already established behaviours with our ubiquitous, mass produced and designed devices. By providing an accessory for devices that is available within the same context of consumption, it is expected to have more impact.

7. What are the biggest misconceptions?

That it is negative and anti-everything.

That it is only commentary and cannot change anything

That it is jokey

That it is not concerned with aesthetics

That it is against mass-production

That it is pessimistic

That it is not real

That it is art

8. But isn't it art?

It is definitely not art. It might borrow heavily from art in terms of methods and approaches but that's it. We expect art to be shocking and extreme. Critical Design needs to be closer to the everyday, that's where its power to disturb comes from. Too weird and it will be dismissed as art, too normal and it will be effortlessly assimilated. If it is regarded as art it is easier to deal with, but if it remains as design it is more disturbing, it suggests that the everyday as we know it could be different, that things could change.

9. Isn't it a bit dark?

Yes, but not for the sake of it. Dark, complex emotions are ignored in design, nearly every other area of culture accepts people are complex, contradictory and even neurotic, but not design, we view people as obedient and predictable users and consumers.

One of Critical Design's roles is to question the limited range of emotional and psychological experiences offered through designed products. Design is assumed to only make things nice, it's as though all designers have taken an unspoken Hippocratic oath, this limits and prevents us from fully engaging with and designing for the complexities of human nature which of course is not always nice. It is more about the positive use of negativity, not negativity for its own sake, but to draw attention to a scary possibility in the form of a cautionary tale.

10. And its future?

A danger for critical design is that it ends up as a form of sophisticated design entertainment: 90% humour 10% critique. It needs to avoid this situation by identifying and engaging with complex and challenging issues. Areas like Future Forecasting would benefit from its more gritty view of human nature and ability to make abstract issues tangible. It could also play a role in public debates about the social, cultural and ethical impact on everyday life of emerging and future technologies(54).

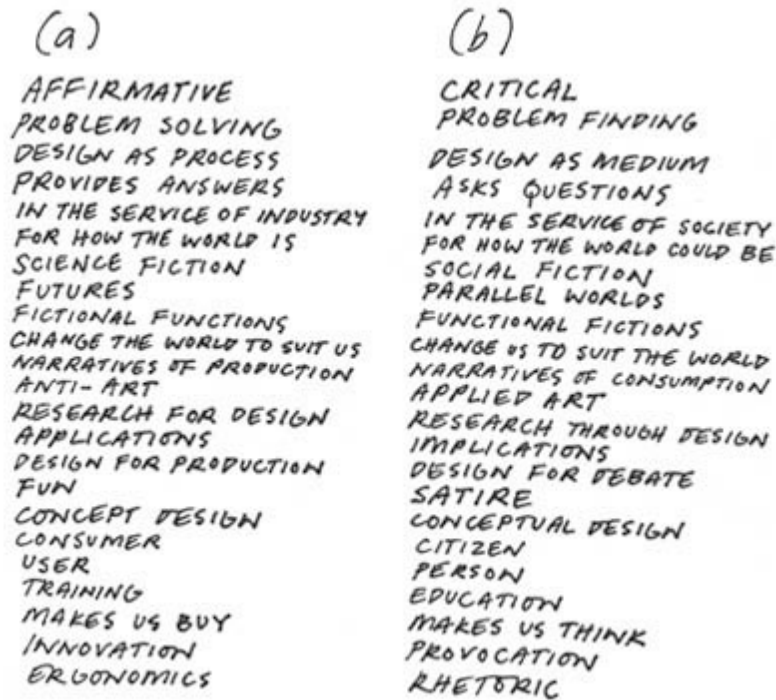


Figure 9 - a/b - "a sort of a manifesto that positions what we do in relation to how most people understand design" by Dunne and Raby. Typography by OK Do.(55)

Critical design is an essential perspective as our lives further entwine with technology. Devices and experiences with technology will only increase heightening the need for a clear perspective of how, why, when and where we use technology.

7.2. Technological Dreams Series No.1 - Dunne & Raby

As outlined in the previous section critical design is a paradigm shift from mass produced consumer products. This section discusses an example of critical design, 'Technological Dreams Series No.1' - by Dunne and Raby. The project focuses on our seemingly endless desire for robots to do everything for us. It accepts that over the coming years robots are destined to play a significant part in our everyday - not as super smart, functional machines, nor as pseudo life forms, but as technological cohabitants. It raises questions about how we will interact with them, what new interdependencies and relationships might emerge in relation to different levels of robot intelligence and capability? Aiming to spark discussion about how we'd like our robots to relate to us: subservient, intimate, dependent, equal? The outcomes are four robots with different functions and behaviours - Robot 1 is shown below.



Figure 10 - Technological Dreams Series No.1 - Robot 1 (54)

Robot 1: This one is very independent. It lives in its own world getting on with its work. We don't really need to know what it does as long as it does it well. It could, for instance, be running the computers that manage our home. It has one quirk; it needs to avoid strong electromagnetic fields as these might cause it to malfunction. Every time a TV or radio is switched on, or a mobile phone is activated it moves itself to the electromagnetically quietest part of the room. As it is ring shaped, the owner could, if they liked, place their chair in its centre, or stand there and enjoy the fact that this is a good space to be in (54).

In 'Technological Dreams Series No.1', Dunne and Raby first establish a narrative and then develop their work around it. The outcomes are not designed for production but designed for debate. Each robot is embedded with simple functionality and has a refined mass produceable aesthetic further enhancing the narrative via the perception that it is a 'real' product.

7.3. Actor Network Theory

The Actor Network Theory or ANT developed by Callon, Latour, Law and others is relevant to the area of critical design and devices as it deals with the narratives and interrelationships that appear between the material and the semiotic, and the agency of nonhumans. Below Madeleine Akrich touches on ANT as it relates to designers and the resulting *scripts* they formulate.

Many of the choices made by designers can be seen as decisions about what should be delegated to a machine and what should be left to the initiative of human actors. In this way the designer expresses the scenario of the device in question — the script out of which the future history of the object will develop. But the designer not only fixes the distribution of actors, he or she also provide a 'key' that can be used to interpret all subsequent events. Obviously, this key can be called into question — consumer organisations specialise in such skepticism. Nevertheless, although users add their own interpretation, so long as the circumstances in which the device is used do not diverge too radically from those predicted by the designer, it is likely that the script will become a major element for interpreting interaction between the object and its users.... Technical objects and people are brought into being in a process of reciprocal definition in which objects are defined by subjects and subjects by objects. (49).

7.4. Andy Warhol & The Factory

Another aspect of Device Shifting is the idea of mass production. This has been explored in art movements such as pop art and device art. Device Shifting uses mass production to place it in the same context as the very devices it aims to shift - integral to the effect of Device Shifting. This is achieved through high quality packaging design and eventually distribution.

Andy Warhol is synonymous with pop art and was intrigued by the idea of mass production. His visually "in your face" images became the iconic remainders of Capitalism and Andy Warhol defiantly worshiped the Gods of Capitalism through those images. Warhol's motivation of this Capitalist worship was his basic and firm idea that mass production is the greatest leveler in today's society (56). His studio in New York was called The Factory. The Factory was the hip hangout for artsy types, amphetamine users, and the Warhol superstars. In the studio, Warhol's workers would make silkscreens and lithographs.

Speaking in 2002, John Cale said, "It wasn't called the Factory for nothing. It was where the assembly line for the silkscreens happened. While one person was making a silkscreen, somebody else would be filming a screen test. Every day something new." (57)

To create his art, Warhol used silkscreens so that he could mass-produce images the way capitalist corporations mass produce consumer goods. In order to continue working the way he did, he assembled a menagerie of adult film performers, drag queens, socialites, drug addicts, musicians, and free-thinkers that became known as the Warhol Superstars, to help him.



Figure 11 - Andy Warhol Screenprint (58)

7.5. Device Art

The concept of device art arose when the latest technologies were fused with the traditional Japanese value of art as an inextricable part of life. In the book *Digital by Design*, Machiko Kusahara discusses what is device art, what does it aim at and what questions does it raise?



Figure 12 - Bitman is a typical example of device art(59)

Device art is a concept derived from the recent digital media art scene in Japan. Using both latest and everyday technologies and material, these media artworks enable users/viewers/interactors to enjoy and understand what media technologies mean to us. In device art, an artwork is realized in a form of device, the device becoming the content itself. Device art is a concept for re-examining art-science-technology relationships, from both a contemporary and a historical perspective, in order to foreground a new aspect of media art.

The concept is a logical extension of a change in the notion of art that already started in the early 20th century with art movements such as Dada and Surrealism. More recently, interactive art has redefined forms of art and the role of artists. What we call device art is a form of media art that integrates art and technology as well as design, entertainment and popular culture. There is a sense of playfulness or wonder in device artwork -even if it involves a serious theme -that makes it possible to be shown or commercialized outside museums and galleries.

The concept reflects Japanese cultural tradition in many ways, including appreciation of refined tools and materials, love of technology, acceptance of playfulness and the absence of a clear border between art, design and entertainment, among other issues. Device art seeks after a new paradigm in art, by producing artworks based on creative use of hardware technologies and opening a

channel to make them more accessible to everyone. Through these activities device art questions the validity of traditional boundaries between art, design, entertainment, technology and commercial products.

‘Being critical’ has been considered an important element of art. Now it is needed to examine what it means to be ‘critical’. There have been avant-garde artists, such as experimental filmmakers, who expanded and visualized what ‘film’ could mean to us. An artist can remain critical in examining the current status in this case: how technology is used in society, how it is commercialized, etc. and provide an alternative perspective, possibly with a sense of humor (Kusahara, 2008)(60).

Device Art affords a good approach to technology, art and design. It reflects Japanese cultural traditions and suggests a functional model as the rest of the world also becomes quite techno-centric. It is also interesting to note that it blurs the borders between art, design and entertainment.

7.6. Parafunctionality

In his book ‘Hertzian Tales’ Anthony Dunne uses the term ‘para-functionality’ to denote a form of design where function is used to encourage reflection on how electronic products condition our behaviour. The prefix ‘para-’ suggests that such design is within the realms of utility but attempts to go beyond conventional definitions of functionalism to include the poetic.

Some naive, curious, or eccentric objects, outside the world of conventional design, unintentionally embody provocative or poetic qualities that most product designs, even those intended to provoke, seldom achieve. Although industrial designers play a part in designing instruments of death (weapons) and pleasure (sex aids) these extreme areas of material culture rarely enter design discourse. Yet Jack Kevorkian’s Suicide Machine, a powerful “unofficial” design that materializes complex issues of law, ethics, and self-determination, shows how an industrial invention can be a form of criticism. Critical of a legal system that outlaws euthanasia, Kevorkian has his machine to overcome this. Its ambiguous status between prototype and product makes it more disturbing than pure artworks by blurring boundaries between the everydayness of industrial production and the fictional world of ideas. It suggests a

role for design objects as discourse where functionality can be used to criticize the limits that products impose on our actions.

At the other extreme is the world of antique walking sticks. A drinking cane, designed for an alcohol merchant who must spend much of his time visiting the bars of his customers, discretely siphons off his drink while his host is not looking; a trigger later releases the drink into a gutter. It satisfies etiquette and exploits the walking stick's inherent potential for connection to other objects and contexts: hand, bar, glass, and gutter (Dunne, 2005)(1).



Figure 13 - The Suicide Machine(1)



Figure 14 - The St Etienne Catalogue Walking Stick (1)

The walking stick is a good example of a designed para-functional object. The devices we use in our everyday rarely seek out the poetic. There are applications for smartphones that border the poetic and accessories for digital cameras designed to shift the perspective of where a photo is taken to a more objective position - simply using telescopic pole to raise the camera higher. The sepia and black and white settings could also be considered a push toward the poetic.

7.7. Designing for Interpretative Appropriation

It appears impossible in principle, and undesirable in practice, to develop technologies without any embodied representation of users, settings and usage. Choosing a set of technical capabilities inherently implies rejecting others, and thus a judgment about desirable opportunities for action. Similarly, there is no such thing as a neutral aesthetics. Choosing to avoid particular aesthetic styles (e.g. modernist, punk, childlike) is not the same as avoiding an aesthetic commitment altogether. Even if perfectly unbiased systems were possible, they would offer nothing for people to react against or be inspired by. Making statements about people and activities is an integral feature of design.

Nonetheless, several tactics have emerged over the last several years for designing technologies that avoid overly constrained representations of users, settings or usage. Two basic strategies can be distinguished by the way they handle the semantic mapping between a system and its environment. On the one hand are systems that leave this mapping unspecified or open-ended; on the other are those that specify a semantic mapping, but create ambiguity around its extent or implications (Gaver, Boucher, Law, Pennington, Villar, 2006)(61).

It is this theory that is important to Device Shifting. It suggests that rather than informing the user of the background, reason or even function of an accessory, it is more impacting to let the user explore the role of the accessory in their own life. Sigmund Freud cites G.Heyman's explanation that a joke works through bewilderment succeeded by illumination.

Both strategies appear promising in allowing users the possibility of interpretative appropriation of interactive systems. Rather than embodying clear and constrained representations of people,

activities and contexts that threaten to commodify our experience, they remain more or less open to people determining their own meanings.

7.8. Value Fiction

Value fiction is a term coined by Anthony Dunne and Bill Gaver from the Department of Computer Related Design at the Royal College of Art in London. A value fiction is a tool to create discussion about the underlying assumptions embedded in designed objects, systems or experiences. In a value fiction, ideas come from imagining possible products, based on existing technologies, and trying to understand why they would not work in our current culture, or why they would work in a fictitious one. The unfeasibility of certain proposals might not be technical or economic, but rather impossible because of current cultural values. Insofar as they are perceived as impractical, they prompt questions about what we do think is practical or useful (especially for electronic technologies), about the values that would be necessary for the proposed designs to be accepted in the culture at large. Accordingly, the deepest question value fictions raise is: 'why not?'(62)

Device Shifting differs from value fiction in such that it is aimed at consumers - not designers. It accepts that designers and corporations will continue to produce products and services based on a consumer capitalist economy. Thus Device Shifting not only presents a value fiction perspective to consumers but also a product or service based solution. People are more likely to adopt a new technology if it is presented in a way that connects with the lives they already lead (Wai & Mortensen, 2007) (53). Given current means of production, i.e. out-sourcing or rapid prototyping designers could effect significant change in the way we relate and behave with each other and devices by deploying accessories of device shifting.

7.9. Chindōgu

Following on from value fictions and device art, chindogu offers a perspective on our relationship with simple un-useless inventions, often employing little or no digital technology. Chindogu is included in this research because of its design process, its somewhat anti-consumerism ideals and because of its reflective quality as an object. The founder of Chindogu, Kawakami thinks of them as a kind of antidote to consumerism, and the Western obsession with making life as 'easy' as possible.

Chindogu is the Japanese art of inventing ingenious everyday gadgets that, on the face of it, seem like an ideal solution to a particular problem. However, chindōgu has a distinctive feature: anyone actually attempting to use one of these inventions would find that it causes so many new problems, or such significant social embarrassment, that effectively it has no utility whatsoever. Thus, chindōgu are sometimes described as ‘unuseless’ – that is, they cannot be regarded as ‘useless’ in an absolute sense, since they do actually solve a problem; however, in practical terms, they cannot positively be called “useful.” Translated literally, chindōgu means unusual (珍 chin) tool (道具 dōgu).

