Towards “After-Modern” Design: A Practice-Based Inquiry

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Abstract

This practice-based PhD investigates the possibility that neutral understandings of technology associated with the instrumentally rational modern worldview restrict product design education from contributing to sustainability in a substantive manner. The concept of "after-modern" design is developed as a means of addressing the shortcomings of the modern and postmodern worldviews – and to support design education to move beyond these worldviews.

A theoretical basis for "after-modern" design is developed by synthesising insights from the philosophy of technology (especially phenomenology and postphenomenology), critical approaches to design, and human values literature relating to self-enhancement and self-transcendence values. The concept of "after-modern" design is further advanced via a research through design approach and by conducting workshops with design students. The original contributions to knowledge that this thesis makes relate to:

- *The research method of conducting "after-modern" design inquiries:* This method advocates creating highly conceptual "inquiring objects" to investigate how unsustainable self-enhancement values become embodied in technological artefacts and associated systems. These objects invite the design student to "see" familiar technologies through a lens of unfamiliar materials and ideas. In doing so, the objects support the discernment of directions for design that are rooted in an alternate set of values that challenge the unsustainable norms of late-modernity.

- *The process of creating "inquiring objects":* Aspects of the designing process are identified that support design students to challenge the limitations that the prevailing modern worldview places upon their practice.

- *An eight-point framework for the "after-modern" design of personal digital devices and associated technologies:* The framework proposes eight transferable qualities that point to "after" modernity by potentially encouraging self-transcendence values, which are known to foster more sustainable ways of living.

Declaration

This thesis is submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy. I declare that this thesis is my own work and has not been submitted in substantially the same form for the award of a higher degree elsewhere. To the best of my knowledge it does not contain any materials previously published or written by another person except where due references is made in the text.

Signed: 

Date: 20.12.2018

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1 Introduction

This thesis is motivated by personal experiences of being a design student, a professional designer and a design educator. These experiences left me discontented with orthodox design practices and agreeing with Thackara's (2001, p. 48) view that "we can do amazing things with technology, and we're filling the world with amazing systems and devices, but we find it hard to explain what this new stuff is for, or what value it adds to our lives". At the time of writing, Thackara's (2001, p. 48) view is almost twenty years old but feels especially resonant today in a world populated by increasingly digital and connected systems and devices – a world that is changing the nature of product design. The idea that we struggle to explain the purpose of these "amazing systems and devices" or articulate the value they bring to our lives is especially baffling when considered in the context of the unprecedented environmental degradation and social inequities that result from their unsustainable cycle of production and consumption.

My discontent with orthodox design practices heightened as a design educator, a role in which I found myself increasingly challenging student expectations about the nature of contemporary products, not least with respect to questioning why some ideas should be designed at all. I was concerned by what it meant to develop "meaningful" products that brought authentic value to our lives but found myself increasingly frustrated by a lack of strategies, methods and tools for supporting more critical, value-laden understandings of

design. This thesis therefore aims to contribute to the notion of “meaningful” design. It does so by contextualising product design education within the unsustainable modern worldview, which emphasises self-enhancement “having” values, which are incompatible with developing more sustainable ways of living. An alternate strategy for product design education is proposed. This strategy proposes that product design education challenge self-enhancement values and instead prioritise self-transcendence “being” values, which are generally considered as ethical values that compatible with developing more sustainable ways of living.

1.1 Context of study

The late-modern phenomenon of unsustainability shows no sign of abating and whilst its root causes are disputed, its major symptoms are widely recognised. Davison (2001, p.2) summarises the symptoms of unsustainability as follows:

- More than half the human population living in poverty.
- Widening economic disparity.
- Overconsumption of resources by wealthy nations.
- Social, physiological and psychological pathologies of overconsumption.
- Disempowerment of women and indigenous peoples by development strategies.
- Depletion and contamination of non-renewable natural resources.
- Escalation of technologically mediated risks to ecological and human health.
- Rapid, irrecoverable loss of biological and cultural diversity.
- Degradation of global ecological life-support processes.

Widespread recognition of unsustainability began to emerge in the 1960s but how to address it remains deeply contested (Hajer & Dryzek, 1995, p. 29). This is reflected in Dryzek’s (2005, pp.15–16) identification of four basic environmental discourses:

- *Environmental problem solving* (Dryzek, 2005, p. 15) proposes adjustments to the political-economic status quo to cope with environmental problems e.g. putting price tags on environmental harms and benefits and institutionalising environmental concern and expertise in its operating procedures.

- *Survivalism* (Dryzek, 2005, p. 15) is an apocalyptic discourse which holds that the earth's stock of natural resources will curtail continued economic and population growth. This discourse advocates a wholesale redistribution of power within the industrial political economy and a reorientation of perpetual economic growth but only sees solutions in terms of options set by industrialism such as greater control of existing systems by administrators, scientists and other responsible elites.

- *Sustainability* (Dryzek, 2005, p. 16) comprises *sustainable development* and *ecological modernisation* (eco-modernism). This discourse advocates environmentally benign growth, viewing environmental and economic values as being complementary.

- *Green radicalism* (Dryzek, 2005, p. 181) comprises *green politics* and *green consciousness*. This discourse rejects the basic structure of industrial society and the way it conceptualises the environment. *Green politics* emphasises targeting social, economic and political structures and practices directly whereas *green consciousness* advocates changing how people think about the world and each other.

The sustainability discourse, especially sustainable development, has become the most popular of the four basis discourses in late-modernity (Dryzek, 2005, p. 143). Sustainable development was popularised by the 1987 Brundtland report and has since become the leading transnational environmental discourse due to its integrative and co-operative nature (Wever & Vogtlander, 2015, p. 515). The sustainability discourse emphasises doing and having more but using less resources through reducing, reusing and recycling (Braungart & McDonough, 2002, p. 51-53). For example, developing coal cleaning technologies rather than encouraging people to be less reliant on potentially frivolous

domestic products (Davison, 2001, p. 28). Sustainable development seeks to "combine ecological protection, economic growth, social justice, and intergenerational equality, not just locally and immediately, but globally and in perpetuity" (Dryzek, 2005, p. 143). A widely accepted approach to sustainable development is Elkington's Triple Bottom Line model of sustainable development (Wever & Vogtlander, 2015, p. 515). This model affords equal weight in corporate activities to people, profit and planet. The Triple Bottom Line encourages a balance between the social aspects of employees in a company, the ecological consequences of a company's products and economic profitability (Wever & Vogtlander, 2015, p. 515). Despite such models however, there has been limited development of wholesale movements in policies, practices, and institutions at all levels from the local to global (Dryzek, 2005, p. 160).

Another prominent aspect of the sustainability discourse is "eco-modernism", which considers environmental interests in terms of how they can be translated into economic language (Barry, 2005, p. 315). Eco-modern approaches to the environment are instrumental, technocratic and efficiency-driven, focusing upon minimising pollution, energy and material resources, but they ignore important elements such as biodiversity conservation (Hajer & Dryzek, 1995, p. 32; Barry, 2005, p. 316). Eco-modernism is a more effective global movement than sustainable development because it is more precisely defined with a sharper focus on restructuring the capitalist political economy along more environmentally sound lines (Dryzek, 2005, p. 167 - p. 169). Eco-modernism advocates that environmental degradation can be addressed by re-organising the economy in a collaborative manner in which industry cooperates in the design and implementation of policy rather than have it imposed upon them by governments (Dryzek, 2005, p. 167). Eco-modernism is based on the premise that businesses can make money out of being more environmentally sound provided the business is far-sighted (Dryzek, 2005, p. 167). There are several ways in which addressing environmental concerns can be profitable:

- Reducing pollution can lead to more efficient manufacturing processes.
- Unpolluted environments can result in happier, more productive workers.
- Not solving problems in the present can lead to more expensive future solutions.

- Increased public awareness can encourage the selling of green goods and services [1].

Like sustainable development therefore, eco-modernism values the natural world extrinsically in terms of its potential to support economic growth (Dryzek, 2005, p. 168-170). And given that technological progress is the driver of economic growth in late-modernity (Walker, 2013b, p.446), there is widespread "uncritical optimism that the congenital disabilities of modernity - its iniquity, myopia and profligacy - can be designed out by a combination of ethical aspiration and techno-scientific ingenuity" (Davison, 2013, p. 44). Paredis (2011, p. 196) points out however that despite the prevailing faith in technological solutions, it is remarkable that "the articles, books and policy debates on sustainability seldom explicitly draw in a discussion of the nature of technology, how technology influences society, and what this implies for sustainable development".

The current sustainability discourse is unlikely to be ultimately successful because it fails to challenge the unsustainable values that modernity has emphasised (Davison, 2001, pp. 107–108). Due to its prioritisation of technological development and economic growth, there is an overproduction of disposable products that have no intrinsic value and often little functional or aesthetic value, which are destined for the landfill (Bakker & Schouwenberg, 2013, p. 387). Compounding this, a "disposable technology paradigm" yields technological artefacts that are expected to have short functional lifetimes despite the potential for longer lifetimes (Huang & Truong, 2008, p. 323). The sustainability discourse allows consumption to continue unabated, often addressing environmental concerns through things to buy (Badke, 2013, p. 393). Consequently, there is a danger of the so-called "rebound effect", which occurs when consumption increases as a result of increased efficiency and reduced consumer costs (Berners-Lee & Clark, 2013, pp. 50–54; Verbeek, 2011, p. 93; Wever & Vogtlander, 2015, p. 534). There are three types of rebound effect: a direct rebound effect, an indirect rebound effect and a long term rebound effect (Wever &

[1] Davison (2001, pp. 27-29) identifies three dominant eco-modern trajectories of industrial ecology, dematerialisation and decarbonisation. Industrial ecology addresses the overall design of modern techno-systems, viewing them as evolutionary processes that feed off one another until eventually, the fittest—i.e. the most efficient and productive—version survives (Davison, 2001, p. 28). Dematerialisation and decarbonisation are major contributors to industrial ecology (Davison, 2001, p. 28).

Vogtlander, 2015, p. 534). The direct rebound effect occurs in the same function; for example, people not turning lights off as much because energy efficient light bulbs have been installed. An indirect rebound effect occurs when, for example, people might travel more when money has been saved through energy conservation. A long term rebound effect occurs when, for example, production and consumption of cars increases as they become more efficient and affordable (Wever & Vogtlander, 2015, p. 534). Despite the evident shortcomings of the sustainability discourse however, Fry (2005) asserts that:

> Industry is still overwhelmingly deaf to those voices that speak of the complexity of unsustainability, the poverty of current responses to it, the misplaced faith in technological solutions, the myopia of present political and corporate leadership and the extent of changes that are required if a psychology, culture and economy of sustainment are to ever arrive.

1.2 Research aim and objectives

In light of the issues outlined above, the aims of this research are:

- To determine how product design education might contribute more substantively to sustainability.

- To develop conceptual and practical ideas that support product design education to contribute more substantively to sustainability.

To address the overall aims, the objectives of this research are:

1) To determine how the modern worldview influences Design for Sustainability.

2) To identify insights from the philosophy of technology that could support product design education to address sustainability in a more substantive manner than the modern worldview permits.

3) To identify values that are compatible with developing more sustainable ways of living, and to consider how design currently engages with these values.

4) To develop a design research method that addresses sustainability in a more substantive manner than the modern worldview permits.

5) To develop a framework that supports the design of personal digital devices and associated technologies that challenge the dominant values of the modern worldview.

6) To explore how the method of conducting "after-modern" design inquiries can support design students to address sustainability in a more substantive manner than the modern worldview permits.

1.3 Thesis overview

Chapter 2 reviews and critically reflects upon literature to address the first objective: *To determine how the modern worldview influences Design for Sustainability.* This chapter contextualises Design for Sustainability in the instrumentally rational modern worldview. This chapter reveals that the instrumentally rational nature of the modern worldview is a major contributor to unsustainability as this form of rationality does not reflect upon the value of the ends being served via technological means. The chapter concludes by suggesting an alternate path for design by introducing the concept of "after-modern" design and articulating some of its key conceptual features. The term "after-modern" is used to highlight the shortcomings of the modern and postmodern worldviews – and to suggest a need to move beyond these worldviews if we are to address sustainability issues more effectively. The concept of "after-modern" design advocates developing approaches to product design education that challenge instrumental rationality by using the creative activity of designing as a research method for investigating a re-framed conception of sustainability – which is that unsustainability be viewed as a crisis in human values rather than as a technical challenge.

Chapter 3 addresses the second objective: *To identify insights from the philosophy of technology that could support product design education to address sustainability in a more substantive manner than the modern worldview permits.* This chapter reviews and critically reflects upon literature from the philosophy of technology to develop understanding about

the non-neutral nature of technologies. This chapter focuses on phenomenological and postphenomenological perspectives of technology as these perspectives offer insights into how technologies can undermine human values that are important for developing more sustainable ways of living. These perspectives offer conceptual and practical insights into the worldbuilding nature of technologies, especially through the postphenomenological insight that technologies mediate human-world relations. The chapter concludes with a discussion that draws out the implications of these perspectives for addressing sustainability in a more substantive manner than the late-modern context permits.

Chapter 4 addresses the third objective: *To identify values that are compatible with developing more sustainable ways of living, and to consider how design currently engages with these values.* This chapter reviews and critically reflects upon literature relating to human values and critical approaches to design. This chapter explores values that are detrimental or beneficial for developing more sustainable ways of living, focusing on Schwartz's conceptualisation of self-enhancement and self-transcendence values. Design is discussed in terms of fostering unsustainable self-enhancement values and some critical approaches to design are explored that challenge these values. Chapter 4 concludes by synthesising the three literature chapters to articulate a basis for "after-modern" design. This basis advocates that "after-modern" design:

- Seeks to recognise, challenge and overcome some of the limitations that the modern worldview places upon Design for Sustainability.

- Harness and prioritise the creative activity of designing to investigate how self-enhancement values become embodied in technologies and subsequently mediate human-world relations.

- Pursue universalism values as the "ultimate ends" of design.

It is envisaged that using design practice as a mode of research could help to overcome the modern propensity to prioritise rationalistic approaches in research, which tend to yield incremental changes to products that appear to be insufficient for addressing sustainability effectively.

Chapter 5 addresses the fourth objective: *To develop a design research method that addresses sustainability in a more substantive manner than the modern worldview permits.* This chapter discusses the main methodological approach of this study, which is research through design. The chapter introduces, describes and demonstrates a design-based, critical research method, which is that of conducting "after-modern" design inquiries. This method is the first original contribution to knowledge that this thesis makes. The method aims to support design students to investigate how modern values become embodied in technological artefacts and systems. Central to conducting "after-modern" design inquiries is the creation of an "inquiring object", which aims to explore issues from the literature, transmuting the issues into tangible forms. Each inquiry comprises an "inquiring object", a discussion of the issues being investigated and reflection upon the object – its aesthetics, form, configuration, materials, etc. Based on these reflections, each inquiry concludes with a set of "after-modern" design directions, which suggest a pathway for the design of technological artefacts and systems that are based in an alternate set of values to those prevalent in late modernity. This chapter concludes by reflecting upon the designing *process* of "inquiring objects" to develop knowledge about how the process supports the concept of "after-modern" design.

Chapter 6 addresses the fifth objective: *To develop a framework that supports the design of personal digital devices and associated technologies that challenge the dominant values of the modern worldview.* This chapter continues with a research through design approach to consider the applicability of the "after-modern" design directions developed in chapter 5. The design directions are used to inform the design of a digital artefact entitled *Memento Box.* This artefact challenges late-modern self-enhancement values by emphasising self-transcendence values. *Memento Box* is scrutinised from a postphenomenological perspective—as being a mediator of human-world relations—to draw out how it can be understood to mediate in favour of universalism values. This analysis

results in the second main contribution of the thesis, which is a framework for "after-modern" design (associated with the design of personal digital devices and related technologies). This framework identifies eight key transferable aspects of *Memento Box,* which are judged important for "after-modern" design. The qualities are:

1) A participatory design process.
2) Honest, sensory material.
3) Distinctive digital objects and associated technologies.
4) Meaningful limits.
5) Contextually-rich data.
6) Purposeful digital objects.
7) A sense of tradition.
8) "Releasement" from the digital world.

Chapter 7 addresses the sixth objective: *To explore how the method of conducting "after-modern" design inquiries can support design students to address sustainability in a more substantive manner than the modern worldview permits.* This chapter builds upon the author's engagement in "after-modern" design inquiries by conducting workshops with design students. Combined with the findings of chapter 5, the final contribution to knowledge that this thesis makes relates to the designing *process* of "inquiring objects". Three main aspects of the designing process are exposed and defined that can be understood as "after-modern". These aspects relate to the disruptive nature of conducting "after-modern" design inquiries, the capacity of the designing process to support meaningful engagement with theoretical ideas, and the designing process representing a different "end" for design.

Figure 1 provides an overview of the thesis and illustrates the relationships between the primary research, secondary research and the contributions.

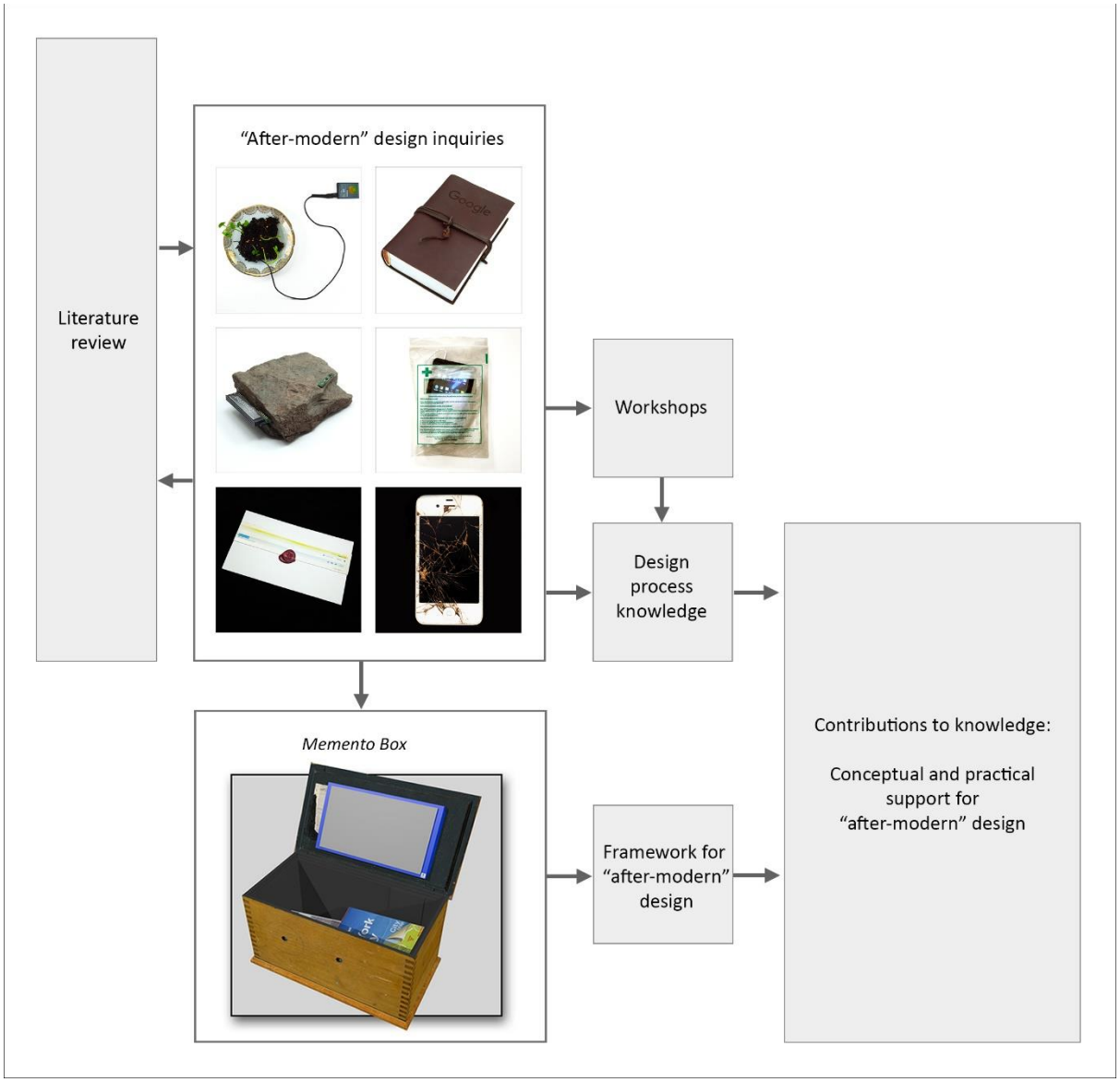


Figure 1: Thesis overview

2 The Modern Worldview: Design and Unsustainability

2.1 Introduction

This chapter addresses the first research objective: *To* d*etermine how the modern worldview influences Design for Sustainability.* To address this objective, literature is reviewed that contextualises Design for Sustainability in the instrumentally rational, modern worldview. The chapter concludes by reflecting upon the literature to draw out its implications for the overall aims of this research – which are to determine how product design education might contribute to sustainability in a more substantive manner, and to offer conceptual and practical ideas accordingly. To this end, an alternate "after-modern" path for design is proposed and some of the key conceptual features of this path are articulated.

2.2 Loss of meaning in modernity

The intermingled cultural epochs of the Renaissance (circa 1300-1600), the Reformation (circa 1517-1650), the Scientific Revolution (circa 1540-1690) and the Enlightenment (circa 1700-1800) formed the modern worldview (Tarnas, 1993, p. 223). Together, these epochs radically altered human perception of the world by eroding traditional, religious understandings in favour of scientific understandings, characterised by empiricism and rationalistic thinking (Tarnas, 1993, p. 282). The emerging scientific outlook dictated that the world no longer be viewed as "a meaningful and value-filled cosmos [but] as a vast aggregate of material objects in causal interactions" (Guignon, 2004, p. 22). As the modern worldview eclipsed the traditional worldview, especially in north-west Europe, people began to perceive themselves as increasingly insular, "self-defining and self-contained rather than as the extended self of earlier times" (Guignon, 2004). This emerging humanist mindset gave man "boundless confidence in his own powers, his spiritual

potential, his capacity for certain knowledge, his mastery over nature [and] his progressive destiny" (Tarnas, 1993, p. 393). By the end of the 19th century, the idea of progress had found its guarantee in the "promise" of technology, which holds that technology is the route to freedom and happiness (Feenberg, 2012, p. 1-2; Fromm, 1976, p. 11). Indeed, as early as the seventeenth century, Descartes predicted that the "technological application of science would yield an unlimited number of devices that would allow people to effortlessly enjoy all the benefits the earth [WS1]could offer them" (Brey, 2015, p. 366). The notion of progress, specifically economic and technological progress, became a matter of ultimate concern in modernity: an end in itself and a path to meaning (Taylor, 2009, pp. 715–716).

The economic and technological emphasis of modernity ushered in the consumer society and a culture of "having" as the acquisition of goods and commodities was promoted as a route to the "good life" (Fromm, 1976, pp. 15–16; Ihde, 1998, p. 106). Concomitantly, human relationships became increasingly negotiated based on utility, greed and competition as capitalism and consumerism accelerated (McGilchrist, 2009, p. 390). Consequently, Fromm (1976, p. 13) argues that modernity has failed to fulfil its promise that individual wealth and "having" is the path to happiness. At the core of this failure are two main psychological premises of modernity: The first premise is that happiness can be achieved through the satisfaction of any desire a person may feel – especially through material acquisition; the second premise is that the egotism, selfishness and greed required for the industrial system to function leads to harmony and peace (Fromm, 1976, pp. 12–16). Fromm (1976, p. 28-37) contends however that the "having" mode of existence is viewed as the most natural mode of existence in advanced industrial societies – and yet these societies are comprised of "notoriously unhappy people: lonely, anxious, depressed, destructive, dependent – people who are glad when we have killed the time we are trying to save" (Fromm, 1976, p. 15). By contrast, there is a rare "being" mode of existence, which is infinitely more difficult to define and has long since preoccupied Western philosophy (Fromm, 1976, p. 3-37). For Fromm (1976, p. 33), the "being" mode is related to the notion of "aliveness and authentic relatedness to the world" – for example, a student in the "having" mode will acquire information from lectures as a means of passing an exam whereas a student in the "being" mode incorporates the information into their own system

of thoughts, enriching and developing it (Fromm, 1976, p. 37) [2]. The "being" mode is therefore concerned with "inner activity" directed at renewing oneself, being interested and transcending one's isolated ego. Modernity has however undermined the "being mode" of existence by engendering "a way of life characterized by obsessive pursuits that lead to alienation not only from others, but from one's own self as a human being with feelings and needs (Guignon, 2004, p. 25).

In his seminal work *The master and the emissary: The divided brain and the making of the western world,* McGilchrist (2009, p. 176) develops the thesis that during modernity, the so-called "left hemisphere" —associated with rationality, reason, detached analysis, etc.— has achieved a position of dominance compared with the "right hemisphere", which is associated with emotion, intuition, holism, etc. (McGilchrist, 2009, p. 6) [3]. McGilchrist describes the right hemisphere as being "in direct contact with the embodied, lived world: the left hemisphere world is, by comparison, a virtual, bloodless affair" (McGilchrist, 2009, pp. 199–200). For McGilchrist (2009, p. 6-7), the "excessive and misplaced rationalism" of modernity has distorted how we view the world, engendering "An increasingly mechanistic, fragmented, decontextualized world, marked by unwarranted optimism mixed with paranoia and a feeling of emptiness". Importantly, the way we comprehend the world has significant implications for how we perceive it and engage with it – moreover, we can measure the consequences of how we comprehend the world by what happens to it, and by what happens to us (McGilchrist, 2009, p. 176). Given that the "left hemisphere" has more affinity with the abstract and the impersonal, the material world reflects its innate structures through identical, repeatable, mechanic forms such as cubes, perfect circles and

[2] Fromm (1976, pp. 39–54) discusses the differences between "having" and "being" using a range of examples including remembering, conversing, reading, exercising authority, having knowledge or knowing, faith and loving.

[3] McGilchrist (2009, p. 1) uses the terms "left hemisphere" and "right hemisphere" extensively to distinguish between the different ways in which the brain deals with materials, words and imagery but acknowledges that both hemispheres serve all identifiable human activity. Despite this, McGilchrist (2009, p. 2) contends that the two hemispheres are unlikely to deal with varying tasks randomly, citing eminent neuroscientists' research to support this claim. For example: Hellige (arguably the world's leading authority on the subject) argues that there are striking differences in the information processing abilities and propensities of the two hemispheres; Ramachandran (another highly regarded neuroscientist) suggests that popular culture should not cloud the notion that the two hemispheres may be specialised for different functions; and Crow (one of the most sceptical neuroscientists) asserts that "there is little doubt that the issues of brain asymmetry and hemisphere specialisation are significant. The question is only – of what?"

straight lines – none of which can be found anywhere in the natural world and are inimical to the human body (McGilchrist, 2009, pp. 386–387). The "imperfection" of the human hand was increasingly eliminated as the Industrial Revolution took hold, replacing variations in form that occur from natural processes with invariant forms (McGilchrist, 2009, pp. 386–387). For McGilchrist (2009, p. 387), this mechanical nature of the material world and excessive management and exploitation of the natural world are antithetical to what it means to be human. Consequently, we experience a loss of richness; for example, Le Corbusier's dispassionate definition of a home as a "machine for living" is quite different from the emotional refrain of "home, sweet home" (Feenberg, 2011, p.866). Similarly, understanding food in a purely functional calorific sense is different to understanding its complex cultural associations, which can bring people together in meaningful ways (Feenberg, 2011, p.866). By contrast, in pre-modernity, objects were often understood in terms of meanings and values rather than simply functions and affordances – and technological development was constrained by craft traditions and religious, ethical and aesthetic conceptions (Feenberg, 2011, p. 871-872). Furthermore, objects were understood for the meanings they acquire through use, associations, significance and belonging to particular ways of life (Feenberg, 2011, p. 866).

2.3 Instrumental rationality

The modern scientific outlook ensured that instrumental rationality emerged as the dominant form of rationality in modernity (Feenberg, 2011, p. 865). This form of rationality prioritises the selection of efficient and expedient means to achieve desired ends, *without reflecting upon the value of those ends* (Dryzek, 2005, p. 195; Feenberg, 2011, p. 867). Accordingly, Davison (2001, p 95) suggests that instrumental rationality leads modern societies to, ". . . blindly [build] a deformed world. Our late-modern world is unsustaining because it is deformed. And the blindness of our technological agency is the cause of our world's deformation". In this context, technologies are largely developed and selected based on technical calculus rather than normative questioning about technological change (Davison, 2001, p. 97). And yet, as Marcuse argues, the choice of a technical rather than a

political or moral solution to a social problem – is politically and morally significant (Veak, 2012, p. 186).

As Winner (2010, p. 11) suggests:

> The very act of using the kinds of machines, techniques, and systems available to us generates patterns of activities and expectations that soon become 'second nature.' We do indeed 'use' telephones, automobiles, electric lights, and computers in the conventional sense of picking them up and putting them down. But our world soon becomes one in which telephony, automobility, electric lighting, and computing are forms of life in the most powerful sense: life would scarcely be thinkable without them.

Instrumental rationality allows natural objects to be separated artificially and isolated from their original contexts to be integrated into technical systems (Feenberg, 2012, p. 203). When natural objects have been reduced to aspects that allow them to become incorporated into a technical network, these aspects become of primary importance to the technical subject; for example, the tree trunk was primarily valued for its roundness when focused upon for making a wheel whilst its pre-technical qualities such as its role as a habitat and as a living species become meaningless (Feenberg, 2012, p. 204). Or, for example, when a river becomes primarily valued for its kinetic energy, it is rational to develop this resource for human use (Davison, 2001, p. 85). This happened, for example, during the Industrial Revolution as the kinetic energy of rivers was exploited for running machinery associated with watermills or more recently for hydroelectric power generators. Consequently, nature is valued extrinsically and exposed to utilitarian evaluations as it is ". . . fragmented into bits and pieces that appear as technically useful after being abstracted from all specific contexts" (Feenberg, 2012, p. 203). For Dryzek (2001, p. 95; 2005, p. 193), instrumental rationality therefore warps how humans perceive the world and their place in it.

Similarly, instrumental rationality subjects people within technical systems to the same arbitrary plans as things. As Berman (1988, p. 44) suggests, "It is impossible to miss some of [modernity's] ominous undertows: a lack of empathy, an emotional aridity, a narrowness of imaginative range. These modernists combine a celebration of the idea of the modern world with an almost total lack of feeling for the actual people in it". To this end,

Habermas discerns an “objectivating attitude” in which the “The buyer on the market abstracts from the human relation to the seller and simply seeks his own advantage. The bureaucrat and businessman too relate to the human objects of their activity in a strictly objective manner, applying rules impersonally and hiring and firing with indifference” (Feenberg, 2011, p. 866). Similarly, for Ellul and Horkheimer, the purely instrumental value of efficiency replaces all others in modern societies as it not only guides technological development but creates a competitive and destructive social pattern as people become incorporated into impersonal technical systems as passive producers and consumers (Feenberg, 2011, p. 867-868). As Ellul suggest “We think we are free and that technology has enhanced our powers when actually we are dominated by technology and increasingly channelled into the paths the pursuit of efficiency opens for us” (Feenberg, 2011, p. 867). Both Ellul and Horkheimer reflect favourably upon the conditions of pre-modernity as a basis for developing their critiques, suggesting that lessons can be learned from the past about what is now missing in order to reconstruct modern societies more humanely (Feenberg, 2011, p. 867).

2.4 Technological advancement

The Industrial Revolution brought rapid and sweeping social changes such as the mass movement of people from rural to urban environments, which eroded familiar social orders and a sense of belonging within more traditional ways of life (McGilchrist, 2009, p. 389). Concomitantly, the widespread transformation of scientific knowledge into technology, brought great advantages such as increased wealth, democracy and medical advances (Feenberg, 2011, p. 866). As the industrial sector expanded, mass production yielded an ever-increasing output of products; from household appliances and gadgets to powerful automobile systems (Commoner, 1972, p. 175). Social thought in modernity became so captivated by the promise of technology however that new machines, techniques, and chemicals are now largely thought to be the only reliable way of improving the human condition (Winner, 2010, p.5). Technological change is therefore largely perceived to be the only change worth making and it is advocated for everything such as our sources of energy, shelter, mobility and nutrition (Davison, 2013, p. 51). With the advent of mass production

however came "productive technologies", which impact more intensely on the environment as they displace less destructive technologies (Commoner, 1972, p. 175). For example: natural soaps have been superseded by highly processed detergents, materials such as flax replaced by cotton, which in turn has been increasingly replaced by synthetic fibres; wood by plastics; and natural farming by intensive industrial farming along with escalating use of fertilisers and pesticides (Commoner, 1972, p. 175). Consequently, the promise of technology appears unfulfilled as Smith (1991, p. 376) describes "an ever tightening technological web encompassing us, complete with impending shortages, ecological imbalances, noxious industrial residues, decreased privacy, a shrinking, overpopulated world". And yet the promise of technology endures as attention focuses on [ws2]the future possibilities of technology rather than the social changes it has wrought (Borgmann, 1987, p. 36; Davison, 2001, p. 104; Verbeek, 2005, p. 176).

2.5 Design and instrumental rationality

Design emerged as a profession within the advanced stages of modernity, deeply rooted in industrialisation; from the beginning therefore, it was embedded in consumer culture (Margolin, 1998). Consequently, in late-modernity product design education largely caters to "the values and virtues of instantaneity (instant and fast foods, meals, and other satisfactions) and of disposability (cups, plates, cutlery, packaging, napkins, clothing etc)" (Harvey, 1990, p. 286). Designers therefore tend to be restricted to addressing instrumental concerns relating to style, function and lifestyle (Chapman, 2005, pp. 16–17; Verbeek, 2005, p. 211). As a result, it is now widely acknowledged that design contributes significantly to unsustainability through the design of transient products that fuel consumption (Chapman, 2009; Davison, 2013, p. 51; Ehrenfeld, 2008; Manzini & Cullars, 1992; Orr, 2002; Thackara, 1988; Walker, 2017). This is made possible by the persistent triumphalism of "means" and little justification as to why many technological artefacts exist other than for frivolity and greed (Chan, 2018, p. 189). In the instrumentally rational modern worldview however, questions of ethics remain generally undeveloped in design and design education despite design being an ethical process (Chan, 2018, p. 184). Indeed for Davison (2013, p.52), design can be particularly unethical in that it often serves to suppress the "inherently illogical,

fundamentally mixed-up" notion of progress that modernity has emphasised by concealing its unsustainable trajectory. Consequently, Thackara (1988, p. 11) suggests that "design has been disarticulated in the public mind from progress, and has managed somehow to evade blame for the negative consequences of its role in our thoroughly modern lives". This is further compounded by product design education having no independent critical tradition upon which to base an alternative because it is thoroughly integrated in the modern capitalist system (Thackara, 1988, p. 22). For Miller (2013, p. 1) however, it ought to be unimaginable for a profession that spends its entire time designing products not to critically reflect upon what the consequences of a particular product might be.

Means-focused approaches to design are also prevalent in design education, which often favours honing technical and marketing skills to simulate the working world of design practice (Tatum, 2004, p. 76). This is symptomatic of what Churchman (1961, p. 1) describes as the most astonishing feature of the 20th century, which is that people developed such elaborate ways of doing things but no ways of justifying any of them. For example, Chan (2018, p. 189) asks: where is that fastest car in the world going? What are the reasons for building the tallest building? And why is a watch that answers our phone calls even necessary? For Thackara (2001, p. 9), this leaves us "brilliant on means, but pretty hopeless when it comes to ends". Consequently, there is a modern dilemma in which we are "trapped between the growing cleverness of our science and technology and our seeming incapacity to act wisely" (Orr, 2002, p. 29). In this context, the end of the design process is usually a commercially viable product of practical utility that is typically judged by the quality of ideas and execution as they relate to function and efficiency (Malpass, 2015, p. 64; Tatum, 2004, p. 76). These criteria may include client expectations, potential to fulfil or stimulate market demand, cost, technical feasibility, usability, eco-efficiency, etc. Ehrenfeld (2008, p. 213) argues however that when everyday consumer goods are judged against humanistic rather than utilitarian and economic values, they possess more "bads" than "goods". The "ultimate ends" of design—for example, enhanced community or satisfying work—are rarely considered in design education and commercial practice (Tatum, 2004, p.76).

Tatum (2004, p. 76) concedes that:

> Perhaps this is because no final agreement can be expected on ends, and because no simple analytical practice can be universally accepted as a means for arriving at such ends. . . . Yet these should not be accepted as excuses for allowing ultimate ends to remain unexamined-everywhere implicit in design, but nowhere explicitly identified, analyzed, or discussed. Every design serves certain interests, certain objectives, to the relative disadvantage of other real or possible interests and objectives. Ignoring this fact is no less a moral or value-based position than attending to the matter explicitly. (Tatum, 2004, p. 76)

For Tatum (2004, p.76), considering “ultimate ends” will be critical to developing more responsible approaches to design. Tatum (2004, p. 76) advocates that students should not be instructed as to what the “correct” ends might be but rather should be encouraged to “carefully examine both their own sense of desirable directions and their commitments to processes for arriving at social and political definitions of desirable directions and objectives for society”. Tatum (2004, pp. 76–77) suggests considering what each “end” might entail and analysing how one or another particular design might undermine or support these ends. Importantly, this process cannot proceed based on assumptions that narrow technical analyses, which focus upon questions such as "What is the most efficient?" and "What is the most cost effective?" can provide the best answers (Tatum, 2004, p. 69). Similarly, technological development cannot be guided by pre-empting the solution, for example:

> . . . we may compare six different alternatives for digital data storage and retrieval; but we proceed as though the task itself had been set for us in the nature of the world, rather than selected as a product of our own focus of attention. (Why, digital data at all, as opposed to some other channel of development? Does "reality" propel the home computer as sustainable solar electricity, for example, languishes in the wings?). (Tatum, 2004, p. 69)

The emphasis that the instrumentally rational modern worldview places upon the notion of neutral technological means makes it very difficult however for designers to negotiate the economic, cultural and perceptual barriers that obscure understanding of our relationships with objects clearly (Badke & Walker, 2013, p. 393).

2.6 Design and sustainability

Despite the significant contributions that design makes to unsustainability, it is widely acknowledged that design can play a substantive role in developing more sustainable ways of living (Chapman, 2009; Davison, 2001; Ehrenfeld, 2008; Manzini & Cullars, 1992; Orr, 2002; Thackara, 1988; Walker, 2017). The latter half of the twentieth century saw a growing interest in exploring the potential of design to create a more sustainable world (Papanek, 1974; Fuller & Kuromiya, 1982). A proliferation of design approaches emerged that came under the umbrella movement of Design for Environment and later, Ecodesign (Sheldrick & Rahimifard, 2013, p. 35). Aligned with the values of the modern worldview, such approaches are efficiency-focused and attempt to improve the ecological aspects of products whilst maintaining price, performance and quality (Ramani et al., 2010, pp. 1004–2). Eco-efficiency is based on the premise that industry can "do more with less" by developing cleaner machines and processes without having to significantly change its structures or compromise its profit margins (Braungart & McDonough, 2002, p. 51). At the turn of the century, industries across the globe considered eco-efficiency to be the most promising approach for effecting change through the "three Rs" – reduce, reuse, and recycle (Braungart & McDonough, 2002, p. 51).

The term "Design for Sustainability" emerged later to reflect an expanded approach to Ecodesign that attempts to be more holistic by accounting for the whole life-cycle of a product, including its social impacts (Sheldrick & Rahimifard, 2013, p. 35). Design for Sustainability is based on Elkington's Triple Bottom Line of sustainability, which is the dominant model for guiding the efforts of industry to be more sustainable (Wever & Vogtlander, 2015, p. 515). The Triple Bottom Line affords equal weight in corporate activities to people, profit and planet, encouraging a balance to be found between the social aspects of employees in a company, the ecological consequences of a company's products and economic profitability (Wever & Vogtlander, 2015, p. 515). The main design approaches are *Cradle-to Cradle* and *Circular Economy*, both of which are technologically and economically driven (Wever & Vogtlander, 2015, p. 517). Cradle-to-Cradle has a utopian outlook, claiming to support environmental and social sustainability with no restrictions to economic growth (Wever & Vogtlander, 2015, p. 519). This approach advocates that

nutrients in materials determine design and that products are made from biodegradable materials, which become food for biological cycles or by staying in uncontaminated closed-loop technical cycles (Braungart & McDonough, 2002, p. 104). Similarly, the Circular Economy seeks to eliminate or deplete materials by reducing toxic emissions through recycling but focuses upon business model innovation relating to restructuring the industrial economy from linear—fast replacement and disposal—to circular, which is based upon reusing and recycling products (Wever & Vogtlander, 2015, p. 517-519). Both Cradle-to-Cradle and Circular Economy approaches claim to be more comprehensive and effective than eco-efficiency because they emphasise the positive effects of commerce and industry, especially with respect to developing restorative strategies as opposed to the eco-efficient emphasis upon minimising negative impacts such as waste (MBDC, 2010, pp. 3–4).

2.7 Criticism of design approaches to sustainability

There is widespread criticism of the dominant design approaches to sustainability due to the impact that the instrumentally rational modern worldview has exerted upon them (Davison, 2013, p. 48; Ehrenfeld, 2013, p. 17; Giard & Schneiderman, 2013, p. 134; Walker, 2013b, p. 446). Accordingly, technological instrumentalism—in its combination of neutrality and human control—dominates the sustainability debate (Paredis, 2011, p. 202). For Davison (2013, p. 52) therefore, “In accepting as given a reality made of autonomous moral ends and neutral technological means, the quest for sustainability runs with the grain of modern worlds”. This is particularly evident in the pursuit of eco-efficiency, which can only slow environmental destruction down, not stop it (Braungart & McDonough, 2002, p. 54; Verbeek, 2011, p. 92). Indeed for Ehrenfeld (2008, p. 7), “Almost everything being done in the name of sustainable development addresses and attempts to reduce unsustainability. But reducing unsustainability, although critical, does not and will not create sustainability”. Furthermore, eco-efficient recycling often amounts to “downcycling” as inappropriate materials are recycled and/or blended with other materials (Braungart & McDonough, 2002, pp. 58–59). This not only reduces their integrity and strength, resulting in lower quality products and shorter product lifespans but it can also be more polluting (Braungart & McDonough, 2002, pp. 58–59). Moreover, a major problem with efficiency is that it has no

independent value; rather it is dependent upon the overall aim it is contributing to (Braungart & McDonough, 2002, pp. 61-62). For Braungart and McDonough (2002, pp. 61-62) therefore "Relying on eco-efficiency to save the environment will in fact achieve the opposite; it will let industry finish off everything, quietly, persistently, and completely. Cradle-to-Cradle and Circular Economy practitioners claim that these approaches are more effective than eco-efficiency approaches as they do not rely solely on efficiency and reducing negative impacts but Wever and Vogtländer (2015, p. 517) claim that in practice, the achievements of these approaches are similar to those of eco-efficiency. Furthermore, sustainability is not always thoroughly embedded within an organisation, which leaves it vulnerable to being viewed as an add-on rather than informing the inception of the design process, which is critical to its success (Ramani et al., 2010, pp. 1004–3; Sheldrick & Rahimifard, 2013, p. 39; Wever & Vogtlander, 2015, p. 546).

Despite Design for Sustainability being a comparatively expansive approach compared to Ecodesign, for Walker (2013b, p. 446) the modern worldview makes it "virtually impossible for the discipline of design to effectively and substantially address the interrelated issues of environmental responsibility, social obligation and personal meaning". Walker (2013a, p. 96) criticises the Triple Bottom Line basis of Design for Sustainability as being too impersonal to address sustainability substantively and instead proposes a Quadruple Bottom Line model for sustainability. This model includes "personal meaning" as the fourth concern to acknowledge that sustainability must be relevant to the individual person (Walker, 2013a, pp. 99–100). The term "personal meaning" encompasses a broad range of understandings and practices that are congruent with deeper values and profound, meaning seeking aspects of our humanity (Walker, 2011, p. 127). In the Quadruple Bottom Line model for sustainability, "personal meaning" is placed alongside social and environmental concerns whilst economic concerns are de-emphasised as they play a fundamental role in driving unsustainability (Walker, 2013a, p. 96). The incorporation of "personal meaning" into Design for Sustainability resonates with growing recognition that the spiritual dimension of being human may have a critical role to play in extricating sustainability from its modernist context (Orr, 2002; Inayatullah, 2005; Walker, 2011; Matthews, 2013).

