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“Why can’t we integrate sustainable design with mobile phones?”

Abstract

Mobile phones have become an integral part of our daily life. Retrieving information has never been easier with current phones offering an array of features such as GPS and Internet access. However, a new mobile phone is released almost every week, and it has become common practice to get a new mobile phone at the end of every year’s contract since they are often offered as free with the new contract. But what then happens to the mobile phone you are upgrading *from*? Many are forgotten, most are thrown away, very few are recycled. Discarding such a high-tech piece of equipment as though it were as easy as balling up a piece of paper and throwing it in the bin surely cannot be sensible. Why do mobile phones only last for just over a year, and what are the effects of all of this high-tech electronic waste that we are generating?

Keywords

Environmental, recycling, sustainable, mobile, design.

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Chapter 1. Introduction.

Mobile devices are designed with a built-in obsolescence in order to maintain high levels of demand for the latest upgrade. Products of a much higher specification are available but not released until the previous range has sold as much as possible. The result of this 'drip feeding' is a massive amount of mobile devices that are only a couple of years old being thrown into landfills. The 'upgrade' culture of today's society may be fast and cheap, but it is not environmentally aware and a lot of perfectly good materials and technology are discarded. Why can we not design mobile devices that are environmentally safe? And failing that, can we not repurpose these old mobile devices? Why can we not design products that last longer than 18 months?

Mobile phones make up a small percentage of all of the electronic devices that are thrown away every year. There is no need to put an electronic device in a landfill. They can be recycled, or at the very least given to someone else so that they are used to their maximum physical life. "Discarded electronics account for approximately 70 percent of the heavy metals and 40 percent of the lead now found in U.S. landfills." Grossman (2006:7) The materials used in the manufacture of electronics devices, and specifically mobile phones, are far from abundant, and although we are currently living in a time of happy ignorance, sooner or later the effects of our over consumption of natural resources will start to become painfully apparent. Chapman (2005: 8) sums this up in a series of startling facts. "Over 90 per cent of the resources taken out of the ground today become waste within only three months." And, "During the past 50 years alone, the human race has stripped the world of a quarter of its topsoil". Finally, and most shocking of all, he quotes Burnie (2005: 5) "In total, one third of all the planet's resources have been consumed within the past four decades."

One cannot blame the public for doing this, since although we happily buy what we are presented with, it should up be the manufacturers that sell these products to us to take some responsibility. After all, they are the ones doing the harvesting, mining and refining in order to make us our mobile phones,

“our embrace of the disposable has contributed to the proliferation of waste and to making the consumers and taxpayers, rather than manufacturers, responsible for that waste”. Grossman (2006: 263)

However, the mobile phone market is huge, as this article on the BBC website states, “by 2009 more than four billion people in the world - out of a population of 6.3 billion - are expected to have a mobile phone connection in their lives.”¹ So, there is too much money to be made in too short an amount of time for people to really consider if what they are doing is going to have an impact five, ten, twenty or a hundred years down the line.

Humans are the only species on the planet capable of producing waste. Waste is material(s) that is un-useable to all species on earth. However, it is not in our nature to be this way, as Chapman (2005: 9) points out, “consumers of the 1900s were not born wasteful, they were trained to be so by the sales-hungry teachings of a handful of industries bent on market domination”.

Over the last twenty years, the mobile phone industry has become incredibly lucrative incredibly fast; products are built with a very short expected lifespan since the technology offered is upgradeable every year. There are many companies that promote their brand new, feature packed mobile device with little regard for what will happen to the older model that it is replacing. There are millions of old mobile phones containing hazardous materials sitting in landfills when they could have been recycled, and we will be looking at why these mobile devices have obsolete within 18 months of buying them and what happens to these mobiles that we are upgrading from.

We must define the terms set out in the question. To start with, sustainable design can be understood in two ways:

- First, as design that is recyclable, so that either the parts of the product are biodegradable and not harmful to the environment, or that the parts of the product are reused.

¹ BBC online article discussing Nokia’s research techniques
<<http://news.bbc.co.uk/1/hi/technology/6698075.stm>>

- Second, as durable design. This means that a product is so well designed that it remains functional well beyond any of its competitors.

At this point, it is necessary to describe what exactly is a mobile device. There are many examples of the features available on a mobile device, for example: mobile phone, PDA, black berry, MP3 player, camera, organizer, radio, email, Internet and TV. The Wikipedia website is quoted here saying that a mobile device is commonly know to be a handheld computer “typically utilising a small visual display screen for user output and a miniaturised keyboard for user input”.² In the last few years, the mobile phone has evolved into a unit that is composed of all of the above features, and although there are mobile devices available that perform just one of the above features, and there are others that perform all of the features mentioned, here we will be looking at the mobile phone as the key product.

The focus of the question “Why can’t we integrate sustainable design with mobile devices?” will be on mobile devices that are currently being manufactured by big brands such as Nokia and Apple. Apple’s iPhone is a good example to use since it is a current design, and although it may be revolutionary in its functionality, its reviews are mixed and it is unclear as to whether it has been sustainably designed.