Every Chindogu is an almost useless object, but not every almost useless object is a Chindogu. In order to transcend the realms of the merely almost useless, and join the ranks of the really almost useless, certain vital criteria must be met. It is these criteria, a set of ten vital tenets, that define the gentle art and philosophy of Chindogu. They are:

1. A Chindogu cannot be for real use:

It is fundamental to the spirit of Chindogu that inventions claiming Chindogu status must be, from a practical point of view, (almost) completely useless. If you invent something which turns out to be so handy that you use it all the time, then you have failed to make a Chindogu. Try the Patent Office.

2. A Chindogu must exist:

You’re not allowed to use a Chindogu, but it must be made. You have to be able to hold it in your hand and think ‘I can actually imagine someone using this. Almost.’ In order to be useless, it must first be.

3. Inherent in every Chindogu is the spirit of anarchy:

Chindogu are man-made objects that have broken free from the chains of usefulness. They represent freedom of thought and action: the freedom to challenge the suffocating historical dominance of conservative utility; the freedom to be (almost) useless.

4. Chindogu are tools for everyday life:

Chindogu are a form of nonverbal communication understandable to everyone, everywhere. Specialised or technical inventions, like a three handled sprocket

loosener for drainpipes centred between two under-the-sink cabinet doors (the uselessness of which will only be appreciated by plumbers), do not count.

5. Chindogu are not for sale Chindogu are not tradable commodities:

If you accept money for one you surrender your purity. They must not even be sold as a joke.

6. Humour must not be the sole reason for creating a Chindogu

The creation of Chindogu is fundamentally a problem-solving activity. Humour is simply the by-product of finding an elaborate or unconventional solution to a problem that may not have been that pressing to begin with.

7. Chindogu is not propaganda. Chindogu are innocent:

They are made to be used, even though they cannot be used. They should not be created as a perverse or ironic comment on the sorry state of mankind.

8. Chindogu are never taboo:

The International Chindogu Society has established certain standards of social decency. Cheap sexual innuendo, humour of a vulgar nature, and sick or cruel jokes that debase the sanctity of living things are not allowed.

9. Chindogu cannot be patented:

Chindogu are offerings to the rest of the world – they are not therefore ideas to be copyrighted, patented, collected and owned. As they say in Spain, mi Chindogu es tu Chindogu.

10. Chindogu are without prejudice:

Chindogu must never favour one race or religion over another. Young and old, male and female, rich and poor – all should have a free and equal chance to enjoy each and every Chindogu(63).



Figure 15 - Example Chindogu Inventions(64)

7.10. Social Mobiles For IDEO

IDEO developed a project exploring behaviour with mobile phones. It has a similar approach to Device Shifting although it resulted in concept prototypes, whereas Device Shifting uses functional accessories to retain our established behaviours with devices.

Rather than create a set of phones that addressed aesthetic concerns of mobile phones, designer and artist Crispin Jones worked as a research associate with IDEO to create five working mobile telephones that in different ways modify their users' behaviour to make it less disruptive. The intent is to provoke discussion about the social impact of mobile phones. This project was developed in 2002 and is a very similar approach to device interventions although it requires the use of specific hardware. A device intervention is an accessory for an existing device.

SoMo1 is the electric shock mobile. This phone delivers a variable level of electric shock depending on how loudly the person on the other end is speaking. As a result the two parties are induced to speak more quietly. These phones would be given to repeat offenders who persistently disturb others with their intrusive conversations.

SoMo2 is the speaking mobile. This phone allows a user to converse silently: a person receiving a call in a quiet space can respond without speaking, using simple but expressive vowel sounds that they produce and intone manually. This is the antithesis of text messaging in that it conveys rich emotional nuance at the expense of textual information.

SoMo3 is the musical mobile. This phone requires the user to play the tune of the phone number they wish to call. The public performance that dialing demands acts as a litmus test of when it is appropriate to make a call. Children would take phone lessons in order to learn to play their phone.

SoMo4 is the knocking mobile. The user knocks on this phone to communicate the urgency of their call. The recipient hears this knock through their phone and can be discerning about which calls they answer. Given time people would learn to recognise each other's knocking mannerisms.

SoMo5 is the catapult mobile. This phone can be used to launch sounds into other people's phone conversations. Firing the catapult transmits a sound into the offender's phone. This provides a direct yet discreet way of invading their space. Businesses will supply users with a choice of interrupts to launch from their phones (IDEO, 2002)(65).



Figure 16 - IDEO Social Mobiles (66)

8. A Theoretical Framework For Device Shifting

The following section relates to the previous sections and how they support the process of Device Shifting.

In summary, the deeper a technology is woven into the patterns of everyday life, the less choice we have about whether and how we use that technology (4). Devices have influenced and changed our everyday and a vast number of experiences throughout it. Our devices are increasingly rich with functionality and as a result enter into our lives at more frequent intervals. Devices exist in ever increasing numbers. The number of connected mobile phones in the world is 5 billion (17). We are no longer alienated by technology but form an integrated circuit with it (38).

If Buurman's theory (40), is right and technology becomes a defining factor for social conditions, culture, perception, education, knowledge, thought and play, then it should no longer be understood as a mediator or a means of structural force. Furthermore, through perpetual use, it will further permeate our everyday environments and become a precondition for individuality and our self-conception. Critical design is an essential perspective as our lives further entwine with technology. Devices and experiences with technology will only increase, heightening the need for a clear perspective of how, why, when and where we use technology, and most importantly who we are in relation to technology. As applied critical design, Device Shifting seeks to engage with the established rhetoric of consumerism to provide functional outcomes. Device Shifting outcomes should provoke and engage people to reflect on their behaviours with devices. Technical objects and people are brought into being in a process of reciprocal definition in which objects are defined by subjects and subjects by objects (49). The process of Device Shifting seeks to intervene in these cycles of reciprocation, designing accessories that merge with people's existing behaviours with devices.

Many of our experiences are driven by products founded on the bottom line: on a consumer capitalist model. This model not only effects our direct experiences with technology but also brings with it a chain of production that also weighs on the consumer. How is a product manufactured? Are the minerals necessary for the device ethically sourced - socially, environmentally and politically? Are employees manufacturing devices in acceptable working

conditions? The reality is, answers to these questions refer to war²⁰, suicide²¹ and environmental waste²². There are alternatives to corporations gradually appearing in the market. Although still fairly nascent, 'Open Design' may shift our dependence on corporations to produce and distribute devices.

Eames and Moggridge (47)(48), stated that design is being aware of the constraints. Device Shifting establishes a series of constraints to engage in an applied critical design practice. Many of the choices made by designers can be seen as decisions about what should be delegated to a device and what should be left to the initiative of human actors. Therefore a designer expresses the scenario of the device in question — the script out of which the future history of the object will develop (Akrich, 1992)(49). Furthermore designers design objects based on constraints defined by the required outcome and afforded processes. Constraints can not only be seen as technological, usability or viability of production, but must also encompass the constraints of designing in the context of a corporation; in a way that sustains that corporation. This is largely dependent on their target market, and a target market is primarily defined by price point²³.

In 'Technological Dreams Series No.1', Dunne and Raby (54), first establish a narrative and then develop their work around it. The outcomes are not designed for production but designed for debate. Due to the significant impact of aesthetic, semantic or symbolic judgements people make when relating to a product each robot is embedded with simple functionality and has a refined mass produceable aesthetic: further enhancing the narrative via the perception that it is a 'real' product. This is also essential to the process of Device Shifting - to engage with consumer rhetoric. Value fictions (61), aim to subvert established design paradigms before they are once again reaffirmed in the design process and become part of the consumer rhetoric. Device Shifting differs from value fiction in such that it is aimed at consumers - not designers: it is aimed at the

20 The civil war in the Democratic Republic of Congo is bankrolled by the sale of illegally mined "conflict resources" such as tantalum which is used in most devices (70).

21 Foxconn is said to be the world's largest contract manufacturer of electronics. It supplies global brands including Apple, Dell, Nokia and Hewlett Packard. Labour campaigners argue that Foxconn's mostly migrant workers are vulnerable because of their 10-hour working days and the monotony of their jobs. They say many feel isolated and pressured by a strict regime that bans them from speaking on the production line and takes them far away from their families. There have been eleven suicides so far in 2010 (71).

22 Rapid changes in technology, low initial cost, and planned obsolescence have resulted in a fast-growing surplus of electronic waste around the globe. (72)

23 Products are often marketed and sold based around any number of models. Many contain price or cost as a key element. Two common examples are the Four Ps - Product, Price, Place or Promotion (E. Jerome McCarthy, 1960), and the Four Cs - Commodity, Cost, Channel and Communication (Koichi Shimizu, 1973).

end of the consumer design process, after the product has been purchased. Thus Device Shifting not only presents a value fiction perspective to consumers but also a product or service based alternative. Device Art is situated closer to Device Shifting than value fictions in that it also focuses on the consumable outcome.

Kusahara establishes a sound argument for device art. Although the argument is somewhat self-referential, contemplating **boundaries** between art, design, entertainment, technology and commercial products. Device Shifting aims to directly question how we use and are effected by, design, entertainment, technology and commercial products. A 'device shift' is a functional design based on theory, research and practical consumable outcomes. Although it may be perceived as device art or as being born from artistic practice, it is approached from a critical design, anthropological and sociological perspective and is directly aimed at our behaviours with devices entering through the context of consumerism. Furthermore, the outcomes of Device Shifting may be similar to those of the Device Art, the key difference is that Device Shifting outcomes have somewhat of a parasitic relationship to existing devices, requiring a host device to function.

As John Maeda (45), suggests, we will witness a return to the integrity of craft, the humanity of authorship, and the rebalancing of our virtual and physical spaces. We'll see a 21st-century renaissance in arts- and design- centered approaches to making things, where you--the individual--will take center stage in culture and commerce. Device Shifting follows this idea suggesting it is possible to design and manufacture accessories without corporate infrastructure engaging with the same rhetoric as 'Open design'.

8.1. What Is Device Shifting?

Device Shifting - shift the behaviour of how a human relates to a device by either occupying it, lowering its level of possible engagement or transforming its input or output with a mass produceable accessory.

Device Shifting is applied critical design. By designing accessories it is possible to affect and engage with established interrelationships, interdependencies and behaviours with the devices. This thesis focuses on four particular devices but it could also be applied to any other device. The four accessories documented in this thesis are as close as I could come to creating the appearance of mass produced accessories for mass produced products. Being not designed for a gallery, they are designed to be consumed in the same environments we purchase our devices. By achieving a high standard of production they engage with the rhetoric of consumption and can be effectively critical. The more believable they are as 'real' products the more functional they are as applied critical design.

8.2. The Four Principles Of Device Shifting

1. Each product must rely on another mass produced product to be functional - each product is an accessory.
2. Each product must have critical value directly relating to human behaviour with its intended mass produced product.
3. Each product must be produceable by means available and function as intended - it may be used in other ways but it must function as the design has intended.
4. Each product must be in a mass produceable, high quality consumer package.

9. Device Shifting Outcomes

9.1. Faraday Handkerchief

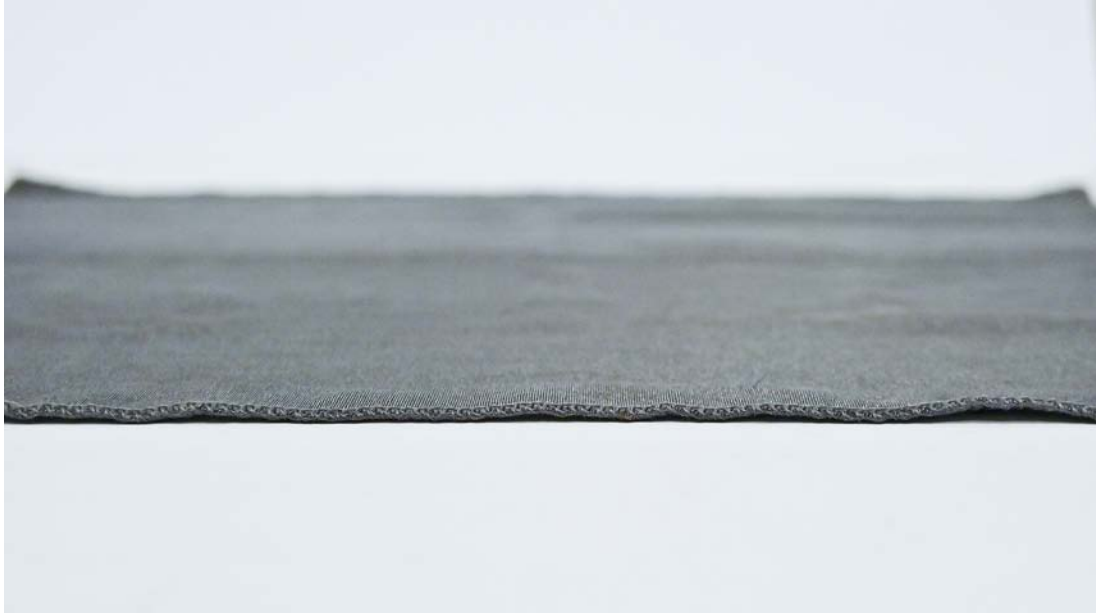


Figure 17 - Faraday Handkerchief

The Faraday Handkerchief uses the inherent faraday properties of conductive fabric to block network signals to a mobile device. A faraday cage functions by creating a lattice that is smaller than the wavelength of frequencies it is intended to block, acting as a net that disperses and absorbs the signal. The weave of the conductive fabric used for the handkerchief is Med Tex 130 – 99% pure silver plated polyamide and elastomer. Med Tex 130 has natural antimicrobial properties and is normally used in medical applications. The silver absorbs the radio waves and the polyamide/elastomer give it soft fabric qualities. The resulting effect is mysterious whereby wrapping a seemingly normal piece of cloth around a mobile phone cloaks all of its functionality - except for maybe an alarm clock.



Figure 18 - Faraday Handkerchief in package side view.

A kerchief (from the French *couvre-chef*, 'cover the head') is a triangular or square piece of cloth tied around the head or around the neck for protective or decorative purposes. The popularity of head kerchiefs may vary by culture or religion, as among Amish women, Orthodox Jewish women, Muslim women, and older Orthodox Christian women.

A 'handkerchief' or 'hanky' primarily refers to a napkin made of cloth, used to dab away perspiration, clear the nostrils, or, in Victorian times, as a means of flirtation. A woman could intentionally drop a dainty square of lacy or embroidered fabric to give a favored man a chance to pick it up as an excuse to speak to her while returning it. Handkerchiefs were sometimes scented to be used like a nosegay or tussy-mussy, a way of protecting those who could afford them from the obnoxious scents in the street.(67)



Figure 19 - Mobile device wrapped in a Faraday Handkerchief .

The Faraday Handkerchief shares similar etiquette to the walking stick mentioned in the chapter on para-functionality. It aims to subsume our subtle interactions with devices that are easily overlooked in the design process. Some Android phones allow the user to switch their phone to silent by simply placing it face down, although this is not possible in every situation.

The text on the packaging states Wrapping your phone in the handkerchief blocks and signal from a network. It does not state the reason for doing so leaving the user to reflect on its usefulness; relating back to the ideas of designing for interpretive appropriation mentioned earlier.