2.8 Discussion: a basis for "after-modern" design

This section reflects upon the literature reviewed in this chapter to draw out implications for the overall aims of this research – which are to determine how product design education might contribute to sustainability in a more substantive manner, and to offer conceptual and practical support accordingly. Based on the literature, this section begins to articulate a basis for "after-modern" design. The basis for "after-modern" design proposes that product design education recognise and challenge the instrumentally rational nature of the modern worldview. This is an important consideration because as the literature revealed, instrumental rationality is detrimental to developing more sustainable ways of living as it emphasises neutral technological means over the ends they may serve, without reflecting upon the value of those ends. Moreover, instrumental rationality pervades how product design education contributes to developing more sustainable ways of living. In this context, sustainability is viewed in discreet, fragmented terms as an economic opportunity and a technical challenge. Furthermore, sustainability is viewed as an end that can be pursued via neutral technological means. When understood in neutral terms however, it is not logical to consider the myriad and complex ways in which technologies shape our actions, behaviours, attitudes and values – all of which are critically important to developing more sustainable ways of living. The potential consequences of technologies therefore remain largely unscrutinised by those involved in their design. "After-modern" design must therefore seek to de-emphasise instrumental rationality. It is proposed in this thesis that instrumental rationality can be de-emphasised by:

1) Counteracting the dominance of the so-called "left hemisphere" in technological development by harnessing the "right hemisphere" (see p.14) to conduct research into how the modern worldview negatively impacts upon the design of technological artefacts and systems.

2) Re-framing unsustainability as resulting from a crisis in human values rather than representing a technical challenge and economic opportunity.

2.8.1 Re-framing unsustainability as a crisis in human values

Whilst the instrumentally rational modern worldview is deeply problematic for developing more sustainable ways of living because it allows technologies to be viewed in neutral terms – it would be wrong to assume that technology per se is the problem. Or that, as Davison (2001, p. 4) suggests is often the case, that technology has simply not yet been developed enough to fix the problem. Einstein (2007, p. 387) once contended that problems arising from technological development should not be attributed to technologies themselves because the real problem lies in the hearts and minds of people. Similarly, Vergragt (2013, p. 364) asserts that "technology in itself is not the main problem: the problem lies in values, lifestyles, and economic growth, and present technology is just an expression of these values". The mounting evidence of unsustainability suggests that Braungart and McDonough (2002, pp. 61-62) are correct in their assertion that relying upon the technological fix of eco-efficiency is insufficient for addressing sustainability in a substantive manner (see p. 23).

Whilst the dominant approaches to sustainability adopted by product design education—such as Cradle-to-Cradle and Circular Economy—are more expansive than eco-efficiency, they are uncritical of consumption. These approaches therefore support the modern culture of "having", which can trigger an undesirable "rebound effect" (see p.5). As Einstein (1946, p. 13) also once famously contended, problems cannot be solved through the same kind of thinking that created them. Consequently, it may be more helpful to view the phenomenon of unsustainability as resulting from *a crisis in human values* – a view which shifts the focus from technology to people. Viewing unsustainability as resulting from a crisis in human values makes it difficult to approach the phenomenon instrumentally, as merely a technical challenge and an opportunity for economic growth – both of which are separated from ethical values in the modern society (Fromm, 1976, p. 16). Instead, viewing unsustainability as a crisis in human values behoves designers to approach the quest for sustainability as a matter of ethics, which for Chan (2018, p. 196) design can no longer ignore with respect to sustainability and technology. Viewing unsustainability as a crisis in human values however inevitably begs the question: *what kind of values are in crisis?* (this is the subject of chapter 4).

2.8.2 Emphasising the "right" hemisphere

The design industry has so far responded poorly to the complexities of unsustainability (Fry, 2005). This is due in part to largely retaining traditional, product-oriented approaches, which favour incremental re-designing rather than the radical re-thinking required for developing more sustainable ways of living (Marchand, 2009). Despite this, it is Ehrendfeld's (2013, p. 25) view that design offers a very "deliberate way out of the unsustainable, dominating, and addictive patterns of individual and social behaviours that have become the norms in . . . affluent, consumerist societies". For this to happen however, Ehrendfeld (2013, p. 26) suggests that radical change must occur as:

> The methods must enable designers to operate at depths of understanding deeper than those that have been available for much of the modern era. The designers themselves, must be willing and competent to think in new ways and be brave enough to break the proverbial mold. If not, we will continue to see marvellous new designs with unheard-of capacities for efficiency, intelligence, speed, and characteristics of which we are as yet unaware, but we will also continue to see unsustainability grow at the same time.

Despite design being an inherently creative activity, increasingly rationalistic methods were developed during modernity for making design decisions (Swann, 2002, p. 50). This is often reflected in design interventions that seek to address sustainability. For example, Brynjarsdottir et al. (2012, p. 950-951) found that many persuasive "sustainable technologies" are "deeply" informed by the four modern values of calculability, predictability, efficiency and top-down control. Consequently, these values constrained the imaginative capacity of designers to focusing mainly on domestic energy consumption as a means of addressing sustainability issues (Brynjarsdottir et al., 2012, p. 953). This study concluded that "persuasive sustainability can be understood as a modernist technology that works by narrowing its vision to define sustainability as resource optimization pursued by individual rational actors conceptualized apart from the messy realities of everyday life" (Brynjarsdottir et al., 2012, p. 953).

The dominant Design for Sustainability tools have also been developed in line with the instrumentally rational modern worldview. For Scott (1998, p. 11) however, such modern solutions tend to be based on:

> . . . a narrowing of vision [that] brings into sharp focus certain limited aspects of an otherwise far more complex and unwieldy reality. This very simplification, in turn, makes the phenomenon at the center of the field of vision more legible and hence more susceptible to careful measurement and calculation.

Popular Life Cycle Assessment tools such as the EcoDesign Checklist (Appendix 1), and the Life Cycle Design Strategy (also known as the LiDS Wheel) (Appendix 2) support such analytical approaches that focus on separate aspects of the problem. These tools are therefore limited in scope; for example, Life Cycle Assessment focuses solely upon the environmental aspect of sustainability whilst the LiDS Wheel can result in the wrong trade-offs as the value of its various evaluations relative to others is unknown – for example, between the energy a product requires to function compared with the environmental burden of its transportation (Wever & Vogtlander, 2015, pp. 525–526). The analytical nature of these tools therefore restricts designers from developing a full picture about what addressing sustainability needs to entail. Furthermore, and unsurprisingly, these tools are often perceived to be overly extensive and complicated, which contributes to a perception that designing for sustainability is a complex, expensive and laborious process (Lofthouse, 2006, pp. 1390–1391; Wever & Vogtlander, 2015, p. 523-524).

It is apparent that design research for sustainability would benefit from gaining a fuller picture about how technological artefacts and systems impact upon developing more sustainable ways of living. For Davison (2001, pp. 101-102), this can be achieved by recognising technologies as "the practices through which we come to know ourselves, each other, and our shared world". This view suggests the need for more holistic, emotional approaches to developing technologies than is currently the case. It is proposed therefore that design research for sustainability may benefit from methods that seek to de-emphasise the rationalistic, analytical, calculative side of being human to instead emphasise the so-called "right hemisphere", which is associated with holism, intuition, emotion and empathy.

2.9 Chapter conclusion

This chapter has addressed the research objective: *To determine how the modern worldview influences Design for Sustainability.* This chapter explored the phenomenon of

unsustainability as emerging from the significant inter-related values that modernity has emphasised, such as values relating to instrumental rationality, industrialism, individualism, technological development, economic growth, consumerism, capitalism and so on. The negative influence that these values have upon Design for Sustainability was discussed and a basis for "after-modern" design was proposed. From this chapter, the conclusions drawn are as follows:

- Instrumental rationality continues to play a fundamental role in contributing to the phenomenon of unsustainability. Moreover, instrumental rationality pervades efforts to develop more sustainable ways of living, which leaves Design for Sustainability operating comfortably within the current capitalist system – in which it largely values the environment extrinsically in terms of resources for human use. Design for Sustainability may benefit therefore from approaches that attempt to challenge and temper instrumental rationality and that seek to make interventions that encourage the intrinsic valuing of both environment and people.

- Instrumental rationality is especially problematic for design because it allows technological artefacts to be viewed as neutral. It is therefore almost impossible for designers to address sustainability in a more substantive manner because technological artefacts are understood simply, in terms of their functions and affordances. Consequently, the significant role that technological artefacts play in influencing people's behaviour, and more fundamentally, people's values—both of which are critical to developing more sustainable ways of living—remains largely unexamined. Design for Sustainability is likely to benefit therefore from developing approaches that view technologies in non-neutral terms.

- The dominant approaches and methods associated with Design for Sustainability appear insufficient for addressing sustainability in a more substantive manner due to their overly rationalistic, analytical nature, which encourage narrow, technologically optimistic and efficiency-driven approaches to sustainability. To this end, design research into sustainability may benefit from developing approaches and methods

that seek to harness the so-called “right hemisphere” which is associated with holism, empathy, emotion and intuition. These attributes may expand a designer’s imaginative range and in doing so, support them to challenge and move beyond the confines of the modern worldview. Approaching sustainability in this way mitigates against addressing sustainability via the same mindset that created the problem.

The next chapter reviews literature from the philosophy of technology to gain insights into how technologies can be understood in non-neutral terms.

3 Critical Perspectives of Technology

3.1 Introduction

This chapter addresses the research objective*: To identify insights from the philosophy of technology that could support product design education to address sustainability in a more substantive manner than the modern worldview permits.* This objective is addressed by conducting a literature review and reflecting upon it. This objective builds upon the findings of chapter 2, which revealed that the technologically optimistic outlook of the instrumentally rational, modern worldview is incompatible with developing more sustainable ways of living. Chapter 2 concluded by proposing a basis for "after-modern" design. This basis advocates viewing unsustainability as resulting from a crisis in human values and emphasising the so-called "right hemisphere" in research approaches that seek to address this crisis.

This chapter further develops the concept of "after-modern" design by turning to the philosophy of technology to investigate non-neutral understandings of technologies. The chapter focuses on four philosophers whose ideas are based in phenomenology. The chapter firstly explores the phenomenological perspective of technology espoused by prominent twentieth century philosopher Martyn Heidegger, before turning to Albert Borgmann who investigates the social aspects of consumer devices (Introna, 2008, pp. 49–50). These philosophers are relevant for developing "after-modern" design as they are both concerned with how technologies support and undermine substantive notions of human meaning. Additionally, Don Ihde and Peter-Paul Verbeek's postphenomenological perspectives of technology are explored. Ihde is relevant for "after-modern" design for his discernment of different "human-world" relations that technologies mediate, which shed light on the powerful ways in which technologies influence how people perceive the world and act in it. Verbeek is relevant for "after-modern" design for his focus on how technological artefacts mediate people's moral decision-making. The chapter firstly

introduces phenomenology before providing an overview of these four philosophers. The chapter concludes by drawing out the implications of the literature for the overall aims of this research – which are to determine how product design education might contribute to sustainability in a more substantive manner than current approaches, and to offer conceptual and practical ideas accordingly.

3.2 The philosophy of technology

The philosophy of technology is driven by three fundamental questions (Brey, 2010, p. 42):

1) What is technology?
2) How can the consequences of technology for society and the human condition be understood and evaluated?
3) How should we act in relation to technology?

The philosophy of technology emerged as a distinct field during the twentieth century through a variety of phenomenological, hermeneutic, existential, theological and critical theory approaches that came to be characterised as the *classical* philosophy of technology (Brey, 2010, p. 36). Classical philosophy of technology views technology as being central to modern life and as concealing the essence of nature and our connection to it (Brey, 2010, p. 36). Classical philosophy of technology is criticised however for being overly pessimistic and deterministic, i.e. viewing technologies as having their own autonomous functional logic that can be explained without reference to society (Brey, 2010, p. 38). The classical field is also criticised for being too abstract due to its tendency to study technology as a whole, whereas more contemporary understandings seek to evaluate the implications of technology for society and the human condition by studying concrete technologies in their contexts (Brey, 2010, p. 38-39).

3.3 Phenomenological perspectives on technology

Phenomenology can be traced back to the early years of the 20th century, originating with Edmund Husserl before being notably developed by Heidegger and Merleau-Ponty (Introna, 2008, p. 43; Verbeek, 2005, p. 110). Phenomenologists investigate the structure of various types of human experiences, which they claim the sciences abstract from (Introna, 2008, p. 44). These experiences include the experience of perception, thought, memory, imagination, social activity, emotion, desire and embodied action (Smith, 2018). The phenomenologist attempts to study conscious experiences, semi-conscious and even unconscious mental activity associated with habitual patterns of action, and the relevant background conditions implicitly invoked in these experiences (Smith, 2018). Fundamental to phenomenology is the concept of *intentionality*, which seeks to overcome the tension between the nineteenth century movements of idealism and realism – the former understanding reality as being entirely the product of consciousness and the latter understanding the knowledge we have of reality as existing "out there" independent of consciousness (Verbeek, 2005, p. 109). Intentionality instead allows human consciousness to be understood as only existing when "it is directed to the phenomena that announce themselves in it" (Verbeek, 2005, p. 109). Phenomenologists therefore understand human experiences as being inextricable from, and embedded in the world (Horrigan-Kelly et al. 2016, p. 2; Verbeek, 2005, p. 110). The "phenomenon" in phenomenology is the experiential relationship between subject and object, to which the subject is always directed (Sieweert, 2002). Intentionality therefore helps to overcome the Cartesian subject/object dichotomy that modernity emphasises (Horrigan-Kelly et al. 2016, p. 2).

Due to the phenomenological entanglement of subject and object, phenomenologists in technology studies are not concerned with technological artefacts per se—as designers and scientists tend to be—but with the world that makes these artefacts seem necessary or obvious to us (Introna, 2008, p. 55). Phenomenology understands people and technologies as co-shaping each other and in doing so, rejects the constructivist view that one can construct the other; rather, they rely on each other's possibility for being what they are, and continually draw upon each other to be meaningful (Introna, 2008, p. 58). The ethical questions posed by phenomenology about technology are therefore also ontological

questions as they ask *what sort of world we are becoming,* rather than what sort of world we value or want (Introna, 2008, p. 57). Phenomenologists argue that if technological development is approached from a phenomenological perspective, it can disclose some of the implications of using seemingly innocent, neutral tools and in doing so, support reflection upon how technologies reconstitute and change the human way of being in the world – rather than simply how they change our ways of doing (Introna, 2008, p. 57).

Because phenomenology views human experience as embedded in the world, it is concerned with the familiar background conditions of everyday life that make the experiences of the foreground meaningful and possible (Ihde & Selinger, 2003, p. 133; Introna, 2008, p. 45). It is these background conditions—often referred to as the "transcendental horizon" or "essence" of a phenomena—that the phenomenologist attempts to disclose (Introna, 2008, p. 45). These conditions are our taken-for-granted "already existent sense or familiarity with the world" (Introna, 2008, p. 45). Accordingly, these conditions are not produced or constructed by the phenomenologist as they already exist as the invariant thing that makes a particular phenomenon possible (Dahlberg, 2006, p. 11-12). Phenomenologists claim that the natural sciences are uncritical of the constituting roles of transcendental horizons, choosing to instead take the objects of their investigations as an already existing given "without considering the conditions that make it possible for them to encounter these phenomena as what they take them to be" (Introna, 2008, p. 47). For phenomenologists therefore, it is the constitutive conditions or horizons that "keep us from becoming lost in or misled by the abstractions of science and the powers of technology" (Introna, 2008, p. 47). To reveal these conditions, phenomenologists must attempt to "voluntarily sustain the awakening force of astonishment" in their investigations (Cogan, n.d.). In other words, phenomenologists explore phenomena naively and sceptically, from a beginner's perspective (Introna, 2008, p. 44). The phenomenologist focuses on generating richly descriptive accounts about how phenomena are experienced but there is no unified phenomenological tradition or explicit and systematic account of phenomenology and its methods (Introna, 2008, p. 44).

3.4 Martyn Heidegger: The "technological enframing"

Heidegger was a leading phenomenologist at the origins of the late-modern, classical philosophy of technology (Ihde, 1995, p. 20). Heidegger sought to explain "the meaning of being" based on the premise that human existence cannot be explained by "being alone" but only in terms of being with others and "being-in-the-world", which is understood as embeddedness in the world (Horrigan-Kelly et al., 2016, p. 2). Heidegger's phenomenology is notable for his inclusion of technology and recognition that the relationship between people and technology is inextricable; technology therefore could not be discounted in his quest to explain the meaning of being (Ihde, 1995, p. 20). For Heidegger, modern technology cannot be fully explained in terms of what it is or what it does but by its "essence" (Wheeler, 2017). Heidegger contends that the essence of modern technology was "the technological enframing" which he describes as:

> . . . the gathering together of that setting-upon which sets upon man, i.e., challenges him forth, to reveal the real, in the mode of ordering, as standing-reserve. Enframing means that way of revealing which holds sway in the essence of modern technology and which is itself nothing technological. (Heidegger, 1977, p. 20)

The "technological enframing" reveals everything, including people, to be extrinsically valuable, controllable resources for human use – Heidegger terms this "standing reserve" (Smith, 1991, p. 376). Consequently, "Nature becomes a gigantic gasoline station, an energy source for modern technology and industry" (Heidegger, 1966, p. 50) and people understand themselves as being "maximally useful when properly ordered, arranged and propitiously 'sallied forth'" (Smith, 1991, p. 377). The technological enframing is a "way of being" in which we pursue increasing levels of flexibility and efficiency for their own sake, seeking the maximum yield for the minimum expense (Dreyfus, 1995, pp. 27–28). For Heidegger, this encourages selfish acquisitiveness at the personal level (Guignon, 2004, p. 84).

Heidegger's great concern was that this intensely instrumental and rationalistic emphasis may result in people being unable to relate to that which is not the product of human choice, and therefore become unable to relate to the distinctive essence of being

human (Coyne, n.d.; Smith, 1991, p. 378). This position was radical because it was not primarily concerned with the technological destruction of nature and civilization but for the "the human distress caused by the technological understanding of being"(Dreyfus, 1995, p. 26). Consequently, Heidegger feared that "the approaching tide of technological revolution in the atomic age could so captivate, bewitch, dazzle, and beguile man that calculative thinking may someday come to be accepted and practiced as the only way of thinking" (Dreyfus, 1995, p. 27). Heidegger asserts that modernity and the "technological enframing" represents "the darkening of the world" which encompasses "the flight of the gods, the destruction of the earth, the reduction of human beings to a mass, the pre-eminence of the mediocre" (Heidegger, 2014, p. 49). Despite this pessimistic analysis of technology, Heidegger maintains that the "technological enframing" is only a *current* understanding of being and if we can recognise this and realise it in our practices, we can step outside of the technological understanding of being, which will allow us to see that "what is most important in our lives is not subject to efficient enhancement" (Dreyfus, 1995, p. 29). Consequently, technical choices become debatable; as one of many choices rather than the only choice (Dreyfus, 1995, p. 29). As Heidegger explains:

> We depend on technical devices; they even challenge us to ever greater advances. But suddenly and unaware we find ourselves so firmly shackled to these technical devices that we fall into bondage to them. Still we can act otherwise. We can use technical devices, and yet with proper use also keep ourselves so free of them, that we may let go of them any time. We can use technical devices as they ought to be used, and also let them alone as something which does not affect our inner and real core. (Heidegger, 1966, pp. 53–54)

As an alternative to the human preoccupation with control and mastery of every situation and machination, Heidegger proposes the concept of "releasement" which tempers instrumental rationality by de-emphasising calculative thinking and pursuing one's own ends (Guignon, 2004, p. 85). As Heidegger (1966, p. 54) puts it:

> We let technical devices enter our daily life, and at the same time leave them outside . . . as things which are nothing absolute but remain dependent upon something higher . . . I would call this comportment toward technology which expresses ''yes'' and at the same time ''no,'' by an old word, releasement towards things.

"Releasement" calls for people to experience themselves as participants in a shared event that is greater than themselves – to focus on what they can contribute to a situation rather than on what they can get out of it (Guignon, 2004, p. 84-85). People who experience "releasement" however have usually already cultivated a sense of compassion, which provides them with a sense of situational awareness about what ought to be done (Guignon, 2004, p. 85).

For Heidegger, his notion of "things" are critically important to "releasement" as "things" bring us into a different relation with technology. In his famous essay "The Thing", Heidegger (1971, p. 197) describes a hand-made jug as being a "thing" because it brings a world into being in a particular way; for example, the jug not only possesses functional utility, it is also rich in connections and context, emerging from art, craftsmanship and poetry. A silver chalice is also a "thing" because it unites means with ends, developing a relationship of mutual indebtedness between the raw material of the silver, the chalice itself, the realm of consecration and bestowal to which the chalice belongs, and the craftsman (Heidegger, 1977, p. 3). An old wooden bridge over the Rhine is a "thing" because it brings together and fashions natural materials in a manner that is both in deep harmony with, and reveals the essence of those materials and the natural environment in which they are set (Wheeler, 2017). Heidegger distinguishes "things" from "mere" objects; for example, the industrially-made Coke can is an object that emerges from the comparatively soulless realm of science and technology (Heidegger, 1969, p. 95). Similarly, a styrofoam cup has no intrinsic value and is destined immediately for landfill whilst the traditional Japanese understanding of a teacup is intrinsically valued for its social meaning and may be passed down through generations (Dreyfus, 1995, p. 27). "Things" therefore draw attention to different "understandings of being" in which:

> . . . the traditional Japanese understanding of what it is to be human (passive, contented, gentle, social, etc.) fits with their understanding of what it is to be a thing (delicate, beautiful, traditional, etc.). It would make no sense for us, who are active, independent, and aggressive—constantly striving to cultivate and satisfy our desires—to relate to things the way the Japanese do; or for the Japanese (before their understanding of being was interfered with by ours) to invent and prefer styrofoam teacups. (Dreyfus, 1995, p. 27)

Additionally, Heidegger suggests that appreciating marginal practices such as a celebratory meal, drinking local wine with friends, friendship itself or back-packing in the wilderness provide a fruitful direction for developing a new attitude towards technology (Dreyfus, 1995, p. 31 - 32). These practices hold the potential to form a new cultural paradigm in which formerly marginal practices become central, and efficiency becomes marginal (Dreyfus, 1995, p. 31 - 32). Whilst Heidegger's philosophy of technology is influential, it is criticised for being overly pessimistic and viewing "technology" as a monolithic whole, which is too abstract for designers who may be interested in exploring its impacts upon their practice (Coyne, n.d.). Many of Heidegger's followers have sought to overcome this abstraction by adopting case-study approaches of specific, concrete technologies but Smith (2015, p. 547) cautions that in doing this, there is a danger of diluting the philosophy of technology as it becomes "parasitically dependent upon the developments of industry".

3.5 Albert Borgmann: The device paradigm

Albert Borgmann (1987) is widely credited as transforming Heidegger's abstract accounts of technology into more concrete terms by addressing actual devices such as televisions, central heating systems, cars, etc. (Coyne, n.d.; Verbeek, 2005, p. 174). For Walker (2011, p. 107), Borgmann has made significant contributions towards addressing a gap that exists between technological artefacts and "more profound understandings of meaning and human purpose". Like Heidegger, Borgmann views technological thinking as a mode in which we approach reality and similarly views "things" as powerfully enhancing human wellbeing, also distinguishing them from mere objects, which he terms "devices". Devices are technological artefacts that encourage disengaged ways of dealing with the world as they require little thought or input whilst providing what we want, when we want it – whilst obscuring their ecological and social relations (Davison, 2001, p. 112). Devices make commodities readily available and promote consumption of them – moreover the device paradigm sanctions commodities and their consumption as being ends-in themselves (Borgmann, 1987, p. 61). For Borgmann (1987, p. 247) however, it is difficult to see how the claim of technology to enrich people's lives by fostering availability contributes to a

meaningful human existence. Borgmann (1987, p. 3) therefore suggests that technology contributes "a characteristic and constraining pattern to the entire fabric of our lives [which is] visible first and most of all in the countless inconspicuous objects and procedures of daily life in a technological society". Borgmann (1987, p. 40) refers to this pattern as the *device paradigm*.

The device paradigm is the most consequential event of the modern period because whilst it fundamentally shapes the world, its "everydayness" and the way it has come into being allows it to go unnoticed and evade scrutiny (Borgmann, 1987, p. 3). The central premise of the device paradigm is that our lives are being filled with an overload of entertaining, distracting and disburdening devices (Borgmann, 2014, p. 246). Borgmann's (1987, p. 4) concern about the device paradigm is that devices are endangering "focal things" and "focal practices", which "center and illuminate our lives". Like Heidegger, "things" are important to Borgmann but he criticises Heidegger for paying only scant attention to the practices associated with "things" (1987, p. 200). A "focal thing" for Borgmann is instead "inseparable from its context, namely, its world, and from our commerce with the thing and its world, namely engagement" (1987, p. 41). A "focal thing" requires engaged "focal practices" for its welfare and prosperity (Borgmann, 1987, p. 200). Importantly, focal practices cannot simply be mere leisure diversions; they must be "totally engaging activities that unite means and ends, effort and accomplishment, labour and leisure" (Borgmann, 1987, p. 219):

> [A focal thing is] concrete, tangible, and deep, admitting of no functional equivalents; they have a tradition, structure and rhythm of their own. They are unprocurable and finally beyond our control. They engage us in the fullness of our capacities. And they thrive in a technological setting. A focal practice, generally, is the resolute and regular dedication to a focal thing. It sponsors discipline and skill which are exercised in a unity of achievement and enjoyment, of mind, body, and the world, of myself, and others, and in social union. (Borgmann, 1987, p. 219)

Borgmann distinguishes focal things from devices by comparing for example, the traditional domestic hearth with a central heating system, and a conventional oven with a microwave oven. A domestic hearth is a focal thing because it relies upon focal practices that provide opportunities for thinking about and caring for one's family. Furthermore, the hearth

requires the skills and attention to build and sustain a fire including sourcing, drying and chopping wood (Borgmann, 1987, p. 41). By contrast, a central heating system instantly delivers heat from an unknown and unseen source with minimal effort, thought and attention required from the user – warmth therefore becomes a readily available commodity (Borgmann, 1987, p. 42). Borgmann's philosophy of technology suggests that the modern obsession with efficiency is draining life of meaning because individual involvement with nature and with other people is reduced to a bare minimum whilst possession and control have become the highest values (Borgmann, 1987, p. 44). In the case of the central heating system, efficiency comes at the expense of building a fire, which arguably provides a richer, more meaningful experience because warmth is procured through engaged activity which unites means with ends. Consequently, the domestic hearth creates a central place in the home and provides rich sensory experiences as it gathers and rewards the family whilst the central heating system is dispersed, invisible, uniform and instant. For Borgmann (2000, p. 299), uniting means with ends provides richer, more meaningful experiences whereas the rewards of a meaningful life are lost when one becomes a mere operator of smoothly functioning machinery[4].

For Borgmann (1987, p. 155) the device paradigm can be restrained by abandoning familiar design objectives such as efficiency, disburdenment, availability and ease of use to instead emphasise focal things and focal practices. This would consign technology to the background of focal things and practices where technology operates in a supportive role to focal things and practices (Borgmann, 1987, p. 220). Focal things and practices provide the basis for a reform of technology by becoming the new ends that technologies serve (Borgmann, 1987, p. 219). This challenges modern inclination to control as it does not involve "imposing a new and unified master plan on the technological universe but in discovering those sources of strength that will nourish principled and confident beginnings" (Borgmann, 1987, p. 199-200). Moreover, "orientation to a focal reality is possible within a world dominated by devices [and] provided they do not define our ultimate ends, devices

[4] See also Feenberg's (2011) theory of Social Rationality, which attempts to explain why people experience a loss of meaning when they become incorporated into technical systems as passive producers and consumers.

may illuminate, heighten, and facilitate our opportunities for focal encounters with the things that truly sustain us" (Borgmann, 1987, p. 200).

3.6 Postphenomenology

Towards the end of the twentieth century an "empirical turn" took place in the philosophy of technology, which sought to overcome the abstract, transcendental and pessimistic nature of the classical field (Brey, 2010, p. 38; Ihde, 2008, p. 2). Within this turn, "postphenomenology" emerged as an approach to studying technology that its founder, Don Ihde (2008, p. 2), claims is "more phenomenological" than phenomenology. During the 1980s, Ihde discerned an unease in philosophical circles that phenomenology had become overly confined within linguistic-centered philosophies to adequately respond to the massive changes taking place in science and technology during the twentieth century, (Ihde, 2008, p. 3). Postphenomenology is rooted in the phenomenological focus upon experience, but can be distinguished from phenomenology in the following ways:

- Whereas the "phenomenon" in phenomenology is the experiential relationship between people and their lifeworld (subjects and objects), the phenomenon in postphenomenology is technology understood as a human-technology relation (Zwier et al., 2016, p. 317). Postphenomenology is therefore technology-focused and emphasises the empirical study of technologies, aiming to integrate science and technology rather than oppose them – postphenomenology therefore distances itself from the romanticism of classical phenomenology (Rosenberger & Verbeek, 2015, p. 11).

- Postphenomenology rejects the transcendental nature of phenomenology by adopting a pragmatic stance. For the postphenomenologist, reality emerges from the practical relations between people and technologies, not from an essence that transcends the experiential correlation (Verbeek, 2016, p. 191; Zwier et al., 2016, p. 316). There are no essences therefore in postphenomenology – instead, technologies are understood as "multistable". Technologies only become what they are in their

contexts of use and therefore yield different non-neutral human-world relations (Ihde, 1995, p. 7; Verbeek, 2016, p. 191; Zwier et al., 2016, p. 316).

- Whereas both phenomenology and postphenomenology view subjects and objects as entangled and inextricable from each other – in postphenomenology, there are no pre-given subjects and objects (as there are in phenomenology) because subjectivity and objectivity emerge only from the human-technology relation, which in turn mediates a human-world relation (Introna, 2017; Verbeek, 2011, p. 7; Zwier et al., 2016, p. 318).

- Whereas phenomenology addresses philosophical questions by analysing and describing human experience, postphenomenology emphasises the perceptual and actional relations people develop with specific technologies (Rosenberger, 2014, p. 375). Postphenomenology focuses on developing rich and subtle accounts of the complexities of the human-technology relationship rather than solely revealing and critiquing it, as has largely been the case with phenomenological investigations (Introna, 2017). Postphenomenology is therefore more outward looking than phenomenology as it "looks forward" from technologies rather than reductively "looking backwards" to the conditions of possibility of technologies (Zwier et al., 2016, p. 320).

The concept of *technological mediation*[5] plays an important role in postphenomenology as human-technology relations are understood to be fundamentally mediated by technology – and importantly, because the mediation is the source from which subjectivity and objectivity emerges: agency lies neither wholly with subject or object (Introna, 2017; Verbeek, 2011, p. 7; Zwier et al., 2016, p. 318). People and technologies therefore co-shape each other (Spahn, 2015, p. 251; Verbeek, 2005, p. 113). Human-technology relations create human-world relations by mediating certain possibilities whilst

[5] The concept of technological mediation has also been notably advanced within Science and Technology Studies (STS) by Bruno Latour (1994) through his *Actor-Network Theory* and by Madeleine Akrich (1992, pp. 205–224) through her *script theory* account of technology.

foreclosing others (Rosenberger, 2014, p. 375). As Verbeek (2005, p. 130) suggests, ‘‘What humans are and what their world is receive their form by artifactual mediation. Mediation does not simply take place between a subject and an object, but rather co-shapes subjectivity and objectivity’’. Postphenomenological studies combine philosophical analysis with empirical investigations to focus on the various ways that technologies help to shape relations between people and their world (Verbeek, 2016, p. 190).

Postphenomenology attempts to describe the varieties of subjectivities and objectivities that emerge through mediation, which invites consideration about *the kind of subjects people become, and what kind of world emerges from technological mediation* – for example, what do we become and what does the world become as a result of using telescopes, self-driving cars, computers, etc.? (Introna, 2017). Increasingly, researchers are adopting postphenomenology to study digital devices such as smart phones, tablets, computers, televisions, watches, gaming consoles, etc. because postphenomenology can help to explore how these devices shape people’s choices, actions and experiences – and how such devices change people’s experience the world (Irwin, 2016, p. 31). Postphenomenology is however criticised for being overly focused on technologies at the expense of critiquing the political systems in which technological mediations take place – for Aagaard (2017, p. 529), this means that postphenomenology is complicit in current injustices.

3.7 Don Ihde: Human-technology relations

Don Ihde (1998, p. 102) originally developed the concept of postphenomenology to address the modern propensity to view technologies as neutral, which leaves their world-building, world-changing capabilities unquestioned. Postphenomenology is a modified, hybrid phenomenology, which combines phenomenology with pragmatism, and directs this combination towards the study of technologies (Ihde, 1995, p. 7). Phenomenology is therefore enriched by pragmatism’s emphasis upon viewing experience in an organism/environment model whereby experience is deeply embedded in both the physical or material world and its cultural-social dimensions (Ihde, 1995, p. 19). To investigate the

role that technologies play in mediating human-world relations, Ihde explores how the perceptual-bodily experiences of technologies transform a person's experience of the world. Ihde (1990, pp. 73–112) discerns four structural features of human-technology relations, which he conceptualises as "I-technology-world" relations [6]:

- *Embodiment relations* occur when we perceive the world *through* technologies such as seeing through spectacles; in this relation, technologies effectively become semi-transparent. Similarly when we use a computer mouse, the screen becomes an extension of our special field (Stusser, 2017, pp. 35–36). This relation is schematised as, "(I–technology)–world" (Ihde, 1990, p. 73).

- *Hermeneutic relations* occur when technologies allow an interpretation of the world to be made such as reading a temperature through a thermometer; in this relation, technologies are highly visible. This relation is schematised as, "I–(technology–world)" (Ihde, 1990, p. 86).

- *Alterity relations* occur when a technology possesses positive experiential aspects allowing it to take on a form of "quasi-otherness" as it becomes a focal entity for human attentions and attentiveness such as a well-loved "spirited" sports car (Kaplan, 2009, p. 90). Similarly, people often have this relation to computer devices such as in-car navigation systems or building something in a video game (Irwin, 2018, p. 193). This relation is schematised as, "I–technology (world)" (Ihde, 1990, p. 107).

- *Background relations* occur when technologies operate in an automatic or semi-automatic way, as a background presence, such as domestic heating, lighting and cooling systems. This is relation is schematised as, "I–(technology / world)" (Ihde, 1990, p. 108-112).

[6] To account for more contemporary technologies, Verbeek (2015, pp. 29–30) discerns further human-technology relations including: *cyborg* relations (for example, a brain implant is more than an "embodied" relation); *immersion* relations (for example, smart, ambient and sometimes persuasive technologies are more than a "background" relation because of their interactive nature); and an *augmentation* relation (for example, the now defunct Google Glass is both an "embodied" and a "hermeneutic" relation).

Through these human-technology relations Ihde (1990, p. 112) demonstrates that there is always a magnification/reduction structure to technologies, which have "important political and ethical implications for its design and implementation, especially if one considers that every disclosure of the world through technology is also immediately a concealment of other possible disclosures" (Introna, 2008, p. 54). For example, a car discloses the possibility of getting somewhere fast but conceals the resources necessary for its existence (Introna, 2008, p. 54). Objects are therefore not neutral intermediaries but active mediators that provide a framework for action through their *intentionality* towards a particular direction that takes shape in a dominant form of use (Ihde, 1990, p. 140). Consequently, a technological object is ambiguous and therefore should not be studied solely in terms of being an object because "whatever else it is, [it] *becomes* what it 'is' through its uses" (Ihde, 1990, p. 69-70).

3.8 Peter-Paul Verbeek: The technological mediation of morality

Verbeek (2016, p. 190) builds upon the work of Ihde, adopting a postphenomenological approach to investigate how technologies mediate moral actions and decisions. For Verbeek (2006, pp. 368–369) the postphenomenological emphasis on subjectivity and objectivity emerging from technological mediation places technologies at the very heart of ethics because ethics is concerned with how to act – and technologies-in-use appear to provide material answers to the question of how to act. Technological mediation therefore significantly influences our normative frameworks, values and responsibilities to the extent that it *makes people who they are and what the world is for them* (Verbeek, 2005, p.130 & p. 228; Verbeek, 2016, pp. 200-201). In line with its phenomenological base, postphenomenology does not assign ethical responsibility solely to people or to objects; rather, moral actions and decisions are co-shaped in the mutual relation that arises between user and object (Verbeek, 2011, p. 58). A favoured example of Verbeek's is the case of obstetric ultrasound (Verbeek, 2011, p. 23-26). When analysed postphenomenologically, the obstetric ultrasound can be viewed not simply as a technology that allows an unborn child to be made visible, but as a technology that co-shapes, for example, a gendered person, or if abnormalities are highlighted, a patient (Verbeek, 2011,

p. 23-26). Consequently, the ultrasound co-shapes the parents as it influences their relationship with the foetus, which can have profound ethical ramifications (Verbeek, 2011, p. 23-26).

Despite the fact that designers play a seminal role in engendering technological mediations, postphenomenology rarely informs product design education (Verbeek, 2005, p. 204). For Verbeek (2015, p. 26; 2016, pp. 202–203) postphenomenology can assist designers to anticipate how products might ethically impact upon people and moreover, postphenomenology makes it possible to *design* moral mediations. Verbeek (2015, p. 28) even goes so far to say that "Designing technology is designing human beings: robots, vacuum cleaners, smart watches – any technology creates specific relations between its users and their world, resulting in specific experiences and practices". Designing moral mediations using postphenomenology differs from other forms of behaviour-influencing technologies such as "nudge" theory and persuasive technology because these approaches retain the modernist subject/object dichotomy by emphasising the delegation of moral responsibilities *from* humans *to* non-humans (Verbeek 2011, p. 98). Instead, postphenomenology begins with the technologically mediated character of human-world relations and focuses on enhancing the quality of the mediated character of human actions and decisions (Verbeek, 2016, pp. 202–203).

Postphenomenology offers designers the opportunity to conduct a *mediation analysis* of existing and proposed technological artefacts and systems, which can take various forms, including conducting a mediation analysis "by imagination", by augmenting versions of Scenario-based Product design education and through Constructive Technology Analysis (Verbeek, 2011, p. 100). A mediation analysis "by imagination" involves imagining various contexts of use in which a proposed technological artefact/system could play a role, focusing on how they might engender specific practices and shape how people experience reality (2011, pp. 101–102). Verbeek (2011, p. 105) also suggests that the established methods of Scenario-based Product design education and Constructive Technology Analysis provide a useful basis for conducting a mediation analysis because both aim to anticipate varied contexts and different uses of technologies-in-design. These methods would need

augmenting however to include consideration of how the ethical actions and decision-making of users might be mediated (Verbeek, 2011, p. 105). Currently, Scenario-based Product design education attempts to anticipate how technologies-in-design might be used and in what contexts, for the purpose of developing optimum functionality (Verbeek, 2011, p. 102 - 104). Constructive Technology Analysis attempts to democratically include a range of stakeholders *during* the development of technologies as a means of ensuring their survival (Verbeek, 2011, p. 102 - 104). Whilst Constructive Technology Analysis highlights how technologies emerge from complex interactions between various actors, it does not address the use context of technologies – the potential mediating role of the technology-in-design is therefore left unexamined (Verbeek, 2011, pp. 102–104).

3.9 Discussion: insights for "after-modern" design

The basis for "after-modern" design developed at the end of chapter 2 seeks to overcome the instrumentally rationally nature of the modern worldview that is detrimental to developing more sustainable ways of living (see p.15). This section builds upon the basis for "after-modern" design by identifying insights from the literature reviewed in this chapter that appear relevant for developing deeper understandings about the non-neutral nature of technologies. Phenomenological perspectives such as those of Heidegger (see p.34) and Borgmann (see p.37) are germane for developing the concept of "after-modern" design – in particular, because they shed light on how technologies can negatively impact upon substantive notions of human meaning that point to the "being" rather than the "having" mode of existence (see p.13). The notions of "focal things" and "focal practices" are especially relevant because as Borgmann suggests "a focal practice discloses the significance of things and the dignity of humans, it engenders a concern for the safety and wellbeing of things and persons" (Borgmann, 1987, p. 220). Moreover, focal practices allow us to "encounter ourselves as carers of significant places, things, beings, and people" (Borgmann, 1987, p. 220). The trajectory of the contemporary technological world appears though to be moving *away* from "things"—which are valued intrinsically—*towards* efficient disburdening devices, which amplify consumption and tend to be valued extrinsically (see p. 37). Whilst the ideas of Heidegger and Borgmann are insightful for developing "after-modern" design,

they leave little room for considering how *new* technological artefacts might be practically developed in the direction of “after-modernity”.

Postphenomenological perspectives such as those of Ihde (see p.42) and Verbeek (see p.44) offer more practical insights than Borgmann and Heidegger through their focus on providing nuanced accounts of the complexities of human-technology relations, rather than solely critiquing these relations. Numerous insights were gleaned from the literature reviewed in this chapter that are especially relevant for informing the notion of “after-modern” design. These insights are rooted in the phenomenological emphasis upon how technologies influence human flourishing and meaning but borrow heavily from postphenomenology. The insights are described under the following five headers:

1) Technological mediation of human-world relations
2) Quality of mediation
3) Magnification and reduction structure of technologies
4) Moral agency of technologies
5) Methods

3.9.1 Technological mediation of human-world relations

For Ihde (1990, pp. 26–27) technologies in late-modernity tend to be understood as “things-in-themselves” rather than as “things-in-use” that shape the relations people have with each other and with the world. The postphenomenological insight that technologies mediate human-word relations is potentially transformative for product design education as it invites technologies to be understood as beginnings of potential ways of life rather than as ends-in-themselves. The insight that technological artefacts and systems mediate human-world relations invites design students to anticipate what those mediations might be and evaluate whether they are compatible with developing more sustainable ways of living. Considering technological mediation in the design process therefore challenges the modern propensity to view technologies in neutral terms and expands consideration of the “use” phase of technological artefacts beyond energy consumption and recycling considerations (see p.21). Re-framing technologies as beginnings of potential ways of life rather than as

ends-in-themselves necessitates radically different considerations during the designing process as this re-framing invites questions such as:

- What realities might this technological artefact disclose and conceal?
- What kind of actions and behaviours might this technological artefact engender?
- How might these actions and behaviours influence values that are compatible with sustainability.

3.9.2 Quality of mediation

Because postphenomenology is focused on technological mediation, it provides the opportunity to consider the "quality" of a potential mediation. This is of special interest to "after-modern" design because in evaluating the quality of a technological mediation, the designer is evaluating the quality of a potential human-world relation. This is a fruitful possibility because it affords designers the opportunity to consider how a broad range of mediations may impact upon sustainability, not simply whether energy use is reduced or whether a product is recyclable. For example, a technological artefact may be judged to have met sustainability criteria because its energy consumption is low and it is easily recyclable, but such a judgement is limited because it fails to account for how technologies establish particular norms and values in the people who use them. For example, if the artefact and/or system being designed promotes distracted, consumptive behaviours—such as those associated with personal digital devices—it is unlikely to engender more sustainable ways of living such behaviours encourage the "having" mode of being (see p.13). Whilst evaluating the "quality" of a mediation may be fruitful for "after-modern" design, it is also ambiguous because "quality" is likely to be judged in terms of the overall aim of a design project and whether it is compatible with stakeholder values. In late-modernity, design projects—including those oriented towards sustainability—tend to be judged by criteria that are not necessarily compatible with sustainability, such as utility, efficiency, market fit and economic viability, etc. (see p.19). Technological mediation alone however cannot support judgements about whether

mediations substantively support sustainability – for this, criteria for evaluating mediations will need to be defined (this is the subject of chapter 4).

3.9.3 Magnification and reduction structure of technologies

Ihde's human-technology relations (see p.43) demonstrate that technologies can withdraw into our bodies, help us to interpret aspects of the world, become loved or conversely fade into the background of our lives. These relations can help to reveal which aspects of reality technological artefacts and/or systems might magnify or reduce. This is important for "after-modern" design as it can be easy to lose sight of how technologies magnify or reduce particular aspects of reality as they become increasingly pervasive, habitual and necessary (Introna, 2008, p. 54). The magnification and reduction insight is pertinent as it can be directed towards considering how instrumental rationality comes to magnify and reduce aspects of reality via the late-modern technologies it is embodied in. The postphenomenological emphasis on magnification and reduction invites, for example, reflection upon how digital media magnifies written text and graphics whilst reducing other modes of expression such as tone of voice and body language – in doing so, intentional expression is privileged over unconscious responses (Stusser, 2017, p. 40). Consequently, it becomes increasingly difficult to gauge how our actions might be interpreted and how they impact on others as digitally mediated interactions are less likely to provide meaningful feedback as they only partially allow us to see how we impact on others (Stusser, 2017, p. 40).