Over the last year, the media has focussed heavily on the amount of damage we are all doing to the planet, and new words such as ‘carbon footprint’ have emerged to measure this damage exactly. This has left the public with a sense of guilt and has started to change the way people look at products. This in turn has put pressure on all manufacturers to show that they are making a conscious effort to cut their carbon emissions by being more environmentally friendly. Whether companies are actually making the effort rather than making a series of empty gestures is going to be investigated.

² Wikipedia online description of the mobile device
<http://en.wikipedia.org/wiki/Mobile_device>

Earlier mobile phones (pre turn of the century) that are not multifunctional and performed simple functions such as just phone calls and text messaging that are now obsolete and lying around in vast numbers either in landfills or in forgotten corners. They could have been recycled but weren't since the manufacturers weren't yet bound by the European Union's WEEE laws. We will be looking at the damage they are causing now, as they sit in their millions in landfills all over the world.

Chapter 2. Literature Review.

2.1 Planned obsolescence.

In order to establish the impact of planned obsolescence of mobile devices on the environment we will need to look at its effects. Since the mid 18th century, humans have been leading an increasingly "resource hungry existence"; and as a result "one third of all of the planet's resources have been consumed within the past four decades". (Chapman 2005: 5).

Built-in obsolescence, or planned obsolescence is no unfortunate problem; it intentionally emerged during the 1950s in the USA as part of the strategies of large corporations. It meant that a product was designed so that it would have a short life because it was either not durable enough, or that it went out of fashion. And fashion relies on styling. Once the consumer is loyal to a particular brand because of whatever reason, be it a particular company's customer service, or the way they advertise their products, the consumer would then buy within the range of available products. Thus, the consumer is hooked, and everyone involved in the product (from design to sales) is guaranteed work. This is of course, unfair to the consumer, and as the Thames & Hudson Dictionary of 20th Century Design and Designers (1993: 146) quotes Vance Packard, who strongly opposed planned obsolescence since he saw this as an "insidious manipulation of consumers as well as being environmentally unjustifiable." Left with no choice, the consumer must buy

products (either knowingly, or unknowingly) that are designed to break or become unfashionable within a short period of time. A statement on the Envocare website puts this practice into figures, “users on average replace mobiles every 18 months; 15 million are discarded in the UK each year but only 4% are recycled.”³

2.2 A Brief History of the Mobile Phone.

To be able to understand the speed at which mobile phones have come into existence; from being available to only a select few people, to becoming a device that is so important, most people (in the developed world) won't leave their home without it, we need to look at a brief history of the mobile phone found on the Wikipedia website.

The mobile phone began as mobile rigs; two way radios in taxis and police cars. These were permanently fixed in the vehicles, and soon became portable phones when they were equipped with chargers that plugged into the cigarette lighter. Radiotelephony was introduced in Europe in 1926 where it was used on trains and airplanes in Germany, and then subsequently installed in tanks during the Second World War. It was not until 1950s that people without extensive training were able to use radiotelephony. From the 1950s onwards, mobile phones existed only as heavy units that were only just portable (weighing in at around 9kg). It was on April 3rd, 1973 that Motorola employee Dr. Martin Cooper made history when he “placed a call to rival Joel Engel, head of research at AT&T's Bell Labs, while walking the streets of New York City talking on the first Motorola Dynastic prototype.”⁴ This was really the start of the mobile phone as we know it today, and the DynaTAC model is more commonly known as the first ‘brick’ phone. Ten years later, in 1983, the Motorola DynaTAC 8000X was available to the public, and was unique in the

³ Envocare website, <http://www.envocare.co.uk/mobiles_telephone_equipment.htm>

⁴ A detailed history of the mobile phone can be found here:
<http://en.wikipedia.org/wiki/History_of_mobile_phones>

way that it was realistically portable. There were other 'portable' phones available, but these had been designed to operate from a car (hence 'car phone') and if you wanted to walk around with it, you had to carry a briefcase-sized unit to power it. Motorola's DynaTAC 'brick' phone was the epiphany of the first generation of mobile phones (1G), and in the 1990s the second generation (2G) phones started to emerge. 2G phones were much smaller (weighing between 100-200 grams) and were rapidly introduced due to advances in battery technology and the increasing demand for them. Soon after 2G phones, the 3G (yes, you've guessed it, third generation) mobile phones were released and that is where we are currently at today. Examples of common features on a 3G mobile phone are: video calling, phone camera, and Internet access.

The mobile phone might have become smaller, but this does not mean that less materials are being used in its manufacture "Miniaturization is not dematerialization" Grossman (2006: 9).

2.3 The Mobile Phone as a fashionable product.

As mobile phone use and ownership quickly became widespread in the developed world during the 1990s, it soon became fully integrated with everyday life. The mobile phone moved on to become a product that offered either a distinct look and feel or excellent functionality, or both. Here, we will look at an example of a mobile phone that has very recently come onto the market, the Apple iPhone. The reason for doing this is to demonstrate the effectiveness of Apple's advertising to create media hype well above the reality.