Figure 20 - Faraday Handkerchief in package top view.

9.2. Interviews With People Using The Faraday Handkerchief

As series of interviews²⁴ with people using the handkerchief revealed that it was conceivable as a product. While interviewing people using the Faraday Handkerchief most were skeptical if it would function as intended. The common scenario was wrap the phone in the handkerchief, call and get directed to voice mail. When they unwrapped the phone they received a message saying 'missed call' or 'new voice mail'.

During the interview three standard questions were asked:

1. Do you think it will work?
2. Do you think it is plausible as a mass produced product?
3. Are you aware of any other products that are similar?

The majority of the people interviewed were surprised that it worked. One person in particular stated that it was 'like a magicians handkerchief'. When asked if they thought it would work most were uncertain but saw no reason for it not to. Another person wondered if it would be produced and sold. One of the subjects who had the handkerchief for over a week didn't use it once. Their reasons were because they were always expecting a phone call from either their family, girlfriend or from a job opportunity. When asked if they ever turn their phone off or silent they answered no. This suggested that the handkerchief was not effective at changing this persons behaviour but was effective at leading them to reflect on their behaviour as they noted the anxiety of not feeling able to turn it off.

One of the people interviewed owned a product that uses similar fabric technology to block electromagnetic radiation to their body. They also taped a piece of Shungite²⁵ mineral to the back of their phone to 'absorb' radiation. This further highlighted the fundamental difference between a Faraday Handkerchief and a pouch to block radiation. One is for fear of the uncertain effects of radiation on the body and the other for disconnecting from a network. From a marketing perspective both products clearly have different target audiences. The handkerchief functions as it is marketed, the user is able to quantify its value subjectively. The pouch to block radiation is

²⁴ Video summary of the interviews is viewable at www.device-shifting.com

²⁵ Fullerenes are found in a family of minerals known as Shungites in Karelia, Russia. A fullerene is any molecule composed entirely of carbon, in the form of a hollow sphere, ellipsoid, or tube molecular structure.

shrouded in uncertainty and a sense of fear, it therefore requires the user to believe that it has value: to believe that electro magnetic radiation has negative effects on the body.

Overall the handkerchief was received as a simple and effective accessory. By simply demonstrating how it functions people were able to reflect on their habits. However if people did not turn their phone off or to silent it was not likely to lead them to start doing it with the handkerchief.



Figure 21 - Mobile phone in commercial pouch to block radiation. The phone also has Shungite taped to the back of the phone to 'absorb' further radiation.

9.3. Viewfinder & Screen Cap

The Viewfinder & Screen Cap is an attachment that fits over the viewfinder and preview screen. It suggests that as digital photography is less costly and consequential you can 'focus on the moment' and trust that the automatic functions will work. As a result it also retains some of the surprise when you download your photos and leads people to use the automatic functions of their devices. With the cap moments are no longer seen and experienced through the body of a camera. Attach the viewfinder and screen cap for your particular brand of camera and set the camera to automatic.

Each model of camera has its own cap so as to integrate seamlessly into the design and further reinforce its perception as a mass produced accessory. Although this accessory reduces part of the functionality of the object it remains optional.



Figure 22 - Viewfinder & Screen Cap on a Canon G9.



Figure 23 - Viewfinder & Screen Cap on Canon G9 side profile.



Figure 24 - Viewfinder & Screen Cap on Canon G9.

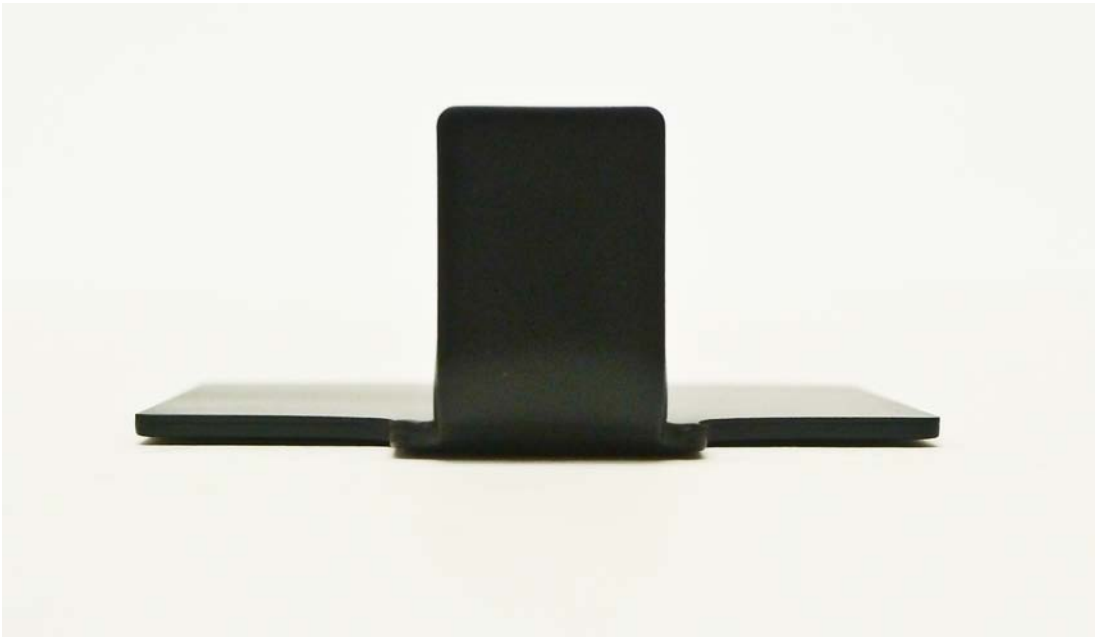


Figure 25 - Viewfinder & Screen Cap top profile.



Figure 26 - Viewfinder & Screen Cap side profile.



Figure 27 - Viewfinder & Screen Cap in packaging.



Figure 28 - Viewfinder & Screen Cap front packaging view.

9.4. For The Curious Listener

Invite strangers to listen along with your music or podcast on public transport with a playful brightly coloured, ear shaped additional headphone jack.

For The Curious Listener aims to break the environmental disconnectedness of headphones. Is simply the possibility of entering the aural-scape of another person enough to shift the inherent disconnection MP3 players exude? It is intended to invite strangers to enter into your private sound world: it is both an experience for you and the person listening to it. By using the form of an ear the user can be playful, leaving it in nooks and crevices that show no sign that they are the source of the audio. It is a playful exploration of the altered perception MP3 players afford. Furthermore it affords or fulfills a fantasy element whereby no longer do you look at a person wearing headphones and wonder, 'What are they listening to?' you can plug in and listen in.



Figure 29 - For The Curious Listener - the packaging text reads 'Share your listening experience with strangers'.



Figure 30 - For The Curious Listener cable and ear with headphone socket.



Figure 31 - For The Curious Listener with two sets of headphones attached.



Figure 32 - For The Curious Listener detailed view.

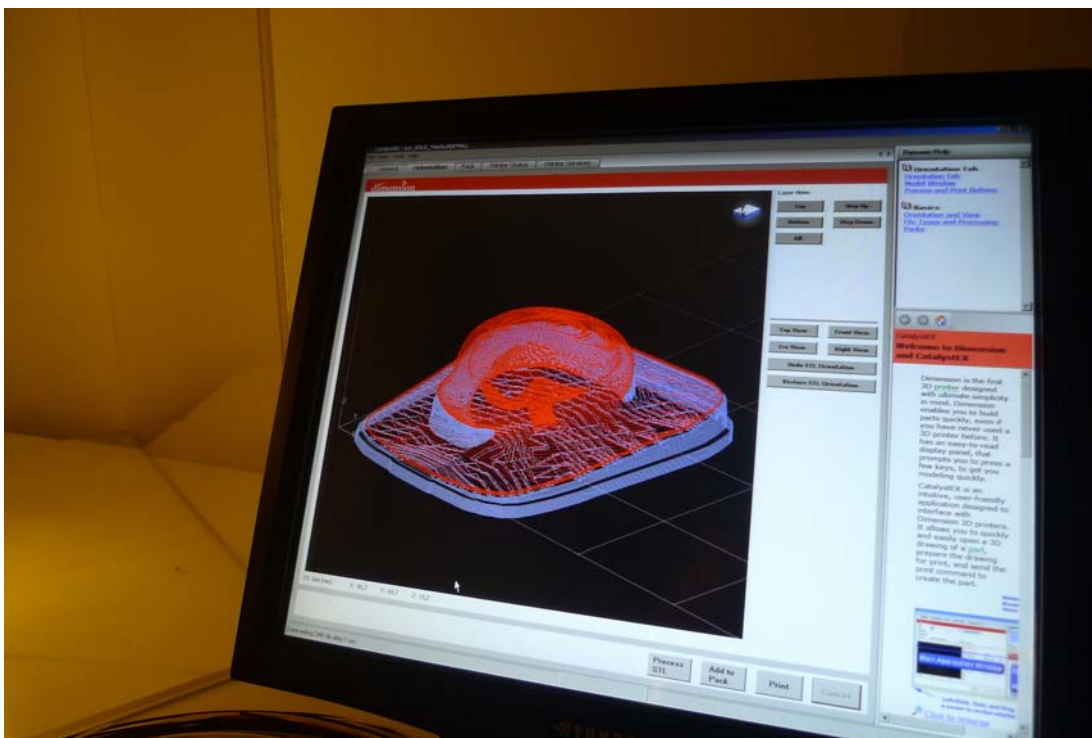


Figure 33 - Rapid prototyping view of ear in red and support scaffolding in blue.

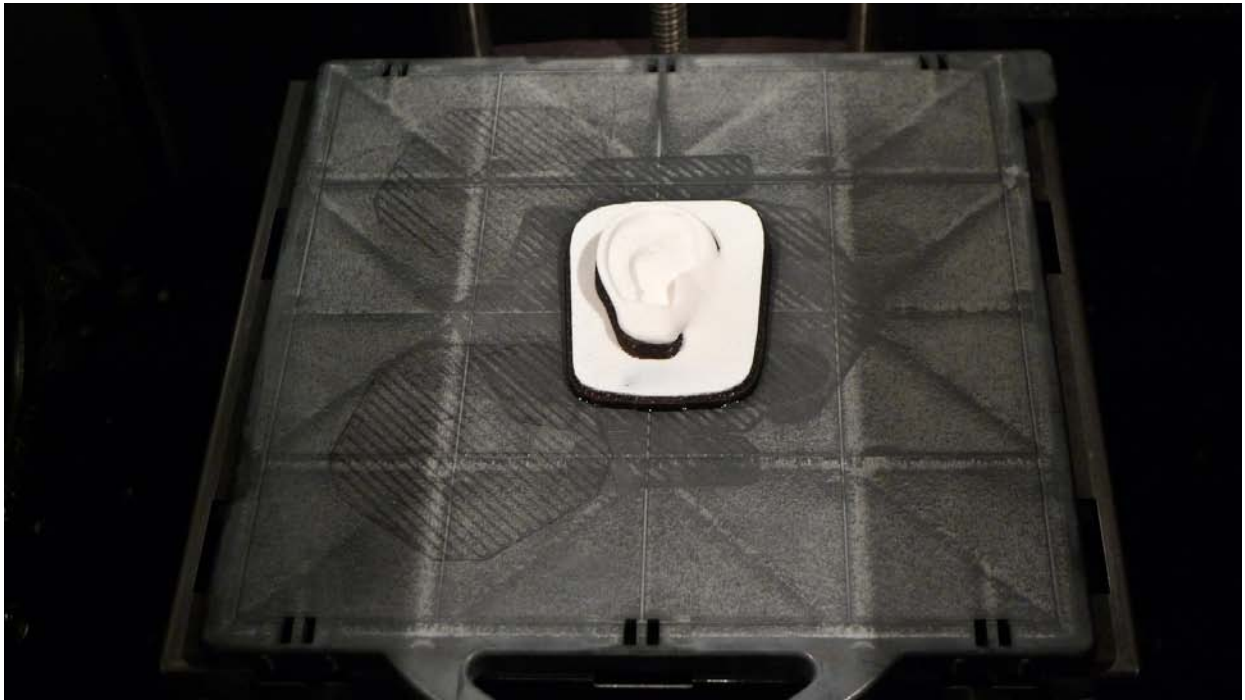


Figure 34 - Ear after printing.



Figure 35 - Halfway through priming the surface of the ear to fill in the small grooves and build lines from the rapid prototyping printer.

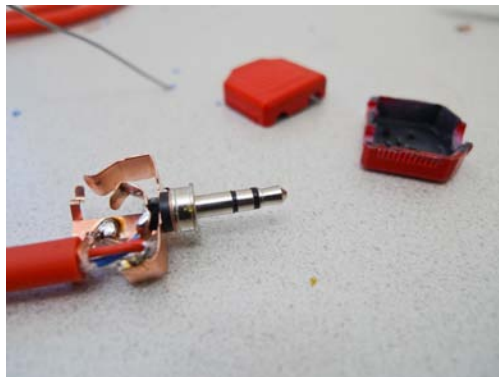


Figure 36 - Building headphone splitter.

9.5. Paper Application

Adhesive paper for the top of laptops. Paper Application explores our relationships with computers and distractions. It can **only** be used when your computer is switched off or sleeping. Paper is still an integral part of our everyday and the computer is as yet incapable of replicating it. Paper Application could be seen as an enhancement for a computer. Although simple, it is an accessory that in a consumer context functions as applied critical design. It is satirical with plausible rhetoric.



Figure 37 - Paper Application - the packaging text reads 'Adhesive paper for the top of portable computers'.



Figure 38 - Paper Application on portable computer perspective view.



Figure 39 - Paper Application on portable computer top view.



Figure 40 - Paper Application packaging side view.



Figure 41 - Paper Application packaging perspective view.

9.6. How is Device Shifting Different to Existing Products?

Critical design, and thus Device Shifting aims not to provide answers but instead provide questions, is not for innovation but for provocation, is not problem solving but problem finding, and is not to make us buy but to make us think.

The outcomes documented in this thesis may be seen as no different to other existing accessories or gadgets. This is in part due to their simplicity. Device Shifting uses the same rhetoric in branding, packaging design and marketing to shift the perception of our behaviours with devices. The accessories themselves are simple although the packaging affords a new context.

The packaging text on the Viewfinder & Screen Cap reads, 'Focus On The Moment'. Protective viewfinder and screen caps exist for some models of camera although they are intended and marketed as protection. By printing 'Focus On The Moment' on the packaging people are lead to interpret its function as a designed mass produced accessory: it does not say, 'Protect your lcd screen and screen cap'. The packaging establishes a different context by which to perceive the accessory inside.

This is also true of 'For The Curious Listener' which reads 'Share your listening experience with strangers'. Headphone splitters have existed for years and continue to appear in various playful forms. 'For The Curious Listener' is a product designed and marketed based on research that suggests people are disconnected and experience a **private** experience in a **public** space while listening to MP3 players(30). 'For The Curious Listener' opens up this experience to both the listener and the person who might listen in.

While there exist on the market products that use similar technology as the 'Faraday Handkerchief' to block radiation from mobile phones they are aimed at protecting people from the as yet unknown effects of radiation on the brain. There are also wallets that offer protection from identity theft from RFID scanners. Both function and are marketed with a sense of paranoia, which is probably not unjustified but has its own agenda. The 'Faraday Handkerchief' intentionally does not market itself as a shield for protection, although it can function in this way. It is marketed solely as a device to connect and disconnect from networks. It focuses the narrative on our behaviours with mobile devices and not the possible health side effects - although health effects could be seen as a result of using a device it is not directly related to behaviour.