3.9.4 Moral agency of technologies

When designers seek to influence the moral behaviour of people, they often seek to "inscribe" morality into technological artefacts in a one-way, linear fashion (Verbeek, 2011, pp. 116–117). In line with the modern worldview, this approach emphasises human control, often resulting in dictatorial artefacts that convey a general sense of mistrust; for example, speed bumps instruct people to "drive slowly", subway turnstiles say "buy a ticket", supermarket trollies say "put me back", water saving showerheads say "don't shower for long", etc. (Verbeek, 2006, p. 369). Whilst many "persuasive" technologies are effective,

how a person may be co-shaped by them is not accounted for. There is a danger, for example, that relying on technological artefacts to moralise people is overly disburdening as people are not required to consciously develop—or at least reflect upon—their own sense of moral responsibility. Similarly, when designers adopt less high-handed approaches such as "reflective design" (Sengers et al., 2005, p. 55)—an approach that seeks to provide people with opportunities to critically reflect on their lives—they do not consider how the co-shaping nature of technologies may undermine what the technology has been designed to achieve. For example, whilst a domestic "smart" meter seeks to encourage critical reflection on domestic energy use, if the meter is connected to a personal device such as a smartphone, the aim of the smart meter may be diluted due to the potential of the smartphone to mediate distracted human-world relations that encourage the "having" mode of existence. Adopting a postphenomenological approach to design can therefore support designers to build a fuller picture about the artefacts and systems they design – especially in terms of their potential to impact upon a person's sense of moral responsibility. This distinction between designing technological artefacts and systems to address moral issues and anticipating how technological artefacts themselves may co-shape a person's sense of moral responsibility is a key factor for "after-modern" design.

3.9.5 Methods

Postphenomenology can itself be construed as "after-modern" because it "is a modest and tentative activity, not a high-handed enterprise for steering human behaviour" (Verbeek, 2011, p. 118). Whilst Verbeek's postphenomenology is design-focused, the methods he advocates may prove counterproductive to "after-modern" design because they are largely based in modern premises. For example, augmented Constructive Technology Analysis requires stakeholders to anticipate moral mediations but does so from within the late-modern worldview (see p.45). Similarly, augmented Scenario-Based Product Design anticipates moral mediations whilst retaining the late-modern focus on optimal functionality (see p. 46). These proposals appear to place high expectations on the designers and stakeholders involved, not least due to one of the central and most significant insights from the field of the philosophy of technology, which is that technological artefacts tend to

conceal their true non-neutral nature. Paradoxically, whilst material culture possesses a strong, forthright presence, it has ". . . a quite remarkable capacity for fading from view, and becoming naturalized, taken for granted, the background or frame to our behaviour. Indeed stuff retains its mastery over us precisely because we fail to notice what it does" (Miller, 2013, p. 155). Moreover, how designers and stakeholders decide upon what is moral and what is not in late-modernity is subject to the late-modern context. This is further compounded by the fact that the ethical nature of design is largely unaddressed and patchy in design education (Fry, 2009, p. 3; Walker, 2012, p. 99).

The method of conducting a mediation analysis by imagination (see p.45) appears to hold the most potential for informing "after-modern" design because it emphasises the imagination. This focus is potentially fruitful for overcoming the modern propensity to develop rationalistic methods for design practice (see p.26). As with augmented Constructive Technology Analysis and Scenario-Based Product Design however, Verbeek does not suggest how designers can conduct a mediation analysis by imagination other than to say that they attempt to anticipate potential mediations (see p.45) There are therefore few established tools that support designers to bring postphenomenological insights into their practice and those that do are rooted in existing rationalistic methods. Consequently, these tools do not harness the "right hemisphere", which the basis for "after-modern" advocates will be fruitful for overcoming the instrumentally rational nature of the modern worldview.

3.10 Chapter conclusion

This chapter has addressed the research objective: To identify insights from the philosophy of technology that could support product design education to address sustainability in a more substantive manner than the modern worldview permits. The chapter chronologically explored phenomenological and postphenomenological perspectives of technologies via some key thinkers in the field; namely, Heidegger (see p.34), Borgmann (see p. 37), Ihde (see p.42) and Verbeek (see p. 44). These perspectives are insightful for "after-modern" design because they challenge the prevailing modern

understanding that technologies are neutral, which conceals their true worldbuilding nature. Moreover, these perspectives offer design students the opportunity to incorporate potentially transformative philosophical insights into the products they design. The insights from the philosophy of technology that are relevant to "after-modern" design are summarised as follows:

- The phenomenological perspectives of Heidegger and Borgmann are important for "after-modern" design as they illuminate how instrumental rationality can be challenged through uniting means with ends. The distinction these philosophers make between "things/focal things" and "objects/devices" is especially important as it reveals that technologies serve "ultimate ends" that lie beyond the device itself. This challenges the tendency of modernity to view devices as ends-in-themselves. Moreover, the distinction between "things/focal things" and "objects/devices" offers "after-modern" design a means of evaluating how a proposed technological artefact and/or system might compare with each.

- Heidegger's philosophy is especially relevant for its identification of the "technological enframing" (see p.52). This concept invites consideration of the world as being "a giant gasoline station" in which everything is a potential resource for human use. This is an important insight for informing "after-modern" design because it draws attention to the relationship between instrumental rationality and unsustainability.

- The phenomenological dismantling of the modernist subject/object dichotomy is especially important for "after-modern" design – particularly as it has been appropriated by postphenomenology. The postphenomenological emphasis upon technological mediation being the source from which subjectivity and objectivity emerges allows subject and object (person and technological artefact) to be viewed as mutually co-shaping. This understanding invites the "after-modern" designer to conceptualise the outputs of their practice not merely as something that people will use but as something that co-shapes—and changes—both the user and the world. For example, a contemporary smartphone might engender habitual actions that

co-shape a person who is not meaningfully engaged with their immediate environment or the people in it. A smartphone might also co-shape a person who engages uncritically in the unsustainable cycle of upgrade and disposal that is associated with such devices.

- The postphenomenological insight that human-technology relations mediate human-world relations is critical to the development of "after-modern" design as it invites designers not only to view the outputs of their practice as mediating potential human-world relations but also to anticipate and evaluate the "quality" of these mediations. Designers can do this by accounting for the magnification and reduction structure of technologies, by considering the "ends" that a technological artefact and/or system might serve, and by attempting to evaluate how technologies might co-shape a person's sense of moral responsibility. Whilst anticipating the quality of mediations is evidently a fruitful direction for "after-modern" design, postphenomenology appears to offer no guidance on what "quality" might mean. Furthermore, the methods that postphenomenology advocate will potentially impede "after-modern" design due to their rationalistic emphasis.

The phenomenological and postphenomenological perspectives of technology explored in this chapter challenge the prevailing values of modernity that emphasise instrumental rationality, technological advancement, economic growth, etc. – values that are proving detrimental to developing more sustainable ways of living. The philosophical insights identified are important for "after-modern" design for their emphasis on the non-neutral nature of technologies, which de-emphasise instrumentally rationality. Whilst these insights challenge the values of the modern worldview, they do not address the "ultimate ends" that "after-modern" design ought to pursue. To this end, the following chapter reviews human values literature to identify alternative values that represent appropriate "ultimate ends" for "after-modern" design to pursue.

4 Investigating Values for "After-Modern" Design

4.1 Introduction

This chapter addresses the research objective: *To identify values that are compatible with developing more sustainable ways of living, and to consider how design currently engages with these values.* This objective is addressed by conducting a literature review and reflecting upon it to draw out key points for "after-modern" design. The purpose of this objective is to identify appropriate values for product design education to pursue as "ultimate ends" that would allow the discipline to move beyond the confines of modernity and into "after-modern" design practice. The reason for exploring human values lies in Kluckhohn's (1951, p. 395) influential definition of values as being "a conception, explicit or implicit, distinctive of an individual or characteristic of a group, of the desirable, which influences the selection from available modes, means, and ends of action". This is relevant to this thesis because, as previously discussed, modernity has emphasised the instrumental selection from "available modes, means, and ends of action" which is detrimental to developing more sustainable ways of living (see p. 15). Moreover, instrumentalism pervades the dominant design approaches to sustainability and consequently, the environment is valued extrinsically – the world therefore remains, in Heidegger's terms, "a giant gasoline station" (Heidegger, 1966, p. 50; see p.35).

The first part of this chapter explores Schwartz's (2012) influential theory of basic values. This theory was selected for its potential to contribute to the development of deeper understandings about the "having" values that modernity has emphasised and moreover, for its potential to contribute to the development of deeper understandings about "being" values, which point to more sustainable ways of living (see. p.13). The second part of the chapter identifies three design approaches that critique the values of modernity and point

to alternate designed futures. These approaches are *critical design, propositional design* and *critical making.* The literature reviewed in this chapter is then reflected upon to draw out its implications for "after-modern" design. Because this chapter brings the contextual review to a close, the chapter concludes by briefly summarising the three contextual chapters. Based on the contextual review, a working definition of "after-modern" design is articulated, which represents a gap in the literature. Finally, two research questions are posed, which are to be addressed via primary research.

4.2 Values

Cheng and Fleischman (2010, p. 2) define human values concisely as being "guiding principles of what people consider important in life" [7]. Values have long been studied in disciplines such as anthropology (Kluckhohn, 1951), sociology (Hitlin and Piliavin, 2004) and psychology (Rokeach, 1973). More recently, values have been of interest to technology-based disciplines, particularly with respect to the design of technologies (Friedman, Kahn, & Borning, 2002; Knowles et al., 2014; van den Hoven, Vermaas, & van de Poel, 2015). Schwartz & Bilsky (1987, p. 551) identify five features common to most definitions of values, summarising that values are: 1) concepts or beliefs, 2) about desirable end states or behaviours, 3) transcend specific situations, 4) guide selection or evaluation of behaviour and events, 5) ordered by relative importance. Schwartz and Bilsky (1987, p. 551) theorise that values are cognitive representations of three types of universal human need, which pre-exist any individual; these needs are biological, social interpersonal, and social institutional relating to group welfare and survival. For example, "requirements for coordinating resource exchange [may be transformed] into values for equality or honesty, and demands for group survival into values for national security or world peace" (Schwartz and Bilsky, 1987, p. 551). People must articulate goals to cope with these universal needs, communicate with others about them and gain co-operation to pursue them – values help people do this as they are the socially desirable concepts that people use to represent these

[7] Cheng and Fleishman define values based on a comparative analysis of how key authors working in the field have defined values over time, including definitions from Rokeach (1973), Kluckhohn (1951), and Schwartz (2012).

goals (Schwartz, 2012, p. 4). Values are therefore abstract and focus on ideals; they are not attitudes, traits, norms or needs but are often mistakenly conflated with these things (Hitlin & Piliavin, 2004, p. 360-361).

Values are also fluid and can change over time; moreover, they are influenced by many different aspects of public and private life such as the culture one lives in (including its institutions, media and policies), the home environment (including family and friends), education and work (including income, peer groups and colleagues), race, ethnicity, gender, social class, occupation, education, family, age, religion, and social movements (Crompton, 2010, p. 36; Hitlin & Pilavin, 2004, pp. 369–378; Holmes et al., 2011, p. 30-31). Values can be engaged when they are brought to mind by particular experiences, which in turn affects attitudes and behaviours (Holmes et al., 2011, p. 18). Values underlie attitudes and form the basis for attitudes, which are evaluations of what is good or bad, desirable or undesirable – evaluations can be of other people, events, behaviours, objects, etc. (Schwartz, 2012, p. 16). Amongst other things, values influence attitudes towards politics, the environment, global poverty and immigration, which in turn influences behaviour – for example, including how we vote, our ecological footprints, political activism, and how empathic we are (Holmes et al., 2011, pp. 8–9). Importantly, "Values are determinants of virtually all kinds of behavior that could be called social behavior or social action, attitudes and ideology, evaluations, moral judgments and justifications of self to others, and attempts to influence others" (Rokeach, 1973, p. 5).

4.3 Schwartz theory of basic values

The Schwartz theory of basic values identifies ten universal, motivationally distinct human value types, which individuals attribute different levels of importance to (1992, p. 5-13). Schwartz (2012, p. 4) theorises that the ten value types are universal as they are grounded in one or more of the aforementioned three types of universal need – biological, social interpersonal and social institutional. Moreover, these value types were found to exist across all cultures and are understood in relatively equal ways across cultures (1992, p. 59). The ten value types are: *self-direction, stimulation, hedonism, achievement, power, security,*

conformity, tradition, benevolence and *universalism* (Schwartz, 2012, pp. 5–7). Figure 2 defines each value type and describes it in terms of a) its central goal, b) specific value items that represent each value type, and c) the universal need that each value type is derived from.

Value type	Defining goal	Exemplary values	Source
Self-direction	Independent thought and action – choosing, creating, exploring.	Creativity, freedom, choosing own goals, curious, independent, self-respect, intelligent, privacy.	Organismic
Stimulation	Excitement, novelty, and challenge in life.	A varied life, an exciting life, daring.	Organismic
Hedonism	pleasure or sensuous gratification for oneself.	Pleasure, enjoying life, self-indulgent.	Organismic
Achievement	Personal success through demonstrating competence according to social standards.	Ambitious, successful, capable, influential, intelligent, self-respect, social recognition.	Social interpersonal Social institutional
Power	Social status and prestige, control or dominance over people and resources	Authority, wealth, social power, preserving my public image, social recognition.	Social interpersonal Social institutional
Security	Safety, harmony, and stability of society, of relationships, and of self.	Clean, national security, social order, family security, reciprocation of favours, healthy, moderate, sense of belonging, conformity	Organismic Social interpersonal Social institutional
Conformity	Restraint of actions, inclinations, and impulses likely to upset or harm others and violate social expectations or norms.	Obedient, self-discipline, politeness, honouring of elders.	Social interpersonal Social institutional
Tradition	Respect, commitment, and acceptance of the customs and ideas that one's culture or religion provides.	Respect for tradition, humble, devout, accepting my portion in life, moderate.	Social institutional
Benevolence	Preserving and enhancing the welfare of those with whom one is in frequent personal contact (the 'in-group').	Helpful, honest, forgiving, responsible, loyal, true friendship, mature love, meaning in life, a spiritual life.	Organismic Social interpersonal Social institutional
Universalism	Understanding, appreciation, tolerance, and protection for the welfare of all people and for nature.	Broadminded, social justice, equality, world at peace, world of beauty, unity with nature, wisdom, protecting the environment, inner harmony.	Organismic Social institutional

Figure2: Motivational types of values (Schwartz, 2012, pp. 5–7)

4.3.1 Dynamic structure of basic values

The Schwartz theory of basic values is distinctive for its organisation of the ten universal value types into a circumplex, which reflects the relations between the various values (Figure 3). The Schwartz circumplex was developed based on significant empirical research involving hundreds of samples in eighty-two countries around the world (Schwartz, 2012, p. 12). The model has been used across disciplines in thousands of academic papers (amounting to hundreds of thousands of participants) (Holmes et al., 2011, p. 58). Researchers have also tested the relationships between values, using various lab and field methodologies across over eighty countries and forty-eight languages – the vast majority confirm the relationships that Schwartz outlines (Holmes et al., 2011, p. 58). The circumplex postulates that values form a continuum of related motivations: the closer they appear on the circumplex, the more similar their underlying motivations and the more distant they appear, the more antagonistic the motivations are (Schwartz, 2012, p. 9-12)[8].

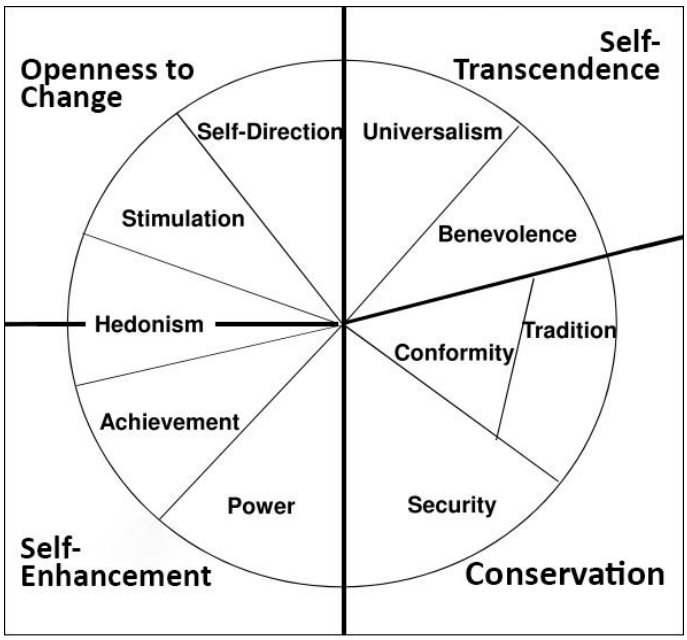


Figure 3: Relations among the ten universal value types (Schwartz, 2012, p. 9)

[8] Also, see appendix 3 for the Common Cause visualisation of the Schwartz circumplex, which maps the exemplary values identified in figure ? onto the ten value types to show their relationships.

The circumplex portrays the relations of conflict and congruity among the values; for example, pursuing achievement values typically conflicts with pursuing benevolence values as seeking success for oneself can oppose actions aimed at enhancing the welfare of others, whereas pursuing achievement and power values are more compatible (Schwartz, 2012, p. 8). The circumplex discerns two over-arching dimensions that capture conflict between the value types. Openness to change values (concerned with independence of thought, action and feeling) conflict with conservation values (concerned with order and self-restriction) (Schwartz, 2012, p. 9). Similarly, self-enhancement values (concerned with self-interest, success and dominance over others) conflict with self-transcendence values (concerned with the welfare and interests of others, and the environment) (Schwartz, 2012, p. 9). Research consistently demonstrates that proximally distant values on the circumplex are unlikely to be held strongly by the same person and that when a particular value is engaged, opposing values are likely to be supressed – this is known as the "see-saw effect" (Holmes et al., 2011, p. 18). By contrast, proximally close values are likely to be engaged together – this is known as the "bleedover effect" (Holmes et al., 2011, p. 18). For example, when people are reminded of generosity and family, they are more likely to support pro-environmental policies (without the environment being mentioned) than those reminded of financial success and status (Holmes et al., 2011, p. 18; Sheldon et al., 2011).

4.3.2 Dynamic contrasts of basic values

Schwartz (2012, pp. 13–14) further developed the circumplex to discern two additional principles that organise the structure of values: the first principle relates to the interests that value attainment serves and the second principle explains the relationship of values to anxiety (Figure 4).

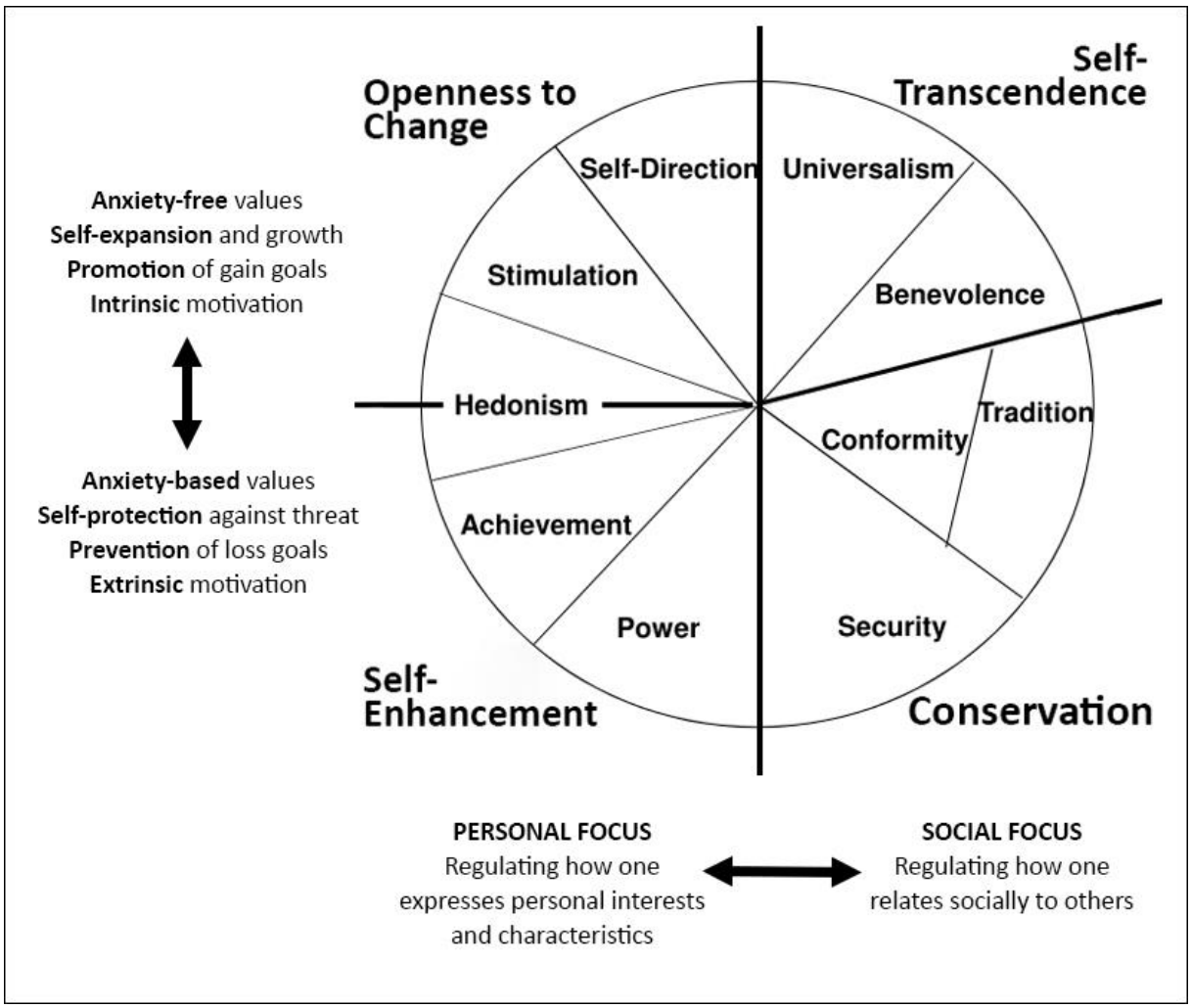


Figure 4: Dynamic contrasts that underlie the circular structure of relations (Schwartz, 1973, p. 226)

Figure 4 conceptualises the value types of self-enhancement and openness to change as primarily regulating personal interests and characteristics whilst the value types of self-transcendence and conservation primarily regulate social interests and characteristics (Schwartz, 2012, pp. 13–14). Figure 4 further conceptualises self-enhancement and conservation value types as expressing anxiety-based motivations that arise from

uncertainty in the social and physical world whilst the value types of self-transcendence and openness to change express anxiety-free motivations (Schwartz, 2012, p. 14).

4.3.3 Sustainability, self-enhancement and self-transcendence values

Schwartz's theory of basic values is widely used in areas such as psychology, sociology and political science research (Cheng and Fleischmann, 2010, p. 5). More recently, it has been adopted for conducting research into sustainability, notably by the Common Cause foundation to support its extensive research into the role that values play in fostering more sustainable ways of living (Blackmore et al., 2013; Boyle, Crompton et al., 2011; Tom Crompton, 2010; Holmes et al., 2011; Kasser, 2013). Schwartz (2012, p. 5) identifies numerous self-enhancement values, which are categorised under the over-arching values types of "power" and "achievement". Self-enhancement values emphasise personal success through demonstrating competence according to social standards (Schwartz, 2012, p. 5). Power values include the value items of *social power, authority, wealth, social recognition* and *preserving my public image* whilst achievement values include the value items of *ambitious, successful, intelligence, influential* and *capable* whilst (Schwartz, 1992, p. 24). Numerous studies have found that self-enhancement values correlate *negatively* with pro-environmental and pro-social behaviour (Holmes et al. 2011; Karp, 1996; Nordlund & Garvill, 2002; Pepper et al., 2009; Schultz et al., 2005; Schwartz, 2007; Stern, 2000, p. 414). When people prioritise self-enhancement values, they often experience lower levels of wellbeing, less happiness and life satisfaction, higher levels of distress and greater degrees of unpleasant emotions like anger and anxiety (Fromm, 1976, p. 15; Kasser, 2013, p. 9). Furthermore, research repeatedly suggests that when people and cultures attach greater importance to self-enhancement values, they tend to be less concerned about global conflict, human rights and how environmental damage affects other people, future generations and non-human life, (Boyle, Crompton, Kirk, & Shrubsole, 2011, p. 15; Schultz et al., 2005, pp. 470–471; Walker, 2011, p. 190). They also tend to be less supportive of free movement of people, more biased against "outsiders", express less concern for people perceived to be different to them, such as through gender, sexuality, religion and disability (Boyle et al., 2011, p. 15; Duriez, 2011; Feather, 2004; Feather & McKee, 2008; Sawyerr, O.,

Strauss, & Yan, 2005; Roets et al., 2006). Additionally, they are less likely to engage in political protest or other civic activities (Augemberg, 2008; Schwartz, 1994).

By contrast, self-transcendence values correlate *positively* with pro-environmental and pro-social behaviour (Holmes et al. 2011; Karp, 1996; Kasser, 2013, Knowles et al., 2014; Nordlund & Garvill, 2002; Pepper et al., 2009; Schultz et al., 2005; Schwartz, 2007; Sheldon & McGregor, 2000; Stern, 2000, p. 414). When people successfully prioritise self-transcendence values, they tend to be happier and healthier (Kasser et al., 2013, p. 9). Schwartz (2012, p. 7) identifies numerous self-transcendence values, which emphasise preserving and enhancing the welfare of others. Self-transcendence values are categorised under the over-arching value types of "benevolence" and "universalism". Benevolence values relate to people close to us (the "in-group") and include the value items: *honest, a spiritual life, forgiving, helpful, meaning in life, true friendship, mature love* and *loyal* (Schwartz, 1992, p. 24). Universalism values are significantly more expansive as they express concern for *all* humankind as well as for the environment (Schwartz, 2007, p. 713). Universalism values include the value items: *equality, social justice, wisdom, protecting the environment, unity with nature, world of beauty, world at peace* and *broadminded* (Schwartz, 1992, p. 24). Schwartz (1992, p. 39) also found that the three universalism values relating to the environment—*unity with nature, protecting the environment* and *a world of beauty*—closely relate to values that express concern for the welfare of people beyond one's "in-group"; namely, *world at peace, equality*, and *social justice* (Schwartz, 1992, p. 39). It is inferred from this that universalism values are "presumed to arise with the realisation that failure to protect the natural environment or to understand people who are different, and to treat them justly, will lead to strife and to destruction of the resources on which life depends" (Schwartz, 1992, p. 39). Self-transcendence values contrast starkly with self-enhancement values as they are intrinsic values that are inherently rewarding to pursue (Holmes et al., 2011, p. 20). Furthermore, people consider self-transcendence values to be ethical values but do not consider self-enhancement values to be ethical (Schwartz, 2007, pp. 712–713).

4.4 Design, self-enhancement and self-transcendence values

For Walker (2011, p. 188), the substantive values that stem from religious and philosophical teachings—such as self-transcendence values—provide a critical link between sustainability and the individual person. As things stand however, values such as these are rarely discussed in design and design education (Walker, 2012, p. 99). These values are closely related to self-discipline, contemplation and virtue, all of which have been essential aspects of a meaningful life for millennia but are antithetical to the current advertising and marketing culture, which drives unrestrained, consumer-based capitalism by encouraging consumption, self-indulgence and pleasure-seeking (Walker, 2011, p.127). Consequently:

> . . . material 'beauty' has become merely the façade of technological progress, which is the dynamo of corporate growth. This superficial version of beauty conceals a ruinous path. It is a shallow, debased beauty divorced from notions of goodness and right action; the outer aspect of a world of things alienated from perennial truths. (Walker, 2013b, p. 446).

Interestingly, research demonstrates that even when designers seek to overtly encourage environmentally friendly behaviour, they tend to focus upon the self-transcendence value of "protecting the environment" and do so through fostering self-enhancement values by creating extrinsic reward systems as a means of persuasion (Knowles, 2013, p. 2715-2716). There is growing evidence to suggest however that offering extrinsic rewards to encourage people to behave in certain ways can be counterproductive as the "see-saw" effect (see p. 59) encourages the suppression of self-transcendence values when self-enhancement values are activated (Holmes *et al.*, 2011, p. 60) [9]. Appealing to self-enhancement "having" values is therefore incompatible with developing more sustainable ways of living (Knowles *et al.*, 2014, p. 1040). Furthermore, self-enhancement values do not intrinsically motivate people, which is critical to effecting long-term behaviour change (Holmes et al., 2011, p. 60; Knowles et al., 2014, p. 1039).

[9] Holmes et al. (2011, p. 60) cite a range of research demonstrating the "see-saw" effect between extrinsic and intrinsic values including for example, monetary rewards for blood donation reducing the number of donors, incentivising volunteer work decreasing overall the time a volunteer contributes and schoolchildren given performance incentives collecting fewer charity donations than those who were not incentivised.

4.5 Alternative values in design

There is no shortage of recognition that design needs to start operating within "a far more complex and critical frame" (Fry, 2005; Chapman, 2005; Dunne, 2005; Dunne & Raby, 2001; Ehrenfeld, 2008; Malpass, 2017; Orr, 2002; Rodgers et al., 2017; Walker, 2006, 2011, 2014, 2017). Consequently, numerous approaches to design have emerged in academia that seek to "provoke, criticize, and experiment to reveal alternatives to the expected and traditional, to transcend accepted paradigms, to bring matters to a head" (Fallman, 2008, p. 8). Approaches such as critical design, propositional design and critical making challenge the perceptual blindness that we appear to have about the consequences of design interventions and the forces that have defined them (Badke & Walker, 2013, p. 389; Orlikowoski & Iacono, 2006, pp. 19–20). These approaches vary in terms of their intentions and outputs but share a common basis as they are driven by critical theory, which argues that our everyday values, practices, perspectives, and sense of agency and self are strongly shaped by forces and agendas that we are normally unaware of, such as the politics of race, gender and economics (Sengers et al., 2005, p. 50). Awareness of these hidden forces however allows designers to challenge them through their practice by developing objects that embody opposing arguments and sets of values (Sengers et al., 2005, p. 50).

4.5.1 Critical design

The term *critical design* is used by Dunne and Raby (2001) to describe an explicitly critical form of design practice. Critical design seeks to challenge the late-modern, market-driven approach to product design, which Dunne and Raby refer to as "affirmative design" because it reinforces the status quo [10]. For example, whereas affirmative design focuses upon problem solving, concept design and innovation – critical design focuses upon problem finding, conceptual design and provocation, etc. critical designers present the everyday in new and surprising ways, aiming to raise questions and stimulate debate through humour

[10] Dunne and Raby provide a comprehensive list of contrasts between affirmative and Critical Design at: http://www.dunneandraby.co.uk/content/projects/476/0)

and strangeness (Badke & Walker, 2014, p. 398). Critical designers do this largely through creating unusual and often provocative objects that tend to be finished to professional standards. To reflect the diversity of the field, Malpass (2017) provides a comprehensive overview of it, identifying its significant practitioners and examples of their work. Moreover, from conducting interviews with many of these practitioners and analysing their work, Malpass (2017, pp. 118–119) developed a taxonomy of critical practices that distinguishes three types of critical design practice in product and industrial design. These are speculative design, critical design and associative design (Malpass, 2017, pp. 118–119):

- Speculative design is futures-focused and is concerned with emerging scientific and technological themes, which designers often seek to domesticate by showing them in everyday contexts (Malpass, 2017, p. 100). Speculative designers aim to make the cultural implications of emerging science and technologies perceptible in different ways to stimulate debate about potential futures (Malpass, 2017, p. 101). Speculative designs tend to integrate one archetype with another such as placing laboratory context technology in an everyday setting (Malpass, 2017, p. 118).

- Critical design is more focused on present social, cultural and ethical implications of design, seeking to offer a critique of what already exists (Malpass, 2017, p. 107). Critical designers tend to use familiar shapes, colours and forms but employ methods of defamiliarisation and estrangement to create a critical distance between object and user in order to stimulate debate (Malpass, 2017, pp. 107–108).

- Associative design focuses on disciplinary concerns allowing designers to rethink dominant traditions and values in both designed objects and their environments (Malpass, 2017, p. 92). The object of inquiry in associative design is typically the relationship of design to manufacture, materials, sustainability, habits in consumption and sustainability (Malpass, 2017, p. 92). Associative designers subvert conventional association and understanding of everyday objects—often through the use of humour and wit—to create a critical distance between user and object in which the user is encouraged to question the object (Malpass, 2017, p. 93).

Despite the potential for Critical design approaches to effect meaningful change however, Malpass (2013, p. 334) notes that:

> More and more, the danger is that critical practice becomes overly self-reflexive and introverted, sustained, practiced, and exchanged in a closed community. By operating in this way, its usefulness as part of a larger disciplinary project is undermined. There are already utterances of critical practice being little more than "design for design's sake," "design for designers," or perhaps more appropriately, "design for Critical Designers".

4.5.2 Propositional design

Walker's "propositional" design practice exclusively addresses issues relating to sustainability (Walker, 2006, 2011, 2014, 2017). Whilst Walker's approach is critical, it differs from the critical design approaches described above as it is less concerned with developing deliberately provocative objects in favour of exploring "enduring notions of human meaning through 'quiet' interventions that aim to achieve a harmony between our material culture and nature, society and self" (Walker, 2013b, p. 449). Consequently, many outputs of Walker's practice are functional, everyday objects that seek to connect with people emotionally and intuitively via aesthetic experiences that reach deeper than the rational arguments of science (Walker, 2017, p. 106). In doing this, these objects aim to develop values-based understandings, which are fundamental to changing our perspectives, attitudes and actions (Walker, 2017, p. 106).

Walker (2017, pp. 108–110) traces an important shift in his practice via the changing nature of the objects created over two decades (Figure 5). This shift is concerned with a move from the outer world of objects to the inner world of the designer. The outer world is evident in Walker's (2017, pp. 105–110) early practice, which is categorised as "incremental design" because these outputs are concerned with functionality, place, materials, processes, reuse and the environment. The *inner world* is evident in later practice, which culminates in the category of "holistic design". The outputs of holistic design are concerned with "inner development" and attend to matters of utility, localisation, values and meaning, and empathy with nature (Walker, 2017, p.107-108). It is through *holistic design* that the inward path becomes manifest in the outer world through objects that express more than the

purely instrumental values that contribute heavily to their perceived disposability (Walker, 2017, p. 107). Holistic design instead discerns a more benign and meaningful path for material culture "through objects whose perceived value lies not just in their functionality but also in their inherent qualities as things – their history, aesthetics, and their enduring meanings, as embodied in their materials" (Walker, 2017, pp. 107–108).

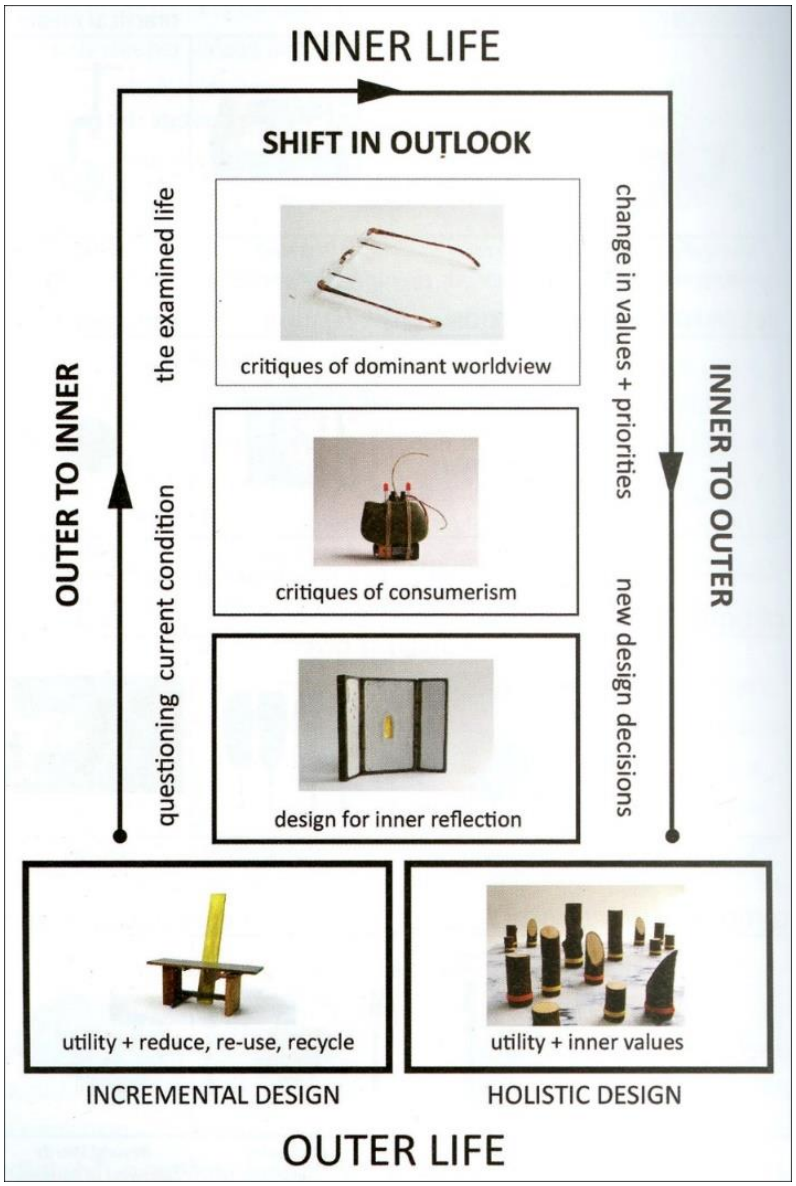


Figure 5: Propositional design journey (Walker, 2017, p. 110)

4.5.3 Critical making

Ratto's (2011) "critical making" differs from critical design and propositional design by bringing together "groups of scholars, students, and/or stakeholders [to] jointly design and build technical prototypes" (Ratto, 2011, p. 253). Like the critical approaches outlined above, critical making is rooted in literature and seeks to "theoretically and pragmatically connect two modes of engagement with the world that are often held separate—critical thinking, typically understood as conceptually and linguistically based, and physical 'making' goal-based material work" (Ratto, 2011, p. 253). The objects developed from critical making are very different to those of critical and propositional design as whilst they can be unusual and provocative, they are not finished to a professional standard because they are not intended to be displayed, speak for themselves or stimulate debate in others (Ratto, 2011, p. 254). Rather, the process of critical making and its outputs aim to support participants (who are often not designers) to explore issues of relevance to their professional practice; for example with respect to investigating issues associated with distance learning techniques in higher education (Ratto, 2011, p. 254) or Web 2.0 developments (Ratto, 2011, p. 255). Critical making therefore is concerned with what the shared act of making can contribute to the knowledge of those involved in the designing process (Ratto, 2011, p. 253).

4.6 Discussion: values for "after-modern" design

This section reflects upon the literature reviewed in this chapter to draw out implications for "after-modern" design. These implications are discussed under two headings: 1) Exploring "being" *through* design, and 2) Pursuing universalism values as "ends" for product design education.

4.6.1 Exploring "being" *through* design

Schwartz's conceptualisation of self-enhancement and self-transcendence values identifies specific, concrete values, which offer a way of investigating the nature of "being" as it relates to unsustainability and sustainability. Schwartz's self-enhancement values are

anxiety-based and individualistic, comprising the overarching value types of “achievement” (associated with being ambitious, successful, intelligence, influential, capable) and “power” (associated with social power, authority, wealth, social recognition and preserving my public image) (see p.61). By contrast, self-transcendence values are anxiety-free and socially-focused, comprising the overarching value types of “benevolence” (associated with honesty, spirituality, forgiveness, helpfulness, a meaningful life, true friendship, mature love and loyalty) and “universalism” (associated with equality, social justice, wisdom, protecting the environment, unity with nature, world of beauty, world at peace and broadmindedness) (see p. 62) In naming these values, Schwartz offers concrete insights into the modern self-enhancement values that support an unsustainable culture of “having” and an opposing set self-transcendence values, which are compatible with the comparatively sustainable “being” mode of existence. In particular, self-transcendence values help to demystify the “being” mode of existence. It is proposed in this thesis therefore that Schwartz’s conceptualisation of both self-enhancement and self-transcendence values are important for “after-modern” design as they can serve as a heuristic guide for discerning how technological artefacts and systems potentially foster both “having” values and “being” values.

The approaches of critical design, propositional design and critical making demonstrate that design can offer a powerful means of critiquing aspects of the modern worldview. Of particular relevance to “after-modern” design is the capacity of these approaches to emphasise the non-neutral nature of technologies through outputs that often illuminate potential consequences of taken-for-granted realities that technologies engender. Moreover, these outputs can reveal new, radically different realities, which in turn, can support the discernment of alternative, more ethical directions for the design of material culture. Indeed, for Chan (2018, p. 195), it is “the quintessential act of designing” that affords designers the greatest opportunity to wrestle with matters of ethics because designing shifts matters of ethics to the medium of materiality. In this way, the ethical issues and values being explored become issues of design – of materials, configurations, colours, textures, etc. This capacity of design to show rather than tell is fruitful for “after-modern” design because the organisational, political, and economic forces that powerfully shape design can make it very difficult for designers to find ways of doing things differently

(Friedman & Kahn Jr, 2002, p. 1179). Further compounding this is that "our very way of reasoning about the world is based on unconsciously held assumptions and perspectives that strongly condition what we see happening around us before we even begin to reason about it" (Sengers et al., 2005, p. 50). Such assumptions are especially problematic for developing new understandings about technologies – and furthermore, these assumptions are compounded by technologies not solely being manifestations of human knowledge, but preconditions to knowledge (2001, p. 104).

4.6.2 Pursuing universalism values as "ends" for product design education

For Borgmann (1987, p. 80), values cannot effect any meaningful change in technological development in late-modernity as they are generally understood within the "paradigm of availability", which allows technology to be understood in terms of realising our *preferred* values. This is reflected in the dominant late-modern sustainability discourse (see p.3). The values literature reviewed in this chapter however suggests that developing more sustainable ways of living will require a shift from the dominant self-enhancement "having" values that modernity has emphasised to self-transcendence "being" values. Whilst both self-transcendence value types of universalism and benevolence are fundamentally similar as they express a concern for the welfare of others, they are also distinctly different in terms of *who* benefits from that concern (Schwartz, 2007, p. 713). Moreover, Schwartz found that benevolence values, which relate primarily to the welfare of the "in-group" were rarely intermixed with values referring to wider social entities (Schwartz, 1992, p. 39). This is reflected in Hick's (1999, p. 35) concern that there is a "continuing tension between the instinct to care only for ourselves and close kinship groups . . . and the ethical requirement to treat *all* persons equally". Similarly, it is Davison's (2001, p. 85) hope that—in the name of sustainability—the love, friendship and care often experienced for immediate kith and kin can be extended "to encompass worlds of people, beings, and things".

The tension between universalism and benevolence values is also reflected in research demonstrating that loyal fair trade consumers rank universalism values as being the most

important whereas intermittent fair trade consumers rank benevolence values as being the most important (Doran, 2009, p. 559). It is proposed in this thesis therefore that product design education prioritise and pursue universalism values as "ends" for design as these values express concern for *all* humankind and the environment (see p. 62). Holmes et al. (2011, pp. 68–69) define universalism values as follows:

- Inner harmony: At peace with myself
- Equality: Equal opportunity for all
- Social justice: Correcting injustice, care for the weak
- Wisdom: A mature understanding of life
- Protecting the environment: Preserving nature
- Unity with nature: Fitting into nature
- World of beauty: Beauty of nature and the arts
- World at peace: Free of war and conflict
- Broadmindedness: Tolerant of different ideas and beliefs

By contrast, late-modern design approaches to sustainability tend to largely address the sole universalism value of "protecting the environment" which, according to Holmes et al. (2011, p. forward) is insufficient as:

> . . working towards a sustainable society is about much more than environmental sustainability. A sustainable society doesn't just consume less, recycle more, use renewable energy and take the train. It is also more community-focused, less prejudiced, more equal, and happier - because it values people and the environment.

Pursuing universalism values—which are generally considered to be ethical values (Schwartz, 2007, p. 712)—represents a radical shift from prioritising the "means" of design practice to prioritising the "ends" that design serves. For Clarke (1983, p. 257), this shift of emphasis from means to ends is essential for developing a better relation to technology and will entail shifting from ". . . teaching customs or *ways* of doing things—so quickly obsolete or irrelevant today—to teaching basic values or goals to be aimed at steadily though the flux of changing ways and means". Pursuing universalism values as "ends" for product design education de-emphasises the modern propensity to design technological artefacts as ends-

in-themselves. Instead, technologies-in-design are conceptualised as beginnings that can potentially foster human-world relations in favour of universalism values.