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Apple's iPhone is advertised as being *the* phone at the forefront of design. The iPhone is revolutionary in its interface (touch screen, only one button – the home button) and features such as being able to flip through images and video and magnify by 'pinching' the image. It combines three products into one device: the mobile phone, the iPod, and mobile Internet. Although it does offer the latest in touch screen technology and fashion, reviews have been mixed since it lacks some basic features such as this online review states there is: no video recording, flash support, instant messaging, direct access to the iTunes Store, and no way of using your digital music tracks as ring tones."⁶ However, people do not seem to care. It is possible then to entice a massive following to a new mobile device despite any warnings that "it lacks features found even on the most basic phones" since once you have purchased one, you can be self assured that you are part of an elite 'club'; a group of people who can afford to buy the latest gadget regardless of its flaws. This desire to be fashionable and to be the first person amongst your group of friends to own an iPhone is a sense of elitism that Apple have worked very hard to achieve.

⁵ The Apple iPhone image and reviews are online at <http://www.orbitcast.com/archives/the_competition/>

⁶ Tech Digest website, online review of Apple's iPhone <http://techdigest.tv/2007/06/first_iphone_re.html>

2.4 What goes into a mobile device?

Due to the sheer scale of the amount of mobile phones that are produced each year, then followed by the amount of last year's phones that are thrown away, surely this must be having some sort of an impact on the environment and ourselves. What is it exactly that is so dangerous about not properly recycling them? Mobile phones are manufactured from a cocktail of chemicals that are safe when recycled in a controlled environment. However, when they are not recycled in this way, they can release harmful toxic materials.

It is very difficult to get an exact list of all of the materials and chemicals that are used by manufacturers to make a mobile phone since they are trade secrets, and these lists change as new ranges of products are developed. However, Elizabeth Grossman does list some of them in her book 'High-tech Trash' (2006: 7) as being: "brominated flame retardants [...] used in plastics that house electronics and circuit boards. Copper, antimony, beryllium, barium, zinc, chromium, silver, nickel, and chlorinated and phosphorous-based compounds, as well as polychlorinated biphenyls (PCBs), nonylphenols, and phthalates, are some of the hazardous and toxic substances used in high-tech electronics."

The reason why you don't want these chemicals anywhere near you is because, "heavy metals cause neurological damage, adversely affect foetal development, and reproductive systems, are known to cause kidney disease, and some are recognised carcinogens" Grossman 2006: 18). The electronics in landfills leak these chemicals, which seep into groundwater, which is then drunk by fish, and insects, which then work their way into our food chain where they end up in our bodies.

Grossman continues, "recent research indicates that very small amounts of lead harm children's cognitive development and that lead may be twice as toxic to adults as existing government standards assume", and a worrying "twenty-three out of thirty-three cell phones tested exceeded U.S. safety standards for lead" (2006: 18)

The lights that illuminate the screen of a mobile phone contain mercury and even in very small amounts, mercury is known to “cause damage to the brain, nervous and reproductive systems, to the lungs, kidneys, and other organs, and to harm a developing foetus” Grossman (2006: 19). However, using mercury is necessary since it makes “electronic products more energy efficient” according to the Electronics Industry Alliance since “if mercury were not used, more energy from coal-fired power plants would be required”.

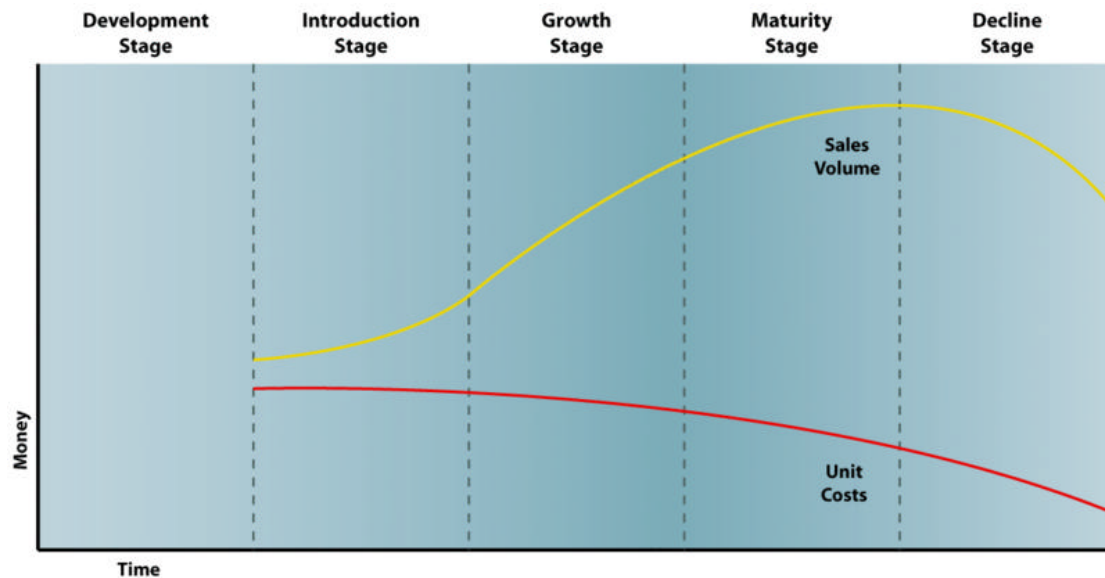
“Like other heavy metals used in electronics, mercury doesn’t pose a health risk while equipment is in use, but it becomes hazardous when equipment is disposed of improperly” states Grossman, (2006: 19). The new WEEE laws state that “e-waste can be exported, but only if the country exporting it can prove that the material will be treated under conditions equivalent to those where the waste originates”. This works well within the European Union, but the United States has no such laws. Since there is no official way to track how and where the electronic waste is exported to and disposed of in the United States, this “creates a loophole that allows the export of copious amounts of e-waste.” (Grossman, 2006: 165) The laws are not global, and so many countries are still shipping their unwanted electronic waste to poorer countries to be recycled in very unsafe conditions, or simply dumped in landfills.