In many ways some accessories on the surface seem quite similar to Device Shifting accessories. The key difference is that Device Shifting accessories **directly relate to our behaviours** with devices. The radiation shield for mobile phones, a normal headphone splitter or a viewfinder and screen protector are not directly concerned with our behaviours with devices, and nor are they marketed in such a way. Device Shifting accessories employ the same consumer rhetoric in their packaging design and in the text on the packaging to further support outcomes as believable, 'real' products. The more 'real' they appear the more effective they are as critical design.

Device Shifting as applied critical design is an ongoing process and the work presented in this thesis establishes a practice by which to build on in the form of four accessories. Furthermore, simplicity is not a principle of Device Shifting, although simple accessories are more easily adapted to existing products.

9.7. Packaging Design Process

As stated in the principles of Device Shifting, packaging should look like it could be placed on the same shelves and consumer context of the devices it is intended for.

The packaging was designed in Illustrator and is cut and etched by a laser to achieve a high standard finish. Originally I intended to print first on paper with a high quality printer and then cut out the form with a laser cutter. This proved to be difficult to align with the laser cutter and the result looked poor.



Figure 42 - Initial package design prototype forms



Figure 43 - Hand-cut package test.



Figure 44 - First tests with the laser cutter were not so successful as it was difficult to match and align the scales with the printer and the laser cutter.



Figure 45 - Badly aligned and scaled package in the laser cutter.

In the process of using the laser cutter I began experimenting with etching techniques. By only slightly burning into the paper I could illustrate and label the packaging without needing to print at all. The result was a far better quality packaging.

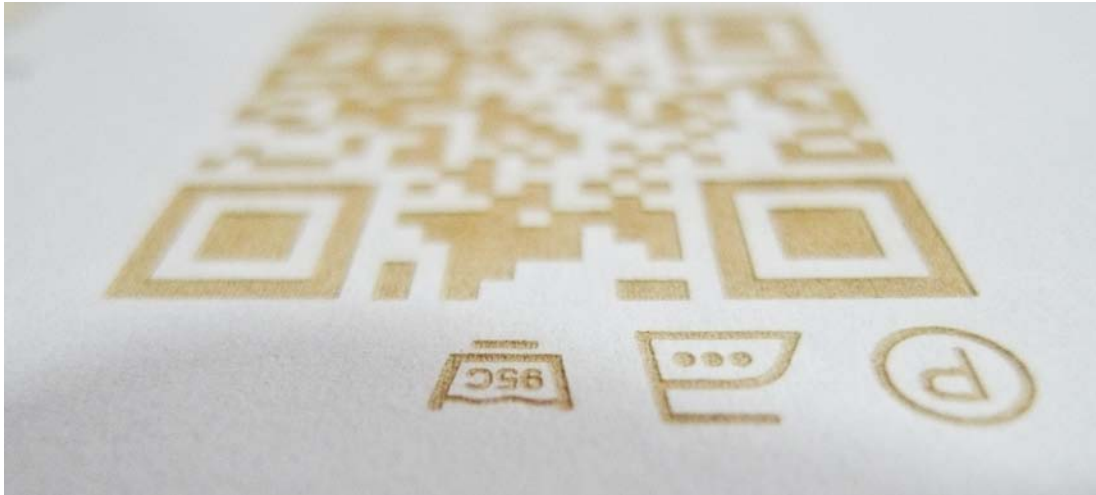


Figure 46 - Etching all the graphics and text into cardboard using the laser cutter resulted in not needing to be concerned with printing and alignment in the laser cutter.

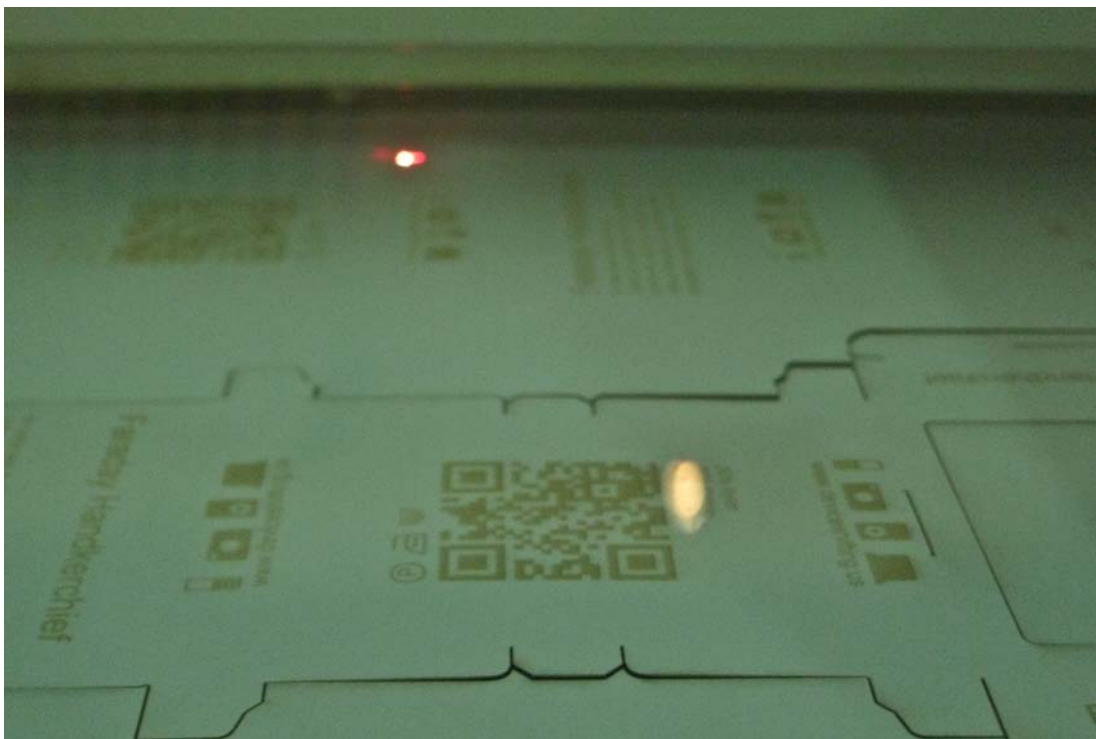


Figure 47 - Laser cutting in process



Figure 48 - Ars Electronica Fab Lab

On my second day in the Fab Lab I decided to investigate other types of paper with heavier weight and different finish. As I was not printing anymore I had to rely significantly on the packaging material to achieve a consumer product look. The final product was not to look like a special, rare or valuable product, but a highly consumable, functional accessory. I therefore worked with consumable materials such as paper or plastic. Not that it should not have a refined aesthetic but there should be sense of semi-permanence to it.

I was fortunate with how a transparent film reacted to the laser cutter. The images below show the steps of production for the final package process.

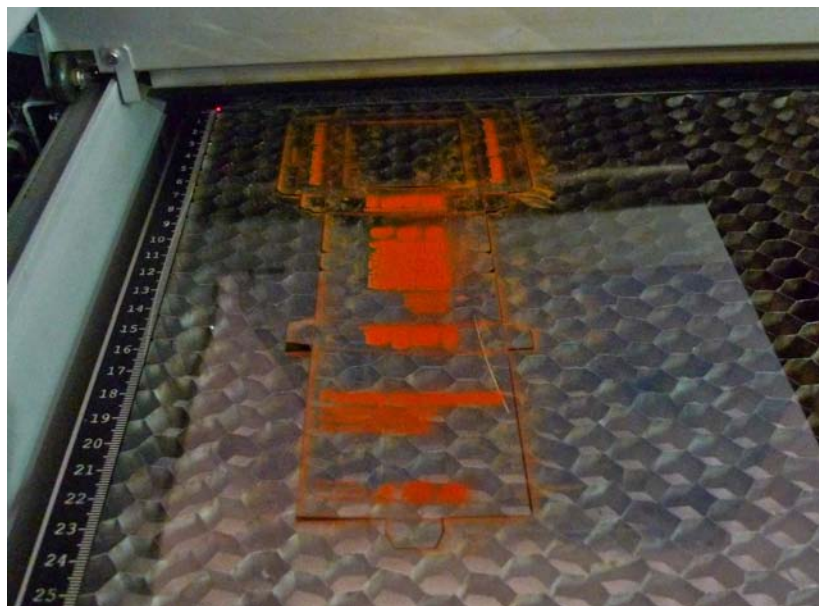


Figure 49 - Testing engraving with a clear sheet was surprisingly successful. A rust coloured print appeared covered in dust.



Figure 50 - Clear sheet after laser engraving before it is cleaned and assembled.



Figure 51 - As the whole package is clear some text had to be moved around to be more readable as in this image, but this is the final packaging aesthetic.

9.8. Unused Device Shifting Concepts

Below are undeveloped ideas for Device Shifting. Some of them are vague sketches and others more refined. They also may not adhere to the principles of Device Shifting.

Digital Camera

Scent Strip

A bad smelling strip with an adhesive backing applied near the view finder of a camera. This aims to inhibit a person from looking through the view finder.

Counter for Photographs

This counter attaches to your camera and allows you to store information, from 1 to 100. It is intentionally vague aiming to be playful and abstract.

MP3 Player

Awareness - Human & Animal

As a person or animal gets closer to you the volume of your MP3 player goes up or down or a lowpass filter is applied to the audio signal: the choice is yours. Awareness is a simple attachment for headphones that uses the inherent capacitance of living beings to adjust the volume of your MP3 player.



Figure 52 - Detail of Awareness - Human & Animal electrode capacitance sensor accessory for MP3 players.

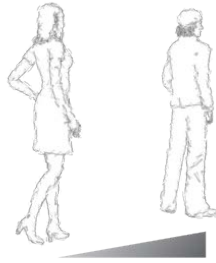


Figure 53 - Interaction illustration for Awareness - Human & Animal

Awareness - Environment

As the loudness of your environment changes your MP3 player goes up or down or a lowpass filter is applied to the audio signal: the choice is yours. Awareness is a simple attachment for headphones that uses the sound of the environment to adjust the volume of your MP3 player.

Visualise

A device to visualise the audio that the person is listening to. The point of this is to give something playful in return to the people who may be effected by a person listening to their music loudly in public.

Draw Effect

A small vibration motor that attaches to a pen or pencil is triggered by the music you are listening to. As you draw the lines are effected by the soundtrack.

Scent Replacement

The louder the volume of your mp3 player the more a pleasant smelling scent is excreted.

Portable Computer

Rise

Using shape memory alloys to generate a metal sculpture to show the passing of time while you are using your computer.

Mat

A thermoelectric mat that the computer rests on generates electricity to do something.

Energy

How to convert heat energy in to stored electricity. As you use your device it gets warmer and then you can have something to play with at the end of it. The longer you work the better your reward!

Smartphone & Mobile Phone

Iron-In Faraday Pocket

The Iron-in Faraday pocket blocks the signal of a mobile/smartphone. Place a device inside and it will be unable to connect to networks. These pockets use conductive fabric to block signals to a mobile device.

It is intended that these pockets are applied on the inside of pants so that you have an easy way to disconnect at hand anytime. Without distracting or disturbing social situations by giving attention to a device.



Figure 54 - Sketch for the Iron-In Faraday Pocket.

Glow in the dark cover

With this cover you can see if your phone has brightened up or not recently. A dissolving of a moment.

Moleskin Book Cover

This makes your phone look like a moleskin book so you don't look like you are checking your phone. Etiquette.

The Two of Us

Aim to make something that needs two phones to use it. When two people are together and might not want to be interrupted.

Home Phone

Using a piezo disk to transduce the vibration of a phone to produce a naturally ringing bell. This will not change the person who is calling, it may still be somebody from work, but by changing the sound of the phone we can begin to redefine the spaces we exist in.

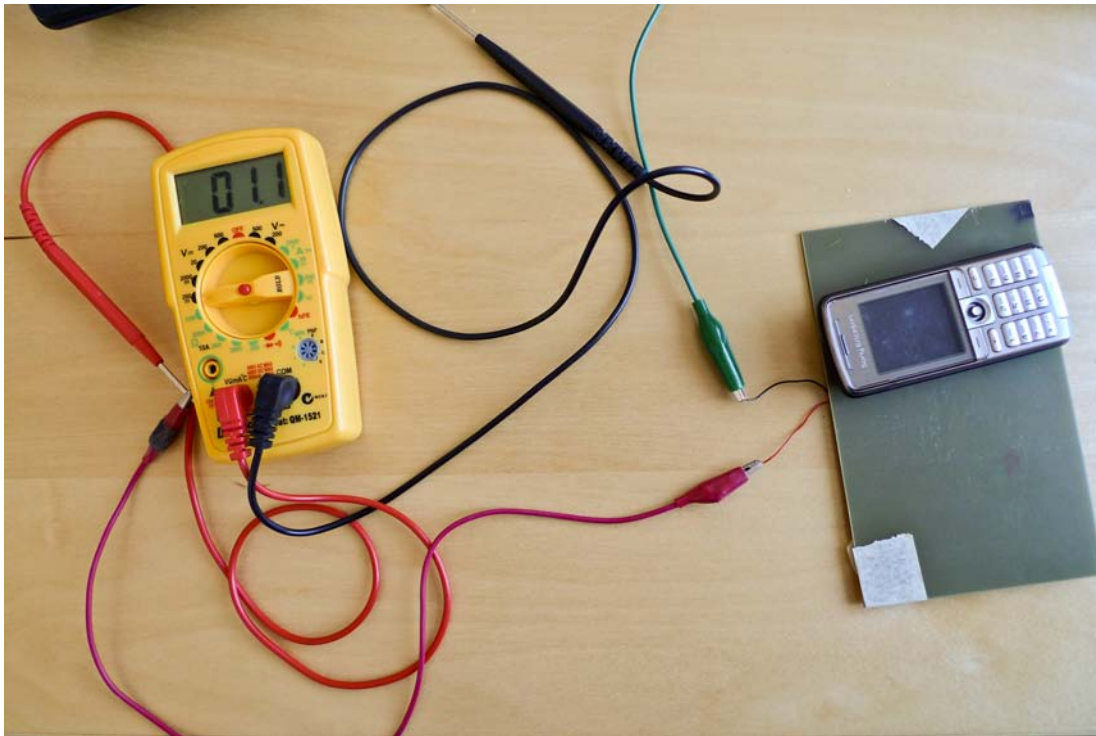


Figure 55 - This was a vibration experiment with a piezo disk sensor to see if I could sense the phone vibrating. It was not so successful. With a proper mount and transference of energy it might work.

9.9. Summary Of Results From Life With Devices Survey

I had over 100 responses to my survey about life with devices. It aimed to see how ubiquitous devices are in our everyday and also explored behaviours with the four devices in focus throughout this thesis.