4.7 Chapter conclusion

This chapter has addressed the research objective: To identify values that are compatible with developing more sustainable ways of living, and to consider how design currently engages with these values. The chapter explored literature relating to human values, focusing on Schwartz's conceptualisation of self-enhancement and self-transcendence values. These two sets of opposing values were discussed in terms self-enhancement values being detrimental to developing more sustainable ways of living and self-transcendence values being compatible with developing more sustainable ways of living. These values were discussed in the context of design and three critical approaches to design that seek to challenge modern values were discussed. Furthermore, the literature was reflected upon to draw out two main implications for "after-modern" design, which were: Exploring "being" through design, and pursuing universalism values as "ends" for product design education. From this chapter, the conclusions drawn are:

- Augmenting postphenomenology with values considerations overcomes the tendency of postphenomenology to isolate technologies from the political systems in which they operate – as postphenomenology has been criticised for (see p. 53). Moreover, this augmentation can potentially support design students to conduct a postphenomenological investigation into how technologies mediate in favour of, or against, values that are compatible with developing more sustainable ways of living. For this, self-transcendence and self-enhancement values appear to be an appropriate heuristic guide for supporting product design education to investigate the technological mediation of sustainability.

- Design practice itself is an important mode of research that can support practitioners to explore and critique how the modern worldview influences the design of technological artefacts and systems. The tangible outputs of critical approaches to design can support reflection on how technological artefacts and systems engender

ways of "being" and in doing so, support the discernment of alternate directions for design. Furthermore, the approach of critical making demonstrates that the designing process itself is an important mode of engagement for developing new ideas.

- Pursuing the range of universalism values as "ends" for product design education can support overcoming the modern propensity to address sustainability too narrowly, via the sole universalism value of "protecting the environment" – which often results in eco-efficiency interventions. The inclusion of values such as "inner harmony", "unity with nature" and "a world of beauty" do not exclude eco-efficiency interventions but offer a means of balancing such interventions (which tend to be oriented towards self-enhancement "having" values) with interventions that encourage self-transcendence "being" values.

4.7.1 Overall conclusions of the contextual review

The contextual review is summarised as follows:

- Chapter 2 develops the argument that the instrumentally rational modern worldview––which doesn't reflect upon the value of the ends being served by technological means—is incompatible with developing substantive design approaches to sustainability. Of particular concern is that in this worldview, technology is understood in neutral and optimistic terms. Chapter 2 concludes by proposing a basis for "after-modern" design. This basis advocates de-emphasising instrumental rationality by emphasising the so-called "right hemisphere" (associated with creativity, intuition, empathy and holism) as a means of investigating a re-framed conception of unsustainability, which is that of a crisis in human values, rather than a technical challenge and economic opportunity.

- Chapter 3 builds upon chapter 2 by developing a deeper understanding about the non-neutral nature of technologies – chapter 2 does this by investigating phenomenological and postphenomenological perspectives of technology. The

phenomenological perspectives shed light on the ways in which technologies support and undermine substantive notions of human meaning, whilst the postphenomenological perspectives view technologies as being mediators of human-world relations. Postphenomenology in particular allows people and technologies to be viewed as mutually co-shaping. From these perspectives, numerous insights for "after-modern" design were gleaned that are envisaged to support the development of deeper understandings about the nature of technologies.

- Chapter 4 explores the role of self-enhancement and self-transcendence values in developing more sustainable ways of living and discussed how these values relate to design. Three critical approaches to design were discussed that demonstrate ways in which design can challenge the modern worldview. This chapter concludes that design practice be adopted as a method for postphenomenologically investigating how technological artefacts and systems mediate self-enhancement and self-transcendence values.

- From the literature review, a gap in knowledge is identified relating to the relationship between postphenomenology, Schwartz's conceptualisation of self-enhancement and self-transcendence values, and product design education – which together form a sound basis for the concept of "after-modern" design. The remainder of this thesis seeks to address this gap via primary research.

4.7.2 Articulating "after-modern" design

Based on the literature, this thesis has thus far developed a basis for "after-modern" design that comprises:

- Viewing unsustainability as resulting from a crisis in human values.

- De-emphasising the analytical, rationalistic thinking prioritised by modernity in favour of emphasising more holistic, intuitive and empathetic thinking.

- Viewing technological artefacts and systems postphenomenologically, as mediators of human-world relations.

- Adopting Schwartz's conceptualisation of self-enhancement and self-transcendence values as a heuristic guide for discerning how technologies potentially encourage or undermine these values.

- Using design practice as a method for researching how technologies mediate self-enhancement and self-transcendence values.

- Pursuing Schwartz's conceptualisation of universalism values as "ends" for product design education.

The remainder of this thesis seeks to develop "after-modern" design and consider its implications for design education. To do this, the next two chapters report on the author's engagement in "after-modern" design research and practice whilst chapter 7 reports on the results of workshops conducted with design students.

5 “After-Modern” Design Inquiries

5.1 Introduction

This chapter addresses the research objective: *To develop a design research method that addresses sustainability in a more substantive manner than the modern worldview permits.* This objective is addressed by adopting a research through design approach, which takes the form of conducting “after-modern” design inquiries. The “after-modern” design inquiries build upon the conceptual basis of “after-modern” design research, which was outlined in section 4.7.2 (see p. 74). The chapter begins by discussing the methodological development of conducting “after-modern” design inquires. The “after-modern” design inquiries are then presented in section 5.3 and the chapter concludes by reflecting upon the designing process associated with conducting “after-modern” design inquiries. These reflections develop knowledge about how the designing process contributes to the concept of “after-modern” design. This chapter resulted in the following outputs:

Thomas, L., Walker, S., & Blair, L. (2015). *Beyond the technological blindfold: A fundamental design research approach to sustainability.* The 4th World Conference on Design and Arts (pp 532-539). St. Petersburg, 26-28 June, 2015. SPROC.

Thomas, L. (2015) *Meaningful design for sustainability: A practice-based research approach.* Better by Design: Environment, Society & Self. Design PhD conference 2015 (Presentation).

5.2 Research through design

Given that "after-modern" design research seeks to de-emphasise instrumental rationality in favour of more holistic, empathetic approaches to sustainability (see section 4.7.2), a research through design approach is adopted in this chapter. Research through design is an appropriate approach as design practice allows contrasting but important forms of understanding—such as subjectivity, intuition and personal judgement—to inform research (Walker, 2013b, p. 448). Walker (2013b, p. 448) differentiates design practice from other forms of academic inquiry accordingly:

> Designing . . . is concerned less with analysis than with synthesis. It composes, organizes and constructs, and resolves and integrates disparate factors. It is concerned with the entirety, and seeks articulation by sensitive consideration of the whole, taking into account factors such as function, aesthetics and materials. In the process, the designer is realizing, discerning, becoming aware of hitherto unknown or unrecognized relationships and connections, and discovering through a symbiotic, creative process of thinking-and-doing.

Similarly, Gaver (2012, p. 942) suggests that "the practice of making is a route to discovery [as] the synthetic nature of design allows for richer and more situated understandings than those produced through more analytic means". Furthermore, researching *through* design engages the researcher in a "haptic process of feeling [rather than seeing] one's way forward in the world" (Ingold, 2011, p. 133). Design practice therefore offers the researcher a means of balancing more rational approaches because designing uses a process of composition rather than comprehensive analysis, which can be counterproductive to designing for change by revealing too many paths (Nelson & Stolterman, 2003, p. 22).

The goal of research through design is the development of new, useful theories that cannot be generated by isolated analysis or traditional empirical approaches associated with rationalistic thinking (Edelson, 2002, pp. 117–118). Increasingly, research through design is being used for the unique contributions that design practice can make to knowledge – this is reflected in a rich and growing body of research whereby the construction of objects is central to research activity, especially in the field of Human-Computer Interaction (Bardzell et al., 2015; Durling & Niedderer, 2007; Gaver, 2012; Gaver et al., 2013; Niedderer, 2007; Niedderer & Roworth-Stokes, 2007; Sas et al., 2014; Zimmerman et al., 2010). For design

practice to be recognised as research in academia however, it must generate new knowledge, and make that knowledge explicit through written documentation (Niedderer, 2005, p. 11). Reflection is therefore fundamental to generating knowledge from design practice as reflection allows the designer to move from doing to knowing through examining the ideas that arise from the interplay between practical experience, reflection, inquiry and theorising (Friedman, 2000, p. 18-23; Walker, 2013b, p.448-450). Walker (2013b, p. 459) suggests that research through design objects, the intention behind their creation, and their accompanying arguments must be effective in furthering our understandings of the issues under scrutiny, and that knowledge can be attained from such objects by interpreting them, interacting with them, and reflecting upon their presence.

5.3 "After-modern" design inquiries

"After-modern" design inquiries respond to Davison's (2013, p. 52) view that the challenge of sustainability "can be met only as a provocation to scrutinize the design of [modern] worlds in great detail with an eye to opportunities for their transformation". The method of conducting an "after-modern" design inquiry is rooted in the conceptual bases of critical design and propositional design in that the process seeks to create artefacts that embody critiques of the instrumentally rational, modern worldview. The method departs from these approaches in its alignment with Ratto's (2011) "critical making" (see p. 68) as the method emphasises the design process as an important mode of engagement for developing new ideas. Further aligned with critical making, conducting an "after-modern" design inquiry does not seek to design objects for others as tends to be the case with critical design and propositional design. The method of conducting an "after-modern" design inquiry exploits both the process of making *and* the resultant artefacts as a mode of learning but whereas "critical making" is undertaken as a mode of group learning, "after-modern" design inquiries primarily seek to support *the design student's own learning.*

Central to conducting an "after-modern" design inquiry is the creation of an "inquiring object". The purpose of creating an "inquiring object" is to investigate how technological artefacts and systems mediate human-world relations in favour of self-enhancement

"having" values, which are detrimental to developing more sustainable ways of living (see p. 61). "Inquiring objects" are vehicles for learning, which encapsulate thoughts, impressions, questions, and aesthetic judgements in tangible forms. There are no claims of comprehensiveness or completeness; rather, the objects can be understood as three-dimensional sketches that attempt to probe issues from the literature through the activity of designing, thus allowing creativity and its associated qualities—neglected during modernity—into the research process. These qualities include subjectivity, originality, expressiveness, imagination, synthesis, contradiction, etc. "After-modern" design inquiries do not therefore pursue the forms of generalisable knowledge that modern thinking emphasises; rather, they recognise the limitations of generalisation for sustainability and instead pursue more nuanced, particularised understandings of the issues under investigation.

As with research through design outputs generally, "inquiring objects" are "concrete exemplars of preferred alterity, which are generative of further design thinking" (Bardzell et al., 2015, p. 2095). Similarly, Walker (2013b, p. 459) suggests that research through design objects can generate original directions for design through the ideas and values they embody. "Inquiring objects" therefore aim to support and contribute to the practitioner's emerging understanding of the issues being investigated in the comparatively rationalistic literature – and to generate insights from the "inquiring objects" that support "after-modern" design practice. To this end, the "after-modern" design inquiries also comprise a discussion and a set of "after-modern" design directions. The discussions associated with each "inquiring object" articulate the issues being investigated. These discussions are inspired by Bardzell's (2015) contention that it is time to stop "wringing our hands over the correct *a priori* account of how/whether/in what ways designs can contribute to generalizable knowledge" in favour of a more humanist approach that involves "writing critically and thoughtfully about what they in fact propose to us (about design, about how to live, about what can and should change)". Insights for design are captured in the form of the "after-modern" design directions. These insights are developed by reflecting upon how each "inquiring object" expresses different values and material sensibilities to those typical in late-modernity through its materials, composition, aesthetics, form, etc.

The “after-modern” design inquiries presented in this section specifically explore the instrumentally rational nature of the modern worldview as it relates to the contemporary digital world. This is an important line of inquiry given that:

> The exponential growth in computer technology will give us more and more gadgets and products in the future, and the release speed of these products will be extreme. . . . But this path of design will simply lead us to designing and producing more stuff and more waste using increasingly scarce materials”. (Juul-Sørensen, 2014)

The “after-modern” design inquiries focus on how personal digital devices and associated technologies mediate self-enhancement values given that Information Technology systems now appear to be the default response to “solving a whole raft of technical and social problems” (Introna, 2005, p. 75). The “after-modern” design inquiries are entitled: *Earth Re-charger, Google Diary, Yours Truly, Lakeland Data Stone, KintugiPhone* and *Anaesthesia.*

5.3.1 **Earth Re-charger**

Figure 6: *Earth Re-Charger*

Earth Re-Charger (Figure 6) comprises three main elements: a battery typical of those used in digital devices, a small ceramic plate of traditional design and patterning that holds soil, seeds and small plants, and an electrical cable. *Earth re-charger* explores how the instrumentally rational nature of the modern worldview influences the design and consumption of short-lived, virtually "throw-away" digital devices that create pollution through intensive energy use, resource extraction and e-waste. *Earth Re-charger* does this by visually expressing the modern propensity to separate means from ends and moreover,

not reflecting upon the value of the ends being served by technological means. This unsustainable trajectory continues as consumers are continually persuaded to prematurely upgrade and dispose of their digital devices through incentivisation, perceived psychological obsolescence in the mind of the user due to the release of a slightly updated model, and/or planned functional obsolescence by the producer (Huang & Truong, 2008, p. 325) [11].

Earth Re-charger explores a dystopic "ultimate end" of the contemporary digital world, which is a future earth too depleted to grow food because it has been valued more for its capacity to provide raw materials for digital devices. *Earth Re-charger* therefore visualises a potential consequence of prioritising self-enhancement "having" values and in doing so, expresses unsustainability as being *a crisis in human values.* In the technologically optimistic spirit of modernity, *Earth Re-charger* proposes a dystopian and implausible techno-fix to this crisis, which is to re-purpose components such as chargers and batteries from digital for re-charging depleted soil so that it might once again be fertile enough to grow food. *Earth Re-charger* creates an implicitly functional relationship between disparate parts to create an unfamiliar whole, which expresses both the inadequacies of current approaches to the development of digital devices and systems – and the danger of continuing to pursue these approaches as a viable solution to sustainability. As previously mentioned, for Braungart and McDonough (2002, pp. 61-62), "relying on eco-efficiency to save the environment will in fact achieve the opposite; it will let industry finish off everything, quietly, persistently, and completely" (see p.23).

The "after-modern" design directions developed from reflecting upon *Earth-Re-Charger* relate to the general design of personal digital devices and may be especially

[11] According to a United Nations Environment Program report titled "Waste Crimes," up to 50 million tons of electronic waste—mainly computers and smartphones—are expected to be dumped in 2017. That's up 20 percent from 2015, when about 41 million tons of electronic waste was discarded, mostly into third world countries serving as global landfills (Ahmed, 2016). Only 15-20% of this e-waste is likely to be recycled (LeBlanc, 2017).

relevant for the development of the Internet of Things – through which everyday objects are envisaged to become more Web connected and inter-connected.

The “after-modern” design directions developed from *Earth-Re-Charger* are:

- Re-purpose existing, physical objects in the design of the digital world, especially objects that may appear unrelated to digital devices, such as the antique plate used in *Earth Re-charger.* This plate has stood the test of time as its traditional patterning is aesthetically pleasing and the plate is well-made. Using objects that express such qualities are more likely to be cared for and even cherished, which mitigates against premature disposal or careless stewardship.

- Re-purpose objects that may be personally meaningful to people in the design of digital devices and systems. This direction offers inspiration for developing bespoke digital artefacts that, due to their personally meaningful nature, are likely to stand the test of time. Additionally, bespoke digital artefacts may transform how people view and use aspects of the digital world.

- Re-order technical priorities by considering and emphasing the potential “ultimate ends” of a design at the beginning of the design process, focusing upon how the ends may relate to self-enhancement and self-transcendence values.

5.3.2 Google Diary

Figure 7: *Google Diary*

Google Diary (Figure 7) assumes the form of a leather-bound journal with a wrap-around tie and the "Google" logo subtly etched onto the leather cover. The content of the diary is a search history extracted from the author's Google account covering a period of one year to reflect a traditional diary. Each individual search from this one-year period is included and presented as they appear in a Google history search (Appendix 4). *Google Diary* explores the propensity of some technologies to become "forms of life in the most

powerful sense [to the extent that] life would scarcely be thinkable without them" (Winner, 2010, p. 11). The Web has become a powerful form of life to the extent that it is now deemed essential to people's participation in society (Ofcom, 2017, p. 164). The average UK user spends 25 hours per week online with 16-24 year olds spending 29 hours online (Ofcom, 2016, p.179). 40% of Web users however believe they spend too much time online and report negative consequences in their work and personal lives (Ofcom, 2016, p. 40). *Google Diary* therefore addresses analogous critiques of the Web relating to distraction (Curtis, 2005), fragmentation (Carr, 2011), isolation (Turkle, 2011), addiction (Young and de Abreu, 2010) and information overload (Postman, 2004). Wertheim (2000, p. 228) describes the Web as "the fastest growing 'territory' in history" which is perhaps unsurprising given the significant political agendas associated with it, which do not accord with sustainable principles. For example, the UK government is increasingly digitising its public-facing services, stating that such a move "requires no more consideration" due to the cost effectiveness of digital transactions (Digital Britain, 2014).

Google Diary forges a relationship between two distinctly opposing ideas: a diary—a deeply meaningful, reflective and private object often safeguarded over a lifetime—and the Web, which is associated with connectivity and comparatively unreflective, distracted and fleeting engagement. *Google Diary* visualises a search history as a continuous document that can be seen as one, in an instant, rather than the small sections available on-screen when (and if) we search our Web history. In doing this, *Google Diary* powerfully communicates the rich picture that a search history builds about a person's life, which can include their interests, ailments, concerns, politics, travels, finances, buying habits and what entertains them, etc. The most striking feature of *Google Diary* is its revelation that search engines record even our most fleeting thoughts, capturing them as data to be mined as it is all too easy to "ask" a Web search engine about anything that may come to mind. As Stephens-Davidowitz (2017) has demonstrated by analysing Google searches, search terms provide a picture of who we really are, rather than who we say we are. In this way, the Web appears to provide a form of cathartic outlet much like a diary does. Whereas a diary facilitates a reflective, introspective experience however, the Web facilitates a comparatively fragmented, unreflective experience as it is designed to bombard with a

range of views from myriad sources that may or may not be significant to what is being contemplated. By making Web activities tangible, explicit and visible in this way, *Google Diary* draws attention to the deeply personal and significant role that the Web plays in our lives, in addition to the trust – or possibly ignorance – we appear to have when it comes to sharing personal information. Combined, these two issues leave users vulnerable not only to increasingly targeted, marketing techniques, but also to being targeted by politically biased imagery and stories intended to foster certain values based on Web searches.

The "after-modern" design directions developed from *Google Diary* are:

- Create opportunities for meaningful aspects of life to be less Web dependent.

- Create opportunities for Web user to reflect upon the time they spend online especially in terms of whether or not that time has been well spent.

- Create meaningful opportunities for users to engage with privacy issues, especially with respect to how personal data is accessed and used.

5.3.3 Yours Truly

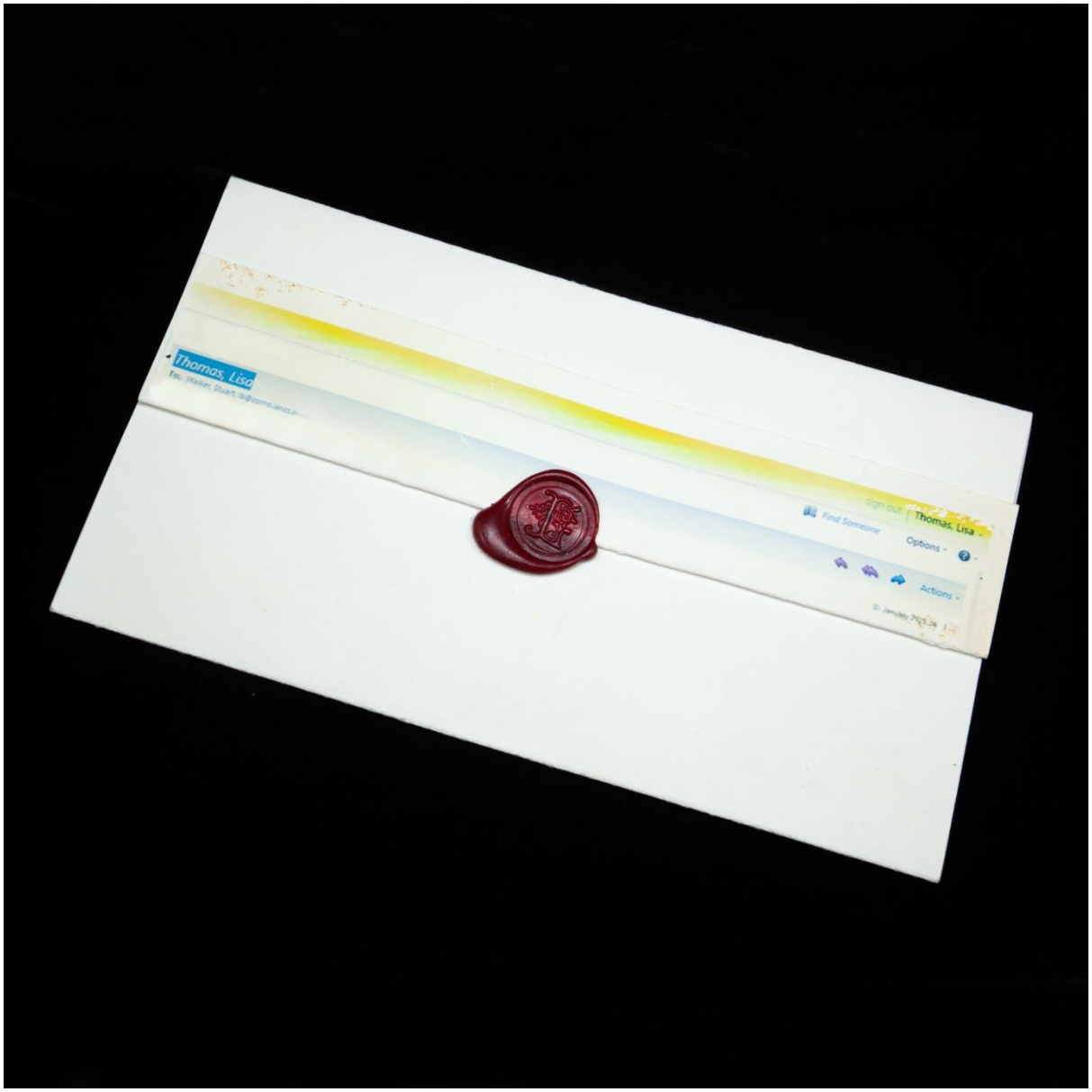


Figure 8: *Yours Truly*

Yours Truly (Figure 8) is a printout of an email, which is folded to resemble a letter. The e-mail address bar is visible, displaying both the sender and the recipients' names but the content is concealed within the folds. A medieval style wax seal used for sealing letters holds the folds intact. *Yours Truly* explores the potential for the digital world to undermine the development of authentic personal relationships given that we have readily adopted a range of text-based digital communication channels for both formal and informal

communication purposes. Late-modern values underpin the development of text-based digital communication channels such as email, SMS and social media, which has led to convenience, cost-effectiveness and efficiency becoming a hallmark of them. Design gives form to these values and consequently digital communication channels are designed to support rapid, fleeting and reductive forms of communication (Lanier, 2011, pp.68–69). Whilst on the surface, this may seem desirable because it allows us to do more and to do it more quickly, Orr (2002, p. 47) suggests that we are becoming increasingly "muddle-headed" in both our public and private lives as "we have mistaken volume and speed of information for substance and clarity". For Orr (2002, p. 47), this has led to a decline in grammar, literary style and most importantly, civility of communication as we inevitably must become more efficient ourselves. Similarly, Ihde (1997, p. 112) suggests that whilst there are many clear advantages associated with the speed and volume that technological advancement affords, its disadvantages include a decline in the craft of handwriting and the considered, reflective nature of handwriting a letter. For Borgmann (2007, p. 201), the task we face in the digital world is reconciling "the fluidity of information technology with the stability of the things and practices that have served us well and we continue to depend on for our material and spiritual wellbeing". Moreover, Borgmann's (2007, p. 218) concern about the volume and speed of information technology is that we are becoming overly accustomed to the "lightness" of virtual experiences and emotions to the extent that "persons and things [can seem] offensively heavy and crude".

Yours Truly juxtaposes a traditional and contemporary text-based medium of communication to consider what we potentially lose through highly efficient, digital communication channels. Whilst on the surface, efficiency may appear desirable and certainly useful for keeping in touch with family, friends and acquaintances, these relationships are inevitably mediated by efficiency, which has implications for the experience of communication and consequently, how we relate to each other. *Yours Truly* draws attention to the fact that many people make potentially hundreds of text-based digital communications per day compared with pre-digital times. This is especially true in social media environments, which not only encourage rapid and voluminous communications but also encourage people to amass hundreds of "friends" which appears

to foster self-enhancement values. The representation of an e-mail in *Yours Truly* appears sterile and uniform compared with the traditional style of the wax seal, which appears comparatively "heavy", softly textured, warm, richly coloured and tactile, evoking the human hand through its imperfections. These aesthetic qualities appear far better suited to supporting more personal, considered and meaningful approaches to text-based communication than digital channels afford.

The "after-modern" design directions developed from *Yours Truly* are:

- Design digital channels that clearly differentiate between, and attempt to meaningful support, different types of communication such as communicating with formal institutions, with family, close friends or acquaintances. Whilst rapid, reductive forms of communication may be helpful for more formal communications, they may be less helpful for developing authentic relationships. To this end, consider how the most meaningful communications can be amplified to express their importance such as through considering mode of delivery and privacy.

- Design mechanisms that facilitate reflective opportunities for people to separate the "wheat from the chaff" in the digital world and in doing so, support people to recognise and overcome issues associated with speed and volume.

- Consider whether the digital world is always the best solution for communication and what other channels might be developed to provide people with ways of communicating that may afford richer experiences.

5.3.4 Lakeland Data Stone

Figure 9: *Lakeland Data Stone*

Lakeland Data Stone (Figure 9) comprises three elements: a piece of Lakeland stone, an SD storage card and a small fragment of a micro-chip. The SD storage card appears to be inserted into the stone and the fragment is attached to the surface of the stone. *Lakeland Data Stone* considers how the increasingly large data storage capacities of personal digital devices mediate and potentially undermine how people experience meaningful events. The accessibility and availability of seemingly limitless digital "memory" appears to compel

people to generate large quantities of data, such as digital photographs – and yet research demonstrates that people are unsure about how to value their "virtual possessions" and often value digital objects less than physical objects (Odom et al., 2009, p. 1056). This is of concern given that throughout history, people have attached importance and meaning to visually documenting personal, family and social histories – and cherishing that documentation for its role in supporting reminiscence and for passing knowledge down through generations. The ubiquity of digital photography and its rapid development within a technical system of personal digital devices has brought significant changes to how photography is practiced, which has implications for how photographs are valued. The data storage capacities that allow us to generate many thousands of images with speed manifest late-modern values of efficiency, convenience, quantity and acquisition. In turn, these values come to mediate how an event is experienced and how the associated documentation of it is cared for.

Lakeland Data Stone was created following a short trip taken by the author to the English Lake District: a place of outstanding natural beauty that affords rich opportunities for connecting with, and photographing, the natural world. Some four hundred photographs were taken over a two-day period, which were destined to languish in a digital "photograph album" alongside many thousands of others. *Lakeland Data Stone* therefore explores the tendency of data storage capacity to foster self-enhancement values by seemingly compelling people to amass voluminous of data at the expense of more fully experiencing the event being documented. Digital storage capacity therefore appears to mediate an illogical human-world relationship, which becomes especially apparent only later when the quantity of images begins to undermine their value. To explore this issue, the memory card used to capture and store the images was destroyed and embedded in a piece of stone that is highly distinctive to the Lake District. The card was embedded in the stone in a manner than emulates how a memory card slots into a camera to evoke the idea of photography. The images associated with *Lakeland Data Stone* therefore do not exist and consequently they are not readily available, cannot be accessed by others, distributed or edited. Instead, *Lakeland Data Stone* renders the images completely private and provides an alternate means of accessing them – via the recollection of real memories, which can be understood

as having been “set in stone”. In this way, the images are “accessed” in a comparatively unpredictable and inefficient process, which requires stillness and reflection. Rather than the typically rapid, occasional scroll-through of digital images, this process evokes something of the *whole* experience; the smell of wet woodland, the feel of rain on skin, the mauve coloured haze hanging over the lake and the sound of waves washing over its shores.

The “after-modern” design directions developed from *Lakeland Data Stone* are:

- Encourage less acquisitive approaches to data generation to diminish the rapacious, distracted behaviours associated with data generation, which can include the rapid sharing of that data through social networks.

- Design to support being present in the moment. Enouraging stillness would potentially increase a person’s appreciation and enjoyment of the event being experienced, including supporting the development of authentic relationships with other people.

- Design mechanisms that aim to amplify the importance of limited sets of data by linking the data to the context in which it was created. In this way, people are supported to differentiate data that is potentially meaningful from the vast digital libraries in which it can easily be lost over time.

5.3.5 KintsugiPhone

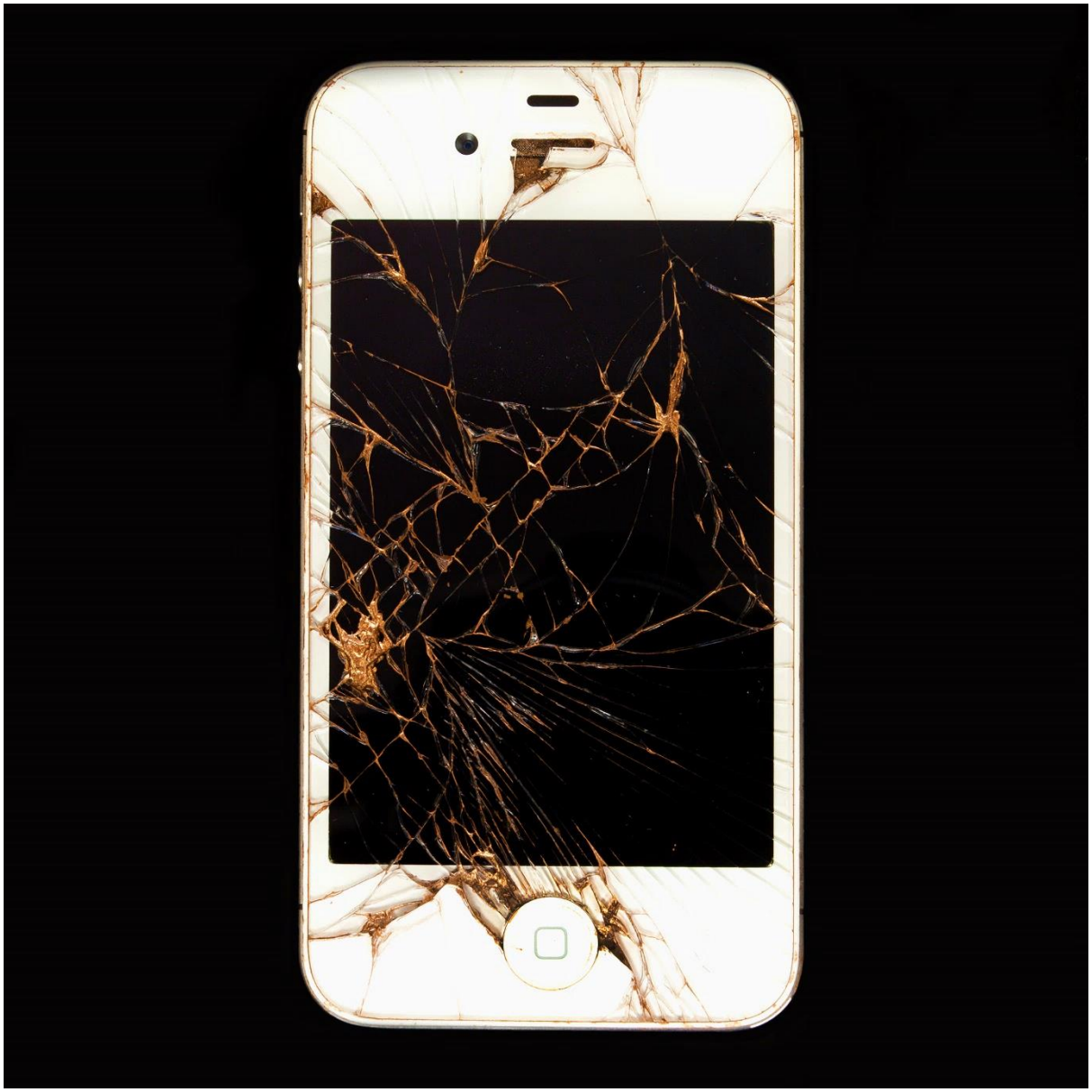


Figure 10: *KintsugiPhone*

KintsugiPhone (Figure 10) is an iPhone with a broken screen. The cracks in the screen have been filled with gold paint to emulate the ancient Japanese art of "Kintsugi" for repairing broken ceramics with a lacquer made from gold dust and resin. *KintsugiPhone* explores the seemingly precious status that the ubiquitous smartphone appears to have for many people. As many aspects of life increasingly converge upon this device, its multi-tasking capabilities, ease of use, efficiency, affordability and portability ensure that it is

rarely far from many people's reach. Despite their seemingly precious nature however, these devices are easily replaceable and consequently, remarkably disposable. In the context of Borgmann's "device paradigm"—which defines devices as typically amplifying consumption and disengagement (see p. 37)—the smartphone could be considered as a form of "mega-device" as it typically amplifies consumption of the digital world, and therefore fosters self-enhancement values. The smartphone has brought significant changes to modern societies by creating an "always on" culture, which includes longer working hours as the smartphone allows work to more easily leak into home life, disturbed sleeping patterns, diminished engagement with our immediate environments, and a reduction in face-to-face communication (Ofcom, 2016, p. 33-38). For some people, smartphones even represent significant risks as they are used, for example, whilst driving, crossing roads and operating dangerous machinery. People cannot be fully present in their immediate physical environment when online because, as Wertheim (2000, find page) suggests: "In some profound way, cyberspace is *another* place… Just 'where' I am when I enter cyberspace is a question yet to be answered" (Wertheim, 2000, p. 300).

KintsugiPhone probes the ostensibly precious nature of the smartphone by emulating the ancient Japanese art of "Kintsugi" – a method for repairing broken ceramics with golden lacquer. Broken objects are aesthetically transformed by the addition of highly visible "golden seams". These seams are valued for their role in prolonging an object's life and honouring its history by drawing attention to signs of wear and tear rather than attempting to hide what might otherwise be viewed as imperfections. *KintsugiPhone* suggests an incongruent repair for a digital device that challenges expectations about rapid disposal and upgrade. Applying gold lacquer to a cracked screen in this way would potentially cause further damage to the device in addition to further obscuring the content on the screen. The golden seams render this device—in Heidegger's terms—as "present-at-hand" as they transform it from being a transparent tool for accessing the digital world to an object that raises questions about repair, recycle or disposal – due to incentivisation schemes and planned obsolescence, the latter tends to be the preferred choice (Ahmed, 2016). *KintsugiPhone* instead alludes to the smartphone as being precious enough to warrant a "Kintsugi" repair. In doing so, *KintsugiPhone* invites reflection upon about what might be

genuinely precious about the smartphone, such as using it to communicate with loved ones or generating and accessing meaningful data. In doing this, *KintsugiPhone* also draws attention to extensive and distracted use patterns, which can potentially undermine how people relate to others and to their immediate environments, in addition to encouraging careless stewardship of meaningful data.

The "after-modern" design directions developed from *KintsugiPhone* are:

- Encourage reflection upon which data is meaningful and facilitate proactive approaches to safeguarding it. This would not only help to safeguard data in the event of a smartphone being irrevocably broken or lost, it would potentially invite users to reflect upon the extent to which they use their smartphones for superfluous activities.

- When designing digital devices, consider the use of materials that age well and absorb signs of wear and tear in aesthetically pleasing ways. This may encourage users to accept, and even embrace, the aging process of digital devices thus fostering greater emotional connections to them. As Chapman (2005) has shown, products are more sustainable when an emotional connection has been established in the mind of the user.

- Consider the use of parts that lend themselves to self-evident repairs, maintenance and parts replacement thus inviting the user into a process of caring.

- Create opportunities for disrupting the flow of use to address the extensive use patterns, which often appear complusive. Disrupting the flow of use may apply to the design of the smartphone itself, the design of services that require smartphone use, and also to the design of physical environments.

5.3.6 Anaesthesia

Figure 11: *Anaesthesia*

Anaesthesia (Figure 11) is a tablet device placed inside a transparent medication bag. *Anaesthesia* explores the addiction-like behaviours often associated with digital devices such as smartphones and tablets. These devices contribute to "more and more of us [being] instantly wired to the global nervous system [but the result is that] we are drowning in unassimilated information, most of which fits no meaningful picture of the world (Orr, 2002,

p. 47). The period of modernity has often been likened to an illness in which neutral understandings of technology are a major symptom. For example, as previously mentioned, Davison (2001, p. 93) suggests that instrumental approaches to technological development leave us "blindly building a deformed world"; Taylor (2009, p. 309) describes "the malaises of modernity"; and McIntosh (2012, p. 52) laments that "our illness is a loss of soul". This is exemplified through the consumption patterns associated with digital devices, which often appear as a craving for the next "big thing", a brief period of post-purchase euphoria and a subsequent sense of dissatisfaction. All too quickly, another next "big thing" appears on the horizon, which invites premature disposal of fully functioning devices (Bocock, 2008, p. 46; Klein, 2014, p. 75).

Anaesthesia casts personal digital devices such as the "tablet" device as being a form of anaesthetic medication for the major symptoms of unsustainability (see p. 2) due to such devices providing "unprecedented opportunities for distraction . . . habitual absorption, information inundation, and unreflective amusement" (Walker, 2014, p. 88). In doing so, *Anaesthesia* explores Orwell's (2016, p. 135) view that:

> The machine has got be accepted, but it is probably better to accept it rather as one accepts a drug – that is, grudgingly and suspiciously. Like a drug, the machine is useful, dangerous, and habit-forming. The oftener one surrenders to it, the tighter its grip becomes.

Framed as an anaesthetic medication, digital devices take on a new purpose, appearing less desirable as they are transformed from being an object of desire into an object of suspicion. Moreover, when viewed in this way, *Anaesthesia* raises important questions about the device such as: *What is this being prescribed for? Who has prescribed this? How often should I use it;* And, *what are its potential side effects?*

The "after-modern" design directions developed from *Anaesthesia* are:

- Design mechanisms that support users to recognise, reflect upon and mitigate against compulsive patterns of use.

- Consider the potential "side-effects" of incorporating the use of a digital device into a design solution and explore alternatives.

5.4 Discussion: "after-modern" aspects of the design process

The design directions developed from each "after-modern" design inquiry are a form of design knowledge acquired from reflecting upon a combination of the literature and the "inquiring objects". This section reflects upon the *designing process* associated with "inquiring objects" to identify key aspects of the process that are important for "after-modern" design. As previously mentioned, design process knowledge is defined by Walker (2013b, p. 455) as knowledge that is distinctive to designing and that cannot be acquired through non-design means. Knowledge acquired from design practice therefore must be distinguishable from existing forms of knowledge brought into the process (Walker, 2013b, pp. 453–456). Three significant aspects of the designing process are identified in this section that can be understood as "after-modern". These aspects are: a disruptive process, meaningful engagement with theoretical ideas, and a different "end" for design.

5.4.1 A disruptive process

The explicitly critical nature of creating an "inquiring object" disrupts normal late-modern assumptions and expectations about the purpose of the designing process and the nature of technological artefacts and systems. Exploring, critiquing and expressing how digital devices and associated technologies mediate self-enhancement and self-transcendence values necessitated sourcing and configuring materials that appear incongruous with this world. For example, *Earth Re-charger* combines digital device batteries with a plate of soil of seeds; *Google Diary* combines a printed Web history with a leather journal; *Yours Truly* combines an printed email with traditional wax letter seal; *Lakeland Data Stone* combines an SD memory card with a stone; *KintsugiPhone* combines a smartphone with the ancient reparative craft of Kintsugi; and *Anaesthesia* combines a tablet device and earphones with a transparent pharmacy bag. Sourcing, working with, combining and configuring incongruous materials to explore the familiar digital world invites the practitioner to "see" this world through a lens of materials not generally associated with

their design. In this way, creating “inquiring objects” supports a form of design-based postphenomenological inquiry into the nature of technologies as conducting “after-modern” design inquiries requires the practitioner to apprehend the everyday technological world naively and with the sense of astonishment that is fundamental to both phenomenology (see p. 32) and postphenomenology (see p. 33). As the designing process unfolds, the emerging objects make the familiar strange, which in turn challenges and disrupts late-modern assumptions about the purpose and design of technologies. This is an important contribution of the designing process as it supports the practitioner to overcome unconsciously held assumptions shaped by the prevailing modern worldview – and to develop new, radically different ideas about the design of technological artefacts and systems that point to “after-modernity”.

5.4.2 Meaningful engagement with philosophical ideas

The literature review in this thesis illuminates some philosophical ideas that appear fruitful for moving design beyond modernity. Philosophical ideas can however be abstract, which makes them difficult to relate to real life, to specific things, and to design. The designing process of “inquiring objects” helps to overcome this barrier by supporting the practitioner to relate their *emerging* understanding of philosophical ideas to specific technologies, *through* the medium of design. For example, in this thesis, the abstract idea of instrumental rationality is investigated in terms of its relationship to personal digital devices and associated technologies. For example: *Google Diary* draws out Web-specific issues relating to privacy, addiction and technological alienation; *Earth Re-charger* draws out issues relating to resource depletion associated with digital technologies; *Yours Truly* draws out issues relating to increasingly efficient, digital communication channels; *Lakeland Data Stone* draws out issues relating to data generation associated with digital storage capacity; *KintsugiPhone* draws out issues relating to the convergent nature of smartphones; and *Anaesthesia* draws out issues relating to the addiction-like qualities of digital devices. A key difference of the designing process is that it invokes the so-called “right hemisphere”, which for McGilchrist (2009, p. 199) “enables us to take things back from the world of the left-hemisphere and make them live again in the right [which makes them] truly new once

again". The designing process of "inquiring objects" invites the practitioner to contemplate and absorb the philosophical ideas being explored in a very different manner to the rationalistic ways that modernity has emphasised – such as reading about them, analysing them, attempting to memorise them, and writing about them. Instead, the designing process allows the practitioner to respond to just snippets of information and develop these snippets through design – rather than develop more comprehensive understanding of them through further reading. Instead, the process of creating "inquiring objects" invites the practitioner to combine their emerging understanding of the abstract ideas being investigated with their own lived experiences and values, which supports meaningful engagement with them.

The designing process serves to funnel this combination of abstract, philosophical ideas and personal lived experiences into tangible, single objects, which transform the combination into a unified whole. In turn, the "inquiring object" expresses new meanings based on the unified ideas and supports more focused and concrete understandings of abstract ideas, as they are related to specific technologies. The designing process therefore develops a relationship—and bridges a gap—between the abstract ideas being investigated, the practitioner's own lived experiences of specific technologies, and concrete materials and tangible forms. This is a tactile, emotionally-engaging process, which allows the practitioner to "feel" their way around the ideas being investigated and in doing so, develop intuitive understandings about whether different materials, aesthetics and configurations resonate with the ideas being explored. Consequently, the designing process can bring the practitioner closer to the theoretical ideas being investigated as they become anchored to personal insights, and to concrete, tangible materials. This is important for moving design beyond modernity because it supports the practitioner to *meaningfully* engage with theoretical ideas that hold potential for transforming and enriching thinking about sustainability – and crucially how to design more substantively for sustainability.

5.4.3 A different “end” for design

Product design in late-modernity largely understands its outputs as ends-in-themselves. The designing process of “inquiring objects” instead yielded a set of artefacts that can be understood as *beginnings* because these objects can generate further design thinking by triggering the creative imagination. Whilst the objects were created primarily to explore and critique how the instrumentally rational modern worldview is manifest in digital devices and associated technologies, they look both backwards and forwards. They look backward by framing critical questions about how late-modern technologies foster self-enhancement values, and they look forward by proposing answers that support the discernment of alternate—and sometimes radically different—directions for the design of technological artefacts and systems that foster self-transcendence values. These answers are expressed via the objects’ aesthetic sensibilities, forms, material combinations and the patterns of use they suggest (see the design directions of each “after-modern” design inquiry in section 5.3). The objects therefore do not rely upon precedents, which can lead designers to inadvertently incorporate undesirable features from existing solutions (Jansson & Smith 1991, p.4). This is important for “after-modern” design research because it challenges the propensity of design education to focus on teaching precedents – a recent study of sixty university design tutors and students found that the majority believed teaching precedents was either more important than teaching innovation and creativity or was equally important to teaching creativity (Rodgers & Jones, 2017, p.446). Whilst teaching precedents is undoubtedly important, it tends to reproduce the status quo, which is highly unsustainable.