2.5 The Product Life Cycle.

As outlined in the brief history of the mobile phone (Chapter 2.2) we have seen how quickly the mobile phone has become an integral part of our lives. This section looks at the product life cycle, and as the Wikipedia website states, “it is claimed that every product has a life cycle”⁷ and will be used here to see what stage we are at in terms of the mobile phones. The product life cycle model is a model, and one could argue that there are better models that

⁷ Wikipedia website description of the product life cycle can be found online at <http://en.wikipedia.org/wiki/Product_life_cycle>

exist to describe the life of a product. However, this model appears to be the universal rule of thumb.



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“All products progress through stages of existence that roughly correspond with birth, adolescence, adulthood, and death. For example, a new type of electronic device is envisioned and developed; its popularity grows; after a while its sales plateau; and then finally, the sales decline.” (Lidwell et al 2003: 126)

“A fair comment is that - at least in the short term - not all products/services die⁹”, a pair of trainers may die, but shoes - on the whole - won't. The same can be said for a type of mobile phone (Nokia, Motorola, etc), a type of phone may die, but mobile phones probably won't. With this in mind, the mobile phone is still very much in the growth stage, and as it starts to plateau, niche markets are beginning to appear. These niche markets will cater for specific user needs, and there are many niche markets that already exist. For example, there is a niche market for users who want a mobile phone that performs only the simplest of functions and is cheap to buy and use. There is

⁸ Quote and Product Life Cycle image is sourced from the Wikipedia website online at <http://en.wikipedia.org/wiki/Product_life_cycle >

⁹ Product Life Cycle diagram found online at < http://en.wikipedia.org/wiki/Product_life_cycle>

also the a niche market of users who dislike using mobile phone keypads to type messages, and would rather have a qwerty-style keyboard or touch screen instead. Ultimately, there are many niche markets; some developed, others fledgling, from the need for a very basic device that just makes calls, to the feature-rich device that can go online and use GPS to tell you your exact location, and all the variations in between these two extremes. It is these niche markets that need to be closely observed, as they will hold the answers to sustainably designing the mobile phone.

There are new laws under the WEEE (Waste Electrical and Electronic Equipment Directive) that have been put in place by the European Union that state "By the end of 2006 – and with one or two years' delay for the new EU members – every country has to recycle at least 4 kg of e-waste per capita".¹⁰ This forces all manufacturers of electronic products to take into consideration their products: environmental impact, how much energy it will take to make it, and then recycle it.

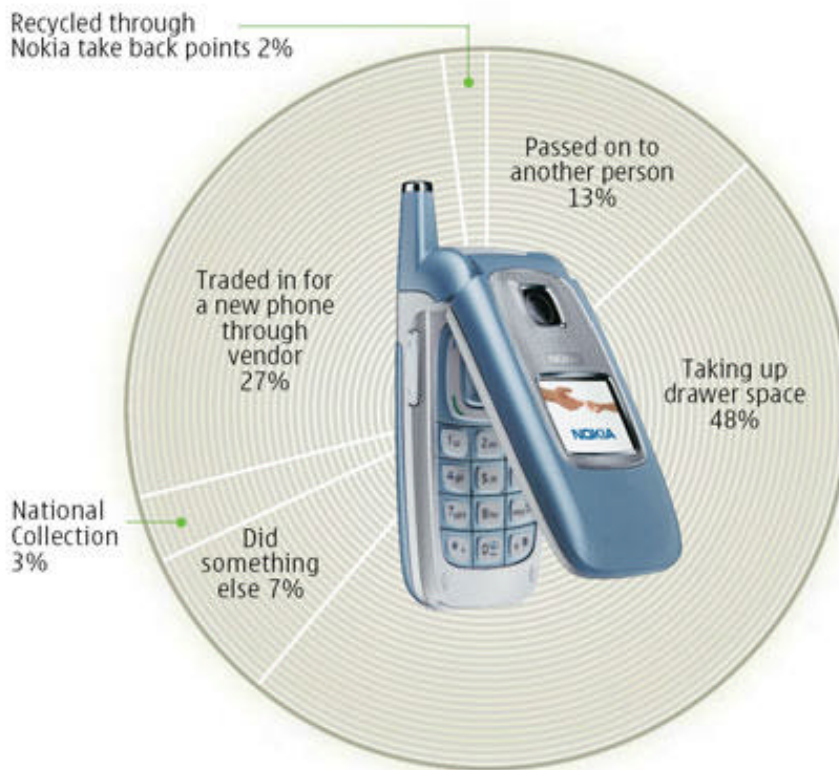
Chapter 3. Case study - Nokia

Since the mobile phone in the developed world is already such an integral part of our lives, and the third world is rapidly becoming saturated with our hand-me-downs, this is rapidly creating new markets for the mobile phone manufacturers to cater for. Jan Chipchase is the principal researcher at Nokia Design, and was recently quoted by the BBC in an interview saying, "The challenge for a company like Nokia is to sell products to all these markets - all of which have different needs [...] we want to meet the needs people have, rather than just putting technology out into the market place."¹¹ Nokia want to address the individuals' needs with their design, in effect, designing for a purpose, not simply for the sake of it.