The interesting results are listed below:

- Most people own a digital camera, portable computer and mobile phone and over half of owned an MP3 player.
- Almost **half** the people access the internet from their mobile phone.
- Almost a **third** of people had purchased applications for their phone.
- **Two thirds** regularly switch their phone to silent or vibrate.
- Most people switch their phone to silent so they do not disturb others.
- Over **two thirds** carry their phone with them **always** and the other **third** carried them **often**.
- More than **half** do not think they are using their phone with they are carrying it with them.
- **Two thirds** do not like having their phone with them sometimes.
- Almost a **third** do not like having their phone with them even though it is switched off.
- Yet over 80% think their phone is important in their everyday.
- Over **half** believe owning a mobile phone is a requirement of modern life.
- Over **half** feel disconnected from their environment when listening to an mp3 player.
- Over **half** use a digital camera often.
- A **quarter** of the people surveyed used their camera mostly on holidays, others used it mostly for work, everyday life or documentation.
- Almost **half** think taking photos takes them out of the moment.
- Over 80% use their portable computer often.
- Portable computers are used **equally** for work and entertainment
- Over 50% of people use their portable computer at home, office, transport and cafés.
- 80% think their portable computer is important in their everyday.
- Two thirds believe devices make life better.
- 90% believe that devices have changed the way we behave.

All the results and the survey can be viewed in Appendix #4.

10. Conclusion

Device Shifting is an initial step from design for production to design for debate. It is clear that devices share a significant presence in both the developed and developing worlds. To reiterate Nicholas Carr,

‘The deeper a technology is woven into the patterns of everyday life, the less choice we have about whether and how we use that technology (4).

Devices have shaped the modern environments we live in: always connected amidst blurred boundaries of work, social and private spaces, whilst in a perpetual cycle of use.

The simplicity of the Device Shifting outcomes was unintentional. In the context of applied critical design and the proposed Device Shifting process, their simplicity serves as a strength as they are mass produceable, simple to incorporate into our existing behaviours with devices, durable and function as intended. In the end a piece of fabric, a piece of plastic, a piece of paper and a cable made up a significant portion of the work. Each one is easily connected to the devices they were designed for. Contrary to the simplicity of the final results, the process involved in achieving these outcomes was highly technical. I experimented and worked with rapid prototyping 3D printing, laser cutting, conductive fabrics, papers, plastics and electronics.

While interviewing people using the Faraday Handkerchief most were skeptical if it would function as intended. After realising it worked many said it was strangely simple and they could see a place for it. When asked if they knew of other products that were similar, all but one answered yes. This particular person owned and uses a pouch to block electro magnetic radiation from the body. They also taped a piece of Shungite²⁶ mineral to the back of their phone to ‘absorb’ radiation. This further highlighted the fundamental difference between a Faraday Handkerchief and a pouch to block radiation. One is for fear of the uncertain effects of radiation on the body and the other for disconnecting from a network. From a marketing perspective both products have different target audiences. The handkerchief functions as it is marketed, the user is able to quantify its value subjectively. The pouch to block radiation is shrouded in uncertainty and a sense of fear, it therefore requires the user to believe that it has value: to believe that electro magnetic radiation has negative effects on the body.

²⁶ Fullerenes are found in a family of minerals known as Shungites in Karelia, Russia. A fullerene is any molecule composed entirely of carbon, in the form of a hollow sphere, ellipsoid, or tube molecular structure.

The survey revealed that most people believe devices change the way we behave and that devices, in particular mobile phones, are a requirement of modern life: 80% stating they are important to their everyday. The dichotomy between this and that the majority do not like having their phone with them sometimes, (a third of which sometimes don't like having them with them **even if it is switched off**), was a striking result.

The outcomes in this thesis achieved the same standards of aesthetic and functionality as consumer products. They were placed in a consumer context in an online store, (www.device-shifting.com). Unfortunately an online store does not place them entirely in the same context as the devices they are intended for. Ideally they would be in a retail environment side by side with the devices they were designed for. A retail environment was unfeasible, firstly because they could not be sold due to their limited number, and secondly because it was not possible to persuade a store to stock them even as an experiment or for documentation. Regardless of the point-of-sale, product aesthetics and functionality satisfactorily exhibit consumer rhetoric.

Device Shifting is an ongoing process. The principles defined in this thesis intend to promote further discussion about devices, their context, mass production and use. It seeks to further define the role of artists, critical designers and designers - each may share similar processes but should result in clearly defined outcomes - unless this is part of the intended rhetoric. To reiterate Dunne and Raby's statement on the difference between art and critical design,

'We expect art to be shocking and extreme. Critical Design needs to be closer to the everyday, that's where its power to disturb comes from. Too weird and it will be dismissed as art, too normal and it will be effortlessly assimilated. If it is regarded as art it is easier to deal with, but if it remains as design it is more disturbing, it suggests that the everyday as we know it could be different, that things could change (37).'

Although the outcomes in this thesis adhere to the principles of Device Shifting, they edge toward 'too normal' and could easily be assimilated; negating their critical value. This does not, however, suggest the principles of Device Shifting are to be dismissed, as it is an inherently ongoing process.

Device Shifting proposes an approach to applied critical design. It accepts that life with technology and devices will continue to suffuse with our everyday. If we are to accept this, and it seems we already have, we must also accept that the production, development and distribution of

technologically rich devices is driven by the bottom line of the corporations capable of producing them. Applied critical design in the form of Device Shifting is one method by which to provoke questions and spark debate about the seemingly incongruous relationship between corporations, devices, people and everyday life.

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12. Glossary

Architected Experience - architected in the same way a structural architect designs a building to be lived in. Experience that is not born of nature. It is not a walk in the forrest - it is receiving an SMS while walking in the forrest.

Cybernalities - as we store information about ourselves online we generate or illustrate our personalities in cyberspace: cybernalities are our cyberspace personalities that exist when we are not online.

Inherent Potential - Inherent potential relates to massively multifunctional devices, inconsequential photography and mass storage, and the ever-connectedness of mobile devices.

13. Appendix #1

13.1. Laser Cutter Package Design Templates

The final package designs that were used for the laser cutter are documented below.

The colours indicate Red = cut, Green = fold and Black = engrave.

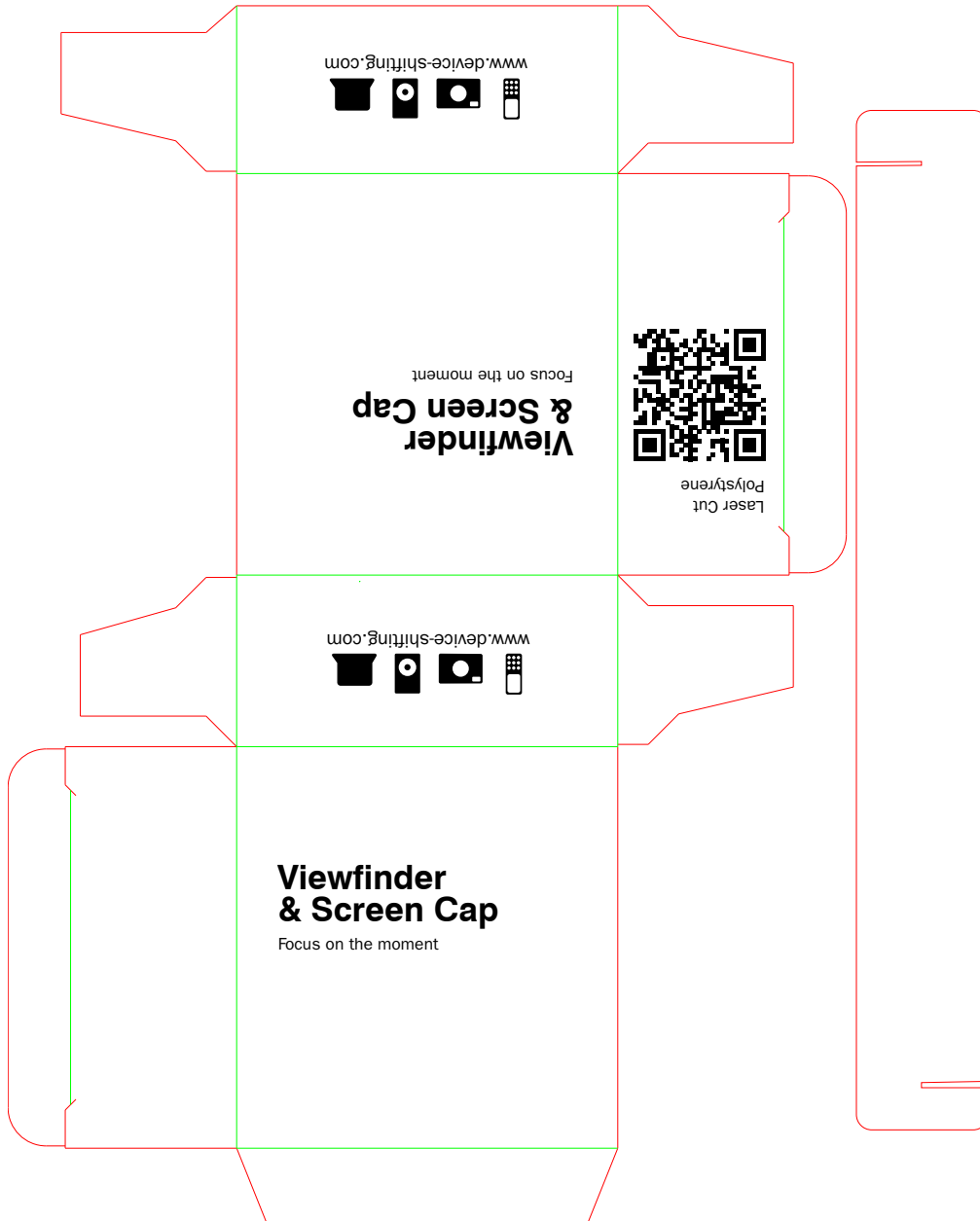


Figure 56 - Viewfinder & Screen Cap laser cutter template.

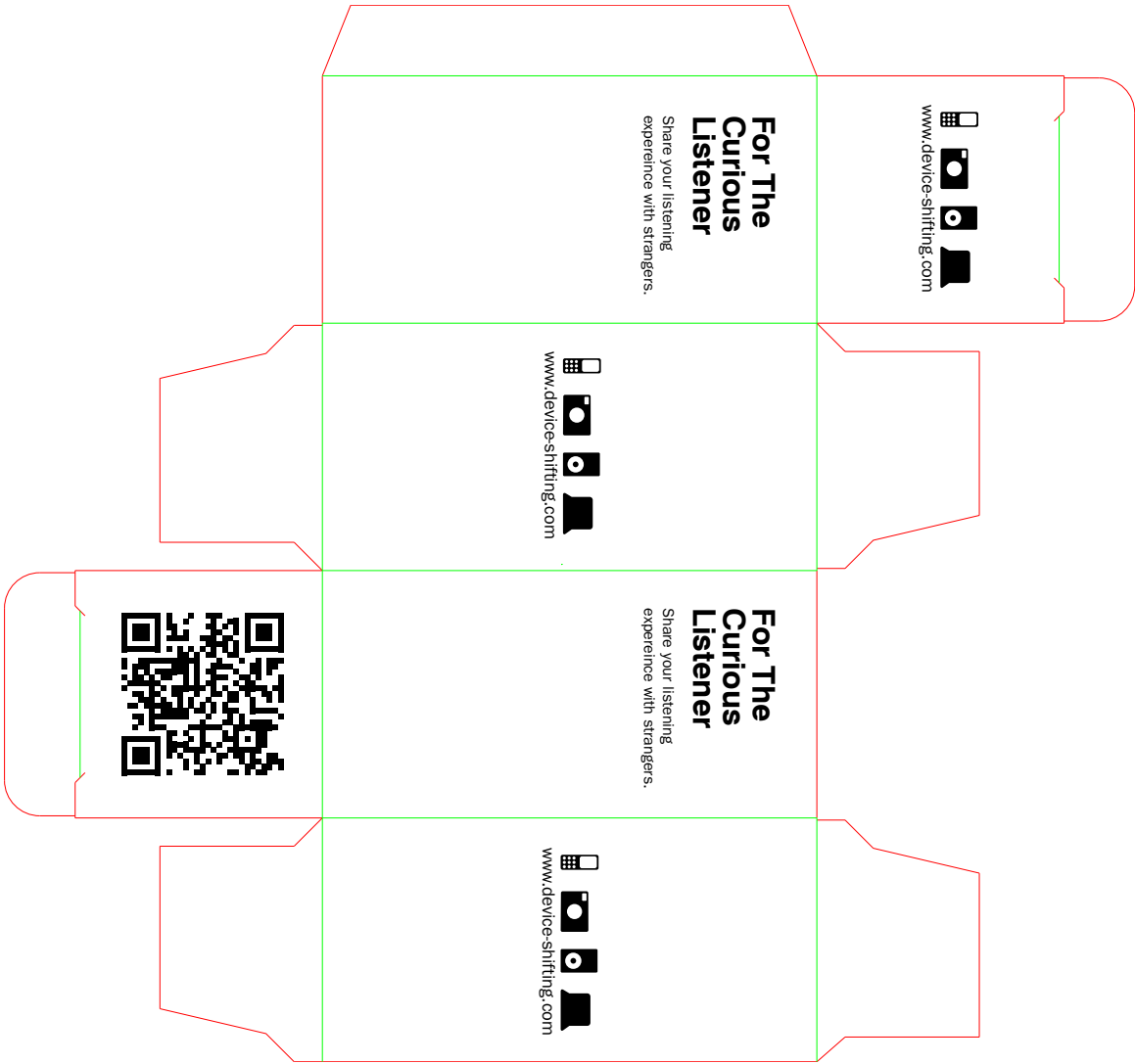


Figure 57 - For The Curious Listener laser cutter template.