By contrast, “inquiring objects” invite the practitioner to contemplate and reflect upon an entirely different set of values that are uniquely expressed via the objects. These expressions can reveal insights into how technologies such as personal digital devices can be designed for different purposes and to engender different “ends” than those typically pursued in late-modernity, which can arguably support self-enhancement “having” values. The “inquiring objects” therefore provide the practitioner with a basis for *judging what is desirable with respect to designing for sustainability.* The designing process therefore

requires that the object of its attention is re-conceptualised as being a fundamental form of values-based sustainability research, not a commercially viable end-in-itself.

5.5 Conclusion

This chapter has addressed the research objective: *To develop a design research method that addresses sustainability in a more substantive manner than the modern worldview permits.* A series of "after-modern" design inquiries were presented that comprise an "inquiring object", a discussion and a set of design directions. Furthermore, the designing process associated with "inquiring objects" was reflected upon to draw out distinctive aspects of the process that support the practitioner to move design beyond the confines of the modern worldview. From this chapter, the conclusions drawn are:

- The design directions developed in each "after-modern" design inquiry demonstrate that creating "inquiring objects" is an effective method for supporting the design practitioner to move design beyond modernity. Harnessing design practice offers the practitioner a design-based means of exploring significant philosophical issues that may otherwise remain separate from the realms of design practice. In this way, the practitioner combines both "left" and "right" hemispheres to conduct design research for sustainability. The resulting objects therefore bring together important philosophical issues with the material world and in doing so, convey material and aesthetic differences to modernity. These objects are therefore generative of design thinking that challenges neutral understandings of technologies, which are detrimental to developing more sustainable ways of living.

- Conducting "after-modern" design inquiries reveals, and challenges unconsciously held assumptions about the nature of technological artefacts and systems in late-modernity. This is especially important for "after-modern" design research and practice because technological development is often based on what already exists (Davison, 2001, pp. 103–104; Miller, 2013, p. 53). Investigating the technological mediation of self-enhancement "having" values offers an alternative way to understand technological artefacts and systems that points to "after-modernity".

Moreover, this alternative understanding transforms what it means to design for sustainability as it challenges the dominant sustainability discourse which views sustainability as an economic opportunity to be capitalised on via technological advancement (see p. 3).

- Conducting "after-modern" design inquiries does not require advanced levels of design expertise as often appears to be the case with critical approaches to design. By contrast, creating "inquiring objects" in this chapter required varying levels of design expertise. And whilst the "inquiring objects" and aspects of the designing process may be radically different to contemporary product design practices, the designing process nonetheless develops *transferable* practical designing skills, such as making expertise, sourcing appropriate materials, and developing skills in visualisation and presentation, etc. Conducting "after-modern" design inquiries is therefore likely to be an inclusive method for supporting design students to move design beyond the modern worldview.

- The conceptual basis for after-modern design argues that invoking universalism "being" values at the inception of the design process is important for "after-modern" design as these values are compatible with developing more sustainable ways of living. This chapter demonstrates that conducting "after-modern" modern design inquiries offers a means of supporting practitioners to pursue universalism values as the inquiries yielded a set of design directions that can potentially support the development of technological artefacts and systems that mediate in favour of universalism values.

The following chapter builds upon the "after-modern" design inquiries by using the design directions developed in them as a basis for designing a digital technological artefact.

6 A Framework for “After-Modern” Design

6.1 Introduction

This chapter addresses the research objective: *To develop a framework that supports the “after-modern” design of personal digital devices and associated technologies.* This chapter continues with a research through design approach by using the design directions developed in the “after-modern” design inquiries as a basis for designing a digital object entitled *Memento Box*. The design directions are used as a basis for designing a digital object as they appear to discern an alternative path for the design of digital devices and associated technologies that can potentially foster universalism values, which are known to be compatible with developing sustainable ways of living (see p. 62). This chapter introduces *Memento Box* (Figure 12), which is used as a basis for developing an eight-point framework for the “after-modern” design of digital devices and associated technologies. The chapter concludes by reflecting upon *Memento Box* and the process of analysing it to draw out conceptual and practical directions for designing technological artefacts and systems that can be understood as “after-modern”.

This chapter resulted in the following output: Thomas, L. (2019). *Designing through a postphenomenological lens: A meaningful way forward?* Nordic STS Conference. Tampere, 13-14 June, 2019 (Presentation).

6.2 Memento Box

Memento Box is a concept for a digitally-enabled container that is used for safeguarding physical mementos of meaningful events, people, places, and periods of time. *Memento Box* affords the opportunity to link limited amounts of digital data such as images, videos, music and audio recordings to physical mementos via an RFID tag that is attached to

each memento. This data is not stored online and cannot be accessed via typical digital devices such as smartphones, tablets and laptop computers. Instead, the data is viewed on the integral touchscreen and/or listened to through earphones.

Figure 12: *Memento Box*

6.3 Developing the framework for "after-modern" design

Given that the design of *Memento Box* was informed by design directions that potentially foster universalism values, it was judged to provide a suitable base from which to develop a framework for the "after-modern" design of personal digital devices and associated technologies. To develop this framework, *Memento Box* was analysed from a

postphenomenological perspective – it was therefore understood as being a mediator of human-world relations, the character of which, emerges from a co-shaped relationship between subject and object (see p.44). The analysis was guided by the following key questions:

1) What kind of experiences might *Memento Box* afford?
2) Which design features facilitate these experiences?
3) How do these experiences and design features differ from late-modern conventions?
4) How can these experiences be understood to support universalism values?

By addressing these questions, eight transferable over-arching qualities were distilled that were judged to foster universalism values and therefore support the “after-modern” design of personal digital devices and associated technologies. These qualities are captured and expressed in the titles of the following categories, which comprise an eight-point framework for “after-modern” design:

1) A participatory design process.
2) Honest, sensory materials.
3) Distinctive digital objects and associated technologies.
4) Meaningful limits.
5) Contextually-rich digital objects and data.
6) Purposeful digital objects.
7) A sense of tradition.
8) “Releasement” from the digital world.

Across these categories, forty-eight potential experiential affordances are identified that are judged to mediate in favour of particular universalism values (see p. 62). These affordances and their relationship to universalism values are summarised in tables at the end of each category.

6.4 An eight-point framework for "after-modern" design

The eight-point framework offers an entry point into exploring the design of an "after-modern" digital world. The framework is envisaged to support product design education to overcome the late-modern propensity to view technologies as neutral by articulating distinct, practical and flexible directions, which intend to inspire rather than prescribe. The framework therefore responds to Sas et al.'s (2014, p. 1974) finding that the design research community is increasingly interested in accessing guiding principles or concrete examples that allow for more creative freedom than the overly detailed, prescriptive frameworks that dominate current design approaches to sustainability.

6.4.1 A participatory design process

Memento Box is not readily available, off-the-shelf, for instant consumption. If *Memento Box* was a commercially available product, only the generic digital components would be available for sale as users are required to source a container that they consider appropriate for their needs. Furthermore, users must collect mementos of meaningful events, people, places, etc. to place in the container and link to data – if they wish to do so. *Memento Box* therefore challenges assumptions about how our digital futures come into being as it transforms passive consumers into active participants in the designing process of digital artefacts. Hence, *Memento Box* challenges the current trend of developing increasingly homogenous, efficient and disburdening personal digital devices – which are usually encountered by the consumer as a "fait accompli". In the latter scenario, consumers are restricted to making decisions about minor style and technical differences, brand and cost. This narrow consumer decision-making process mediates human-world relations in favour of self-enhancement values because it encourages digital devices to be valued instrumentally, for what they provide access to and/or for how they are perceived to signify social status.

By contrast, *Memento Box* denies this typical consumer decision-making process because there is no sleek, pristine, branded device to consume. Instead, the user is invited into a comparatively burdensome, active designing process, which requires reflective,

imaginative and creative input on their part. This process is unlikely to be instantly gratifying as it is envisaged to be time-consuming compared with the process of selecting an off-the-shelf device. Active participation in the designing process however can be an immersive, intrinsically rewarding experience, which instils a desire to do something well for its own sake (Sennett, 2009, p. 9). In other words, the rewards are inherent rather than instrumental. Furthermore, the participatory designing process associated with *Memento Box* provides users with opportunities to develop digital objects and interfaces through practices of reusing, making, buying second-hand and repairing. Such practices are perceived by sustainable consumers to reduce stress by avoiding the work-spend cycle, which in turn increases their own quality of life, the quality of life for others, and the quality of the environment (Marchand, 2013, p. 164). The participatory designing process therefore challenges unsustainable consumption practices associated with the dominant sustainability discourse, which prioritises the acquisition of new products (Marchand, 2013, p.164). A *Memento Box* is likely to be an emotionally-engaging object due to both the designing process and its resonance with personal needs, tastes and values. Consequently, it is likely that *Memento Box* will be cared for over time and potentially cherished.

A *participatory design process* potentially mediates in favour of universalism values as follows:

A participatory design process	**Coded universalism values**
Invites users into an emotionally engaging designing process.	– Inner harmony – Broadminded
Can result in intrinsically valuable digital objects.	– Inner harmony – Protecting the environment – Broadminded – A world of beauty
Allows users to source environmentally benign materials.	– Inner harmony – Protecting the environment – Broadminded – Unity with nature – A world of beauty – Equality
Allows users to source objects that they consider to be beautiful.	– Inner harmony – Unity with nature – A world of beauty – Equality

Allows users to source materials and objects from local and/or natural environments that can be returned to these environments.	– Inner harmony – Protecting the environment – Broadminded – Unity with nature – A world of beauty – Equality
Confers greater responsibility upon users, which helps to redress the balance of power in the processes of technological development.	– Broadminded – Equality
Can release users from rapid upgrade cycles as digital objects are not readily available and come into being at a slower pace.	– Inner harmony – Protecting the environment – Broadminded

6.4.2 Distinctive digital objects and interfaces

Memento Box challenges the current "one-size-fits-all" approach to designing the digital world, which tends to yield a homogeneous array of devices (Norman & Verganti, 2014). The most distinctive feature of these devices is often the brand itself, which is desired for its cultural power to signify social status (Gobe, 2010, p. 125). By contrast, *Memento Box* is not brand-driven because only its generic technological components would be available for sale. Consequently, *Memento Box* can be a highly distinctive digital object as the container and mementos are chosen by the user; they can therefore be almost anything and can come from almost anywhere. Amongst other things, the container could be a box, bag, tin, drawer, basket, cupboard or even simply a shelf; it might be bought (new or second-hand), already owned, passed down, gifted or be home-made. Moreover, the container could be unique and/or hold sentimental value, making it personally meaningful to the owner and therefore irreplaceable – for example, the Kodak film tank used to create the *Memento Box* in this thesis is a family heirloom of the author's, stored for many years without being used for anything.

Due to its physical form, aesthetic presence, texture, size, colours, smell, audio qualities and age, *Memento Box* and its mementos may be considered as being strange, symbolic, enchanting, sentimental, nostalgic, etc. These qualities are not usually associated with personal digital devices and associated technologies. Hence, as an interface to digital data, *Memento Box* contrasts with typical digital interfaces that are a combination of screen-based devices and two-dimensional, technicoloured on-screen icons. The latter interfaces afford comparatively bland experiences, providing predictable, efficient ways of

accessing a predictable, efficient digital world. Consequently distracted, fragmented, multi-tasking behaviours come to mediate meaningful relationships and events, etc. (Postman, 2004, p. 4; Borgmann, 2007, p. 201). In the case of *Memento Box*, the nature of the container, the mementos and the technology combine to create a distinctive presence that draws special attention to its digital data, which is envisaged to invite mindful engagement with the data.

Distinctive digital objects potentially mediate in favour of universalism values as follows:

Distinctive digital objects and interfaces	**Coded universalism values**
Can draw attention to the false needs created by brands, which often lead to feelings of inadequacy and premature disposal of devices.	– Inner harmony – Protecting the environment – Equality
Can help to safeguard meaningful data.	– Inner harmony
Are potentially unique and irreplaceable.	– Inner harmony – Protecting the environment – Broadminded – A world of beauty
Can respond to personal values, needs and tastes.	– Inner harmony – Protecting the environment – Broadminded – Unity with nature – A world of beauty – Equality
Reveal the powerful role of branding in distinguishing between homogenous digital devices.	– Inner harmony – Broadminded – Equality
Can incorporate qualities and sensibilities that more deeply resonate with being human.	– Inner harmony – Broadminded – Unity with nature – A world of beauty – Equality

6.4.3 Honest, sensory materials

As early as the late seventeenth century, makers began ascribing ethically-laden descriptors such as “honest”, “modest” and “friendly” to objects constructed from relatively raw, natural materials in order to favourably distinguish them from increasing levels of artifice (Sennett, 2009, pp. 135–138). These materials include wood (bamboo, rattan, bark, etc.), natural fibres (wool, silk, hemp, etc.), composites (clay, porcelain, etc.), stone and

leather – all of which can afford rich sensory experiences. The simple, wooden construction of the Kodak film tank re-purposed to develop the *Memento Box* in this thesis represents a relatively honest use of materials, which contrasts starkly with the highly engineered materials used to develop contemporary digital devices. The sensory nature of our material world is important for sustainability because it plays a powerful role in mediating human-world relationships (Verbeek, 2010, p.211-212). For example, the pristine, polished and fragile surfaces of digital devices afford sensory experiences that are cold, remote, inviolable and concealing – qualities which aesthetically identify unsustainability (Walker, 2006, p. 117). These qualities can instil senses of dissatisfaction in users as they are not perceived to age well and they restrict users from making simple repairs and/or changes such as upgrading batteries (Blevis, 2007, p. 503). Some of the sensory affordances of contemporary digital devices can, therefore, be understood to mediate human-world relationships in favour of self-enhancement values by fostering superficial emotional attachments, which encourage a cycle of premature disposal and consumption of products (Chapman, 2013, pp.140–141).

By contrast, the sensory affordances of the Kodak film tank confer upon it a degree of transparency in terms of its construction and origin. This transparency is expressed and experienced through sensory affordances which resonate more deeply with what it means to be human – the Kodak film tank feels warm, soft and textural to the touch, the box can be fully opened and examined, its wooden material evokes nature, its audio qualities differ slightly with each use, and its advanced age is apparent through its label, a faint smell of ageing wood, and obvious signs of wear. These signs of wear are not undesirable as the wood has absorbed the marks of time with grace allowing them to hint at unknown stories and past practices – narratives which support the development of emotional product attachments (Rognoli & Karana, 2013, p. 146). Designing digital objects with “honest” materials can support users to make ethical choices relating to a product’s origin and invite the repair and maintenance of products; for example, one can imagine how to embark upon the process of repairing and maintaining a simply constructed wooden box. Moreover, “honest” materials can permit users to incorporate alternate notions of beauty into the digital world that resonate with sustainability principles and deeper notions of human

meaning – such as *Kintsugi* repair work or *Wabi-sabi* sensibilities of imperfection, simplicity and incompleteness (Powell, 2004, p. 146). Users may also source "honest" materials from natural, local environments, which can promote meaningful engagement with these environments (Walker, 2011, pp.64–65) – in addition to being able to return them to their natural environments at later dates.

"Honest" sensory materials potentially mediate in favour of universalism values as follows:

Honest, sensory materials	**Coded universalism values**
Can diminish senses of dissatisfaction that encourages consumption.	– Inner harmony
Can afford rich sensory experiences.	– Inner harmony – Broadminded – Unity with nature – A world of beauty
Can support users to make ethically-informed choices.	– Inner harmony – Protecting the environment – Equality
Invites engagement in maintenance and repair.	– Inner harmony – Protecting the environment – Broadminded – Equality
Can permit alternate notions of beauty into the digital world.	– Inner harmony – Broadminded – Unity with nature – A world of beauty – Equality
Can evoke nature.	– Inner harmony – Broadminded – Unity with nature – A world of beauty – Equality
Can be sourced from natural, local environments and returned to them.	– Inner harmony – Protecting the environment – Broadminded – Unity with nature – A world of beauty – Equality

6.4.4 Meaningful limits

Memento Box embodies an argument that the seemingly limitless nature of the digital world may be incommensurate with supporting meaningful activities by encouraging unreflective, frenetic and acquisitive behaviours, which encourage self-enhancement values (Curtis, 2005, pp. 98–99). These behaviours include easy consumption of readily available material goods online (Walker, 2014, p. 89), skim reading instead of deeper, reflective engagement with varied types of literature (Berry, 2014, p. 180), acquiring large quantities of "friends" through social networks (Turkle, 2011, p. 437), accessing too much information (Postman, 2004, p. 4) and generating too much data to manage it appropriately (Curtis, 2005, pp. 102–103). *Memento Box* challenges these issues by imposing limits on data storage in two ways; firstly, through its technology and secondly through its materiality. The technology associated with *Memento Box* permits only limited quantities of digital data to be stored. Each RFID tag stores up to thirty individual images, five minutes of video, two minutes of audio and one music clip. Using *Memento Box* therefore requires deeper levels of reflection than the often automated, instantaneous process of uploading large quantities of personal data to the increasingly popular, but energy-hungry cloud (Knowles, Walker & Blair, 2013, p. 491). Instead, users must engage in a comparatively burdensome process of reflecting upon, and thoughtfully pruning digital data to assign it to a memento.

The materiality of *Memento Box* also serves to limit storage capacity through its physical size, which is likely to constrain the quantity of mementos collected over time. More importantly however, the materiality of *Memento Box* is envisaged to play an important role in supporting user acceptance of limited data storage capacity – a feature which may appear undesirable in the context of a seemingly limitless digital world. Attempting to similarly limit data storage on a typical digital device (for example, through an app) leaves the concept vulnerable to rejection because it jars with expectations about the nature of digital devices, which through their materiality persuasively argue in favour of the opposite. By contrast, the materiality of *Memento Box*—both container and mementos—allows its limited digital functionality to be encountered through different aesthetics and sensory experiences. These differences are envisaged to temper user expectations about the role and nature of digital technology. In doing this, *Memento Box* demonstrates new

possibilities for our digital futures and invites new understandings about potential roles for digital objects that function in more limited ways. Through their limited storage capacity, which is reinforced and supported by their materiality, mementos tell singular coherent stories, which support meaningful user engagement with them. Creating digital objects that limit data generation through both their technological affordances *and* their materiality is likely to naturally distil the most meaningful data whilst expunging the superfluous. This helps to mitigate against potentially meaningful data being devalued by "information overload" and its associated pitfalls, such as careless stewardship of data (Curtis, 2005, p. 102).

Meaningful limits potentially mediate in favour of universalism values as follows:

Meaningful limits	**Coded universalism values**
Can mitigate against "information overload".	– Inner harmony
Can safeguard potentially meaningful data.	– Inner harmony
Can reduce acquisitive behaviours.	– Inner harmony – Protecting the environment – Broadminded
Demonstrate alternate, less convenient possibilities for our digital futures.	– Inner harmony – Protecting the environment – Broadminded
Can support user acceptance of limited data storage capacities.	– Inner harmony – Protecting the environment – Broadminded
Invite users to meaningfully engage with digital data.	– Inner harmony – Broadminded – A world of beauty

6.4.5 Contextually-rich digital objects and data

Digital devices and data—including potentially meaningful data—tend not to express their contexts, which is of concern given that context helps to create meaning (Curtis, 2005, p. 15). For example, vinyl records provide a context for music through sights, smell and touch, affording an arguably richer experience than digital music (Curtis, 2005, pp. 12–13). The absence of context supports the efficient development of homogenous devices, which in turn, tend to be easily replaceable and disposable. By contrast, *Memento Box* provides digital data with a context through the use of mementos as a memento relies upon context

for its functionality and is redundant without its context. Despite often being ubiquitous and mundane in nature—seashells, travel tickets, receipts, coins, etc.—mementos often become deeply meaningful over time because of their powerful evocation of context, serving as tangible reminders of significant people, events, places and periods of time.

Contextualising digital data in this way challenges assumptions about its materiality, malleability, repeatability and transience – all of which can contribute to the undervaluing and careless stewardship of potentially meaningful digital data (Odom, Zimmerman & Forlizzi, 2010). By contrast, the materiality of mementos imbues digital data with a presence, stability and weight that "anchors" the data in an otherwise highly fluid, intangible digital world. The context-laden mementos effectively provide data with its own home, creating relatively safe havens from digital pitfalls such as data loss, inadvertent sharing, hacking or simply forgetting about it. This does not mean however that digital data associated with *Memento Box* is future-proof – as with all technological data, it is dependent upon a supporting network of technologies, which are always subject to obsolescence (Borgmann, 2007, pp. 195–196). It is envisaged however that users will attempt to protect the data over time, such as updating the technology of *Memento Box* if it is necessary and possible to do so.

Contextually-rich data can potentially mediates in favour of universalism values as follows:

Contextually-rich data	**Coded universalism values**
Can amplify the meaning and value of significant personal data, which in turn supports its safekeeping.	– Inner harmony
Can challenge the aesthetic and functional norms of the digital world, revealing alternate digital futures.	– Inner harmony – Broadminded – Unity with nature – A world of beauty – Equality
Allows natural materials and environmentally benign objects to be sourced and incorporated into the digital world.	– Inner harmony – Protecting the environment – Broadminded – Unity with nature – A world of beauty – Equality

6.4.6 Purposeful digital objects

Personal digital devices and associated technologies are becoming increasingly convergent as they are being designed to support the efficient execution of many different types of daily activities. Whilst on the surface, this may appear desirable in the context of a busy life, the multi-purpose nature of personal devices tends to conflate meaningful activities with comparatively meaningless ones – both of which are approached in similar ways. By contrast, the singular purpose of *Memento Box* allows typical features of digital devices to be rejected. For example, *Memento Box* eschews Web connectivity and its data cannot be accessed via other digital devices. In rejecting such features, *Memento Box* mitigates against the distracted, multi-tasking behaviours that Web-connected personal devices encourage – which may undermine the meaningful documentation of, and subsequent reflection upon a personal history.

The single purpose nature of *Memento Box* commands undivided attention as users must set other things aside to engage in its process of use. In doing this, purposeful digital objects can draw attention to imbalances created by increasingly convergent, multi-purpose digital devices, which encourage progressive use. These imbalances include the work-home balance, and the amount of time spent in the online world compared with the "real" world. For many people, these imbalances become "second-nature" and consequently can go largely unnoticed. Designing purposeful digital objects can result in a more nuanced, richly textured, divergent digital world that addresses what is at risk of being lost in the rush to digitise so many aspects of life. Furthermore, single purpose digital objects can support the development of aesthetic and functional affordances that powerfully respond to their intended contexts of use (for other examples, see: Edwards et al., 2017; Gaver et al., 2010 & 2016; Wallace et al., 2013).

Purposeful digital objects potentially mediate in favour of universalism values as follows:

Purposeful digital objects	**Coded universalism values**
Can reject aspects of the digital world that may not be commensurate with supporting meaningful activities.	– Inner harmony – Broadminded – Unity with nature – A world of beauty – Equality
Invite, focused, engaged experiences that are intrinsically meaningful.	– Inner harmony
Can meaningfully support their contexts of use.	– Inner harmony
Can invite critical self-reflection upon imbalances created by digital devices.	– Inner harmony – Broadminded – Equality
Can contribute to the development of a richly textured, aesthetically divergent digital world.	– Inner harmony – Broadminded – Unity with nature – A world of beauty – Equality

6.4.7 A sense of tradition

Memento Box demonstrates that the digital world need not reject traditions, which can offer a sense of security and rootedness as they connect people to enduring beliefs and practices. Many daily activities such as communicating, socialising, trading, managing finances, listening to music, working, exhibiting artwork, planning travel, political protest, keeping diaries, etc. have been undertaken for millennia and accordingly, have associated traditions. Whilst technological change inevitably alters the tools and practices of traditions over time, the partial transference of many daily activities to the digital world has radically and rapidly altered traditions associated with them as digital tools and practices confer a high degree of efficiency upon them. This transference often results in relatively impoverished experiences due to the propensity of the digital world to flatten the texture of many activities (Borgmann, 2007, p. 201). For example, whilst personal histories can be documented via diary “apps” and blogs, these tools lack the rich materiality of non-digital tools such as mementos, handwritten journals, scrapbooks comprising snippets from newspapers, photographs, personal letters, etc. – all of which coalesce over time to create a richly textured, patined, unique hotchpotch of objects that evoke a sense of time, history

and meaning. Furthermore, objects such as the Kodak film tank evoke a bygone era in which photographs were relatively scarce and consequently cherished.

Despite being a digital object*, Memento Box* more substantively supports the distinctly human, time-honoured tradition of collecting and safeguarding mementos to document personal histories. *Memento Box* does this through its three levels of functionality (limited digital, Web-free, non-digital). The limited digital functionality admits the digital world in a manner that doesn't reject or diminish traditional methods – as Borgmann (1987, p.157) suggests, reforming the "device paradigm" will not entail rejecting technology; rather, it will entail consigning technology to a role in which it supports rather than dominates meaningful activities (see p. 39). The Web-free functionality aims to support the focused attention that traditional methods foster. Likewise, the non-digital aspect allows *Memento Box* to function in the way such containers have done throughout history, which supports the deeper reflection, inner searching and focused attention that have been critical to human wellbeing for millennia (Walker, 2013a, p.94).

A sense of tradition potentially mediates in favour of universalism values as follows:

A sense of tradition	**Coded universalism values**
Invites engagement in enduring practices that offer a sense of security and rootedness.	– Inner harmony – Broadminded – Unity with nature – A world of beauty
Invites critical reflection upon the suitability of current digital tools and practices to support aspects of life that have been meaningful for millennia.	– Inner harmony – Broadminded – Equality
Can support reflectiveness and focused attention.	– Inner harmony – Broadminded
Invite the use of physical expressions of creativity associated with traditions.	– Inner harmony – Protecting the environment – Broadminded – Unity with nature – A world of beauty – Equality
Can elicit a sense of caring for the tools that support traditions.	– Inner harmony – Protecting the environment – Broadminded – Equality

6.4.8 "Releasement" from the digital world

When used as a non-technological object, *Memento Box* functions traditionally, as a container for storing mementos that support the recollection of memories. Through its non-technological affordance, *Memento Box* responds to Heidegger's (pre-digital era) fear that we are becoming overly shackled to technical devices by offering an alternative (see p.35). For Heidegger, affirming and denying technical devices allows us to experience something he called "releasement toward things", which occurs when we engage in meditative thinking rather than calculative thinking (see p.35). Meditative thinking is critical to human flourishing as it ponders the meaning of what we are engaged in whereas calculative thinking is concerned with the usefulness of what we are engaged in (Heidegger, 1966, pp. 53–54). *Memento Box* supports meditative thinking through its provision of a radically different conception of functionality in a digital object: *that of non-digital functionality. Memento Box* therefore supports users *not* to engage with the digital world, which is envisaged to invite critical reflection upon the role of digital technology—with its innate characteristics of speed, volume and efficiency—in supporting the practice of documenting a personal history. This is important, as for Ehrendfeld (2008, p. 144), designing technological artefacts and systems that seek to "induce reflection and an awareness [in users] of what has been going on" is critical to designing more substantively for sustainability.

This non-technological affordance *of Memento Box* invites users into a reverie characterised by mindfulness, presence-in-the-moment, stillness, solitude and focused attention. This is a non-linear experience that requires "inner" work, calling upon the imagination as the mind freely wanders around the memories being recollected. In doing this, *Memento Box* provides a holistic experience as it can evoke something of the *whole* experience being recollected, often conjuring mundane recollections that can surprise and enchant. Whilst this process is unpredictable and inefficient, for many people mementos appear to provide a reasonably predictable way of triggering recollections through their powerful evocation of context. In this way, *Memento Box* functions as a radically different back-up system as it can help to safeguard the *memories* of the data associated with each memento – which in a sense future-proofs them. Designing digital objects that afford

opportunities for “releasement” provides users with a choice as they are not obliged to engage with digital technology. Indeed, eschewing digital technologies may lead to more meaningful experiences as the richness, textures, serendipity, contradictions and contexts of the “real” world are allowed to nourish meaningful activities. Moreover, the addictive behaviours increasingly being associated with the digital world—which appear to be detrimental to human wellbeing—are mitigated against. This is particularly the case when addictive behaviours lead to large amounts of time being spent on unnecessary and unplanned activities (Harris, 2017).

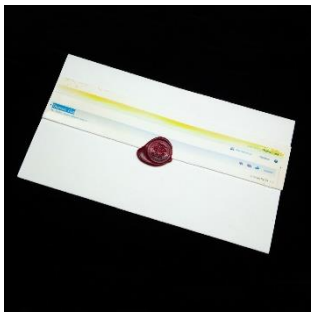
“Releasement” from the digital world potentially mediates in favour of universalism values as follows:

“Releasement” from the digital world	**Coded universalism values**
Can invite mindful, intrinsically valuable experiences.	– Inner harmony – Broadminded – Unity with nature – A world of beauty
Can reduce and promote more balanced use of digital devices.	– Inner harmony – Broadminded – Equality
Can invite critical self-reflection upon how much time is being spent in the digital world.	– Inner harmony – Broadminded – Equality
Can challenge assumptions about perceived necessity of the digital world.	– Inner harmony – Broadminded – Equality
Can empower people to reject the digital world for certain activities.	– Inner harmony – Protecting the environment – Broadminded – Unity with nature – A world of beauty – Equality
Can reveal and mitigate against the tendency of the digital world to impoverish meaningful activities.	– Inner harmony – Broadminded – Unity with nature – A world of beauty – Equality
Can invite meaningful engagement with, and appreciation of the “real” world by addressing the tendency of devices to distract from it.	– Inner harmony – Protecting the environment – Broadminded – Unity with nature – A world of beauty – Equality

6.5 Relationship of *Memento Box* to "after-modern" design directions

Having identified and analysed a broad range of features and functions associated with *Memento Box,* the following table (Figure 13) is included to demonstrate how the features and functions were informed by the design directions in the "after-modern" design inquiries (see section 5.3).

"After-modern" design inquiry	**Summary of design directions**	**Relationship to *Memento Box***
Earth Re-charger 	Re-purpose existing objects, especially those that may have stood the test of time and/or are already personally meaningful.	– The Kodak film tank already exists, has stood the test of time and is personally meaningful to the author. – Mementos already exist, and either are, or become, personally meaningful.
	Re-order technical priorities by considering the potential "ultimate ends" of a design at the beginning of the design process.	– *Memento Box* encourages universalism values.
Google Diary 	Create opportunities for potentially meaningful aspects of life to be Web-free.	– *Memento Box* doesn't connect to the Web.
	Create less fragmented, more mindful encounters with the digital world.	– Access to digital data is optional through *Memento Box*. – Data quantity is limited, and data can only be accessed through *Memento Box,* rather than online.
	Create meaningful opportunities for users to engage with privacy issues.	– Using mementos as interfaces to data creates a layer of privacy as mementos are often understandable only to the person or people they belong to.

“After-modern” design inquiry	**Summary of design directions**	**Relationship to *Memento Box***
Yours Truly 	Consider how digital communication channels might facilitate opportunities for more considered, less frenetic ways of communicating with meaningful others.	– Digital data can only be shared on a face-to-face basis and is only likely to be shared with a small number of people, on rare occasions. – Mementos provide access to limited sets of data.
	Develop digital communication channels that challenge the application of efficiency to human communication.	– Mementos can function independently of the digital functionality through re-collection alone. – Data linked to *Memento Box* is not online and isn’t accessible via typical digital devices. It therefore lacks the efficiency associated with being online and with digital devices.
Lakeland Data Stone 	Create attachment to data through linking it to its context.	– Mementos strongly evoke their context.
	Encourage a “less is more” approach to data generation.	– Mementos can store only limited quantities of data.
	Support being present in the moment.	– Mementos invite quiet reflection when used in isolation from the digital functionality of *Memento Box.* – Accessing data is isolated from the distracting online world.

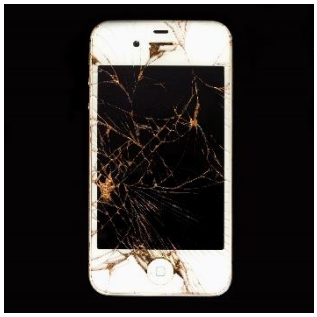
"After-modern" design inquiry	**Summary of design directions**	**Relationship to *Memento Box***
KintsugiPhone 	Address compulsive use of smartphones by creating opportunities for disrupting the flow of use.	– Selecting a memento interrupts the flow of use associated with digital devices. – Digital data is not accessed through web-connected digital devices. – Mementos can be used for recollection alone.
	Encourage reflection upon which data is potentially meaningful.	– Data is likely to need pruning as mementos accommodate only limited quantities.
	Consider the use of materials that age well and/or are repairable.	– Mementos endure psychologically and emotionally because they evoke context and support recollection of it. – The Kodak film tank is made of wood; a long lasting, natural material that both ages well and lends itself to simple repairs.
Anaesthesia 	When designing digital devices or services that require the use of a digital device, consider what alternatives are available.	– *Memento Box* offers non-digital functionality and in doing so, transforms memories into a form of "data".
	Design mechanisms that support users to recognise, reflect upon and mitigate against compulsive patterns of use.	– The limited digital, Web-free, and non-digital functionalities mitigate against compulsive patterns of use.

Figure 13: Relationship between design directions and *Memento Box*

Discussion: Implications for "after-modern" design

This section reflects upon the process of analysing *Memento Box* and the eight-point framework for "after-modern" design that was developed from this analysis. Three implications for "after-modern" design practice emerged, which relate to using universalism values as a heuristic guide, the relationship between universalism values and "things" and finally, transforming how the "use" phase of products is evaluated.

6.5.1 Re-thinking the "use" phase

The dominant design approaches to sustainability in late-modernity tend to address the use phase of products narrowly, usually in terms of energy consumption and recyclability (Vezzoli, 2013, p.107). Whilst these considerations are important, they cannot account for the ways in which technologies influence how we perceive the world and act in it – which have important implications for developing more sustainable ways of living. These considerations therefore represent a limited view of a product's use phase. The postphenomenological insight that technological artefacts mediate human-world relations is helpful for re-thinking how the "use" phase of products can be construed (see p. 42). This insight invites the practitioner to consider many potential mediations, in particular by exploring what aspects of reality might be magnified and reduced (see p. 49). As previously discussed, postphenomenology has been criticised for being overly focused on the artefacts themselves, which leaves it vulnerable to not accounting for the broader political context in which mediations takes place (see p. 53). Using universalism values to evaluate the "ends" of design allows potential mediations to be assessed in terms of values that are compatible with developing more sustainable ways of living (see section 6.5.1). Evaluating the mediatory role of technological artefacts and systems in this way therefore supplements the postphenomenological approach with values-based understandings that expand the analysis beyond solely the experience of use to account for the broader political context. Instead, the practitioner can consider the implications of the experience of use for fostering universalism values. Evaluating technological artefacts and systems in this way can be understood as "after-modern" because the evaluation process seeks to understand how a technological artefact potentially mediates human-world relations in favour of universalism

values, and in doing so, embraces and reveals the non-neutral nature of technologies. Consequently, this approach addresses the "use" phase of products more substantively than the dominant sustainability tools permit.

6.5.2 Universalism values as "ends"

As previously discussed, the sole universalism value of "protecting the environment" tends to dominate environmental discourses (see p. 71). From a product design perspective however, "protecting the environment" tends to be addressed through rationalistic, economically-driven approaches, which focus largely upon addressing pollution and using renewable resources (Ramani et al., 2010, pp.91004-2–91004-5; Wever & Vogtlander, 2015, p.546). Moreover, these eco-modern approaches tend to address sustainability by encouraging consumption, which can foster self-enhancement values and engender an undesirable "rebound effect" (see p. 5). By contrast, universalism values offer design practitioners a *range* of sustainability-oriented values to pursue that embrace society and self in addition to the environment – which for Walker (2011, p. 127) are critical to addressing sustainability substantively (see p. 23). The range of universalism values is therefore important for "after-modern" design because these values offer a more expansive vista of what addressing sustainability may need to entail.

The values coding exercise revealed that *Memento Box* can potentially foster and support the six universalism values of *inner harmony, protecting the environment, broadmindedness, unity with nature, a world of beauty*, and *equality* (for definitions of these values, see p.71). Interestingly, the value of "inner harmony" was coded the most. This suggests that the process of conducting "after-modern" design inquiries is especially supportive of "inner harmony" and that this value is important to "after-modern" design practice. Given that not all universalism values were coded, the following table (Figure 14) conceptualises universalism values as having a hierarchical structure with respect to "after-modern" design. This structure conceptualises the values of inner harmony, protecting the environment, broadmindedness, unity with nature, a world of beauty, and equality as being

primary universalism values as these values can be directly supported by design features – as demonstrated in the eight-point framework (see section 6.4). The values of social justice and a world at peace are conceptualised as *secondary* universalism values as these values are more likely to be *indirectly* supported via the more meaningful material culture that emerges from addressing the primary values. Finally, the value of wisdom is conceptualised as a *tertiary* value because it is envisaged to be the ultimate outcome of addressing the primary and secondary values. As Orr (2002, p. 48) suggests, "The speed of genuine wisdom, which requires the integration of many different levels of knowledge, is [a slow process]. Only over generations through a process of trial and error can knowledge eventually congeal into cultural wisdom about the art of living well within the resources, assets, and limits of a place". Classifying *wisdom* as a tertiary value however does not mean that it is the least important; on the contrary, it is arguably the most important value, as Walker (2013a, pp. 99–100) suggests: "redressing the imbalance in our contemporary worldview to give greater recognition to age-old understandings that foster wisdom and inner development could lead to more fundamental, lasting change".

Values for "after-modern" design		
Primary universalism values (coded instances)	Secondary universalism values (coded instances)	Tertiary universalism values (coded instances)
Inner harmony (47)	Social justice (0)	Wisdom (0)
Broadminded (38)		
Protecting the environment (27)	A world at peace (0)	
Equality (24)		
A world of beauty (22)		
Unity with nature (19)		

Figure 14: Values structure of "after-modern" design

6.5.3 Towards digital "things"

Wallace and Olivier (2011, p. 9) suggest that collective assumptions about digital technologies relating to dominant characteristics such as the immediacy, replication and ubiquity of digital technologies are "[impeding] the scope and potential for digital technologies to be interwoven with the true complexities and richness of our lives". *Memento Box* and the eight-point framework challenge this trend by including elements that are largely omitted from modern approaches to designing the digital world – such as notions of authenticity, uniqueness, personal history and memories, and the accumulated meanings that accrete to objects such as family heirlooms. In doing so, *Memento Box* resonates with the notion of a "thing", which as previously discussed, for Heidegger (see p. 34) and Borgmann (see p. 37) are critical to human flourishing. For Borgmann, it is the intrinsically valuable "focal practices" associated with "things" that are especially important for supporting substantive notions of human meaning (see p. 38). *Memento Box* arguably exemplifies how a digital artefact can be understood as a "thing" because it invites a focal practice rather than the typically rapid, disburdening and efficient practices associated with contemporary digital devices and related technologies. These practices often encourage acquisitive, distracted and addiction-like behaviours that tend to encourage self-enhancement values and in doing so, are incompatible with developing more sustainable ways of living.

Instead, *Memento Box* is comparatively inefficient, inviting considered use and engagement over time. To this end, *Memento Box* is not simply a hybrid object that brings together typical digital components—such as data storage devices, web access, photo album software or online video repositories—with unusual physical objects. Rather, in addition to re-thinking the physical form of a digital device and its interface via the Kodak film tank and the mementos, *Memento Box* re-thinks the technology itself, recognising that simply changing how digital technology is encountered is unlikely to engender meaningful change. Designing digital artefacts that invite "focal practices" is therefore important to "after-modern" design – as Ehrenfeld (2008, p. 213) suggests, "What we need is a balance between those things that have, more or less, purely utilitarian ends, and those things that focus us on what it is to be human rather than hide that aspect of our existence from us".

Given that the eight-point framework for "after-modern" design was developed from analysing *Memento Box,* it is envisaged that the framework can offer practical, flexible guidance for designing technological artefacts as "things" rather than mere devices. In doing so, the modernist focus on "form follows function" is de-emphasised in favour of a *form follows meaning* approach, which for Walker (2011, p.204-205) is critical to addressing sustainability more substantively.

6.6 Conclusion

This chapter has addressed the research objective: To develop a framework that supports the "after-modern" design of personal digital devices and associated technologies. An eight-point framework was developed based on an in-depth evaluation of Memento Box. This evaluation was informed by postphenomenology, and especially the postphenomenological insight that technologies mediate human-word relations (see p.42). Furthermore, the eight-point framework was reflected upon to draw out three main implications for "after-modern" design. These implications relate to: universalism values as "ends", re-thinking the use phase of products and the notion of digital "things". From this chapter, the conclusions drawn are:

- Conducting an evaluation of a technological artefact in terms of its potential to mediate in favour of universalism values can be understood as an "after-modern" design method. This method allows technologies to be analysed not as ends-in-themselves—as tends to be the case in late-modernity—but as mediators of human values, and therefore, as the *beginnings* of particular human-world relations. Understood in this way, technological artefacts and systems can be seen as having important implications for how we view the world, how we relate to it, how we behave, what we consider to be "normal" and what we come to expect. Accordingly, the framework developed from analysing *Memento Box* is envisaged to support product design education to expand its understanding of designing for sustainability by shifting its focus from being largely concerned with how artefacts impact upon the environment, to how they impact upon human values, which have profound implications for developing more sustainable ways of living.

- *Memento Box* suggests that conducting "after-modern" design inquiries (see section 5.3) is a fruitful method for supporting product design education to pursue universalism values as this method informed the development of *Memento Box*, which in turn, can potentially foster universalism values. Furthermore, *Memento Box* suggests that pursuing universalism values supports the development of technological artefacts and systems that possess qualities associated with "things" (see p.38). Given that the framework was developed from analysing *Memento Box*, it is envisaged that this framework can support product design education to develop technologies as "things". As previously discussed, Heidegger's philosophy is generally considered to be too abstract to translate into design practice and whilst Borgmann's philosophy is less abstract, it offers no insights into how "things" can be practically designed. To the author's knowledge, there appears to be little practical guidance with respect to this.

- Conducting an "after-modern" evaluation of a technological artefact can challenge the rationalistic nature of the dominant, eco-modern Design for Sustainability approaches in late-modernity due to the subjective and imaginative nature of the process. An "after-modern" evaluation does not rely solely on scientific understandings of materials, energy efficiency, pollution control, etc. Instead, it permits the practitioner to augment scientific understandings by imaginatively—and expansively—conceptualising the use phase of a technological artefact and/or system by anticipating *many* potential experiential affordances – and crucially, considering the potential character of the human-world relations that might be mediated.

- There are many examples in the literature that demonstrate how technological artefacts and systems mediate different human-world relations. These examples tend to focus however on the technological artefacts and systems as a whole, or upon their principle affordances. They tend not to provide detailed accounts of how various features and functions engender human-world relations – all of which stem

from design decision-making. By contrast, the framework for "after-modern" design draws special attention to the role of design decision-making in engendering human-world relations by illuminating how many different features and functions of *Memento Box* potentially foster universalism values. Conducting an "after-modern" evaluation of a technological artefact therefore significantly expands what it means to design for sustainability, as a broad range of potential experiential affordances can be accounted for that may not otherwise been considered in the context of sustainability.

- From engaging in the process of conducting "after-modern" design inquiries, developing the concept for *Memento Box,* evaluating *Memento Box* and developing the framework for "after-modern" design, the process of "after-modern" design can be summarised as follows (Figure 15):

STAGE 1: Fundamental design research	**STAGE 2: Applied design**	**STAGE 3: Values analysis**	**STAGE 4: Framework development**
"After-modern" design inquiries	Design of technological artefacts	Values analysis of technological artefacts	Knowledge acquired from analysis

Figure 15: Summary of "after-modern" design process

The next chapter brings a "second voice" to this research by eliciting feedback from design students in higher education design about the concept of "after-modern" design and engaging undergraduate students in the process of creating "inquiring objects".

7 “Inquiring Objects”: Third-Party Perspectives

7.1 Introduction

This chapter addresses the research objective: *To explore how the method of conducting “after-modern” design inquiries can support design students to address sustainability in a more substantive manner than the modern worldview permits.* This chapter therefore reports upon a series of workshops conducted with postgraduate and undergraduate design students. These workshops expand upon the knowledge developed from the author’s designing process in the previous two chapters by bringing third-party perspectives to this knowledge. The workshops were centred on the “inquiring objects” developed in the “after-modern” design inquiries in chapter 5. The workshops sought to develop a deeper understanding about how “inquiring objects” can potentially support design students to move design beyond modernity.

This chapter resulted in the following output: Thomas, L., Walker, S., & Blair, L. (2019). *The technological mediation of sustainability: Design as a mode of inquiry.* The LeNS World Distributed Conference. Milan, 3-5 April, 2019.