¹⁰ Wikipedia entry on the definition of electronic waste
<http://en.wikipedia.org/wiki/Electronic_waste>

¹¹ BBC online article <<http://news.bbc.co.uk/1/hi/technology/6698075.stm>>

Where are all the phones



In order to increase customer access to take back potentials, Nokia has created take back points within our various vendors. A key focus of our take back efforts is to educate consumers about the environmental benefits of returning their unused phones and other accessories, regardless of the point of entry into the recycling process.

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According to Nokia, half of all old mobile phones don't go anywhere; they are lying around in forgotten drawers. This is a very large number of mobiles that could be being put to new use. According to Markus Terho, director of environmental affairs at Nokia, "the biggest roadblock to getting them back is the fact that people have very strong emotional bonds with their mobiles".¹³

¹² Image found on the Nokia website at <<http://www.nokia.com/A4243029>> click on 'where are all the phones' for image in separate pop-up window.

¹³ Markus Terho, quote on Nokia recycling website (see above footnote for url).

So, are Nokia recycling mobile phones, and is it making a difference? In December 2005, Nokia launched its Green Box Program¹⁴ in China. According to the Nokia website, it has been described as “unique in that it was an industry partnership with China Mobile and Motorola”. The program was then extended in April 2006 to include six more mobile phone manufacturers – the majority being Chinese – whilst Nokia remained in charge of the scheme, it emphasised the fact that “the program is firmly based upon the principle of collaboration”. The program involved 1500 “Nokia Care Points” being set up in 40 major cities in China where the public are able to return old mobile phones. It is important to note that the scheme will take back any make of mobile phone and is now being pushed to include “white goods” such as televisions, refrigerators, and microwave ovens. Cai Yun, the head of Communications for Nokia's Customer and Market Operations in China is quoted on the site as saying, “these products, like mobile phones, contain metals and plastics that can be re-used or burned to produce energy rather than dumping them in landfill sites to the detriment of the environment.”

However, what still remains unclear is what quantity of mobile phones Nokia are recycling and then giving the proceeds of to charity, and how many old models are being repurposed and shipped to third world countries such as Pakistan, India, Sri Lanka, and Zambia. The mobile phone may well be a positively life changing product for someone in Zambia, but the irony is that that same person is quite likely to be employed to recycle other electronic products in dangerous conditions.

“An estimated 80 percent of a given year’s electronic waste makes its way from countries like the United States and the United Kingdom to poorer countries – like China, Pakistan, India, and those in west Africa – where huge amounts of equipment are dismantled in unsafe conditions or are discarded in ways acutely harmful to the environment.” Grossman (2006: 8)

¹⁴ Nokia’s Green Box Program can be found online at <<http://www.nokia.com/A4241148>>

The Nokia website also states, “though we are not in the recycling business, we understand the need to cooperate with partners who specialize in this industry. Collected products are forwarded to selected recyclers for reclaiming. Recyclers we use comply with Nokia standards and are assessed by us on a regular basis.” This gives no indication of what Nokia’s standards are, and what the ratio is of mobile phones being actually taken apart to have their raw materials recycled, and those being given a new lease of life and sold on to the third world.

Chapter 4. A solution?

Recycling of electronic products is harder to do than for example, recycling paper or bottles, due to the complexity of the design. Grossman illustrates (2006: 141); “electronics can’t be safely broken up or disposed of except under professionally controlled conditions”. One would think that it is the circuit boards, or the batteries that are the problem here, but it is in fact the plastics. “Plastics have proven to be the most difficult materials in high-tech electronics to recycle” due to them being “stubbornly durable”.

A team at the University of Warwick, which is being led by Dr Kerry Kirwan, have paired up with PVAXX Research and Development Ltd and Motorola to create a mobile phone case that has a sunflower seed embedded in it. When this is then placed in soil, it will (after several weeks) grow into a sunflower. “Using a biodegradable polymer they've created a mobile phone case with a seed embedded in a small transparent window. The polymer is perfectly stable in a normal working environment – but when placed in compost completely biodegrades, releasing its seed for germination.”¹⁵

When asked “what is stopping manufacturers of mobile devices from making products from recyclable materials?” Dr Kirwan responded: “*from my*

¹⁵ Dr Kirwan’s research into biodegradable polymers can be found in this online article at <http://www.research-tv.com/stories/technology/mobilephones/>

experience, performance issues and (most probably) costs. There are also some standards that come into play as well that make it difficult to move away from existing materials - if you imagine, the standards were drawn up around what was being used 20 years ago (i.e. PC-ABS etc.) when devices cost a fortune and were intended to last for a long time, now they are cheap and only designed to last for a few months (in reality!) but still engineered to the same levels as previously.”¹⁶

I wanted to know if there was scope in the future for a series of mobile devices that were as varied and individual as humans are, that they would become tailor made to each persons' set of needs.