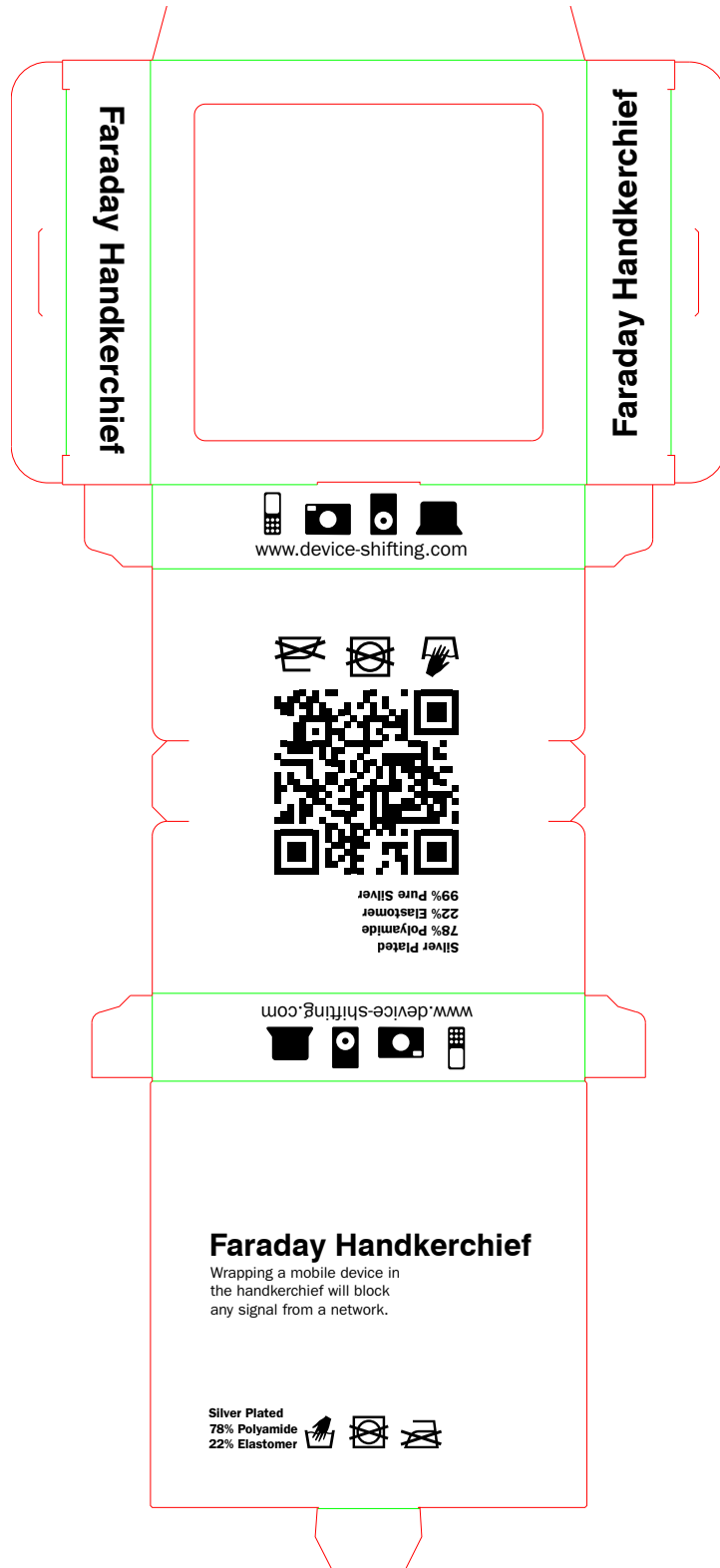


Figure 58 - Faraday Handkerchief laser cutter template.

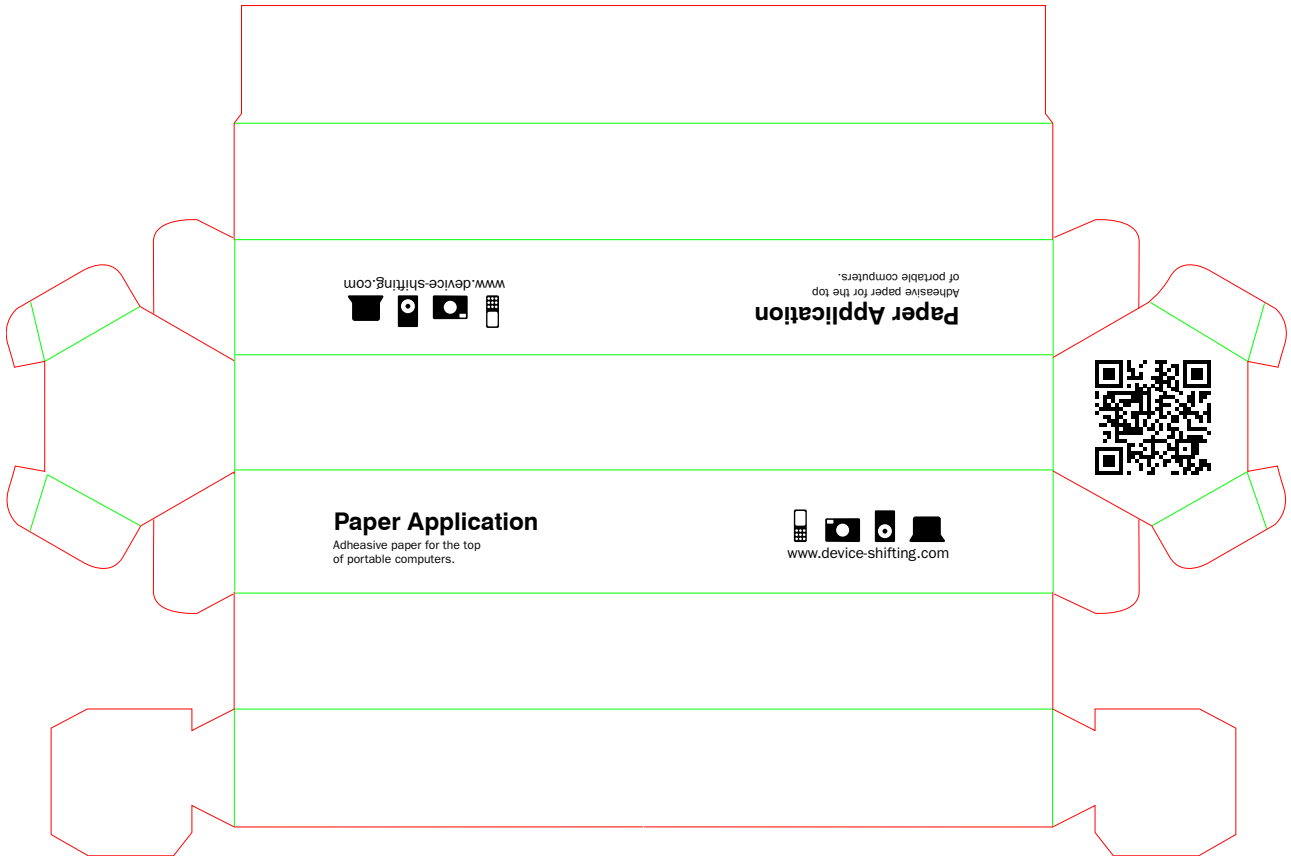


Figure 59 - Paper Application laser cutter template.

14. Appendix #2

14.1. Process Documentation



Figure 60 - Mockup of For The Curious Listener

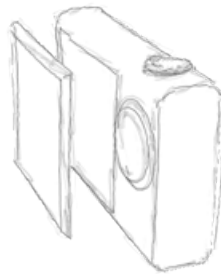


Figure 61 - Sketch for Viewfinder and Screen Cap



Figure 62 - Rendering of Viewfinder & Screen Cap



Figure 63 - Sketch for the Paper Application



Figure 64 - First test of faraday cage for the mobile phone. It worked wrapping it in tin foil which led me to try it with conductive fabric.



Figure 65 - Faraday Handkerchief laser cut and etched package design prototype.

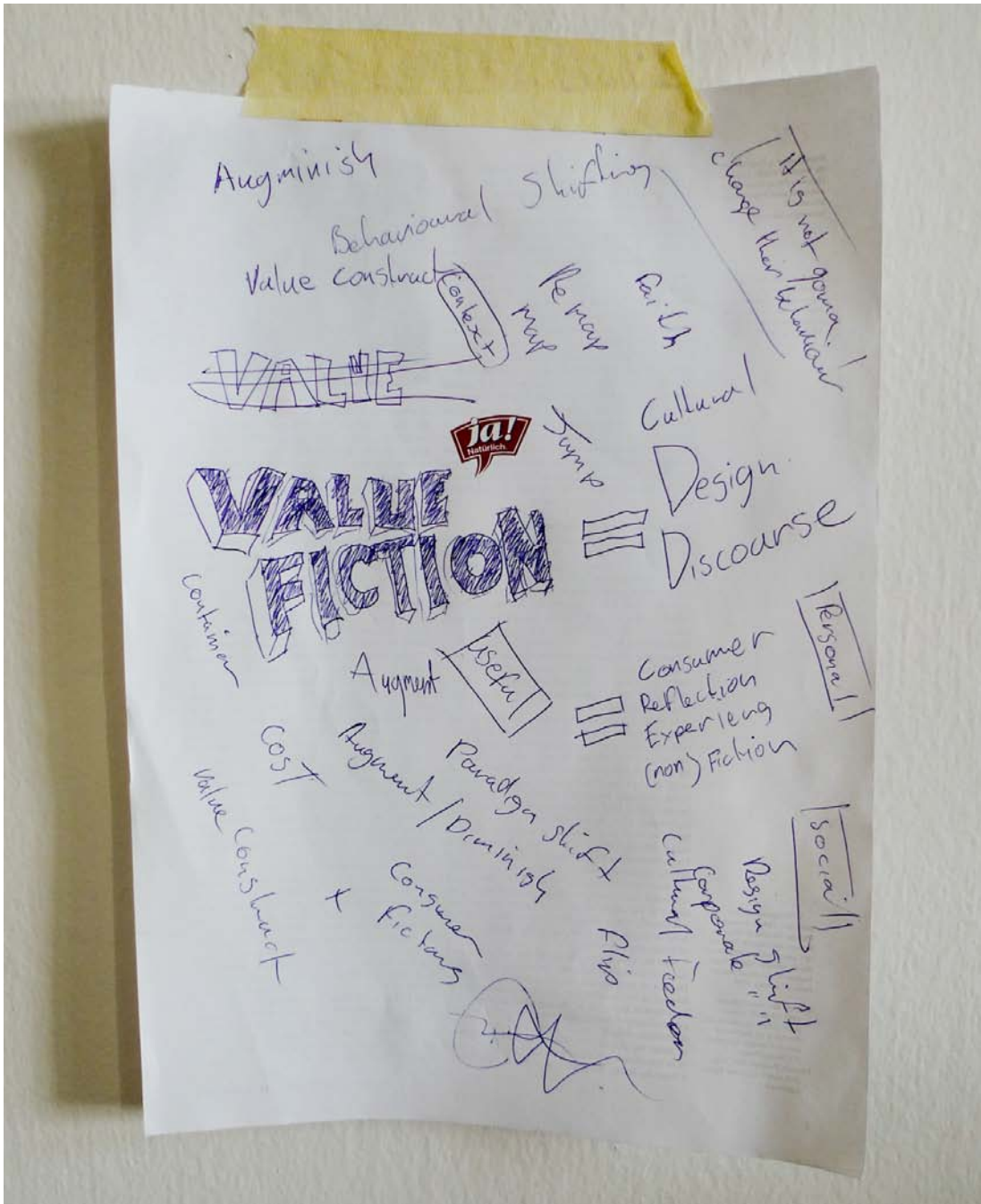
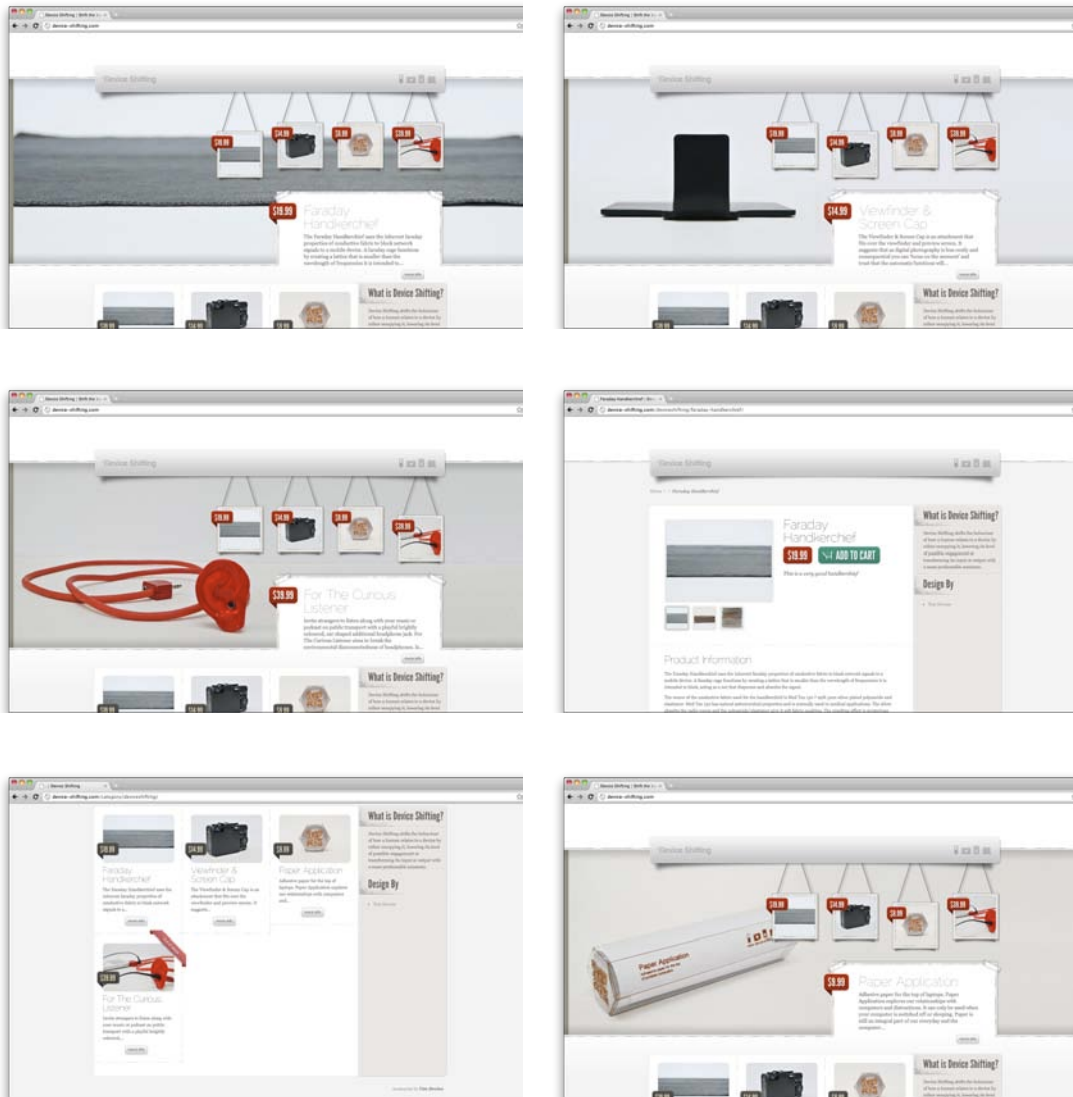


Figure 66 - Device Shifting brainstorming, at the top of the sheet reads 'Behavioural Shifting', the initial term.

15.Appendix #3

15.1. Device Shifting eStore - www.device-shifting.com



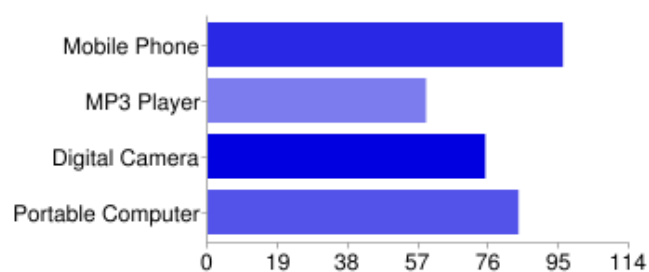
16. Appendix #4

16.1. Survey and Summary of Results

103 [responses](#)

Summary [See complete responses](#)

What devices do you use?



Mobile Phone	96	96%
MP3 Player	59	59%
Digital Camera	75	75%
Portable Computer	84	84%

People may select more than one checkbox, so percentages may add up to more than 100%.

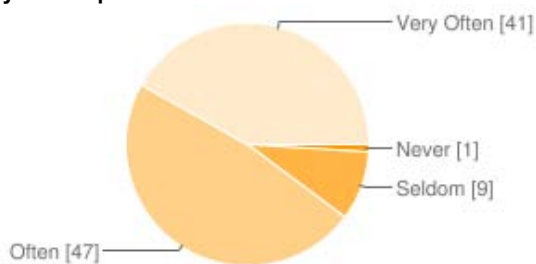
Mobile Phone

Complete this section if you answered YES to using a mobile phone.