7.2 Methodology

Workshops were conducted with forty-three design students from three UK universities located in Lancashire, Greater Manchester and London. Thirty-four students were from two postgraduate programmes in Design Management and Sustainable Design. Nine students from an undergraduate BA Design programme. The objectives of the workshops were:

1) To introduce key themes from the literature.
2) To provide participants with opportunities to consider the author’s portfolio of “inquiring objects” (see section 5.3).

3) To find out how students respond to the “inquiring objects”.

4) To find out how students respond to the process of creating their own “inquiring objects”.

Single workshops were conducted at all three universities to address objectives 1-3. These workshops aimed to gauge how participants responded to the author’s portfolio of objects to consider their pedagogical potential. A further workshop and tutorials were held with the undergraduate students over a six-week period to address workshop objective no.4. Ethics approval was granted by Lancaster University to conduct the workshops (Appendix 5). The workshop activities and corresponding data collection methods are outlined in the following table (Figure 16):

Workshop	**Activities**		**Data Collection**
University no. 1 (addresses objectives 1-3)	1 x presentation	1 x group exercise	Group worksheet (see appendix 6)
		1 x individual exercise	Individual questionnaire (see appendix 7)
University no. 2 (addresses objectives 1-3)	1 x presentation	1 x group exercise	Blank worksheet
		1 x individual exercise	Individual questionnaire (see appendix 8)
University no. 3 (addresses objectives 1-4)	2 x presentations	1 x group exercise	Blank worksheet
		1 x individual exercise	Individual questionnaire (see appendix 9)
		1 x individual exercise	Reflective account (see appendix 10)
		1 x individual design exercise	“Inquiring objects” (see section 5.3)

Figure 16: Summary of workshop activities and methods

The workshops comprised a presentation given by the author, a group exercise and an individual exercise for participants to complete. The group exercise provided participants with an opportunity to see, handle, discuss and interpret the author’s portfolio of “inquiring

objects". This exercise took place at the beginning of the workshops prior to the presentation to encourage intuitive responses to the "inquiring objects" that were not influenced by the author's input. Following this exercise, a presentation was given by the author to introduce the research context, key themes from the literature and the relationship of the objects to these. The individual exercise in each workshop aimed to support participants to reflect upon and articulate their personal responses to the objects – this exercise followed the presentation. A questionnaire was provided for this purpose, which contained open questions to elicit rich responses (Gray, 2004, p. 195). Whilst the aims and objectives of each workshop were the same, the questionnaires were tailored slightly to the participants' programmes of study to ensure the questions felt relevant to their personal experiences and were understandable to them (Gray, 2004, p. 193). Data collected via questionnaires and worksheets was analysed using *thematic* analysis as this method allows important information to be captured that relates to the research questions (Bob-Milliar, 2014, p. 79). Thematic analysis involves familiarising oneself with the data, generating initial codes, searching for themes, reviewing the themes, defining and naming them (Bob-Milliar, 2014, p. 83). An "open coding" approach was used, which is defined as "the naming and categorising of phenomena through close examination of the data" (Strauss & Corbin, 1998, p. 62). This process involves making comparisons and asking questions, both of which assist with labelling phenomena in terms of concepts or categories (Gray, 2004, p. 331). Analysis and coding of the data was guided by two main questions:

- In what ways are the "inquiring objects" interpreted?
- In what ways do the "inquiring objects" support participants to move design beyond modernity?

Additional data was collected from the workshops conducted with the undergraduate students to explore their experiences of creating "inquiring objects" – for this, the students produced reflective accounts of their designing process. The data relating to the objects created by the undergraduate participants was analysed in terms of the three categories of design knowledge developed from the author's design process in order to substantiate or refute this knowledge (see section 5.4).

7.3 Engaging with "inquiring objects"

This section analyses and discusses the data relating to how participants engaged with the author's portfolio of "inquiring objects". This section therefore explores the potential role that existing "inquiring objects" could play in supporting design students to move design beyond modernity.

7.3.1 University no.1: Results of workshop and discussion

Participants formed into groups and each group was provided with a single object and two guiding questions: 1) *What do you think this object is?* and, 2) *What do you think this object is for?* The responses to these questions suggest that the objects were interpreted in an overwhelmingly rationalistic manner:

- 58% of responses were coded as being *logical* interpretations as a process of logical inference appeared to have taken place, for example *Phone Farm* (Appendix 13) elicited the response of *"Mobile phone and smartphone and battery which are broken so they have been used as plant containers"* (Appendix 14: P7).

- 34% of responses were coded as being *literal* interpretations as no judgement was made on what the objects might be, e.g. *"It is a flash memory card plugged in a stone"* (Appendix 14: P8).

- 8% of responses were categorised as *emotional* interpretations because they expressed visceral and aesthetic responses e.g. *"I don't like this kind of product . . . I feel that my privacy may be infringed"* (Appendix 10: P7) and *"I think this object is [an art] installation"* (Appendix 10: P18).

These results suggest that most participants had not interpreted any symbolic meaning associated with the objects and consequently, had been unable to engage with the issues that the objects attempt to embody. Instead, the opposite appears to have occurred with responses largely indicating an analytical form of thinking as participants often analysed

separate elements of individual objects as a means of determining what the objects might be.

Despite 92% of responses to the first question being coded as logical or literal, 41% of participants went on to interpret the objects as having potentially "after-modern" functions as these responses emphasise self-transcendence values by expressing concern for others (Appendix 13: P22), concern for nature (Appendix 13: P8), and relate to meaningfulness (Appendix 13: P2, P14, P17, P10), and reflectiveness (Appendix 13: P10, P20). For example: responses suggest that *KintsugiPhone* may be a repaired phone for someone who cannot afford to buy one; *Google Diary* may support critical self-reflection; *Yours Truly* may support meaningful communication; and *Lakeland Data Stone* may draw attention to nature and the history of nature. The remaining 59% of participants interpreted the objects instrumentally as having typically modern, utilitarian functions – despite the objects not being functional in the modern sense or indeed expressing any obvious function. Considering the high proportion of logical and literal responses to the first question (What do you think this object is?), this figure is lower than expected. These responses—including responses relating to sustainability—suggest that the author's portfolio of objects may have roles to play in maintaining the consumption-based status quo via reducing pollution and finding new ways to exploit natural resources. This finding reflects the modern propensity to view technologies instrumentally, in terms of means rather than the "ends" they serve (see p. 15). For example, *Phone Farm* elicited suggestions about reducing pollution from batteries (Appendix 13: P13), transferring pollution into energy, and generating power from natural resources (Appendix 13: P12). *Earth Re-charger* elicited suggestions about producing and storing energy through natural resources (Appendix 13: P26) and charging batteries (Appendix 13: P21, P23, P25) whilst *Google Diary* elicited suggestions that this object may be a useful corporate tool for tracking personal data (Appendix 13: P5, P7). These responses were both uncritical and optimistic about the potential role of the objects in supporting economic agendas. The responses therefore tend to emphasise self-enhancement values, rather than interpret the critiques of these values that the objects attempt to embody.

These results suggest a mixed picture about the extent to which "inquiring objects" may be successful in encouraging conversations and thinking about "after-modern" design. Encountering the ambiguous objects with no contextual information appears to have impeded critical and intuitive thinking for many participants with 25% stating that they were too abstract to understand or be of any practical use (Appendix 14). Furthermore, some participants misconstrued them as art. This finding resonates with views that the outputs of practice-based research need to make clear what is being achieved and communicated via objects (Frayling, 1994, p. 5; Niedderer and Roworth-Stokes, 2007, p. 15). Potentially contributing towards the high proportion of rationalistic interpretations were the guiding questions of *"What do you think this object is"* and *"What do you think this object is for?".* These questions appear to have encouraged rationalistic thinking from the outset. This raises questions about the language we use when we talk about design and especially the language we use when we hope to encourage critical, intuitive and creative thinking that supports students to challenge the late-modern context of design.

When the participants understood the purpose of the "inquiring objects" following the presentation, 50% indicated that they could envisage encouraging a design team to create "inquiring objects" despite their own difficulties in meaningfully engaging with them (Appendix 14). These responses suggested that "inquiring objects" may be useful for:

- Stimulating the imagination of a design team (25%).
- Supporting a design team to engage with sustainability issues (14%).
- Developing new design directions (14%).

Interestingly, participants indicated that they would be less likely to create "inquiring objects" themselves:

- 25% expressed an interest in creating "inquiring objects" to investigate issues and search for unexpected relationships (Appendix 14).
- 71% were unsure.
- 4% expressed no interest in creating "inquiring objects" (Appendix 14).

Recurring themes within the "unsure" and negative responses were that 33% of participants felt unsure about how to approach the process of creating "inquiring objects" whilst 22% suggested that they were too unscientific to be of any practical use (Appendix 14). This reflects the modern propensity to neglect, suppress and devalue the side of human nature that seeks meaning and higher purpose and which is closely related to subjective, intuitive and emotional ways of knowing (Walker, 2006, p. 63).

7.3.2 University no.2: Results of workshop and discussion

Whilst the overall aim of the group exercise conducted at university no.2 was the same as university no.1, the content was altered slightly in an attempt to avoid instigating rationalistic thought processes. This included developing an annotated portfolio, which can transform individual objects into a systematic body of work that captures similarities and differences between designs (Gaver & Bowers, 2012, pp.46–47). The relationship between the objects and the annotations is mutually informing as "artifacts are illuminated by annotations [and] annotations are illustrated by artifacts" (Gaver & Bowers, 2012, pp. 46–47). Moreover, an annotated portfolio can communicate the nature of the portfolio and shape how objects are appreciated and understood, as well as suggest future research and design possibilities (Gaver & Bowers, 2012, p. 47). Each object was therefore supplemented with a descriptive title, a short quote and an indication of potentially related universalism values. The quotes aim to capture something of the spirit of the philosophy of technology by drawing attention to technological optimism, technological neutrality, instrumentalism and the worldbuilding nature of technologies. Each group explored all objects for shorter periods of time (rather than exploring a single object) and were provided with a large piece of paper to collaboratively record their thoughts in a "brainstorm" style. The participants were encouraged to respond intuitively to questions vocalised by the author, such as: *how does this object make you feel?* and, *what does the object make you think about?* The intention of doing this was to avoid participants becoming fixated on questions, which can lead to rationalistic responses – as was the case with the workshop at university no.1. Instead, this approach sought to trigger more spontaneous, intuitive engagement with the objects.

These changes appear to support a greater degree of critical engagement with the objects as the logical and literal responses amounted to 33% of the total responses, which is significantly less than the 85% at university no.1 (Appendix 15: U). The majority of responses related to how technologies can negatively impact upon people and the environment. The provision of a limited amount of context appears to have supported participants to meaningfully interpret the objects, and the objects themselves appear to have supported participants to relate the contextual information to specific aspects of digital culture. Furthermore, the use of titles appears to have played an important role in guiding participants as the data indicates that self-explanatory titles such as *Anaesthesia* strongly influenced responses (Appendix 15: Q). The categories of *logical, literal* and *emotional* responses identified in the results from university no.1 were also present in the results from university no.2 and additionally, two further categories emerging during the coding process relating to the *inquisitive* and *symbolic* responses. *Inquisitive* responses are expressed as questions about the objects but only 31% of these responses indicate that participants could interpret and discuss some of the issues the objects embody (Appendix 15: V). Nonetheless, in encouraging participants to ask issues-based questions, the objects can support design students to move beyond modernity as the questions they posed encourage critical scrutiny of the modern worldview. For example, questions posed in response to *Earth Re-charger were, "What is the right way of using tech?"* and *"Is technology making us shift from reality?"* (Appendix 15: C). A question posed in response to *Google Diary was, "You wonder where it is all stored?"* (Appendix 15: I). And a question posed in response to *KintsugiPhone was "What is the value and purpose of this broken stuff?"* (*Appendix* 15: A).

Interestingly, *all* the symbolic responses—which amounted to 26% of the total responses—relate to issues the objects attempt to embody. This finding suggests that *if* "inquiring objects" are interpreted symbolically, they support thinking and discussion about the issues they embody (Appendix 15: S): For example:

- *Earth Re-charger* elicited responses relating to the relationship between nature and technology, over-reliance on technology and problems associated with how we approach technological development (Appendix 15: C).

- *Google Diary* elicited responses relating to "big brother" culture, privacy issues associated with being online, information overload, and searching for a better life in the online world (Appendix 15: I).
- *Yours Truly* elicited responses relating to insecure connections, the impersonal nature of some digital communication channels, and choosing what we send digitally with more care (Appendix 15: F).
- *Lakeland Data Stone* elicited responses relating to the connection between technology and nature, and "reprogramming" and "reinstalling" the earth (Appendix 15: M).
- *Anaesthesia* elicited responses relating to digital devices having an anaesthetic effect upon users, numbing reality, encouraging unconscious decision-making, and impacting negatively upon health and wellbeing (Appendix 15: Q).

These responses invite critical reflection upon how design may be compounding some of these issues and illuminate opportunities as to where design can intervene to create positive change, particularly with respect to the relationship between the digital world and sustainability – as two participants suggested, *"When it comes to digital culture it is easy to forget sustainability issues"* (Appendix 16: B) and *"We don't think really about our daily actions in the digital world"* (Appendix 16: C). Whilst this prompted discussions about the impact of the digital world upon sustainability, tellingly these discussions emphasised eco-modernism as they focused upon materials and energy use, which reflects the dominant late-modern approaches to designing more sustainably (see p.4).

Compared with the results from university no.1, a higher percentage of participants (43%) indicated that they could imagine making an "inquiring object", 43% felt unsure and 14% could not (Appendix 16: D). Of those that responded positively, the majority did not appear to consider the possibility that creating "inquiring objects" might be a useful method for developing their own practice (Appendix 16: D). Rather, they expressed an interest in using "inquiring objects" as a method for engaging non-design stakeholders in their research and practice (Appendix 16: D – P.2, P6, P8). This may relate to the participants' advanced level of postgraduate studies, which can lead to prior knowledge and experiences taking precedent (Jansson & Smith, 1991, p. 4). Half of participants who were unsure about

creating “inquiring objects” felt that the critical and philosophical nature of the objects was irreconcilable with late-modern, market-driven technological development (Appendix 16: D – P1, P3). Despite this, 75% of participants felt that the “inquiring objects” played a useful role in generating questions about how values can be incorporated into existing design practices (Appendix 16: E).

7.3.3 University no.3: Results of workshops and discussion

Analysis of the data collected at university no.3 revealed the same five categories, with the undergraduate participants interpreting the “inquiring objects” *symbolically* (38%), *logically* (38%), *literally* (3%), *emotionally* (16%) and *inquisitively* (5%) (Appendix 16: G). No further categories were identified. These results demonstrate that these participants responded with the highest proportion of *symbolic* interpretations but far less *inquisitive* interpretations than university no.2. The higher proportion of symbolic responses indicate that these undergraduate participants approached the exercise in a freer, more open-minded manner than the postgraduate participants, which may be attributable to their comparatively early stage of design education in which they have likely been less exposed to precedents, which can serve to hinder creativity (Rodgers & Jones, 2017, p. 446). Likewise, the low proportion of *inquisitive* responses (5%) compared with the postgraduate participants (25%) may be attributable to lower levels of confidence at this stage of education.

The majority of *symbolic* interpretations related to the issues the objects attempt to address – as was the case with the data collected at university no.2. The symbolic interpretations yielded two further categories of “modern” (18%) and “after-modern” (82%) (Appendix 17: H). The “after-modern” interpretations were particularly encouraging as they indicated that critical engagement with the mediatory role of technologies had taken place (Appendix 17: H). For example:

- *Earth Re-charger* responses relate to moving away from traditions and being overly dependent upon technology (Appendix 17: H).

- *Google Diary* responses relate to online privacy concerns and the dominant role that the internet plays in many people's lives (Appendix 17: H).
- *Yours Truly* responses relate to information overload, the dominant role of digital communication channels and safeguarding traditional modes of communication (Appendix 17: H).
- *Lakeland Data Stone* responses relate to the longevity of data and its relationship to memories (Appendix 17: H).
- *KintsugiPhone* responses relate to digital devices being replaceable tools, taken for granted, being culturally bland and searching for value in damaged products (Appendix 17: H).
- *Anaesthesia* responses relate to digital devices dominating daily life and creating addiction-like behaviours, distracting people from the real world and having a soporific effect on users (Appendix 17: H).

These symbolic responses reflect the results from university no.2 as the objects played an important role in supporting participants to relate broad, abstract ideas from the philosophy of technology to specific aspects of digital culture and in doing this, supported some meaningful interpretation of the objects.

The undergraduate participants were provided with a copy of the author's portfolio to reflect upon following the workshop. This extended period of time appears to have supported interpretation of some of the issues the objects attempt to embody. In particular, responses allude to some of the major themes from the philosophy of technology, including the propensity of technology to fade from view (Appendix 18: B – P3), instrumental attitudes towards technological devices (Appendix 18: B – P4), focusing upon means rather than "ends" (Appendix 18: P1), reliance upon technology (Appendix 18: B – P6), and the technological mediation of morality (Appendix 18: B – P3). When questioned about their initial responses to the "inquiring objects", all participants responded positively, stating that they found the objects thought-provoking (Appendix 18: A – P1, P4, P7), generative (Appendix 18: A – P5) challenging (Appendix 18: A – P9) and unexpected (Appendix 18: A – P3). Participants indicated that initial thoughts about the objects centred upon the

relationship between technology and nature (Appendix 21: A – P1, P5), contrast between the past and present (Appendix 18: A – P1, P7) and that digital technologies connect the "inquiring objects" (Appendix 18: A – P4). One participant (Appendix 18: A – P3) commented that:

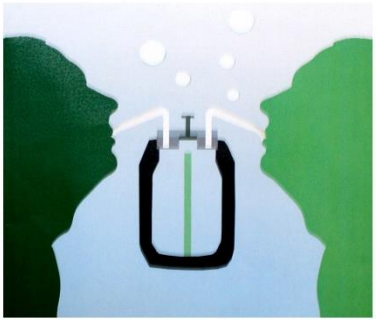
> It was unexpected. It had a very new feel to it, very thought-provoking. I found it very interesting to see so many concepts / elements come together like that. The concepts for the objects were very unexpected, but the objects themselves looked very plausible, which made me consider the possibility that this might be how our future / the future of design could look in some cases.

These responses suggest that the initial impact of the objects was both positive and disruptive but despite these encouraging results, 41% of participants interpreted the objects logically and literally (Appendix 17: G), thus reflecting the difficulties of overcoming unconsciously held assumptions shaped by the modern worldview (Snodgrass & Coyne, 1996, p. 26; Sengers et al., 2005, p. 50).

7.4 Creating "inquiring objects"

This section moves from the undergraduate participants at university no.3 engaging with the author's portfolio of "inquiring objects" to creating their own "inquiring objects". The section presents and briefly describes the objects created by the participants whilst section 7.5 analyses and discusses the data collected relating to their design process. This data is reflected upon with respect to the three categories of design knowledge developed from the author's experience of the design process (see section 5.4). Following this, section 7.6 draws out opportunities for design education.

7.4.1 Breathing Machine



Description: *Breathing Machine* is a concept for a jar that contains air-purifying algae. It is designed to allow two people to inhale algae as a means of breathing some fresher air in heavily industrialised urban areas.

Issues being addressed: the impact of heavy industrialisation upon air quality.

Relationship to "after modernity": *Breathing Machine* proposes a dystopic techno-fix—in the spirit of eco-modernism—to the problem of polluted air. It explores the insufficient measures implemented by governments and industry to tackle growing levels of pollution. Through its emphasis upon sharing clean air, *Breathing Machine* attempts to draw attention to the unequal relationship between heavy industry and ordinary citizens – in particular to the powerlessness of ordinary citizens to expect clean air.

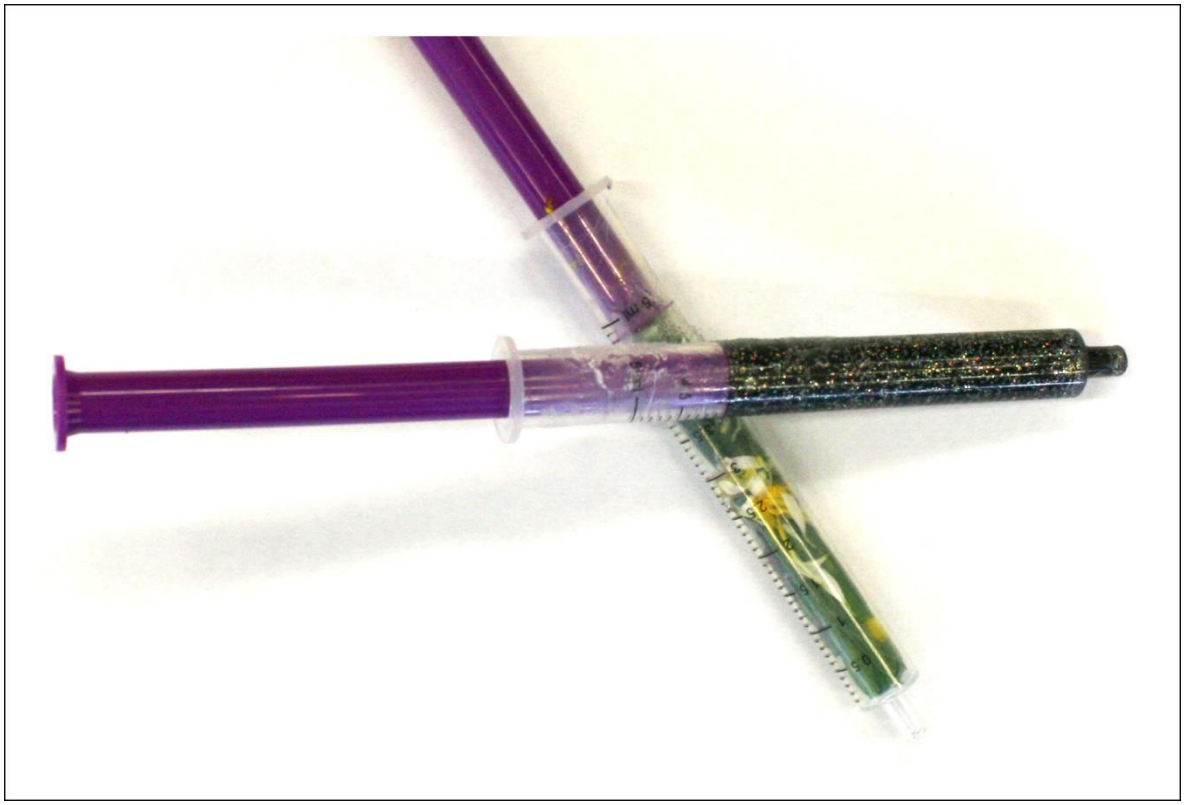
7.4.2 Digital Detox Survival Kit

Description: *Digital Detox Survival Kit* is a survival kit for supporting the completion of one digital-free day. It offers various exercises, advice on how to prepare for a digital-free day and a panic button should the user feel overwhelmed by the need to return to their digital device.

Issues being addressed: The propensity of digital devices and the online world to create addiction-like behaviours.

Relationship to "after modernity": *Digital Detox Survival Kit* attempts to address the negative impacts that the digital world can have upon personal wellbeing. These impacts include compulsive checking patterns, distracted behaviour and reduced concentration levels.

7.4.3 Unnecessary medicines



Description: *Unnecessary Medicines* comprises two syringes; one contains natural elements such as dried flowers and leaves whilst the other contains glitter.

Issues being addressed: This object investigates the potentially unnecessary use of over-the-counter medicines. The use of glitter explores the impact of technological optimism upon personal decision-making about treating simple, everyday ailments.

Relationship to "after modernity": *Unnecessary medicines* cautions about the dangers of rejecting more natural approaches to personal wellbeing such as exercise, a good diet and traditional remedies. This object attempts to draw attention to the fact that a technological solution is not always necessary, and not always the best solution.

7.4.4 Transparent Smartphone

Description: *Transparent Smartphone* explores the largely unseen "big brother" nature of global digital communications and relates it directly to the smartphone, which for many people is a highly personal digital device. The object is transparent piece of plastic shaped to resemble a smartphone. An eye and a map of the world is etched onto the plastic.
Issues being addressed: Privacy issues associated with the ubiquitous smartphone.
Relationship to "after modernity": *Transparent Smartphone* investigates and attempts to express the unequal relationship that exists between large digital corporations and their consumers. This object explores hidden corporate agendas relating to the use of personal data and in doing so, poses questions about the ethical responsibilities of such corporations.

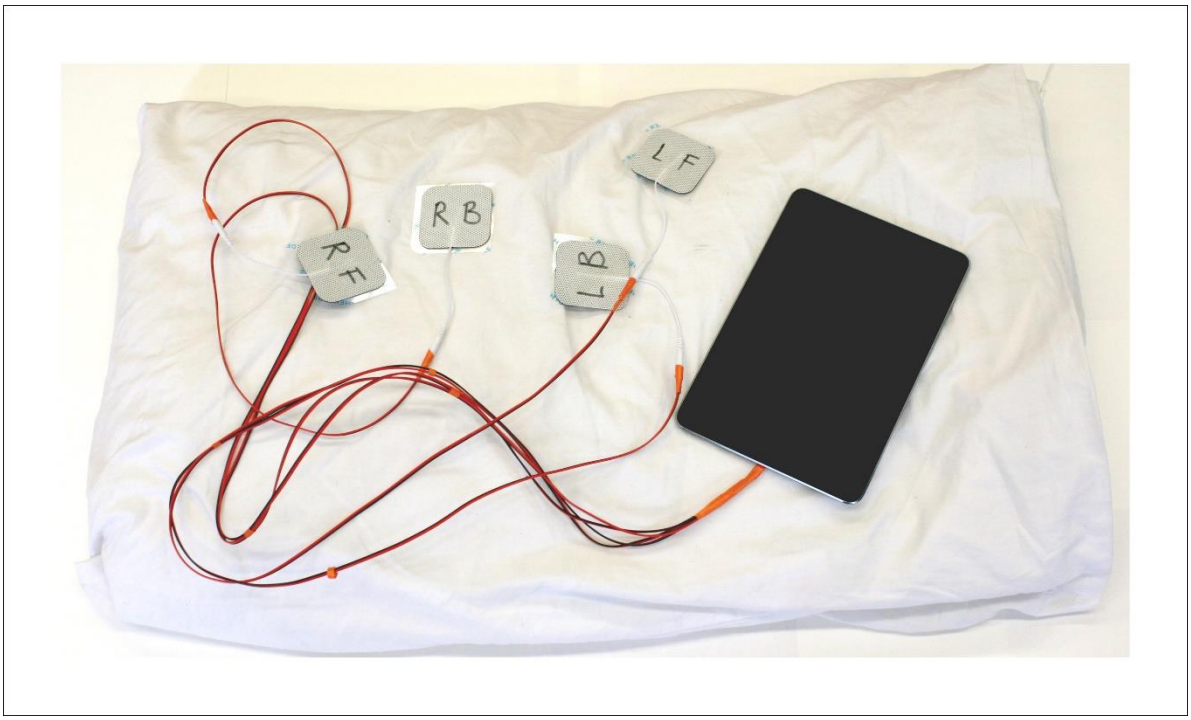
7.4.5 Tablet case

Description: *Tablet Case* is a concept for a tablet case that visualises physical toys from an era in which personal digital devices were not prevalent.

Issues being addressed: The capacity of digital devices such as tablets to replace "real" toys due their addictive tendencies.

Relationship to "after modernity": *Tablet Case* explores what might be lost in the transference of children's play time to the digital world.

7.4.6 ***Nocturnal Device***

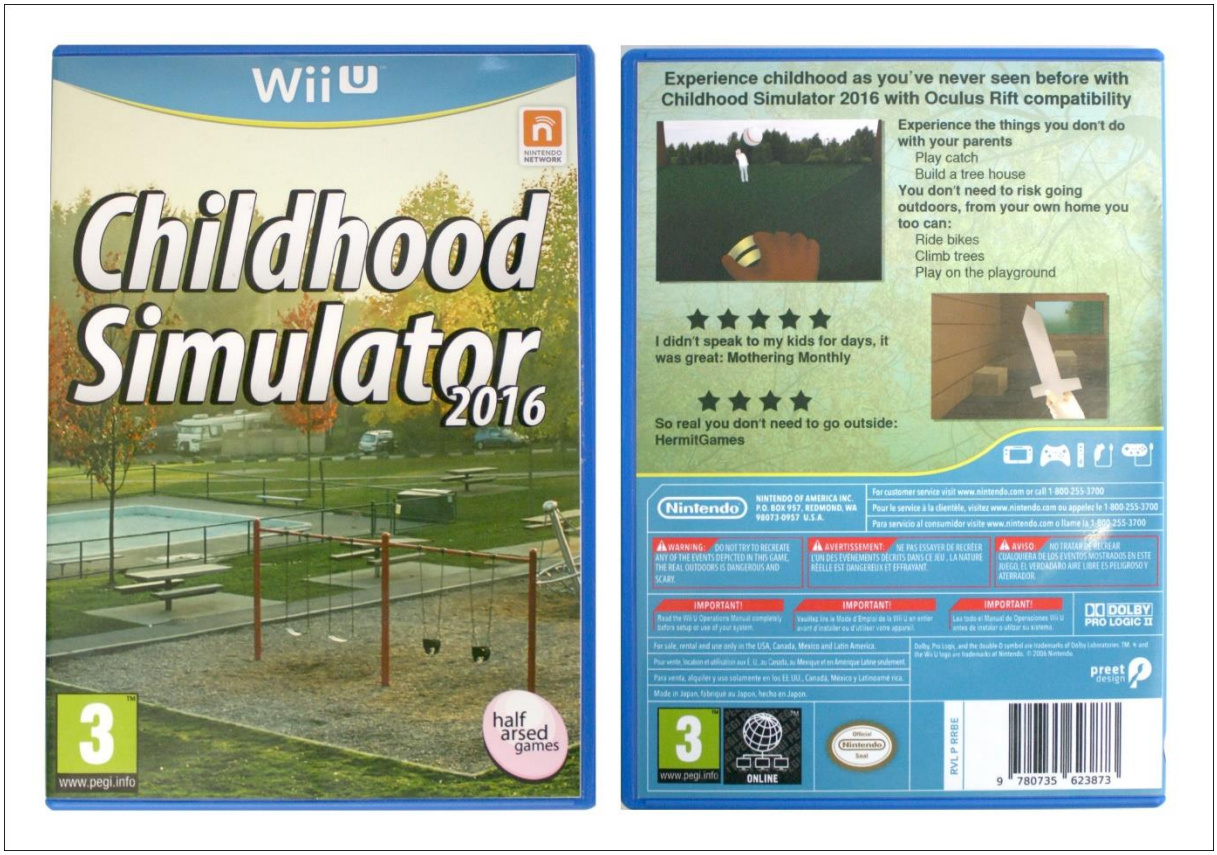


Description: *Nocturnal Device* is a concept for a series of electronic patches that link to personal digital device such as a smartphone in order to transmit digital information directly to a person's brain whilst they sleep.

Issues being addressed: The increasingly pervasive and addictive nature of digital devices.

Relationship to "after modernity": *Nocturnal device* attempts to draw attention to the negative impact that digital devices such as smartphones can have upon sleeping patterns, and consequently, upon health and wellbeing.

7.4.7 Childhood Simulator



Description: The object proposes a virtual game that allows children to experience everyday childhood activities such as going to the park and climbing trees from the comfort of their own bedrooms.

Issues being addressed: The impact of the virtual world upon childhood.

Relationship to "after modernity": *Childhood Simulator* explores and expresses the potential of the digital world to isolate children from their local environments, and from other children and adults, which has implications for how they act in the "real" world and learn about it.

7.5 Discussion: Design knowledge revisited

The design knowledge developed from the author's practice identifies three aspects of the designing process that support moving design beyond modernity. These aspects relate to the disruptive nature of the designing process, meaningful engagement with philosophical ideas, and a different "end" for design (see section 5.4). This section builds upon the design knowledge by analysing the data relating to the designing process of the participants at university no.3. The three categories developed from the author's practice guided data analysis. These categories were corroborated, and no new principal categories were discovered. New themes emerged however that relate to these categories and expand upon them. These themes are organised into sub-categories accordingly:

Design knowledge categories developed from author's practice.	**Related sub-categories developed from participants' practice.**
A disruptive process.	– Modern understandings about the role of function. – Modern understandings about the role of the designer.
Meaningful engagement with philosophical ideas.	– An effective learning tool. – A sense of empowerment.
A different "end" for design.	– An expanded sense of sustainability.

The remainder of this section (7.5) is organised in terms of the original three categories of design knowledge, which are: A disruptive process; meaningful engagement with philosophical ideas; and, a different "end" for design.

7.5.1 A disruptive process

The disruptive nature of the designing process associated with "inquiring objects" was identified as being important for moving design beyond modernity as it helps to overcome unconsciously held assumptions that result from being immersed in the modern worldview (see p. 98). In particular, disruption is experienced from the capacity of the "inquiring objects" to defamiliarise, which in turn allows technologies to be "seen" through an unusual lens of materials. The participants experienced disruption in this way but the main catalyst for their disruptive experience was their late-modern understanding about the role of

function in design, and about the role of the designer in late-modernity. *Late-modern understandings of function* and *the role of the designer in late-modernity* were therefore developed as sub-categories.

7.5.1.1 Late-modern understandings of function

The deeply ingrained modernist dictum of "form follows function"—concerned with optimisation and efficiency—can impede comprehension of design forms that do not function in the utilitarian sense (Malpass, 2015a, p.65). This was evident in the early phase of the participants' designing process as frequent clarification was sought that their object need not function in the traditional utilitarian sense. One participant (P4: Appendix 21) explicitly identifies the role of function and its association with optimisation as being especially difficult to shake off, reporting that *"perhaps I could [have] made the final object even better. [The] thought of creating a fully functional, problem solving object was distracting me from critical design".* As tension eased about the role of utilitarian function, all participants reported experiencing a heightened sense of creative freedom. This suggests that despite design being an inherently creative activity, addressing functional concerns can inhibit a practitioner's sense of creativity; this point also resonates with the findings of Rodgers and Jones (2017, p.446) that some design students believe that focusing upon precedents in their education inhibits creativity (see also p.101). The sense of creative freedom was welcomed by the participants, which further accords with the finding that students welcome opportunities that offer freedom to experiment, to self-direct, and to be independent (Rodgers & Jones, 2017, p.449).

The sense of creative freedom that emerged from eschewing conventional notions of function is important for moving design beyond modernity because participants felt supported to "think in new ways and be brave enough to break the proverbial mold" (Ehrenfeld, 2013, p.26). For Ehrendfeld, this is critical otherwise "we will continue to see marvellous new designs with unheard-of capacities for efficiency, intelligence, speed, and characteristics of which we are as yet unaware, but we will also continue to see unsustainability grow at the same time" (Ehrenfeld, 2013, p.26). For example, one

participant (P7) felt that that the designing process *"gives me the opportunity to be creative and make a statement. Makes me think and develop my ideas"* and another (P5: Appendix 21) that the designing process had enabled them to be *"out of the ordinary"* and *"to come up with ideas that are maybe more outlandish and unrealistic. You can really ask questions like 'what if?'".* A further participant (P3: Appendix 20) found that moving away from conventional notions of function was *"very freeing [due to] the focus of the design process in this instance [not being] on the actual product or the technology behind it, but on expressing our take on a current issue".*

Interestingly however, despite the designing process affording a refreshing sense of freedom, which resulted from eschewing modern notions of function, the majority of objects created by the participants suggest utilitarian function. In particular, *Childhood Simulator* (see p. 149) and *Digital Detox Survival Kit* (see p. 144) are plausibly functioning objects – the latter to the extent that it can be readily used. Similarly, despite being relatively implausible objects, one can easily imagine how *Breathing Machine* (see p. 143), *Nocturnal Device* (see p. 148) and *Unnecessary Medicines* (see p. 145) might be used and for what purposes. For these participants, preconceived ideas about function were difficult to shake off but despite this, their objects nonetheless manifest powerful critiques of modernity. In this way, the objects function in the same way as those from the field of critical design—as popularised by Dunne and Raby (2001)—because they can be viewed as industrial designs that operate in a system of use (Malpass, 2015a, p.63). The participants have therefore used "their functional capacity as designers, still drawing on their training and practice as designers but re-orienting these skills from a focus on practical ends to a focus on design work that functions symbolically, culturally, existentially, and discursively" (Malpass, 2015a, p.60).

7.5.1.2 The role of the designer in late-modernity

Preconceived ideas about what it means to be a designer resulted in some participants (P3: Appendix 20; P5: Appendix 21; P6: Appendix 23: P7: Appendix 24) struggling to disregard the client-focused nature of design in late modernity. It was difficult for these

participants to accept that there were no real or imagined stakeholders specifying the outputs of their designing process, and perhaps importantly, sharing responsibility for them. This resulted in participants appearing to experience a degree of exposure as both alternative values to those that support consumerism and their own personal values began to concretise and become visible through the emerging objects. This exposure was expressed as a concern that their objects could be interpreted "correctly" by others – despite the objects not being created for others. This degree of exposure is however advantageous for moving design beyond modernity as it can raise awareness that values become embodied in design and can support deeper understanding of issues being investigated. For example, one participant highlighted the important relationship between materials and message, feeling challenged by how to *". . . translate everything I want to say into one object. Creating a critical object has made me think of what resources would be the best to translate what I want to say to the audience through the object"* (P6: Appendix 23). Similarly, another participant (P3: Appendix 20) reported that *"making sure that I sent the right message through my design [was] likely the biggest challenge for me in the realisation of this project. It involved me spending a large amount of time dissecting the issue I was trying to address and all the ways my design might be interpreted".* A further participant (P5: Appendix 21) echoes these views, suggesting that a particularly thoughtful and inquisitive process had occurred:

> It is a rather useful way of looking at a subject area as in the creation of your critical object you have to really think about what you are trying to say about your topic and pick out what is bad and what is good . . . At first thinking of only the relationship between technology and children was hard but it took some focusing and asking myself questions about the relationship between kids and tech.

Again, as tension eased with respect to preconceived ideas about the role of the designer in late-modernity, two participants (P3: Appendix 20: P5: Appendix 21) reported feeling liberated by the process with one (P3: Appendix 20) stating that *"It is a very freeing prospect to pick out problems but with no pressure to solve them."*

These findings are important for moving design beyond modernity because they suggest that the process of creating "inquiring objects" can raise practitioners' awareness

that designers do not simply create things, but that values come to be embodied and expressed in the outputs of their practice. Moreover, that through their decision-making about material choices, configurations and purposes, designers create "a persuasive argument that comes to life whenever a user considers or uses a product as a means to some end" (Buchannan, 1985, pp. 8-9). This has powerful implications for developing more sustainable ways of living.

7.5.2 Meaningful engagement with philosophical ideas

The designing process associated with "inquiring objects" was identified in section 5.4 as being an important factor for moving design beyond modernity because it invites meaningful engagement with theoretical ideas. Developing understanding of theoretical ideas can be difficult and time-consuming; moreover, it may be challenging for design students to appreciate the relevance of doing this as they are often, understandably, impatient to get on with the business of designing. The "inquiring objects" created by the participants demonstrate that the designing process supported participants to learn about, and meaningfully engage with theoretical ideas such as that of technological mediation. Learning about and meaningfully engaging with theoretical ideas in turn fostered a sense of empowerment. *An effective learning tool* and *a sense of empowerment* were therefore developed as sub-categories.

7.5.2.1 An effective learning tool

The "inquiring objects" created by the participants demonstrate that the designing process supports meaningful engagement with the philosophical ideas being investigated as they clearly explore, embody and develop some of the ideas. Additionally, participants reported that the designing process played an important role in helping them to learn about the philosophical ideas because it mitigated against getting "lost" in detailed information – as can be the case with learning methods that emphasise "left hemisphere" forms of knowledge associated with the intellect. This often results in students feeling compelled "to 'research more' to make more and more connections, until they have a full picture of the situation they were addressing" (Ward, 2014). For Ward (2014), this meticulous

searching of “what is” can be counterproductive to deciding when, where and how to act; instead designers “need to make a leap into the material unknown” (Ward, 2014). Creating “inquiring objects” supports participants to make a leap into the unknown as the synthetical, holistic designing process allows them to “feel” their way around some basic insights from the philosophy of technology and combine these insights with their own lived experiences of technologies. This finding is important for moving design beyond modernity as it suggests that important theoretical ideas—which have powerful implications for developing more sustainable ways of living—can be brought into the designing process with relative ease. As one participant (P3: Appendix 20) reported:

> I personally found that the more hands-on approach to design we applied for this project was a more efficient way of doing research/ understanding a topic. It is mostly because the academic way of researching results in a large volume of data of usually good quality, out of which only a certain amount can be absorbed properly, while actually making an object and getting personally involved in a project leaves a more lasting impression. It is because through creating something we make use of our emotional memory, not to mention there is much less information to get lost into, that it is can be very impactful experience.

Similarly, another (P6: Appendix 23) suggested that the designing process itself deepened understanding about the ideas being investigated:

> The process of creating an object helped me understand what my topic is really about by making me think of all the different aspect of my topic, and the majority of it I never would have considered if I were doing research on the internet and writing an academic report about the same topic.

A further participant (P2: Appendix 19) commented that:

> I think creating an artefact is a very useful way to conduct an investigation because, it helps me to understand problems and solve them at first hand. It helps me to think more openly. I remember and learn more when I do stuff practically instead of researching on the internet and writing reports.

The complementary role that the designing process can play alongside more traditional learning methods was also recognised: *“I find it far more interesting than traditional research methods, it does gather different results though which means it would work well alongside more traditional methods to gain a much wider base of information”* (P9:

Appendix 26). Despite not developing detailed knowledge of philosophical ideas, one participant (P9: Appendix 26) commented that:

> The process was no less difficult or educational than more traditional work methods but the actual output [took] me only a few minutes to knock up and is still a very thought-provoking object. The challenge I found producing an object of critical design was defining the issue I want to address, I found I spent the majority of the time figuring out exactly what the issue was that I wanted to address was.

In addition to the designing process supporting the participants to meaningfully engage with issues, some participants reported that the process deepened their understanding of design: *"I will most definitely create a critical object in the future to express future designs as I found there was a lot more freedom to be creative and an actual designer rather than just creating the same old reports, and never fully understanding the whole process of designing"* (P7: Appendix 24). Similarly, another (P8: Appendix 25) stated that *"It has certainly deepened my thought as to say if I was to come up with a design, I would certainly want to create something which made people think and wonder whether there is message being told and what it means".*

7.5.2.2 A sense of empowerment

A sense of empowerment emerged in the data as most participants reported being able to assert and express themselves as designers more powerfully. The emotionally-investing nature of the designing process empowered participants because it supported understanding of the issues being investigated and permitted the participants to bring their own lived experiences into the process. For example, one participant stated that *"I think creating this object is a good way of casting a critical eye and putting across your personal viewpoint"* (P5: Appendix 21). Participants frequently used terms such *as "express my feelings"* (P5: Appendix 21), *"expressing our take on a current issue"* (P3: Appendix 20) and *"express myself"* (P7: Appendix 24). This freedom of expression was viewed as a positive aspect of the designing process and one which appeared rather unique for these participants, for example: *"I enjoyed the freedom of the project and feel that this has been my favourite and most fulfilling project throughout the year, as it has allowed me to express*

myself. As this has been one of the few projects we had such individual freedom on." (P7: Appendix 24). Similarly, another participant (P9: Appendix 26) suggested that the process of creating "inquiring objects":

> . . . allowed me look at the problem from a personal point of view, I was not reliant on research and points of views of more experienced people, I was able to think about the issue from a purely personal view point. As such the object produced was more an expression of my thoughts than an embodiment of other people's research and ideas. This is different to how most work I have produced, and this allows me to express different thoughts in a more interesting and enjoyable way and gives a very different output that allows me to express my feelings.

Interestingly, this participant viewed the process as being entirely personal and uninformed by other research, yet this was not the case as the design process was based upon some basic insights from the philosophy of technology relating to the non-neutral, worldbuilding nature of technologies. Another participant (P3: Appendix 20) commented at length about how this project had impacted upon their emerging identity as a designer:

> I can safely say that I feel like I have learnt more about what it means to be a designer (and most importantly, help me to understand who I am as a designer), design for sustainability and design responsibility because of this project . . . I feel more aware of the power and responsibilities as a designer, and I strongly believe that any and all designers should try to work through a project the way we did at least a few times in their lives, in order to gain better perspective and insight into what they truly want to express through their designs.