Dr Kirwan commented, *“We are seeing more basic machines coming back into the market place (particularly for older people or young children). I'm not sure about mass variation in design or manufacture as (as demonstrated by the car industry - think Ford Fiesta vs. Aston Martin) personal customization costs a lot of money which is not compatible with a mass industry produced product unless the customers are willing to take the hit in the wallet.*

What I think is more likely is that units will have everything embedded, but the customer only gets limited bits activated for a certain price, if they want more then they have to buy extra bits (a bit like how text, picture messaging and video streaming evolved from early mobile phones - we are seeing it happening again with GPS and satellite navigation options on Nokia's).”

Chapter 5. Sustainable design.

It has become a common sight to see mobile phones thrown away when they still function perfectly well although they might carry some minor blemish such as a scratch on the screen, and “although your current cell phone works just fine despite a little crack in the case, you get a new one” Grossman (2006: 139). If you scratched your car, you wouldn't throw it away and get a new one,

¹⁶ Extracted from Dr Kirwan's emailed reply to questions (please refer to appendix for full correspondence).

so why do it with a mobile phone? Jonathan Chapman describes this carefree manner in which consumerist society take little care for their products since after all, you can always buy a new one. *“The rampant consumption and waste of natural resources so prevalent in the developed world is a legacy of modern times, born largely from the inappropriate marriage of excessive material durability with fleeting product-use careers”*. Chapman (2005: 8) goes on to quote Mont here as he describes the avaricious nature of humans. *“Some products are discarded before they are physically worn out or are technically superseded because their design is out of fashion or inappropriate to changed circumstances.”*

Is it the look of the mobile phone that is replaced every 18 months, or is it the functionality? We change our mobile phone because of new user needs that have been created by the market. “We do not desire a smaller mobile telephone [...] in order to lend support to the market economy. Indeed, it is the desire for the new that maintains the modes of production and consumption upon which our market economy depends”. Birkeland (2002: 44) Without this artificial motivation to upgrade, a person’s mobile device could easily last for 5 to 10 years. Datschefski (2001: 154) says “the goal of sustainable design is so simple – to make all products 100 per cent cyclic, solar and safe”. Sustainable design does not mean adding more features; it is the art of addressing the user’s needs.

So, it is not the built-in obsolescence that needs to be addressed, it is the style obsolescence. Mobile phones will work for many years after they have been purchased, but they will no longer be in style. The mobile phone companies have worked hard to make the mobile phone as ‘sexy’ as possible, but in the most wasteful way. At the moment the entire phone must be upgraded rather than just the ‘look’ of the product.

“Telephones can have a removable outer casing and buttons, allowing for changes in style and fashion while retaining the internal workings. Many personal computers have been designed to allow the upgrading of the PCU,

the RAM, hard disk and graphics card, and so on, often with easy access ports and slots so the end-user can perform DIY upgrades.”

Datschefski (2001: 61)

Chapter 6. Comment and critique of findings.

Recycling takes a lot of energy and money, and although it will be worth it in the long term, in short term, it is much more economical and effective to simply throw the old out and make a brand new one. The worrying question is; are companies recycling mobile phones as an empty gesture to the public, or is it actually working?

So, the manufacturers are very publicly offering recycling services to their customers, often advertising it as a gesture of good will when the truth is that they are in fact required to provide these services under the new WEEE laws as stated on the Mobile Take back Forum website. “From July 2007 all electronic products, including mobile phones, will come under the new Waste Electrical & Electronic Equipment WEEE regulations which requires manufacturer/importers/resellers to collect unwanted products for disposal.”¹⁷

The mobile phones that are being recycled are being used by charities that are using them to keep in touch with their workers in the field, and are “providing people in third world countries with affordable communication devices”.¹⁸

What’s more, although there are now WEEE laws in place under the European Union, and a keen interest to recycle these are recent developments that have come about only in the last year. There is no mention of the generations of mobile phones that are already sitting in landfills, quietly oozing toxic materials into our water supply.

One might consider this situation of metaphorically sweeping the dirt under the carpet to be largely a problem of the Western world. But it would be foolish to overlook countries such as China and Japan that are renowned for

¹⁷ MTF website <http://www.mtf.org.uk/consumers/index.asp>

¹⁸ Quote from Mobile Take Back Forum website (see above footnote for url).

being voraciously hungry for new technology. As Chapman (2005:9) points out, “the common practice of burying mountains of post-consumer waste out of sight and out of mind is equally prolific in the developed East”. The problem is a global one, and although European Union’s WEEE laws are starting to have an impact here, many countries are still turning their backs on it.