What is the model of your phone

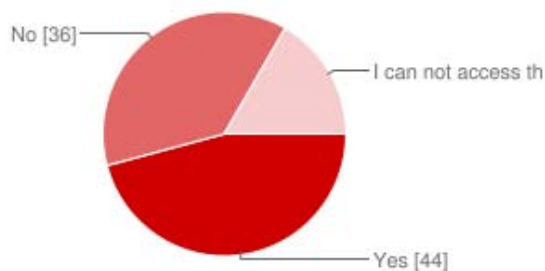
Samsung Shit Sony Erricson nokia, blackberry iPhone 3G iphone Nokia 6500c iPhone 4 nokia n96 iphone 3gs Samsung Galaxy Spica Nokia 6650fold Samsung, 4-Jahre altes Klapphandy nokia 6280 X10 iPhone 2G Android HTC Ma ...

I use my mobile phone



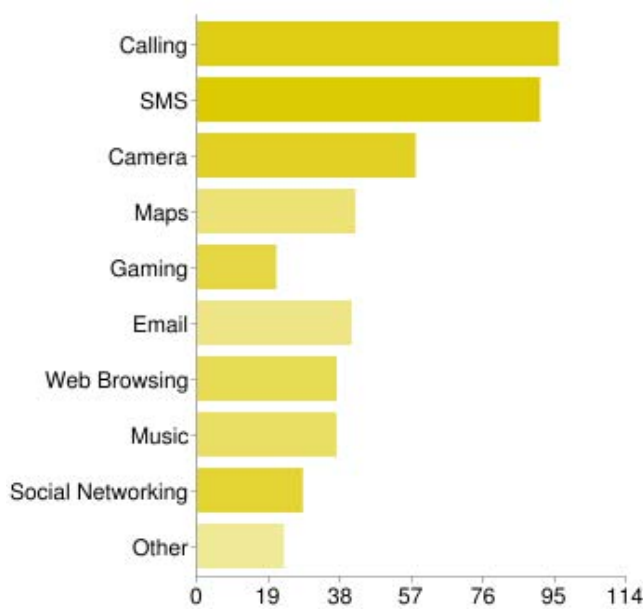
Never	1	1%
Seldom	9	9%
Often	47	46%
Very Often	41	40%

I use my phone to access the internet



Yes	44	43%
No	36	35%
I can not access the internet on my mobile phone	16	16%

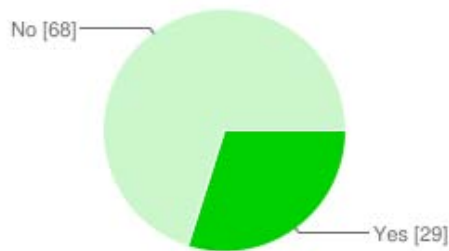
What do you use your phone for?



Calling	96	99%
SMS	91	94%
Camera	58	60%
Maps	42	43%
Gaming	21	22%
Email	41	42%
Web Browsing	37	38%
Music	37	38%
Social Networking	28	29%
Other	23	24%

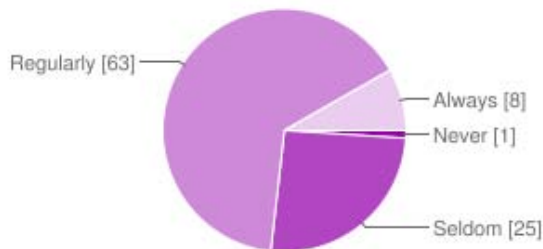
People may select more than one checkbox, so percentages may add up to more than 100%.

Have you purchased applications for your phone?



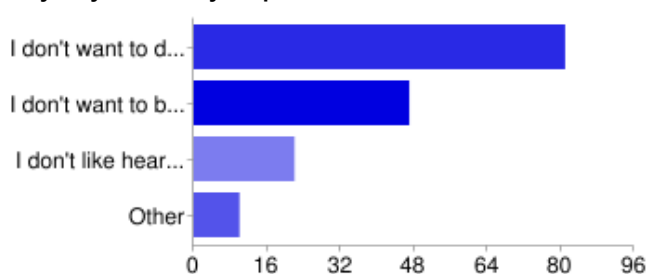
Yes	29	28%
No	68	66%

How often do you switch your phone to silent or vibrate?



Never	1	1%
Seldom	25	24%
Regularly	63	61%
Always	8	8%

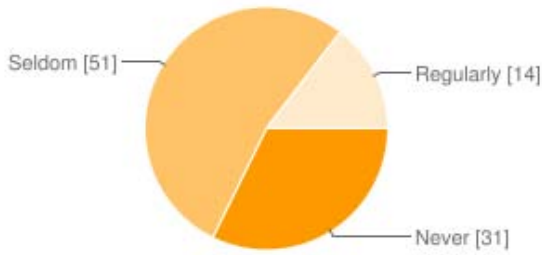
Why do you switch your phone to silent?



I don't want to disturb others	81	86%
I don't want to be disturbed	47	50%
I don't like hearing ringtones	22	23%
Other	10	11%

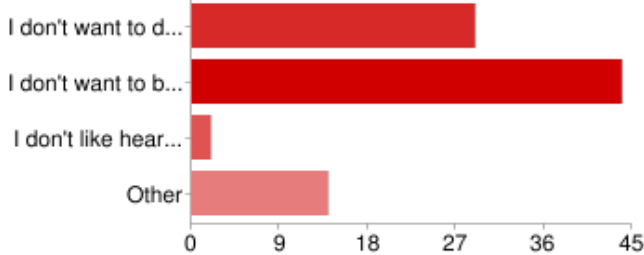
People may select more than one checkbox, so percentages may add up to more than 100%.

How often do you switch your phone off?



Never	31	30%
Seldom	51	50%
Regularly	14	14%

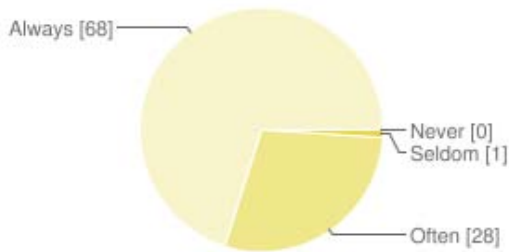
Why do you switch your phone off?



I don't want to disturb others	29	43%
I don't want to be disturbed	44	65%
I don't like hearing ringtones	2	3%
Other	14	21%

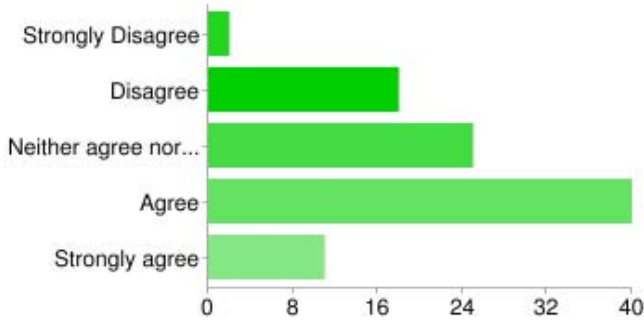
People may select more than one checkbox, so percentages may add up to more than 100%.

When do you carry your phone with you?



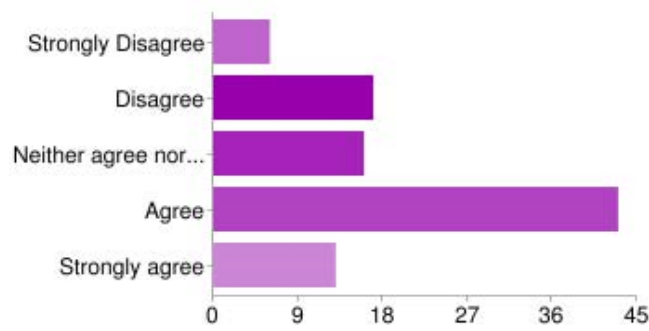
Never	0	0%
Seldom	1	1%
Often	28	27%
Always	68	66%

I am using my phone just by having it with me.



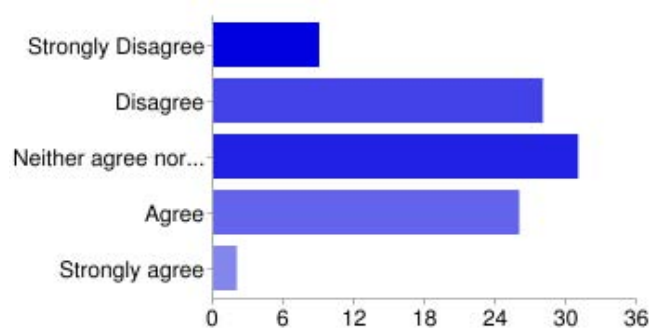
Strongly Disagree	2	2%
Disagree	18	17%
Neither agree nor disagree	25	24%
Agree	40	39%
Strongly agree	11	11%

Sometimes I don't like having my phone with me.



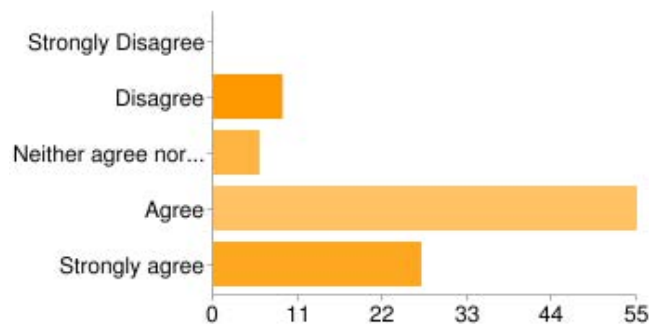
Strongly Disagree	6	6%
Disagree	17	17%
Neither agree nor disagree	16	16%
Agree	43	42%
Strongly agree	13	13%

Sometimes I don't like having my phone with me - even if it is switched off.



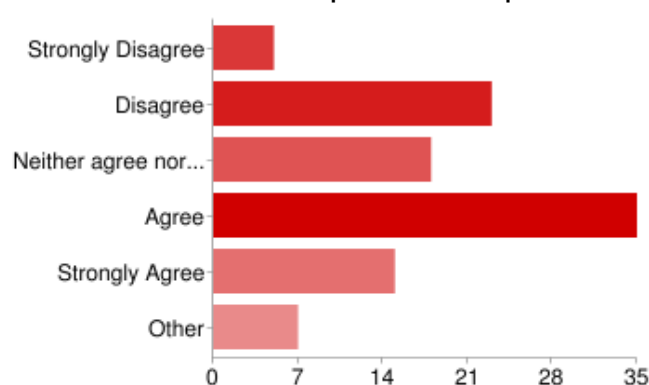
Strongly Disagree	9	9%
Disagree	28	27%
Neither agree nor disagree	31	30%
Agree	26	25%
Strongly agree	2	2%

My phone is important in my everyday.



Strongly Disagree	0	0%
Disagree	9	9%
Neither agree nor disagree	6	6%
Agree	55	53%
Strongly agree	27	26%

I don't choose to own a mobile phone - it is a requirement in modern life.

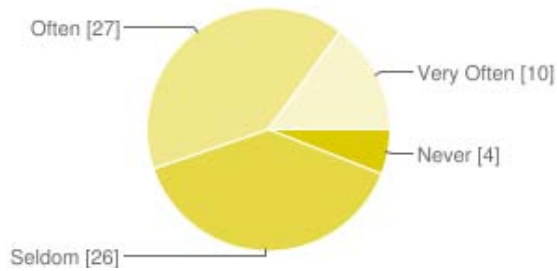


Strongly Disagree	5	5%
Disagree	23	22%
Neither agree nor disagree	18	17%
Agree	35	34%
Strongly Agree	15	15%
Other	7	7%

MP3 Player

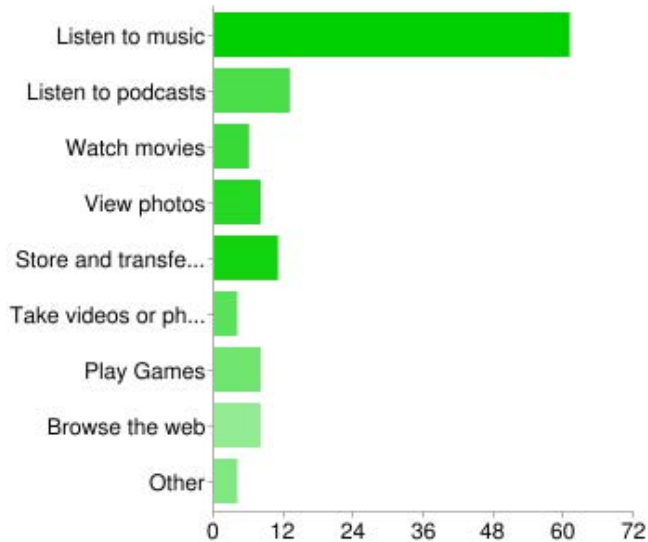
Complete this section if you answered YES to using an MP3 player.

I use my MP3 player



Never	4	4%
Seldom	26	25%
Often	27	26%
Very Often	10	10%

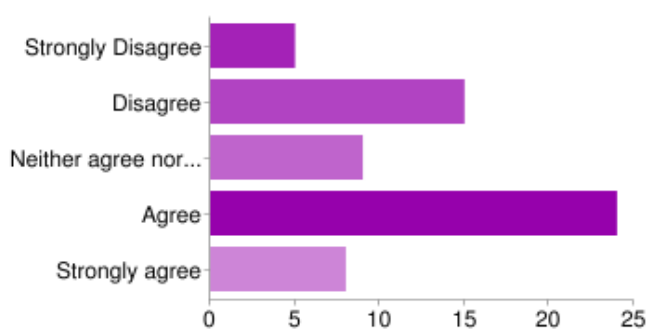
I use my MP3 player to



Listen to music	61	98%
Listen to podcasts	13	21%
Watch movies	6	10%
View photos	8	13%
Store and transfer data	11	18%
Take videos or photos	4	6%
Play Games	8	13%
Browse the web	8	13%
Other	4	6%

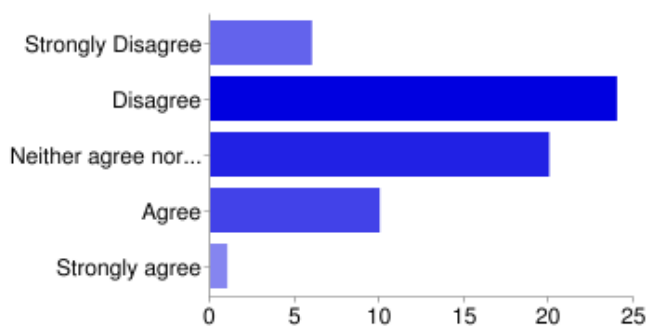
People may select more than one checkbox, so percentages may add up to more than 100%.

I feel disconnected from the environment around me when using my MP3 player



Strongly Disagree	5	5%
Disagree	15	15%
Neither agree nor disagree	9	9%
Agree	24	23%
Strongly agree	8	8%

I don't like being surrounded by people with headphones on - regardless if I can hear what they are listening to.