The sense of empowerment felt by the participants draws attention to the continuing role of the designer largely still being an "agent of capitalism" (Malpass, 2015b, p.60) in which a designer's personal values are often subservient to those of their clients. As one participant (P6: Appendix 23) stated *"The process of creating a critical object has made clear to me that there are a million possible ways of designing something"* whilst another (P3: Appendix 20) reported that *"It seems like an opportunity to re-analyse the world around me and come out of it with a clearer picture out of it. Either way, it's a chance to offer input about the world around me through design, if nothing else. It's a challenge that I'm more than happy to answer".* Similarly, a further participant (P8: Appendix 25) suggested that *"I certainly preferred creating a critical object rather than most methods as it certainly enables you to think and ask questions more".*

7.5.3 A different "end" for design

"Inquiring objects" were judged to represent a different "end" for design because they can be used as a basis for both exploring and judging what is desirable (see p.101). In other words, the objects can be understood as a beginning instead of an end as they provide a basis for discerning alternate directions for design. Whilst the participants were not asked to consider how their objects might inform their general design practice, some volunteered opinions that both the designing process and the objects themselves are likely to be useful for judging what is desirable. For example, one participant (P4: Appendix 21) reported that they had conceptualised new design ideas for addressing the distracting nature of the smartphone. Other participants suggested a role for "inquiring objects" as a research method *within* standard design projects. For example: *"it is quite possible to reflect on the critical object and maybe gain inspiration for an idea that is more realistic and that could work in today's society"* (P5: Appendix 21). This participant went on to say that:

> The process of creating a critical object has made me think about my design process more. Perhaps during the early stages of projects, I could come up with ideas for critical objects just as a quick response in the hope that I can further reflect on these objects and make something better suited for whatever brief I am tackling.

Similarly, another (P6: Appendix 23) believed creating "inquiring objects" during a standard design project could assist with critically reflecting upon their decision-making in order to improve the outputs of their practice. A further participant (P9: Appendix 26) recognised the flexible, generative nature of their object: *"Looking back on the project and reflecting on the piece was also really useful and interesting, it opened me up to different ways of looking at my object".* These participants evidently recognised the fruitful role that "inquiring objects" can play in revealing previously unconsidered relationships, which they can consider in their future design endeavours. An additional theme relating to this category emerged in the data that suggests the process of creating "inquiring objects" engenders an expanded sense of what sustainability entails. A sub-category of *an expanded sense of sustainability* was therefore developed.

7.5.3.1 An expanded sense of sustainability

For most participants, creating "inquiring objects" fostered a sense of ethical responsibility to "do the right thing" through design. This sense of ethical responsibility was expressed broadly in terms of the participants' general practice and was rooted in new understandings about the technological mediation of human-world relationships. In addition to the participants' objects providing compelling evidence that critical engagement with technologies had taken place, some of their comments reinforce how the project has developed and deepened how they think about technologies. For example, one participant (P3: Appendix 20) commented at length:

> The process we had to undertake in the making of this project was also useful for my personal growth, in a way, as it forced me to carefully consider what I thought was the one most important issue I wanted to address when it comes to people's interaction with technology. In the end, what was most important to me was to address the fact that technology can take away from people's lives . . . The fact that we investigated said issue through the making of an actual object instead of writing or reading about it was also very unique and, I believe, useful. What this accomplished was that it forced me to ask myself about the actual purpose of my design and the larger implications it might have in everyday life. It made me question the end-result I actually want to achieve by creating this product: is it about creating something marketable, or is it that I want to create something and that will have a positive impact on our society?

A further participant (P4: Appendix 21) stated that *"I look at my projects from different angles now. I am asking different questions in a process of a designing, Before I was just making something I liked without deep understanding of the purpose, sustainability, etc."* Another (P5: Appendix: 20) alluded to the development of a more philosophical outlook on design: *"perhaps it is important to think when designing something, 'is this going to add anything worthwhile to the world?'"* This ethically-loaded question resonates with Baumer and Silberman's (2011, p.2272) contention that sometimes, in the name of sustainability, designers ought to consider when not to design technologies. One participant (P3: Appendix: 18) reported that *"In the end, the most important thing to consider in the making of my critical object was not the technology or effectiveness of it as a design, but rather the way it might influence human behaviour and the message it would send".* Similarly, a further participant (P2: Appendix 19) commented:

> I think it has expanded my understanding in sustainable design. Sustainable design is about how users react to the artefact/product. . . . It has deepened my thinking because before I [used] to design ideas without a meaning but after this mini project, I consider how can my artefacts inspire others and giving it purpose so it's not a blank object.

Another participant (P4: Appendix 21) recognised that the abstract condition of distraction had implications for developing more sustainable ways of living. This participant suggested ways in which a smartphone could be better designed to mitigate against its distracting nature and reported that *"When designing in future I will pay more attention to [these] aspects of sustainability in my designs".* A further participant (P8: Appendix 25) felt that the process had been *"extremely useful as it has opened my eyes to new kinds of challenges we have to face as designers . . . [and to] the relationship between technology, human-relationships and sustainability. . . . I feel as though there are many possibilities in sustainable design".* A further participant (P9: Appendix 26) stated that *"I feel like I do know more about design for sustainability but without feeling like I have been studying it [and I now] realise that sustainability was a much larger than just an environmental concern".* A different "end" for design was therefore discerned with respect to this designing process serving as a tool for learning about the relationship between sustainability, technology and values.

7.6 Discussion: opportunities for design education

The data suggests that designing "inquiring objects" is a more effective method for supporting students to move design beyond modernity than engaging with existing "inquiring objects" due to the active designing process being comparatively involving and personal. That said, engaging with existing "inquiring objects" is not without merit as their ambiguous, visual nature can spark conversations about the ideas they embody, provided they are interpreted symbolically and inquisitively. Whilst symbolic interpretations are undoubtedly the most successful in prompting thinking and discussions about the issues the objects attempt to address, the inquisitive interpretations also do this, albeit to a lesser extent. These interpretations are important for moving design beyond modernity because they encourage thinking and discussions that emphasise self-transcendence values and in doing so, overcome typical utilitarian concerns. In this way, "inquiring objects" create a

critical distance from the modern worldview and suggest new possibilities and priorities for design "after" modernity. "Inquiring objects" do this by supporting students to investigate and challenge deeply ingrained late-modern presuppositions. The "inquiring objects" are particularly useful for overcoming such presuppositions precisely because they are objects, as one participant (P8: Appendix 25) commented *"I found it useful to be able to look at a physical object and analyse what it could be without having to read [any academic material]. This way it generates ideas and thoughts a lot quicker".* Through their often radically different tangible forms, these objects can invite students into a subjective and intuitive process of sense-making, which is very different from the forms of certain, generalisable knowledge that modernity has emphasised. This process invites students to "see" and discuss alternative designed futures and provides a basis for discerning new directions and priorities for design. This is especially important because even the "rawest" of design students bring presuppositions to the design process that have been shaped from birth about the nature of products that design educators cannot simply eradicate (Snodgrass & Coyne, 1996, p.87).

It is worth noting that the vast majority of participants were enthusiastic about, and appeared to enjoy working with the author's portfolio of "inquiring objects". The participants responded positively and warmly to the objects; for example, stating that the objects are interesting, provocative, fascinating, expressive, engaging, strange and thought-provoking. Reasons given for these descriptors include that the objects are like art, contrasting ideas embodied in single objects, physical objects can be explored in ways that images of them cannot, and that the objects prompted thinking about the relationship between technology, sustainability and unsustainability. Furthermore, the "inquiring objects" designed by the author played an additional role for the participants involved in designing their own objects. The author's portfolio of "inquiring objects" served to both inspire and reassure students about embarking upon their own design process – not least because these objects demonstrate that advanced practical design expertise is not a prerequisite for creating "inquiring objects", as tends to be the case with Critical Design. For example, whilst *Google Diary* (see p. 84) is a technically complicated piece, *Anaesthesia* (see p. 96) is not – but both support the discernment of new priorities and directions for design.

As one participant (P9: Appendix 26) commented: *"I had thought critical design was this exclusive gallery setting practice, but these objects opened critical design up to me, showing me it was an obtainable thing".* This reflects the view of Malpass (2013, p. 334) that critical practice is in danger of becoming too introverted and practiced in a closed community, which undermines its "usefulness as part of a larger disciplinary project". Creating "inquiring objects" represents an inclusive way that critical design practice can engage a broader community.

There is a possibility in late-modernity that spending time creating "inquiring objects" may be viewed as a superfluous activity because it does not support the design of familiar, marketable products. The objects however demonstrate that the designing process supports students to challenge the modern tendency to view technologies as neutral – a prevailing view that is incompatible to developing more sustainable ways of living (see p. 22). In doing this, students can explore what Davison (2013, p.52) describes as "the contradictions and ambiguities embedded within modern worlds of practice, and thus the strangeness that lies beneath the familiar surfaces of unsustainability" – in particular, the technological mediation of self-enhancement and self-transcendence values. This supports students to challenge the modern propensity to approach sustainability as a discreet objective by expanding conceptions about what designing for sustainability entails. Furthermore, the data indicates that all participants reported that the process of creating "inquiring objects" had been an especially valuable experience for many varied reasons and all expressed an interest in creating further "inquiring objects" to support their design practice (see section 7.5). Furthermore, creating "inquiring objects" develops transferable, practical designing skills, such as developing making expertise, sourcing appropriate materials, problem-solving and developing creative skills. As one participant (P7: Appendix 24) stated: *"This has given us the ability to grow as designers".*

7.7 Conclusion

This chapter has addressed the research objective: *To explore how the method of conducting "after-modern" design inquiries can support design students to address sustainability in a more substantive manner than the modern worldview permits.* A series of workshops conducted with undergraduate and postgraduate students were reported on, which explored how engaging with existing "inquiring objects" and creating "inquiring objects" can potentially support students to move design beyond modernity. Furthermore, this chapter reflected upon opportunities for design education associated with "inquiring objects". From this chapter, the conclusions drawn are as follows:

- Both engaging with existing "inquiring objects" and designing "inquiring objects" were found to be inclusive and engaging methods for supporting students to move design beyond modernity, albeit with varying degrees of effectiveness. Facilitating opportunities for students to design "inquiring objects" is the more effective method as the active process of designing is comparatively involving and emotionally engaging. The designing process is therefore better able to overcome rationalistic thinking than the comparatively less involving activity of engaging with existing objects.

- Learning how to transmute philosophical ideas into concrete, tangible forms supports students to recognise and overcome ingrained presuppositions about the nature of technologies and of their design. The designing process associated with "inquiring objects" develops critical, reflective skills that are important for supporting students to critically engage with what they do, why they do it, and with what consequences – skills which remain largely underdeveloped in design education (Fry, 2005, p.1). Moreover, creating "inquiring objects" offers design students a design-based means of conducting research, which engenders new understandings about the nature of design and the role of the designer in late-modernity.

- Students can engage in the process of creating "inquiring objects" with only limited knowledge of the philosophical ideas that underpin the process. Using the tools and

techniques of design to engage with such ideas at the outset of the research process helps to bridge the gap between the theoretical ideas and design. In doing this, the designing process invites the student to translate the ideas into design terms, which supports appreciation of the relevance of such ideas to design practice. The process particularly supports students to view technologies as non-neutral mediators of human-world relations, which has important implications for designing technologies that support more sustainable ways of living.

- The three main categories of design knowledge (a disruptive process, meaningful engagement with philosophical ideas and a different "end" for design) and their sub-categories clarify how the designing process associated with "inquiring objects" can be understood as "after-modern". This knowledge suggests that it is not simply the technological artefacts and systems that result from product design practice that need to change in the quest to develop more sustainable ways of living but also, the design process itself must be reconceptualised in order to move product design beyond the unsustainable modern worldview.

8 Thesis Conclusions

8.1 Introduction

The purpose of this final chapter is to:

- Re-visit the original aims and objectives of the research to re-cap how they have been addressed.
- Summarise the main conclusions of the thesis.
- Re-cap the original contributions to knowledge that the thesis offers.
- Explore the limitations of the thesis and suggest opportunities for future work.

8.2 Summary of chapters

This section re-visits the aims and objectives of the thesis to clarify how each has been addressed. The two main aims of this thesis were:

- To determine how product design education might contribute more substantively to sustainability.

- To develop conceptual and practical ideas that support product design education to contribute more substantively to sustainability.

To achieve these aims, six objectives were successively developed as the study progressed. These objectives are re-stated below alongside a summary of how each has been addressed.

1) *Determine how the modern worldview influences Design for Sustainability*. This objective was addressed in chapter 2 by reviewing literature. Drawing on literature, this chapter revealed that the instrumentally rational nature of the modern worldview is restricting design from making substantive contributions to sustainability as this form of rationality values both the environment and people extrinsically. Furthermore,

instrumental rationality does not reflect upon the value of the "ends" being served by design. This chapter concludes by offering a basis for "after-modern" design, which seeks to support product design education to contribute to sustainability in a more substantive manner than the modern worldview permits. This basis for "after-modern" design firstly means re-framing unsustainability so that it is better understood as resulting from a crisis in human values rather than representing a technological challenge and secondly, harnessing the so-called "right hemisphere" to explore this re-framed conception of unsustainability.

2) To identify insights from the philosophy of technology that could support product design education to address sustainability in a more substantive manner than the modern worldview permits. This objective was addressed in chapter 3 by reviewing literature from the philosophy of technology to identify insights for developing the basis of "after-modern" design outlined in chapter 2. Phenomenological and postphenomenological perspectives of technology were explored to develop non-instrumental understandings about the nature of technologies. Chapter 3 concludes by developing the concept of "after-modern" design by proposing that technologies are conceptualised as mediators of human-world relations as this conceptualisation invites the "quality" of potential mediations to be anticipated and evaluated – including how technologies might mediate moral actions and behaviours.

3) To identify values that are compatible with developing more sustainable ways of living, and to consider how design currently engages with these values. This objective was addressed in chapter 4 by reviewing literature relating to human values and to critical approaches to design. Schwartz's (2012, p. 9) conceptualisation of self-enhancement values and self-transcendence values were explored and related to the context of design. Consequently, the dominant approaches to Design for Sustainability were identified as pursuing self-enhancement values, which are associated with unsustainable practices. This chapter concludes by proposing design practice as a research tool for investigating how self-enhancement values mediate human-world relations through technological artefacts and systems. Furthermore, Schwartz's (2012,

p. 7) conceptualisation of self-transcendent, universalism values was identified as representing appropriate “ends” for “after-modern” design to pursue as these values include compassion towards all humankind (thus addressing the social justice and equity elements of sustainability) and the natural environment.

The contextual review concluded by articulating the concept of “after-modern” design, based on the three literature chapters. The concept of “after-modern design seeks to overcome some of the limitations that the instrumentally rational modern worldview places on Design for Sustainability. This concept proposes that the creative designing process be used to investigate how self-enhancement values become embodied in technologies, and subsequently mediate human-world relations.

4) To develop a research method that supports product design education to address sustainability in a more substantive manner than the modern worldview permits. This objective was addressed in chapter 5 by adopting a research through design approach. This approach took the form of conducting “after-modern” design inquiries. The method of conducting “after-modern” design inquiries uses the creative designing process to investigate how self-enhancement values are mediated by technological artefacts and systems. Central to each inquiry is the creation of an “inquiring object”, which attempts to transmute the issues being investigated via unique configurations of forms and materials – to discern alternative directions for design practice.
This chapter concludes by reflecting upon the designing process of “inquiring objects”, drawing out three distinctive aspects of the designing process that were judged to be distinctive to, and supportive of “after-modern” design (see section 5.4). These aspects relate to the particularly disruptive nature of the designing process, meaningful engagement with philosophical ideas, and “inquiring objects” representing a different “end” for design.

5) *To develop a framework that supports the "after-modern" design of personal digital devices and associated technologies.* This objective was addressed in chapter 6 by using the design directions developed in the "after-modern" design inquiries (see section 5.3) as a basis for designing a digital artefact, entitled *Memento Box*. An eight-point framework for "after-modern" design was developed from conducting an in-depth analysis of *Memento Box* – this analysis was influenced by postphenomenology. Accordingly, *Memento Box* was understood as being a mediator of human-world relations and, aligned with the basis for "after-modern" design, the analysis sought to understand and articulate how this object potentially mediates self-transcendence values. The eight-point framework for "after-modern" design distils eight key qualities of *Memento Box* that potentially foster self-transcendence values. These qualities were judged transferable to the design of other personal digital devices and associated technologies.

6) *To explore how the method of conducting "after-modern" design inquiries can support design students to address sustainability in a more substantive manner than the modern worldview permits.* This objective was addressed in chapter 7 by conducting workshops with design students that sought to explore their responses to the author's portfolio of "inquiring objects" and to the process of creating "inquiring objects". This chapter concludes that the process of creating "inquiring objects" is the more effective, inclusive and engaging method for supporting design students to move design beyond the modern worldview.

8.3 Main conclusions of thesis

The main conclusions of this thesis are summarised as follows:

- The dominant approaches to Design for Sustainability are premised in the instrumentally rational modern worldview, which is potentially counterproductive to developing more sustainable ways of living. In this context, Design for Sustainability is largely concerned with the sole value of "protecting the environment". Whilst this value is evidently important, it results in the "use" phase of technological artefacts and associated systems being addressed too narrowly, largely in terms of technical concerns such as domestic energy consumption and ease of recyclability. Whilst these concerns are undoubtedly important, they cannot account for the many broad-ranging symptoms of unsustainability such as widening economic disparity and overconsumption of resources by wealthy nations (see p.2). Addressing sustainability substantively will therefore require a more holistic response that recognises the inter-relationships between different aspects of sustainability such as environmental sustainability, social sustainability and economic sustainability. To make more substantive contributions to sustainability, it is apparent that product design education must temper instrumental rationality by reflecting upon the potential nature and value of the "ultimate ends" served by design. This can be achieved by investigating how technological artefacts and associated systems foster unsustainable, self-enhancement "having" values – which are associated with anxiety and low levels wellbeing and are incommensurable with developing more sustainable ways of living. It is concluded therefore that an effective way for product design education to contribute more substantively to sustainability is to: a) ensure that students can investigate and challenge how self-enhancement values are embodied in—and become enacted through—technological artefacts and systems; b) ensure that student practice is informed by self-transcendence values, such as Schwartz's conceptualisation of universalism values, which should be regarded as the "ultimate ends" of design practice (see p.62). Striving to foster a range of universalism values overcomes the modern propensity to prioritise the sole universalism value of "protecting the environment", which is too simplistic and

seemingly insufficient for developing more sustainable ways of living. Developing value laden strategies for product design education can instead stretch the student designer to move beyond orthodox perceptions of design practice to instead address sustainability more substantively than the late-modern worldview permits.

- Phenomenological and postphenomenological perspectives of technology are important for overcoming the instrumentally rational modern worldview as these perspectives view subjects and objects as being entangled and inextricable from each other. Postphenomenology is particularly relevant as it focuses on the technological world, viewing technologies as mediators of human-world relations. Importantly, postphenomenology views technologies as co-shaping *the character* of the relations that emerge between people and their world – technologies are, therefore, emphatically not neutral. The understanding that human-world relations are technologically mediated is pertinent to product design education as it invites the question: *what kind of world do we create when we design technological artefacts?* Through this understanding, design students can challenge the modern tendency to view technologies as neutral ends-in-themselves to instead address the "use" phase of technologies in a manner that authentically reflects the role that technologies play in co-shaping people's lives. In doing so, design students can develop a fuller picture about the ways in which technologies encourage people to perceive the world and act in it. These perceptions and actions can then be reflected upon in terms of how they potentially support universalism values, which are known to support more sustainable ways of living (see p. 62).

- Conducting "after-modern" design inquiries is a highly relevant, timely and disruptive research method for product design education. The method stretches the design student beyond orthodox perceptions of design practice by offering a way of addressing sustainability via a different mindset than the one which created unsustainability – particularly because the method challenges pursuing sustainability via self-enhancement values. In doing so, the design student is supported to recognise the limitations of eco-efficiency approaches, especially with respect to

how increasingly efficient technological artefacts and associated systems can negatively impact upon values that are compatible for developing more sustainable ways of living. The active process of designing “inquiring objects” is critical to the success of conducting “after-modern” design inquiries both in terms of the process itself and the resultant objects. Because the designing process views technological artefacts and associated systems as being mediators of human values that have implications for developing more sustainable ways of living, the process equips the student with new understandings about design and much-needed critical thinking skills. This empowers students to challenge orthodox perceptions about the role of the designer in late-modernity and fosters a heightened sense of ethical responsibility to “do the right thing” through design. Crucially, the designing process transmutes issues from literature into tangible objects, which contribute new understandings about the relationships between design, technological artefacts and human values. The “inquiring objects” do this by presenting new realities through their tangible forms, which can then form a basis for discerning directions for product design that challenge self-enhancement values and instead point towards self-transcendence, universalism values.

8.4 Contributions to knowledge

This section summarises the original contributions to knowledge that this thesis makes. The contributions relate to the *method* of conducting “after-modern” design inquiries (see section 0), the designing *process* of “inquiring objects” (see section 7.5) and to the eight-point framework for “after-modern” design (see section 6.4).

8.4.1 The method of conducting “after-modern” design inquiries

The method of conducting “after-modern” design inquiries was developed by synthesising insights from three different disciplinary areas:

1) The conceptual bases of other critical approaches to design.

2) Insights from phenomenological and postphenomenological perspectives of technology.
3) Schwartz's (2012, p. 9) conceptualisation of self-enhancement and self-transcendence values.

The method of conducting "after-modern" design inquiries harnesses the creative activity of designing to investigate how technological artefacts and systems mediate human-word relations in favour of self-enhancement values. The method also supports the discernment of alternative directions for product design education that emphasise self-transcendence, universalism values. The portfolio of "after-modern" design inquiries evidences the method in practice and this method was also tested with design students.

8.4.2 "After-modern" design process knowledge

A further contribution to knowledge relates to the designing *process* associated with "inquiring objects". The designing processes of both the author and the design students who participated in this study was reflected upon and three distinctive aspects of the designing process were exposed that can be understood as "after-modern" – these three aspects are as follows:

1) The disruptive nature of the designing process
The designing process associated with "inquiring objects" is disruptive due to its explicitly critical nature, which challenges modern preferences for certain kinds knowledge, efficiency and optimisation. The disruptive nature of this process was found to be important for challenging design students' assumptions about the nature of contemporary technological artefacts and the role of the designer in late-modernity.

2) Meaningful engagement with philosophical ideas
The designing process associated with "inquiring objects" supports the student of design to meaningfully engage with philosophical ideas that can potentially move

product design education beyond the limitations of the modern worldview. Meaningful engagement with philosophical ideas takes place for two main reasons. Firstly, the designing process permits the design student to interpret the philosophical ideas being investigated with respect to their own lived experiences of technologies. Secondly, the designing process associated with "inquiring objects" effectively bridges the gap between philosophical ideas and design practice, allowing the philosophical ideas to be related to, and understood, in the context of design practice. Importantly, these new understandings foster a sense of empowerment as the design student is permitted to challenge the unsustainable values that drive late-modern, commercial product design.

3) A different "end" for design

"Inquiring objects" reconceptualise the role of the object in the designing process as they do not represent the end of the designing process but can be understood instead as the beginning of the designing process. "Inquiring objects" represent a beginning as they provide a basis for judging what is desirable with respect to designing technological artefacts and systems that address sustainability in a more substantive manner than the modern worldview permits. "Inquiring objects" do this through their tangible forms, which suggest new material sensibilities and patterns of use that potentially foster self-transcending universalism values, which are known to foster more sustainable ways of living.

8.4.3 Framework for "after-modern" design

There is a growing body of literature calling for design to explore and incorporate deeper notions of human meaning – such as self-transcendence values (Hick, 1999, p.8; Walker, 2011, p.188; Klein, 2014, p.342; Fromm, 2013, p.167; McIntosh, 2012, p.52). The framework for "after-modern" design makes a practical contribution to these calls as it proposes an alternate, arguably more meaningful path for the design of digital devices and associated technologies. The framework is envisaged to provide conceptual and practical support for moving product design education beyond the limitations of modernity. Eight

transferable qualities are identified that can be understood as “after-modern” due to their potential to foster various universalism values. The qualities are:

1) A participatory design process.
2) Honest, sensory material.
3) Distinctive digital objects and associated technologies.
4) Meaningful limits.
5) Contextually-rich digital objects and data.
6) Purposeful digital objects.
7) A sense of tradition.
8) “Releasement” from the digital world.

It is envisaged that the framework can support product design education to address sustainability in a more substantive manner than the modern worldview permits by inspiring radically different understandings about how digital artefacts and associated technologies can be designed to foster self-transcendence, universalism values.

8.5 Opportunities for future work

This section identifies five opportunities for future work.

1) This thesis focuses on “after-modern” design research within an academic context as academia offers rich opportunities for introducing radical approaches that challenge the modern worldview – *before* students become professionally ingrained in this worldview. It was beyond the scope of this study to investigate how the concept of “after-modern” design might support students to create meaningful change in their future careers, which will inevitably evolve in the late-modern worldview. There is an opportunity therefore to conduct longitudinal research to investigate how “after-modern” design may be influential beyond a student’s formal design education.

2) This study engaged participants in the designing process of “inquiring objects” but not in the full process of conducting “after-modern” design inquiries, which includes developing insights for future design work. Given the success of the participants’

designing process and their insightful reflections upon the process, it is envisaged that conducting “after-modern” design inquiries will be a fruitful venture for design students. Opportunities therefore exist for engaging students in the full process of conducting “after-modern” design inquiries and from this, to develop pedagogical insights into “best practice”.

3) Given the significant insights that the eight-point framework for “after-modern” design captures, it sheds light on the benefits of conducting an “after-modern” evaluation of technological artefacts and systems. It is envisaged that this evaluation can be developed into an evaluative tool for analysing both existing and proposed technological artefacts and systems. This tool would be “after-modern” because it addresses limitations of the dominant Design for Sustainability tools, in particular the limitations relating to the use phase of products. Future work would therefore benefit from developing guidelines for conducting an “after-modern” values analysis.

4) Testing the eight-point framework for “after-modern” design was beyond the scope of this study. Opportunities therefore exist for investigating how design students use and interpret the framework and how the framework informs their practice.

5) Based on the concept of “after-modern” design, it is theoretically argued that *Memento Box* can foster self-transcendence values. Rich opportunities exist therefore for providing participants with “after-modern” artefacts to test and evaluate how they encourage self-transcendence values.

8.6 Final remarks

This thesis was motivated by Thackara’s (2001, p. 48) view that whilst we are developing “amazing” technological artefacts and systems, increasingly we find it hard to explain what value they add to our lives. “After-modern” design goes some way to resolving this issue by focusing on the loss of meaning associated with late-modern, self-enhancement “having” values – and their relationship to design. “After-modern” design

exposes the limitations that the modern worldview places upon Design for Sustainability by providing an expanded vision of what designing more substantively for sustainability may need to entail. In doing so, “after-modern” design offers a glimpse of the kind of technological artefacts and systems that might lie beyond modernity. The method of conducting “after-modern” design inquiries supports the discernment of radically alternate directions for design, which respond to Sennett’s (2009, p. 12) view that if we are to address sustainability more substantively “we are obliged to change both the things we make and how we use them”. “After-modern” design offers a means of doing this, but also exposes a further requirement as it appears that we are also obliged to change how we approach the *process* of designing itself.

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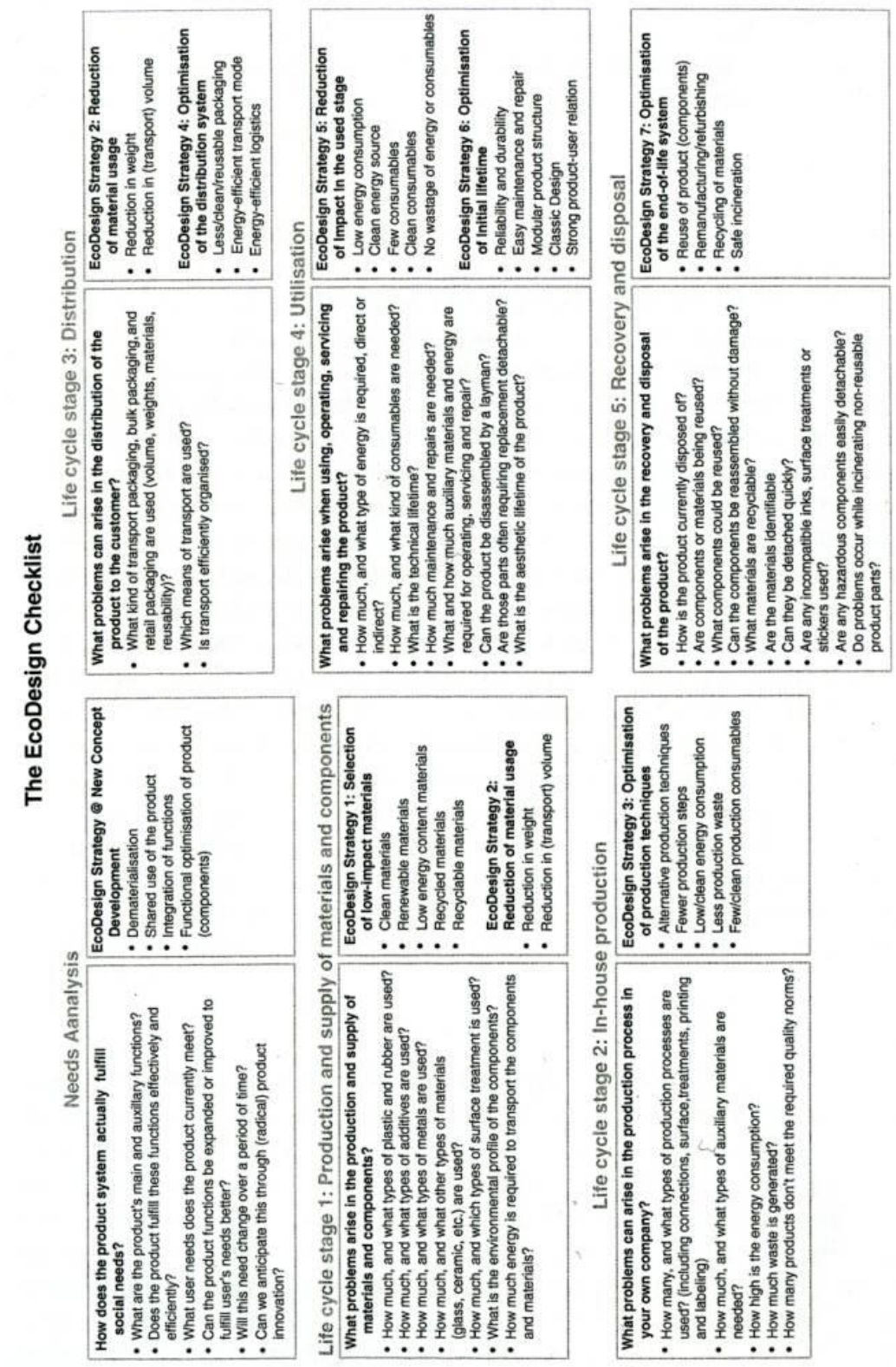
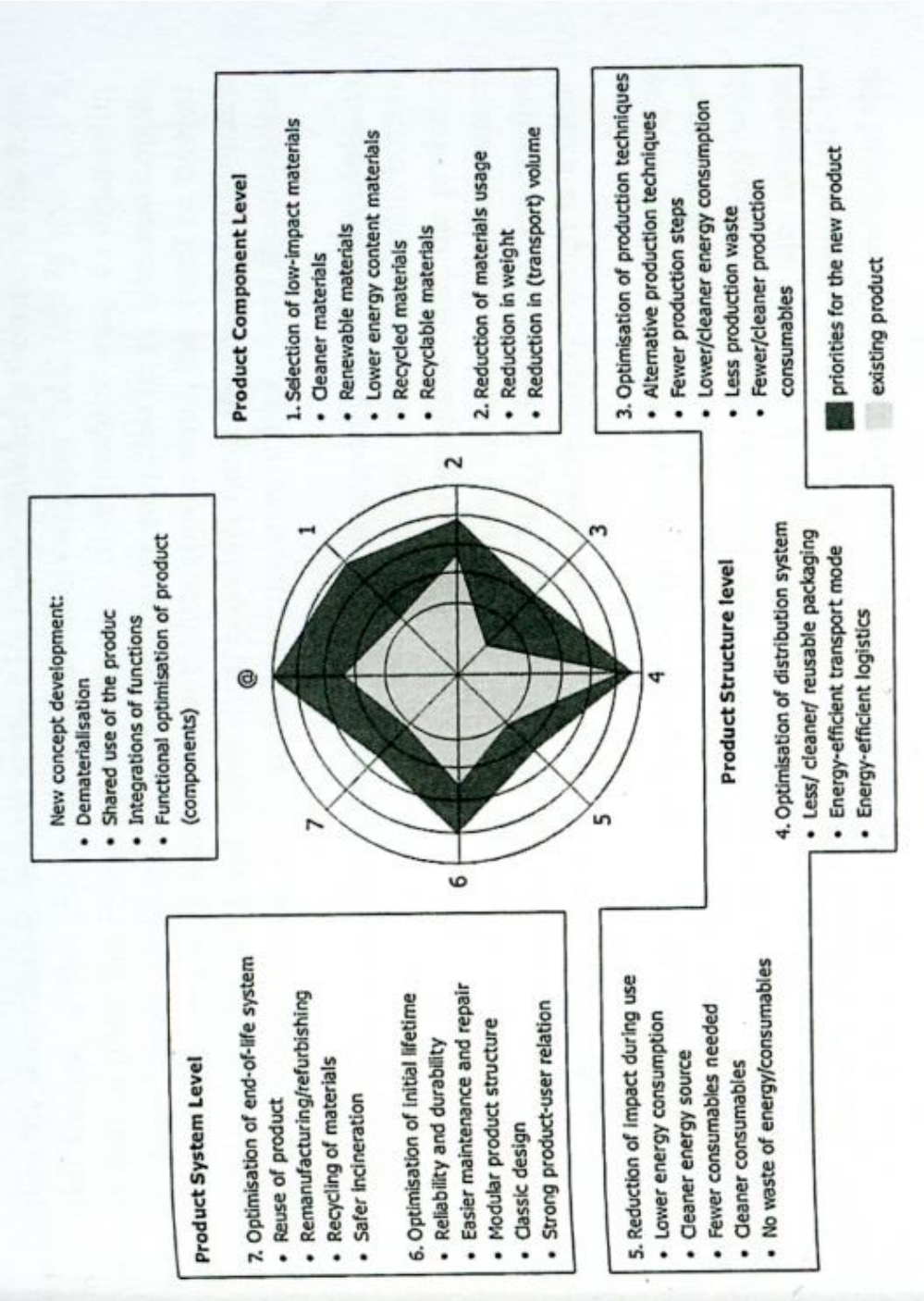
Appendices

Appendix 1: The EcoDesign Checklist



(Wever and Vogtlander, 2015, p. 524)

Appendix 2: The Life Cycle Design Strategy (LiDS Wheel)



(Wever and Vogtlander, 2015, p. 525)

Appendix 3: Common Cause visualisation of the Schwartz circumplex

(Holmes *et al.*, 2011, p. 13).

Appendix 4: Example page from Google Diary

Appendix 5: Email confirming ethics approval

From: Ethics (RSO) Enquiries
Sent: 29 October 2015 18:57
To: Thomas, Lisa
Subject: Stage 1 self assessment approval UREC reference RS2015/24

Dear Lisa

Thank you for submitting your completed stage 1 self assessment form for **Practice-Based Research: Design for Sustainability.** The Part B information has been reviewed by members of the University Research Ethics Committee and I can confirm that approval has been granted for this project.

As principal investigator your responsibilities include:

- ensuring that (where applicable) all the necessary legal and regulatory requirements in order to conduct the research are met, and the necessary licenses and approvals have been obtained;
- reporting any ethics-related issues that occur during the course of the research or arising from the research (e.g. unforeseen ethical issues, complaints about the conduct of the research, adverse reactions such as extreme distress) to the Research Ethics Officer;
- submitting details of proposed substantive amendments to the protocol to the Research Ethics Officer for approval.

Please contact the Research Ethics Officer, Debbie Knight (ethics@lancaster.ac.uk 01542 592605 if you have any queries or require further information.

Kind regards,

Debbie

Debbie Knight | Research Ethics Officer | Email: ethics@lancaster.ac.uk | Phone (01524) 592605 | Research Support Office, B58 Bowland Main, Lancaster University, LA1 4YT
Web: Ethical Research at Lancaster: http://www.lancaster.ac.uk/depts/research/ethics.html

Lancaster University

www.lancaster.ac.uk/50

Appendix 6: University no.1: Copy of group worksheet for exercise no.1

Please discuss the following four questions with your group. WHILST YOU ARE DOING THIS, PLEASE ANSWER THE FOLLOWING QUESTIONS INDIVIDUALLY. YOU HAVE 25 MINUTES TO COMPLETE THIS EXERCISE.

1. What do you think this object is?

2. What do you think this object is for?

Appendix 7: University no. 1: Copy of questionnaire for exercise no.2

NAME: _____

1. The objects that you have seen today aim to stimulate thought about the relationship between digital culture, substantive human values, and design. Did the objects encourage you to think about this relationship?

Yes ☐

No ☐

Please try to briefly explain your answer…

2. Consider the design critique that you have developed in your first assignment for this module (entitled *Product Sustainability and Critique*). Could you imagine making an exploratory object to communicate your findings? (e.g. in addition to your written critique or instead of it)

Yes ☐

No ☐

I'm not sure ☐

Please try to briefly explain your answer…

3. Imagine yourself as a design manager in the future. Would you consider using exploratory objects like those you have seen today as a means of conducting design research (for example, encouraging a design team to reflect upon and interpret existing objects and/or to create their own objects as part of a design process)?

Yes ☐

No ☐

I'm not sure ☐

Please briefly explain your answer…

Appendix 8: University no.2: Copy of questionnaire for exercise no.2

NAME: _____

1. What were your initial thoughts about the portfolio of critical artefacts?

2. The critical artefacts were developed in order to explore the relationship between digital culture and sustainability *through* the medium of design - did the portfolio lead to any discussion about how digital culture relates to sustainability? Please explain…

3. Following today's session, do you think you might experiment with Critical Design practice *as a means of investigating issues* within your own design projects? Please explain…

4. Have the artefacts you have seen today developed your understanding of designing for sustainability in any way? Please explain…

Appendix 9: Individual questionnaire for university no.3

1. What were your initial thoughts about the portfolio of Critical Design practice?

2. What (if anything) has the portfolio led you to think about?

3. How do you feel about the prospect of making your own critical artefact?

Appendix 10: Guiding questions for individual reflective accounts at university no.3

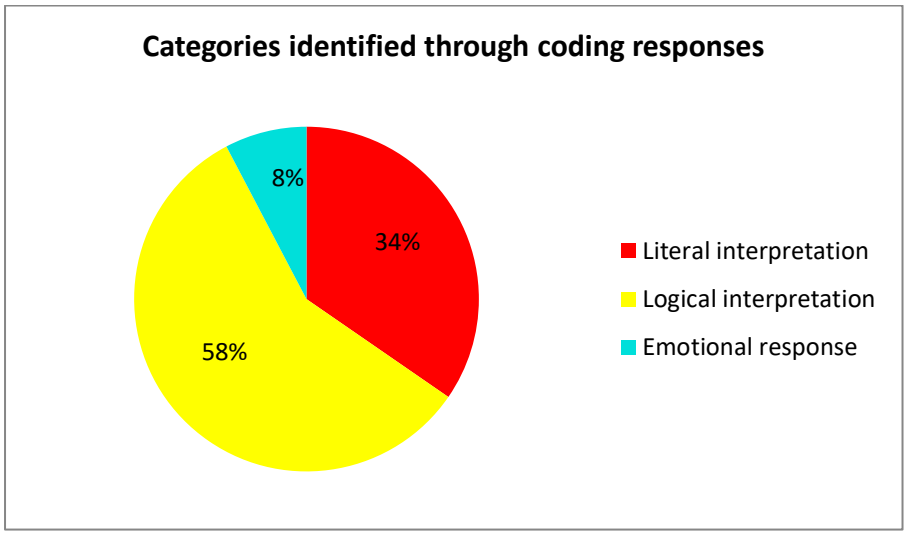
1. Is designing for sustainability important to you?
2. What were you investigating through the process of creating a critical artefact?
3. Do you think that creating an artefact was a useful way to conduct an investigation?
4. What were the main challenges you faced in this project?
5. Has creating a critical artefact enriched and/or expanded your understanding of designing for sustainability?
6. How likely are you to create critical artefacts as a means of investigating issues in the future?
7. Has the process of creating a critical artefact deepened your thinking about designing in general?
8. In what ways did you use the portfolio of critical artefacts that you were provided with at the beginning of the project?
9. What did you enjoy and not enjoy about the project?

Appendix 11: *Phone Farm*

This object was created as part of this study but does not feature on the “after-modern” design inquiries in chapter 5.

Appendix 12: Coding of group exercise at university no.1 (Q.1)

Q1: What do you think this object is?



Grow-your-own: phone farm:

P24: Mobile phone and smartphone and battery which are broken so they have been used as plant containers.

P13: An equipment of reducing pollution of battery or electrical products.

P1: Mobile phone, smart phone, battery, plant pot

P9: A installation device for generating electricity from tow directing objects and store power in the battery.

Yours Truly:

P29: JEYON – Very precious sealed letter/message

P27: Sealed email with a stamp with her initial maybe wax.

P14: A sealed letter which written by 'L''. Meaningful.

P4: A letter from person whose name is 'L'.

KintsugiPhone:

P10: Broken screen

P22: Broken still have nice hand feeling.

P15: A broken phone. Maybe classical product of Apple.

Appendix 12 (cont.)

P11: Broken iPhone

Google Diary:

Appendix 12 (cont)

P20: The object is an indicator of what you have done, how you consult the internet, an indicator to your interests and your behaviour. Your inner seeking.

P7: I don't like this kind of product. I could see in a different time phase what I was interested in. However I feel that my privacy may be infringed.

P6: Collecting what you watched in every period.

P5: Know what you searched. GD combines all of people's search history, which can reflect individual own search in different times. When you check your search, you may understand more than your search.

P2: Take your history of search online down, make the abstract record of search history into the real book.

Lakeland Data Stone:

P19: I think this object is a compact flash stuck in a stone.

P18: I think this object is an installation art.

P17: A new type of information carrier. Memory chips.

P16: A advertising of glue.

P8: It is a flash memory card plugged in a stone.

Earth-Re-charger:

P26: A prototype for producing /storing energy or some kind of power.

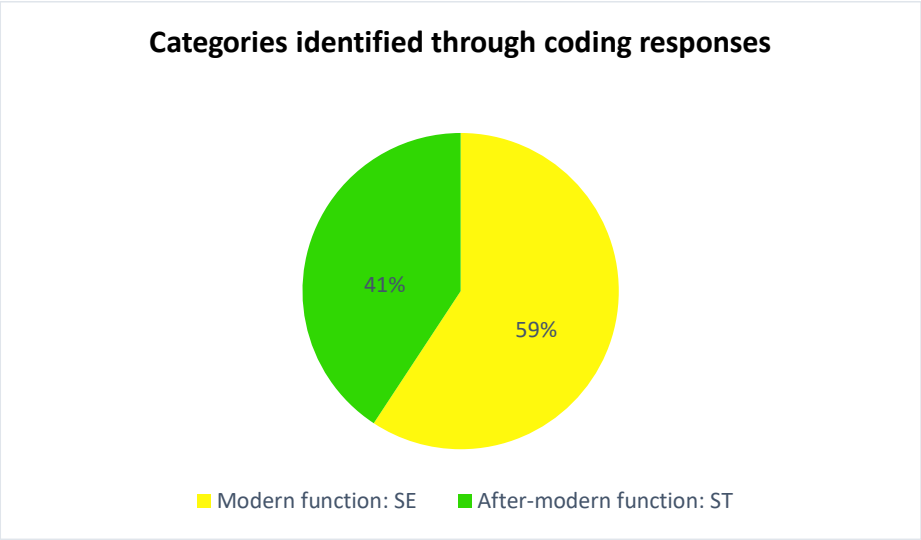
P25: A system that creates a natural source of energy.

P23: Plate of soil and seeds, phone battery, coriander seeds connected by wires.

P21: Electric energy generator.

Appendix 13: Coding of group exercise at university no.1 (Q.2)

What do you think this object is for?



Grow-your-own: phone farm:

P24: Mobile phone is for communication. But the smartphone may offer more functions such as camera. Music players etc.

P13: It reduces the pollution from the battery or it is an experiment to text current influencing plants growing.

P3: Powers for environmental phone industry development harmful the natural. Good products for human. Human activities harm the environmental suitable for the human and nature balance.

P12: Transfer pollution energy into good way. 2. Too much or less both not good. Middle is suitable.

P1: Mobile phone is used for communication but the object instead was use as a plant pot.