“Recycling alone is not a one-stop solution to sustainable production and consumption.” Chapman (2005: 9)

It now becomes clear that there is a problem at each of the three basic stages of a product’s life. Firstly, at the design stage, sustainable design is not answered by adding more features so that the mobile phone will be more useful. The answer lies in addressing the user’s needs and designing for the niche markets rather than the larger, saturated markets that already exist. Secondly, the consumer is at fault for either being too apathetic to bother to return their old mobile phone, or too attached to their phone as Markus Terho, director of environmental affairs at Nokia is quoted saying, “the biggest roadblock to getting them back is the fact that people have very strong emotional bonds with their mobiles”.¹⁹ Or, simply, the consumer is completely unaware that there is a problem with electronic waste and they did not know that they could recycle their old mobiles.

Thirdly, at the recycling stage, many manufacturers are complying to the new WEEE laws by setting up collection points for old mobile phones, but it is unclear what portion of old products are being made to work again and then sold on to third world countries where they could then be deemed as ‘sustainably designed’ since they are being used all the way up to their death.

For a truly durable design, for example, a car tyre that never wore out, it might be possible to make such a thing, but it would cost so much that no consumer would ever buy it. At this point, Datschefski (2001: 60) finds a solution, “one way round this would be to lease or rent the product”, and this would mean

¹⁹ Quote from Nokia website on recycling <<http://www.nokia.com/A4243029>>

that the mobile phone would continue to pass hands until it died. However, for this to happen, the manufacturer has to take on the responsibility of making sure that they get their product back in order to re-rent it to someone else. Currently, you are able to take out a contract with a mobile phone company and can select a deal where you receive a free mobile phone, but this is where the 'cycle' part of recycling ends. You are not asked to return your mobile phone after your contract is up, and so, you upgrade and the old phone gets thrown to the back of a desk drawer.

The root of the problem for the design of new mobile phones is at the design stage where planned obsolescence prevents any design from lasting for more than two years; be it due to the phone not being physically durable enough, or that it is out of style. So, the ideal mobile phone would be one that performed only the specific needs of the user, and all other functionality would be left out. This means making individual mobile phones for each individual person.

This however, is a comment for the future of the design of mobile phones, and overlooks the more prolific problem of the fact that yes, mobile phone companies are complying with WEEE laws, and are recycling, but how are they doing it? It is much cheaper to ship electronic waste to poorer nations where labour may cost a fraction of what it does in the developed world, but the cost to the environment is staggering. The reason being, electronic devices can only be recycled under very controlled conditions by very expensive machinery, both of which are unavailable to the countries faced with this task.

Chapter 7. Conclusion.

Certainly, the facts quoted above regarding the amount of mobile phones that become electronic waste and their effects if not recycled properly may appear to have been included to instil a sense of guilt in the reader, but they are the facts. It would be wrong to stop buying mobile phones altogether, but perhaps

one should consider using their mobile until it dies rather than until the contract on it runs out and the mobile phone company offer a very desirable new model as a free upgrade. Planned obsolescence has a stranglehold on all electronics products, and is the cause of all of this electronic waste. The root of the problem lies with the manufacturer, at the start of the mobile phone's life, its design. What materials are used, how they are sourced and processed simply starts a long list of processes that are damaging to the environment and could be altered to be more eco-friendly. By not recognising this, mobile phone manufacturers are adding to the millions of tons of electronic waste that already permeate landfills the world over.

The two forms of sustainability that have been discussed are: the way a product can be designed and manufactured so that it is made of environmentally friendly materials (i.e. ones that are biodegradable). This form of sustainability takes into consideration the entire life cycle of the mobile from design through to the end of the products' life taking into account the new laws passed by the WEEE Directive. And secondly, durable design is a product that is designed to be so durable that there is no need to upgrade it since it will function perfectly for a very long time. The mobile phone is in fact very durable in its design; the plastics that make up the case will last longer than you will, and the electronics inside only fail due to planned obsolescence.

We change our mobile so regularly because of the new user needs that the mobile phone market creates (for example, a better camera, or more memory), but the mobile can last for five to ten years if treated correctly. That is to say, following simple guidelines outlined in every mobile phone manual, for example, if the battery is only charged when completely empty, then it will last for longer over a longer period of time.

“Another aspect of durability, but distinct from it, is the tendency of consumers to want the latest model of a product. This usually requires the replacement of a product, but if it can be engineered to be upgradeable, then the life of the original product can be extended. (Datschefschi 2001: 61)

Currently, it is both the look and the functionality of the mobile phone that is upgraded every 18 months, and here lies the problem; it does not have to be this way. The mobile phone is a fashion accessory, and styles come and go, but the hardware inside the mobile does not have to be replaced quite so often. It would make more sense to develop a mobile phone that can be upgraded online, so the device is simply plugged into the Internet, and the software and drivers can be upgraded at a fraction of the cost of buying a new mobile device. The shell of the mobile could then be the recyclable component (using Dr Kirwan's new biodegradable plastic technology), which would be under constant redesign in order to meet consumer needs to stay fashionable. In this way, the inner workings of the mobile, the hardware is used until it dies, and the shell, or packaging of the mobile is replaceable.

Renting a mobile phone could be the answer since, "renting gives much more utility per unit of material than buying", as stated by

And this is essentially what is happening, except with renting, you are only borrowing the property. Mobile phone companies will give you a phone for free so long as you enter into a contract with them for one year, and at the end of that year, you are able to get a newer phone for another year's contract. The crucial stage of returning the old phone in order to get a new one has been completely overlooked until now, and this has resulted in the mountains of electronic waste that we have now generated.