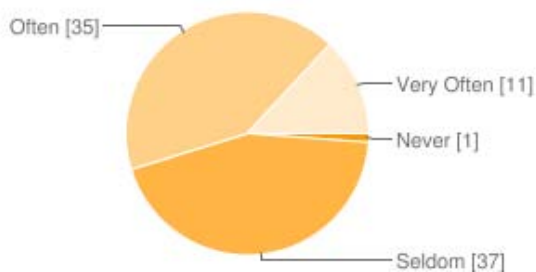


Strongly Disagree	6	6%
Disagree	24	23%
Neither agree nor disagree	20	19%
Agree	10	10%
Strongly agree	1	1%

Digital Camera

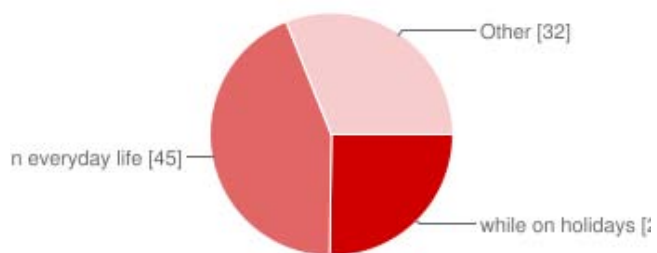
Complete this section if you answered YES to using a digital camera.

I use my digital camera



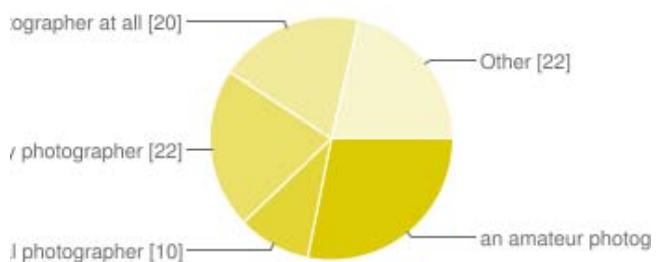
Never	1	1%
Seldom	37	36%
Often	35	34%
Very Often	11	11%

I use my digital camera mostly



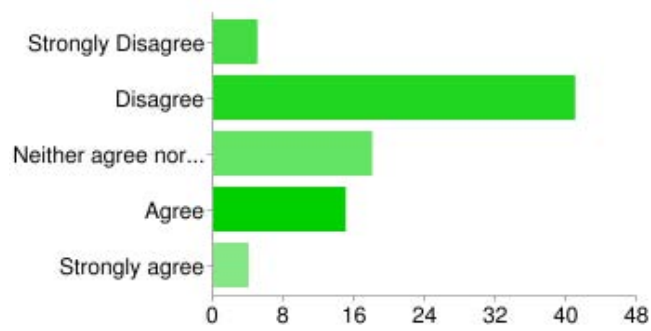
while on holidays	26	25%
in everyday life	45	44%
Other	32	31%

I would consider myself



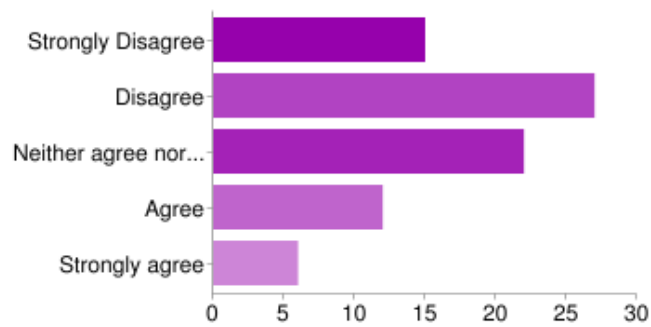
an amateur photographer	29	28%
a professional photographer	10	10%
a hobby photographer	22	21%
not a photographer at all	20	19%
Other	22	21%

I often take too many photos



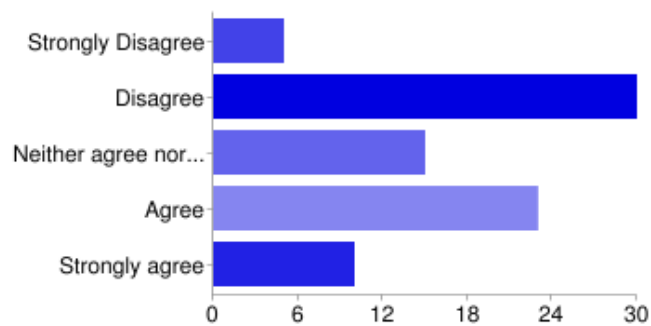
Strongly Disagree	5	5%
Disagree	41	40%
Neither agree nor disagree	18	17%
Agree	15	15%
Strongly agree	4	4%

I would prefer somebody else to take photos for me



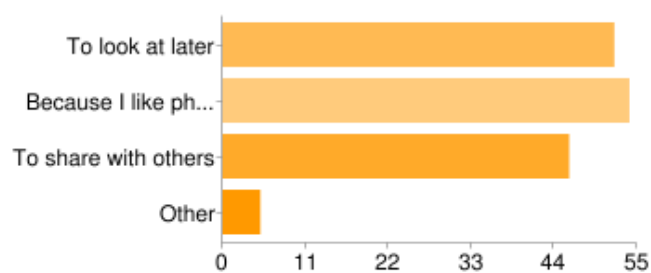
Strongly Disagree	15	15%
Disagree	27	26%
Neither agree nor disagree	22	21%
Agree	12	12%
Strongly agree	6	6%

I sometimes feel taking photos takes me out of the moment.



Strongly Disagree	5	5%
Disagree	30	29%
Neither agree nor disagree	15	15%
Agree	23	22%
Strongly agree	10	10%

Why do you take photos?

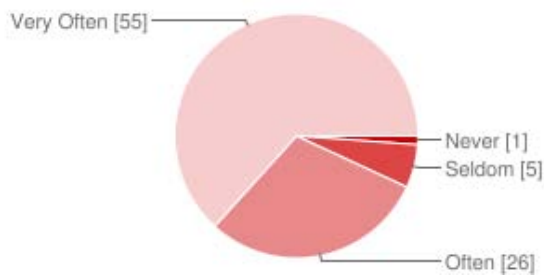


To look at later	52	65%
Because I like photography as a medium	54	68%
To share with others	46	57%
Other	5	6%

People may select more than one checkbox, so percentages may add up to more than 100%.

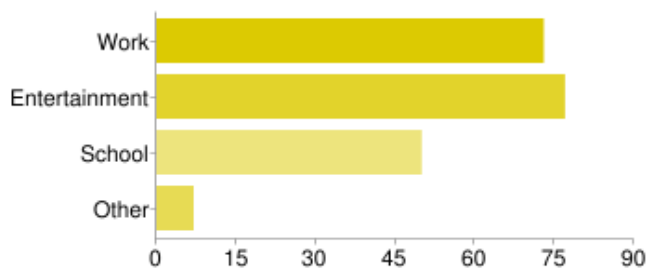
Complete this section if you answered YES to using a portable computer.

I use my portable computer



Never	1	1%
Seldom	5	5%
Often	26	25%
Very Often	55	53%

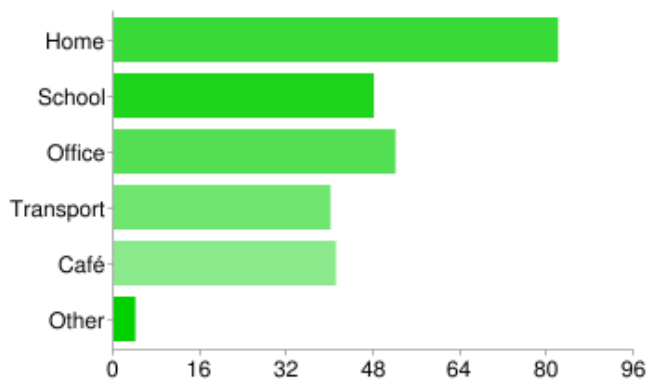
I use my portable computer for



Work	73	85%
Entertainment	77	90%
School	50	58%
Other	7	8%

People may select more than one checkbox, so percentages may add up to more than 100%.

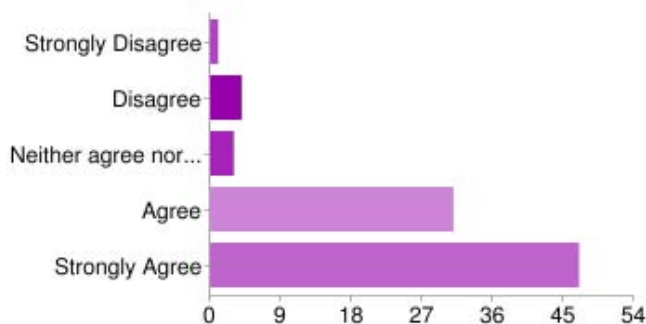
I use my portable computer at ...



Home	82	95%
School	48	56%
Office	52	60%
Transport	40	47%
Café	41	48%
Other	4	5%

People may select more than one checkbox, so percentages may add up to more than 100%.

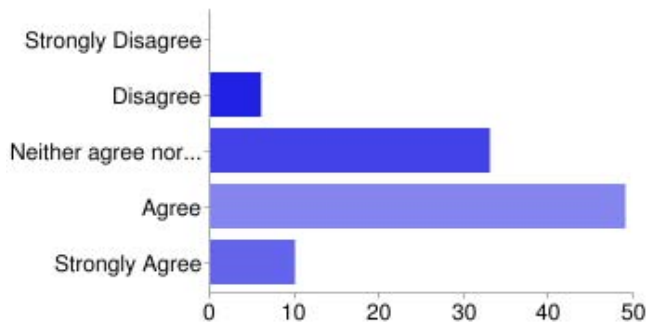
My portable computer is important in my everyday



Strongly Disagree	1	1%
Disagree	4	4%
Neither agree nor disagree	3	3%
Agree	31	30%
Strongly Agree	47	46%

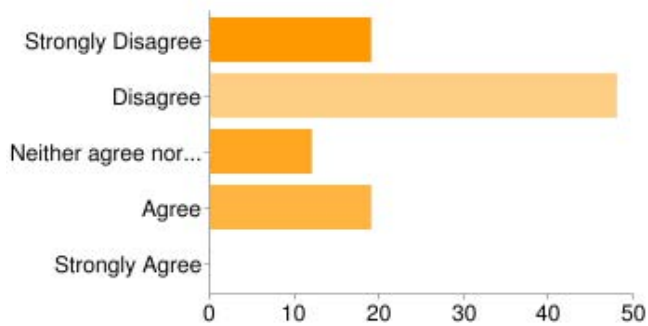
Life With Devices.

Devices make life better



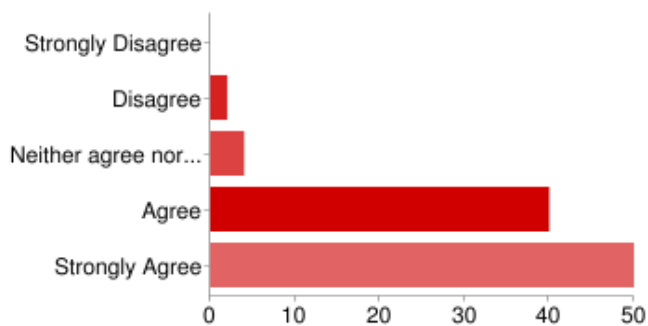
Strongly Disagree	0	0%
Disagree	6	6%
Neither agree nor disagree	33	32%
Agree	49	48%
Strongly Agree	10	10%

As soon as a new version of my device is released it feels less functional



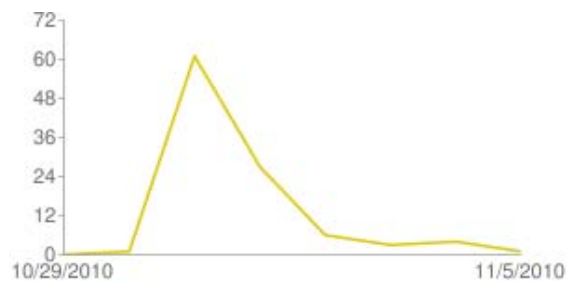
Strongly Disagree	19	18%
Disagree	48	47%
Neither agree nor disagree	12	12%
Agree	19	18%
Strongly Agree	0	0%

Our behaviour has changed because of devices



Strongly Disagree	0	0%
Disagree	2	2%
Neither agree nor disagree	4	4%
Agree	40	39%
Strongly Agree	50	49%

Number of daily responses



Devices In Our Everyday.

This survey is for my masters thesis research it will take about a minute. Please forward it to as many people as you feel comfortable.

What devices do you use?

- Mobile Phone
- MP3 Player
- Digital Camera
- Portable Computer

Mobile Phone

Complete this section if you answered YES to using a mobile phone.

What is the model of your phone

I use my mobile phone

- Never
- Seldom
- Often
- Very Often

I use my phone to access the internet

- Yes
- No
- I can not access the internet on my mobile phone

What do you use your phone for?

- Calling
- SMS
- Camera
- Maps
- Gaming
- Email
- Web Browsing
- Music
- Social Networking
- Other:

Have you purchased applications for your phone?

- Yes
- No

How often do you switch your phone to silent or vibrate?

- Never
- Seldom
- Regularly
- Always

Why do you switch your phone to silent?

- I don't want to disturb others
- I don't want to be disturbed
- I don't like hearing ringtones
- Other:

How often do you switch your phone off?

- Never
- Seldom
- Regularly

Why do you switch your phone off?

- I don't want to disturb others
- I don't want to be disturbed
- I don't like hearing ringtones
- Other:

When do you carry your phone with you?

- Never
- Seldom
- Often
- Always

I am using my phone just by having it with me.

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Sometimes I don't like having my phone with me.

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Sometimes I don't like having my phone with me - even if it is switched off.

- Strongly Disagree
- Disagree
- Neither agree nor disagree

- Agree
- Strongly agree

My phone is important in my everyday.

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

I don't choose to own a mobile phone - it is a requirement in modern life.

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly Agree
- Other:

MP3 Player

Complete this section if you answered YES to using an MP3 player.

I use my MP3 player

- Never
- Seldom
- Often
- Very Often

I use my MP3 player to

- Listen to music
- Listen to podcasts
- Watch movies

- View photos
- Store and transfer data
- Take videos or photos
- Play Games
- Browse the web
- Other:

I feel disconnected from the environment around me when using my MP3 player

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

I don't like being surrounded by people with headphones on - regardless if I can hear what they are listening to.

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Digital Camera

Complete this section if you answered YES to using a digital camera.

I use my digital camera

- Never
- Seldom
- Often
- Very Often

I use my digital camera mostly

- while on holidays
- in everyday life
- Other:

I would consider myself

- an amateur photographer
- a professional photographer
- a hobby photographer
- not a photographer at all
- Other:

I often take too many photos

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

I would prefer somebody else to take photos for me

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

I sometimes feel taking photos takes me out of the moment.

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Why do you take photos?

- To look at later
- Because I like photography as a medium
- To share with others
- Other:

Portable Computer

Complete this section if you answered YES to using a portable computer.

I use my portable computer

- Never
- Seldom
- Often
- Very Often

I use my portable computer for

- Work
- Entertainment
- School
- Other:

I use my portable computer at ...

- Home
- School
- Office
- Transport
- Café
- Other:

My portable computer is important in my everyday

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly Agree

Life With Devices.

Devices make life better

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly Agree

As soon as a new version of my device is released it feels less functional

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly Agree

Our behaviour has changed because of devices

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly Agree

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