Modern culture demands a continuous supply of new mobile devices (partly to stay trendy, and partly to get the most from the new features on offer) and although mobile phone companies can give it to us, it is a very short cycle before a new device is available. This way of living (consumerism) is over indulgent and wasteful, and we continue to use up the earth's resources so voraciously, that although gestures of recycling are made, they are empty. There is a general feeling that yes, there will be a problem eventually, but either we will be able to deal with it when it crops up, or it will be someone else's problem.

“Developed world consumer desires relentlessly grow and flex, while material possessions remain hopelessly frozen in time. This incapacity for mutual evolution renders most products incapable of sustaining a durable relationship with users”, Chapman (2005: 20) Surely then, the answer lies in a product that stays with you for life, and almost becomes an extension of your body. If the mobile device was designed to grow with the user, and alter to their needs and moods, and be so customisable that two of the exact same mobile devices could be unrecognisable from each other after a few years’ use by two different users. This is simply an step up from the customisation that exists today; it can be seen everywhere, from a person getting in to drive someone else’s car and having to readjust the mirrors and seat to their preference, to having to learn ones’ way around the interface of a new mobile phone. Getting the user emotionally attached to their mobile phone surely would be a good enough reason to design mobile phones that lasted for a lifetime rather than 18 months.

The answer could lie in mass customisation, and mass variability, but the more likely one is that we cannot sustainably design mobile phones since they are not emotionally durable enough. Mobile phones are a fashion accessory, and fashionable things do not last.

So, the solution to electronic waste, for mobile phones at least, is to design them in two parts, an outer ‘shell’ or package, and the internal, working part. The internal hardware of the phone could be designed to last for five years and would be not too dissimilar to a computer. It would have Internet access and an operating system that could be upgraded as new versions are released online. These upgrades could open up more features on the phone, and would allow the user to fully customise their phone to their needs. This is partly happening with Apple’s iPhone as discussed earlier, as it is released with an operating system that has access to the web. However, the iPhone is not a sustainable device since Apple intends to release a better version once they have reached their expected sales figures.

The outer shell would be designed from a recyclable material such as Dr Kirwan’s biodegradable polymer and could easily be snapped on and off the

phone depending on the user's taste at that particular moment (for example, there could be different covers for different occasions). These snap on and off shells were immensely popular with 2G phones in the late 1990s and early 21st century as they offered a cheap alternative to upgrading the whole phone. However, they were not designed to be recyclable, and 3G phones are not designed with this snap on/off feature anymore. If reintroduced, with the biodegradable polymer, or failing that, a type of plastic that is recyclable, it would be far easier for both the consumer to take off an old shell and put in a recycling bin, and for the manufacturer to break down and use again, rather than the dangerous process that currently exists for recycling mobile phones.

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All links are correct at time of printing (July 2007).

Section 11. Appendix.

Online correspondence with Dr Kirwan of Warwick University.

-----Original Message-----

From: Peter van Lanschot [mailto:dutchpete32@hotmail.com]

Sent: 15 July 2007 14:46

To: kerry.kirwan@warwick.ac.uk

Dear Dr Kirwan,

I am studying a Masters in Interactive Multimedia at London College of Communication, and am currently writing my thesis on the question "Why can't we integrate sustainable design with mobile devices?" I have contacted you because it would be a great help to my research if I could ask you three questions:

1. There are two types of sustainable design; firstly design of a product that is made from parts that can be recycled or repurposed, and secondly, design of a product that is so well designed that it lasts for a very long time (durable design). Do you agree with this statement?
2. What is stopping manufacturers of mobile devices from making products from recyclable materials?
3. People often choose a new mobile phone for its' look, and / or its' features, and they often don't use all of the features available. Is it feasible to consider the mobile devices of the future to be as varied and individual as humans are?

Best regards,

Peter van Lanschot

Kerry Kirwan <KIRWAN_K@WMGMAIL.wmg.warwick.ac.uk>

Peter

In answer to your questions:-

1 - I would also include design of parts from renewable/biodegradable materials.

2 - From my experience, performance issues and (most probably) costs. There are also some standards that come into play as well that make it difficult to move away from existing materials - if you imagine, the standards were drawn up around what was being used 20 years ago (i.e. PC-ABS etc.) when devices cost a fortune and were intended to last for a long time, now they are cheap and only designed to last for a few months (in reality!) but still engineered to the same levels as previously.

3 - We are seeing more basic machines coming back into the market place (particularly for older people or young children). I'm not sure about mass variation in design or manufacture as (as demonstrated by the car industry - think Ford Fiesta vs Aston Martin) personal customization costs a lot of money which is not compatible with a mass industry produced product unless the customers are willing to take the hit in the wallet.

What I think is more likely is that units will have everything embedded, but the customer only gets limited bits activated for a certain price, if they want more then they have to buy extra bits (a bit like how text, picture messaging and video streaming evolved from early mobile phones - we are seeing it happening again with gps and sat nav options on Nokia's).

Hope that helps.

cheers

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