P9: Generate power from natural resources.

Earth-Re-charger:

P26: To explore how to produce or store energy through natural resources.

P25: Charging a battery

Appendix 13 (cont.)

P23: Charging system for battery.

P21: Charging a batter using two different sources (one positive, one negative)

Yours Truly:

P29: To deliver a very important message to someone in distance.

P27: To seal message. To confirm whether or not someone has opened it. To secure the message. To decorate.

P14: Email. Exchange some information between Lisa and receiver. Maybe some sincerely words or some book time schedule or important information like guide or map.

P4: A decoration. Not a secret, just a letter because it was put into the inside package. The paper is thick, means the person is very sincerely. The letter was printed from university's email account, the person printed it maybe she didn't get reply from that person online, she wants to get reply quickly.

KintsugiPhone:

P10: Past stories, memories

P22: Repair. For the people who can't afford a new one.

P15: Maybe this is use for decoration, cause some colour on the screen. 2. Maybe this used for test the hardness of the phone.

P11: Art

Google Diary:

P20: For reflecting yourself.

P7: For data-collecting as for Google. They could collect the search data and habits of ultimate users for them to modify their searching mechanism.

P6: To know what is popular every day every month. But our secret content will be peeked. The tendency of many areas will be found if every diary has been collected.

P5: It is interesting to conclude search history. Through these search history we can know people's preference.

Appendix 13 (cont.)

P2: Let you know the everyday's record into the diary, make your knowledge become meaningful and also make your process of using the internet meaningful.

Lakeland Data Stone:

P19: The object has saved many information about this stone.

P18: Decorative effect.

P17: To store memories about this stone. Store special memories like magic.

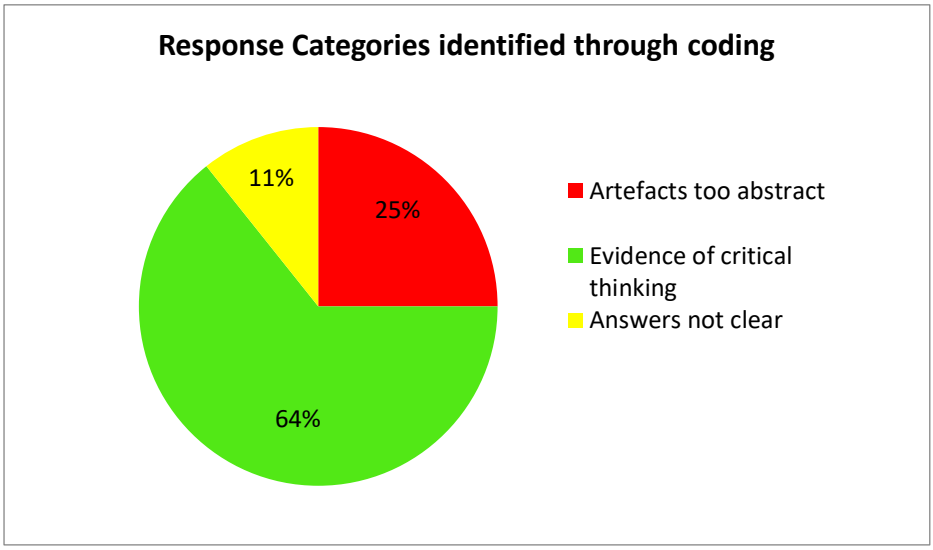
P16: It's a prop for glue advertising.

P8: I think it is a kind of artwork to encourage people pay attention to nature or the history of nature.

Appendix 14: Coding of individual exercise at university no.1

1. The objects that you have seen today aim to stimulate thought about the relationship between digital culture, substantive human values, and design. Did the objects encourage you to think about this relationship?

Please try to briefly explain your answer…



P26: They do but for me they are still in a very philosophical framework. They make you, even force you, to explore and think about certain relationships but I'm not sure how I can get a practical use or outcome as a design manager.

P25: I found the objects quite provocative. I think they conveyed the 'loss of meaning' issues, but they were too abstract to bring in any change in the practice of design.

P23: The process of the workshop today did encourage thinking about this relationship. But I feel as though *anything* could have been used as a stimulant in place of them e.g. a painting, a photo. At the end of the exercise seemed academic, and sustainability is too pressing an issue for that, I think a priority is replacing unsustainable consumption with more sustainable consumption.

P10: Maybe some of design it is give the product a second life but I think for a product the most important thing is function, then I will care about the appearance and the artistry.

P22: Depends on what kind of product will design based on the digital culture. If design for a collection maybe should not think much about substantive human values.

Appendix 14 (cont)

P15: Actually just think this object is a broken iPhone. After the explanation of the tutor I realised it is a kind of art called Kintsugi. It's really interesting and makes the people think of maybe the broken product still has their value and can be sustainable.

P11: In my opinion digital culture influence the substantive human values. Digital culture provides a different thing for people. Also the human values changes design.

P19: As a designer I should not only think about the design, also think about the digital culture and substantive values, which is useful for sustainability.

P18: Yes – I think a good design need to consider lots of factors. Need to be useful to people and environment protection.

P17: Yes – Design is not just for human beings it also need to be give culture meaning to describe. How to combine tradition and modernisation.

P16: Yes – A good design not only carries emotion, but also considers the nature and social situation.

P8: Yes – The digital products have become a very important role in our lives. However, using too many digital products sometimes make us ignore the substantive human values. These objects can help me to establish a link between cultures and human values.

P28: Yes – no explanation.

P27: Yes – At first, I thought it was strange to pair a printed email with a sealed initial stamp. Then a group member thought that the letter must not have been received and let the sender to print the email and send it. After the presentation, I understood how easily privacy could be threatened and how important privacy is to me,

P14: Yes – maybe the technology used in digital and design something different from the original apply to human values, to be more accepted by humans.

P4: no – It is difficult to understand exploratory designs. But the 'modernity' and 'original' in comparison I got from your lecture.

P20: Yes – reflecting on what we are doing with digital worlds, on what we have been designing, question it, debate it, then maybe radical change. From the perspective of individual, inner world.

P7: Yes – Digital culture is currently affecting the substantive human values into unsustainable. For the vital use of design is to achieve the balance between the sustainability and digital issues rather than denying meaning of the digital issues.

P6: No – no explanation.

P5: Yes – the relationship between digital culture and substantive human values is important. It can lead to people think ahead and make progress. Reflect contemporary issues.

P2: Yes – Digital culture makes human life become more convenient. Sometimes it's easy for them to live life. Design can let people get the aim of the sustainability.

Appendix 14 (cont)

P24: Yes – Social medias, smartphone can provide news, current situation very fast so it can change people's perceptions or can change how people would value each product.

P21: Yes – I think the objects shown are very extreme and they work very well in provoking people but being so extreme they also maybe easily dismissed by more practical and 'modern' persons.

P13: Yes – I think the objects can improve personal awareness to add substantive values.

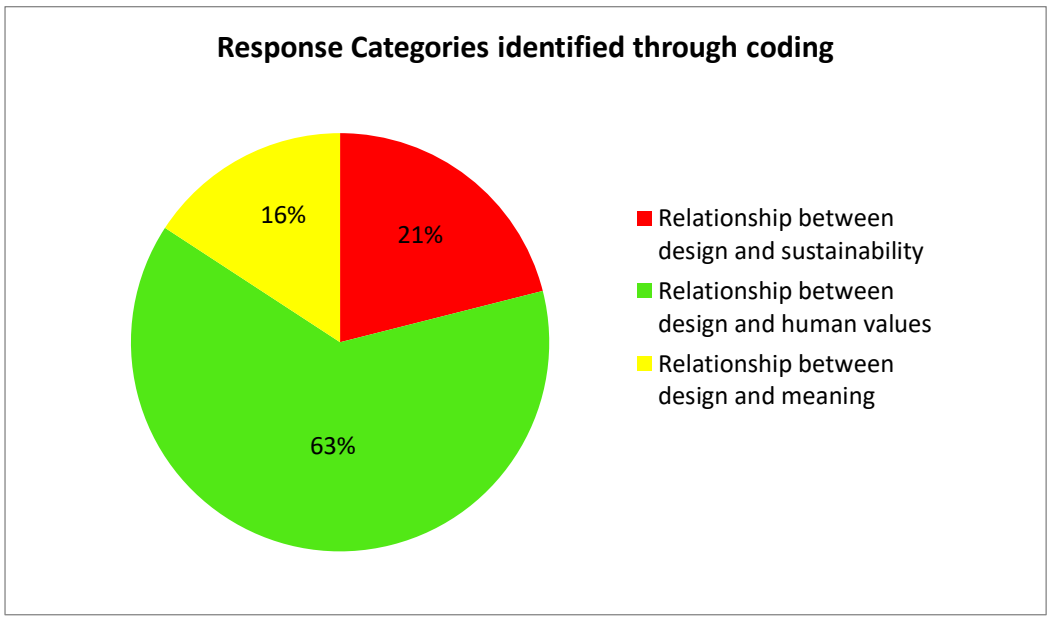
P3: Yes – Digital culture is that means the digital can replace he people's identity.

P9: Yes – 1. Provocative 2. Integrated digital/material product into more meaningful/value stuff.

P12: Yes – Human value with product can create more interesting design but actually we need to improve the function, let it be more useful, not only just looks interesting.

P1: yes – The object made me realise that meanings and values that I think it is actually have another meaning behind it. Values of the digital culture may altered. And design is an important means in process.

Coding of "Evidence of critical thinking"



P25: I think they conveyed the 'loss of meaning' issues

P15: It's really interesting and makes the people think of maybe the broken product still has their value and can be sustainable.

P11: In my opinion digital culture influence the substantive human values. Digital culture provides a different thing for people. Also, the human values changes design.

P19: As a designer I should not only think about the design, also think about the digital culture and substantive values, which is useful for sustainability.

P18: Yes – I think a good design need to consider lots of factors. Need to be useful to people and environment protection.

P17: Yes – Design is not just for human beings it also needs to be give culture meaning to describe. How to combine tradition and modernisation.

P16: Yes – A good design not only carries emotion, but also considers the nature and social situation.

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I understood how easily privacy could be threatened and how important privacy is to me,

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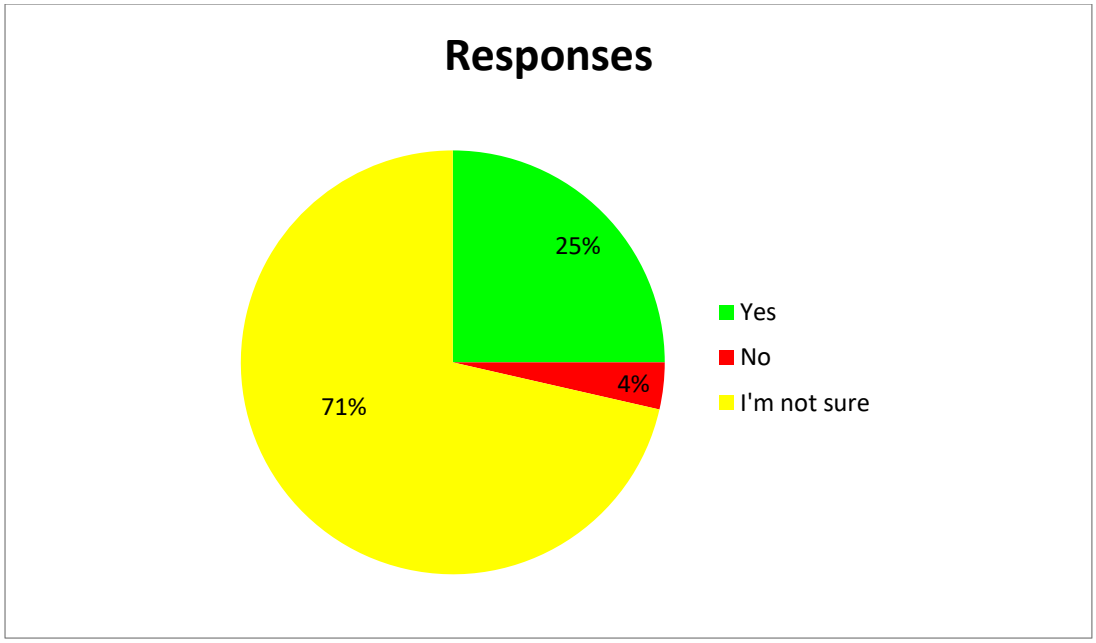
P1: yes – The object made me realise that meanings and values that I think it is actually have another meaning behind it. Values of the digital culture may altered. And design is an important means in process.

2. Consider the design critique that you have developed in your first assignment for this module (entitled *Product Sustainability and Critique*). Could you imagine making an exploratory object to communicate your findings? (e.g. in addition to your written critique or instead of it)



Please try to briefly explain your answer…

P26: yes - I can imagine it considering our group researched beauty products and we found there is a major issue between 'social meaning' and the environmental impact. It would be interesting trying to put together two objects or processes out of context (which I think these exploratory objects do) and find unexpected relationships.

P25: I'm not sure -Critique of whether or not we need lipstick – This is such a complex issue that I can't think of such an object straight away.

P23: I'm not sure - We looked at smart watches. An exploratory object could be a watch that measures carbon output or some metric of sustainability. This is a practical example.

A more theoretical example could be a watch that measures happiness or freedom, but I prefer a more practical/scientific approach.

P10: I'm not sure - No explanation.

P22: yes - Could be a new kind of architectural style.

P15: yes - Maybe I'd like to use other materials or products which can have impact on others.

P11: No explanation.

P19: Yes - I analysed the first assignment from four issues which are functional issues, social issues, symbolic issues and economic issues.

P18: No explanation.

P17: I'm not sure – Making an exploratory object is truly useful for creative part and culture meaning but I'm not sure that if I use that I use this method I can comment critically and find other new findings.

P16: I'm not sure – We compared five types of furniture and figured out cons and pros of them but we have not found suitable exploratory object to communicate yet.

Appendix 14 (cont)

P8: I'm not sure – I focus on linen in my first assignment. Linen is a plant-based fabric which is very eco-friendly. And some of linen is made by human hands. So, I think linen itself a symbolise of human values. But I'm not sure about that.

P28: I'm not sure – no explanation.

P27: No – We discussed this in the group but couldn't see how nylon fibres could be used in this manner.

P14: I'm not sure – Just like an email which be printout and sealed and have no other idea about the letter. Maybe guess that a precious or meaningful thing.

P4: I'm not sure: my topic is electric kettle. The tech of it is a basic tech, not high-tech, it is hard to apply exploratory design conception into the product.

P20: Yes - I haven't done that assignment but I will conduct some conceptual object to inquiry and explore issues.

P7: I'm not sure – When I picked the product, I have made a judgment of it and during the critical procedures it could not be avoid to be affected by the prejudgment. If I know the way using an exploratory object, I would use this way that I think I could keep an objective insight.

P6: I'm not sure – no explanation.

P5: I'm not sure – no explanation.

P2: I'm not sure – Exploring product sustainability mostly can help human to get more sustainable life but the process of finding the way of sustainability may based on designing the product without any sustainability (for example, plastic sometimes do some harm for the environment, but good for people to is daily life.

P24: Yes – My report was about watch that is not a very expensive one, but it can be compare with high street brand because of their qualities. This would give some meaning and values to someone who bought the watch because the products gave some social status, personal meaning and etc. but somehow watch (as a accessories) is not a necessary product for human.

P21: I'm not sure – The extremism of these objects can deviate the attention of numerous persons, decreasing the credibility of the findings and conclusions.

P13: - I'm not sure – no explanation.

P3: I'm not sure – The meaning where we give to the product my not meanful. The critique thinking may be wrong in something or may right in some parts. Critique thinking needs more angles to analysis.

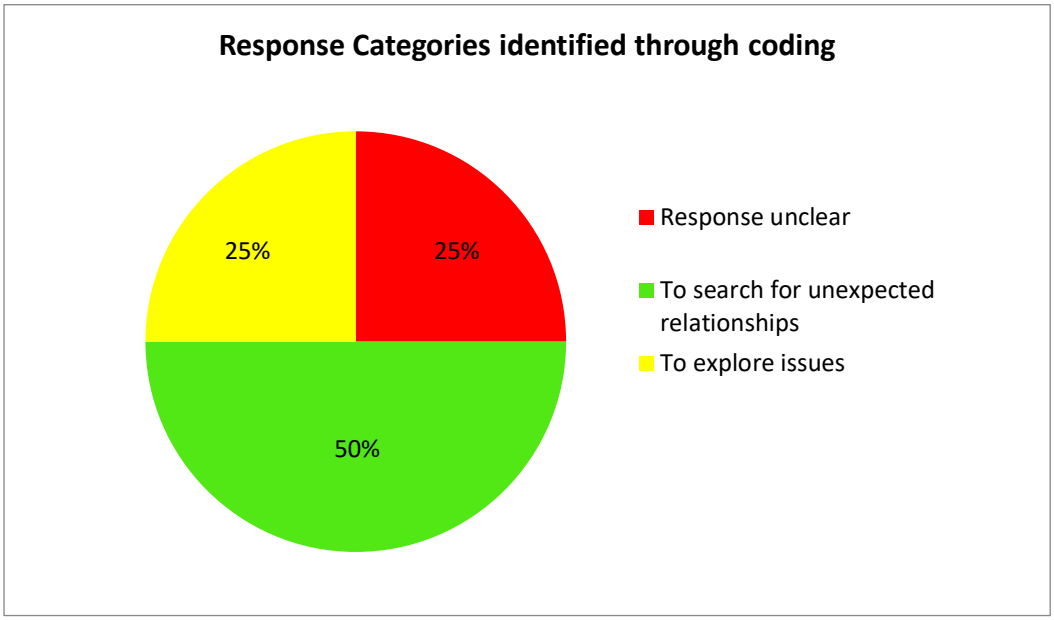
P9: I'm not sure – Product: kid watch – good for parents to find children whereabouts and make sure their safety. Add function: video/camera (real time interaction) stop tracking button (avoid privacy issue).

P12: I'm not sure: This kind of approach much suit small product, my research is about kitchen appliances, too big product: still don't know how to use this method. But I think if I do, I will start from materials.

P1: I'm not sure – I think it is depends on what finings I want to get. It can be a useful approach if it is about what the values effect me. But might not be useful if it deals with the whole society issue.

Appendix 14 (cont)

Analysis of 'yes' answers:



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P15: yes - Maybe I'd like to use other materials or products which can have impact on others.

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Analysis of 'no' answers:

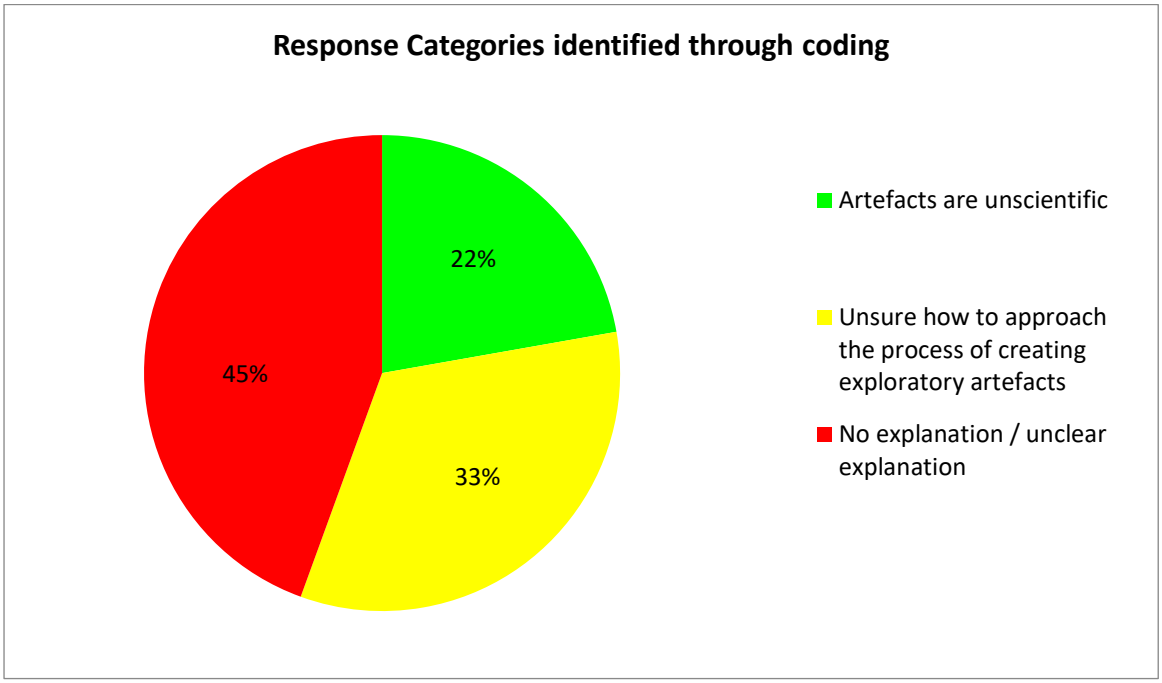
P11: No explanation.

P18: No explanation.

P27: No – We discussed this in the group but couldn't see how nylon fibres could be used in this manner.

Appendix 14 (cont)

Analysis of 'I'm not sure' answers:



P25: I'm not sure -Critique of whether or not we need lipstick – This is such a complex issue that I can't think of such an object straight away.

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P10: I'm not sure - No explanation

P17: I'm not sure – Making an exploratory object is truly useful for creative part and culture meaning but I'm not sure that if I use that I use this method I can comment critically and find other new findings.

P16: I'm not sure – We compared five types of furniture and figured out cons and pros of them but we have not found suitable exploratory object to communicate yet.

P8: I'm not sure – I focus on linen in my first assignment. Linen is a plant-based fabric which is very eco-friendly. And some of linen is made by human hands. So, I think linen itself a symbolise of human values. But I'm not sure about that.

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Appendix 14 (cont)

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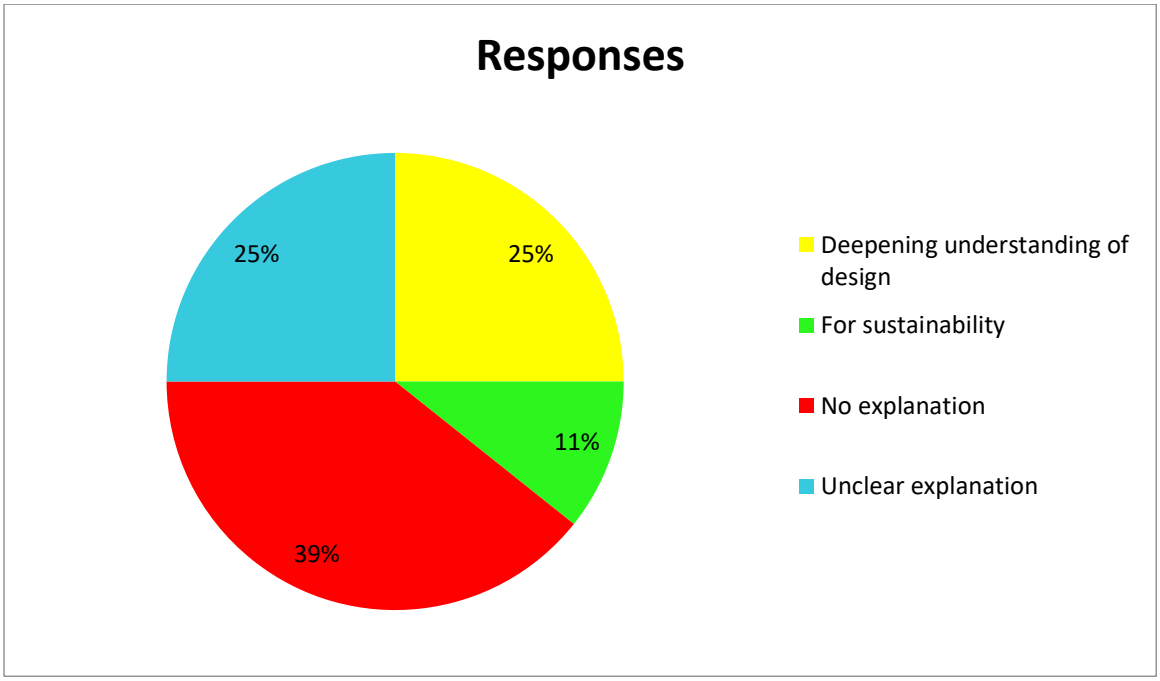
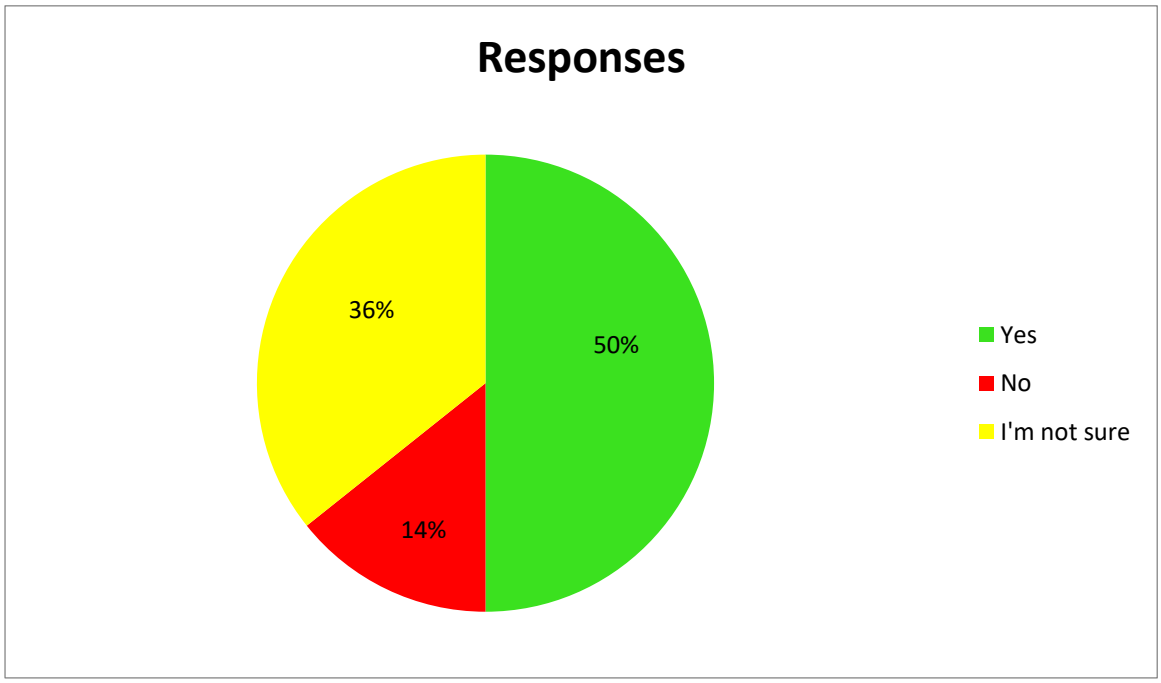


Appendix 14 (cont)

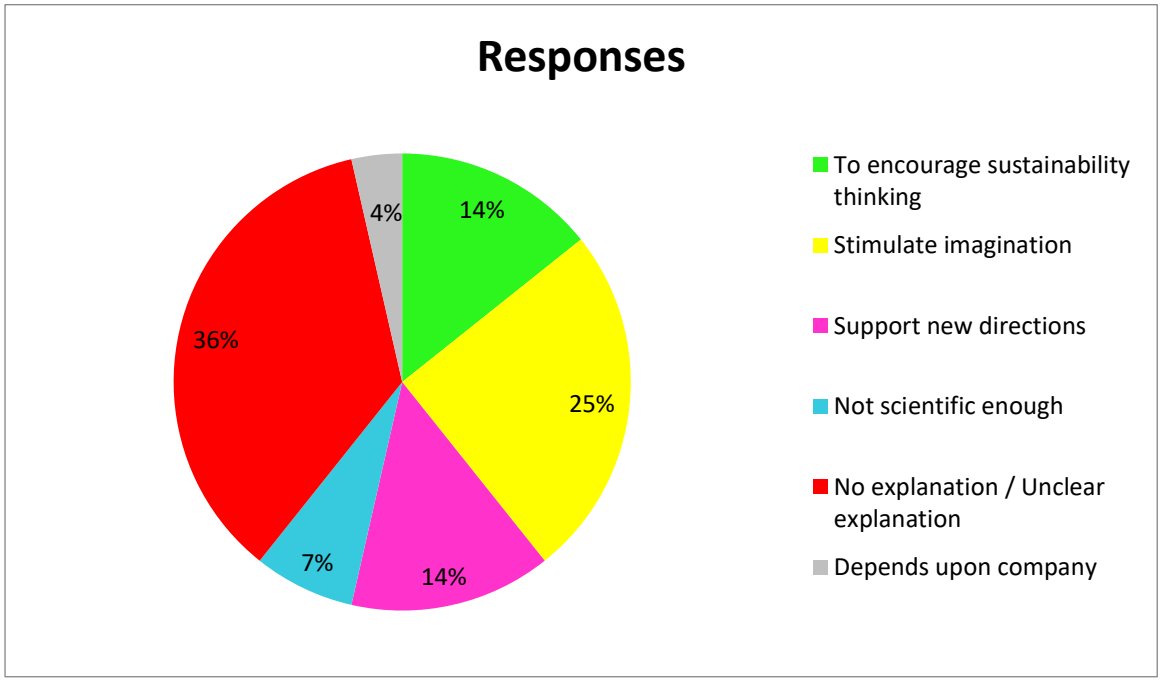
3. Imagine yourself as a design manager in the future. Would you consider using exploratory objects like those you have seen today as a means of conducting design research (for example, encouraging a design team to reflect upon and interpret existing objects and/or to create their own objects as part of a design process)?

Appendix 12 (cont.)



Please briefly explain your answer…

Appendix 14 (cont)



P26: Yes: Despite I wouldn't be sure how to undertake at first I think it could reveal how people think and behave. From a design thinking approach it fits the purpose.

P25: I'm not sure: I don't think they have a very practical use, it's very philosophical and I don't know how it could serve a realistic purpose. They are good things to look at to understand sustainability issues better though, so they could serve as inspiration, but I wouldn't make anyone create one.

P23: No - I think there are other methods I prefer.

P15: I'm not sure Frankly speaking most of users are more care about the function of the product. They won't focus on the aesthetic or potential value of this product too much.

P10: No explanation.

P9: No explanation.

P11: No explanation.

P19: Yes – I want to make sure the products can be more sustainability.

P18: Yes – Encouraging a design team more sustainable and profitable product.

P17: Yes – Some existing research are really boring, if we can use imagination to make a new way to do so, it will be useful for research.

P16: Yes – it's a good way to stimulate people's creativity and imagination, which is very useful for development of design company.

P8: Yes – These exploratory objects are very unique and fancy. It can stimulate a design team to think about things they don't focused before.

P28: I'm not sure – no explanation.

Appendix 14 (cont)

P27: Yes – It is an interesting means of research that forces people to think critically.

P14: I'm not sure – I think use exploratory objects is important. However, it doesn't mean to use objects one right and have great effect anytime. It depends on the different situation.

P4: I'm not sure – If my work is related to highwire, high-tech I may consider exploratory objects.

P20: I'm not sure – no explanation.

P7: I'm not sure – For the ultimate designers who are going to operate the practical designs it is much more important to show them these items less theoretically. If I were a design manager I would use exploratory objects to help the designers to interpret or modify the existing objects but in a less straight way.

P6: Yes – Managing some games or some activities to explore employees creativity and encouraging them to do something which is beneficial to company on their own way.

P5: I'm not sure – It depends on what kind of design research. If project is related to exploratory objects we should encourage people to create.

P2: Yes – In recent days people develop based on the use of the environment, the process for them to thinking thoroughly is important.

P24: Yes – I would do research about people would use some objects for a long period so the project will be made in the future will be long lasting and will not become waste.

P21: I'm not sure – It depends on the company I'll be working for, its target and its philosophy.

P13: Yes – I think redesign existing objects is necessary.

P3: Yes – Creativity something new is always important, the right and left brain need to work together.

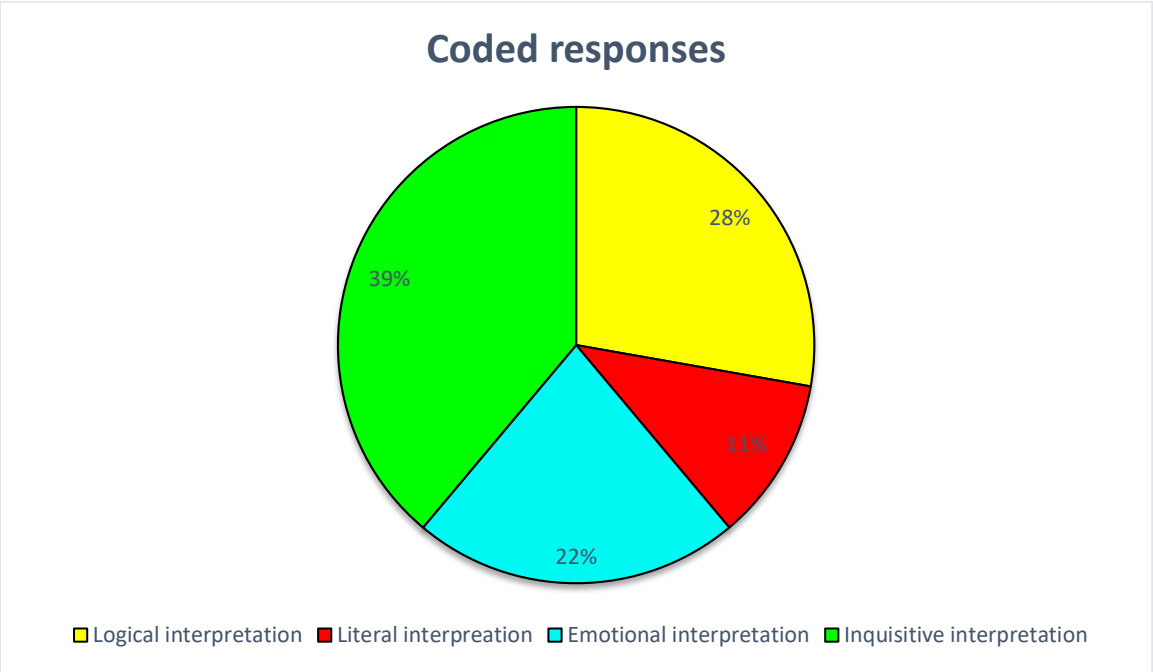
P9: Yes – Will encourage clients or internal team to try to integrate stuff together and create something more creative and innovative.

P12: I'm not sure – only few hours lecture actually not make me to understand these research deep meaning, still need to know much about it.

P9: Yes – It is easier for people to visualise the meanings/values with this approach.

Appendix 15: Coding of group exercise at university no.2

A. KintsugiPhone:



Useless

It is broken obviously

The pattern is nice. The pattern looks natural, the phone doesn't: contrast

Someone put nail polish in the cracks

I wonder if it still works?

It's not working

Kintsugi – is that the Japanese art of imperfection?

Not very sustainable

What would it look like if it still worked?

Waste.

Amazingly useless.

What is the value and purpose of this broken stuff?

Borrowed principle from ceramics. Doesn't really work in the same way.

Will break again? Failures and fixtures.

Grabs attention

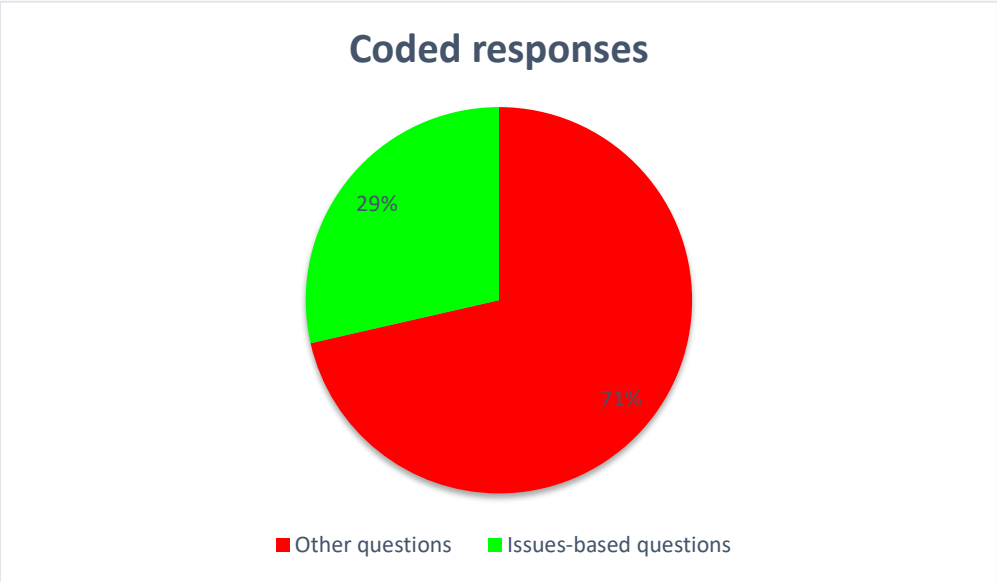
Aesthetically appealing

Is it still functionable?

Is it a good idea to waste more resources on waste?

Appendix 15 (cont)

B. Further analysis of "inquisitive" responses:



I wonder if it still works?

Kintsugi – is that the Japanese art of imperfection?

What would it look like if it still worked?

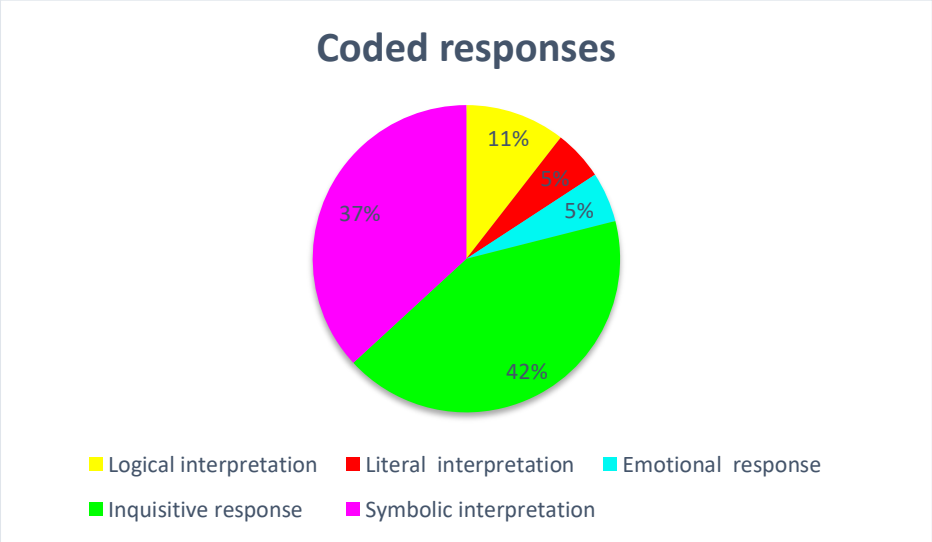
What is the value and purpose of this broken stuff?

Will break again? Failures and fixtures.

Is it still functionable?

Is it a good idea to waste more resources on waste?

C. Earth Re-charger:



The technology is obsolete

The contrast with the green coriander label with the actual seeds

The plate looks specific, does it mean anything? Could it be somewhere else?

Coriander label shows the future, why are they connected?

What do we understand?

What is the relationship between our perception and the digital?

Nature takes away the technology from it!

Maybe it is a virus

It will grow without the technology

Are they heating coriander?

What is the right way of using tech?

Boundary line of tech and nature world

Is technology making us shift from reality?

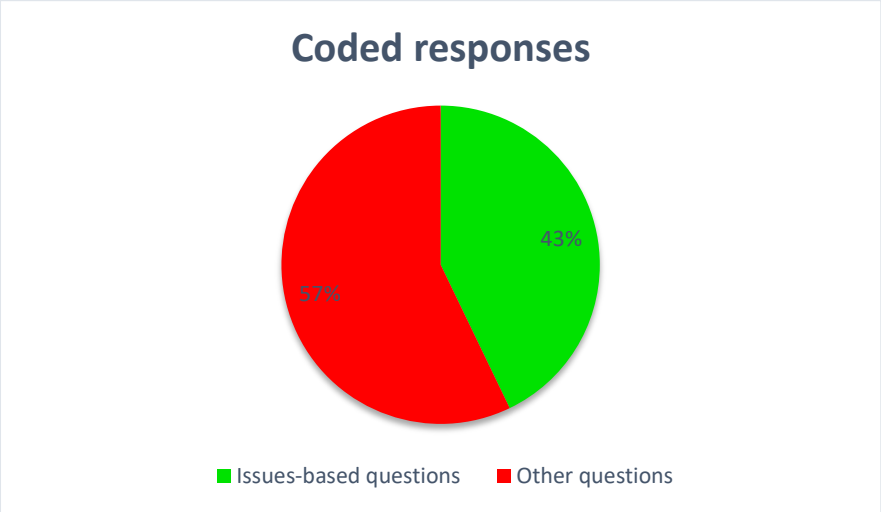
We're lost

Can the seeds grow up through the electronics?

A tea saucer would be too shallow to grow a full plant. Seedlings might be ok.

I like the line with the coriander. Nice touch.

D. Analysis of "inquisitive" responses:



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What is the relationship between our perception and the digital?

Are they heating coriander?

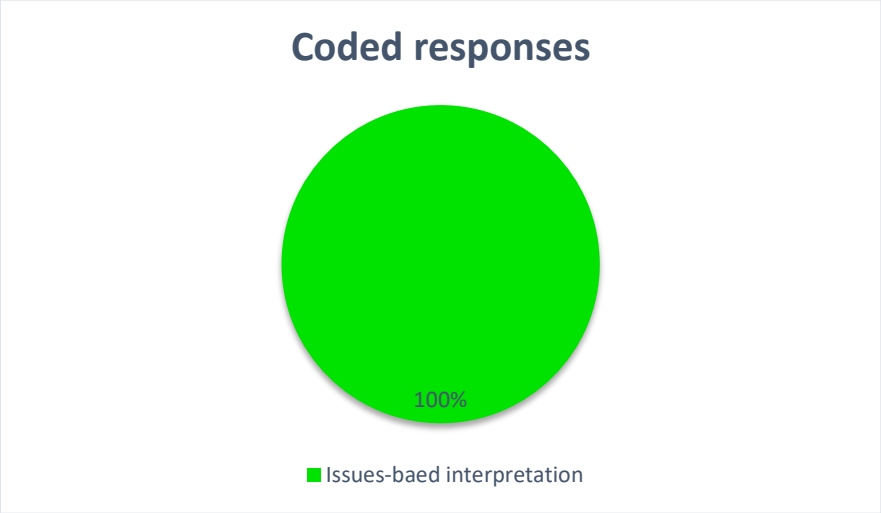
What is the right way of using tech?

Is technology making us shift from reality?

Can the seeds grow up through the electronics?

Appendix 15 (cont)

E. Analysis of "symbolic" responses:



Nature takes away the technology from it!

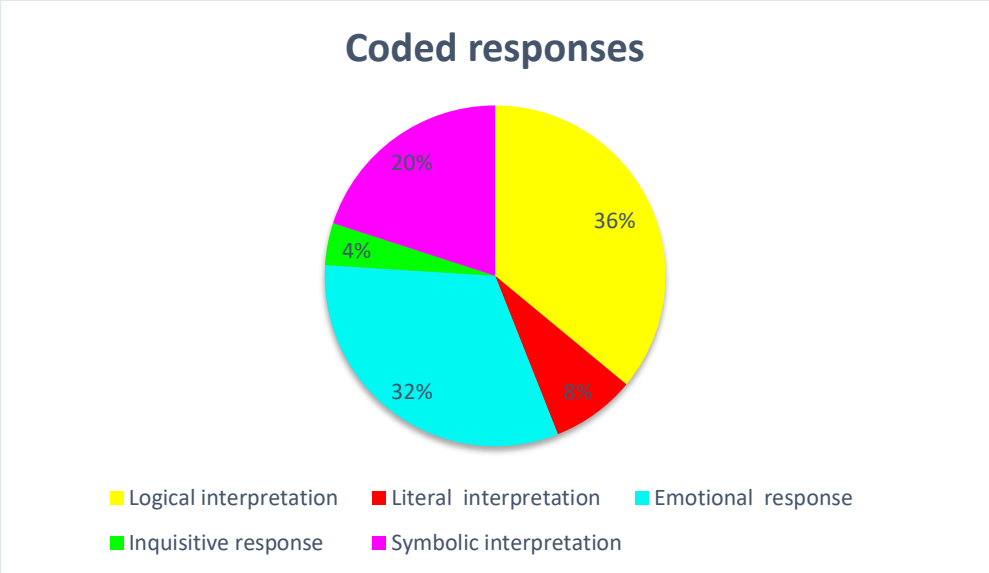
Maybe it is a virus

It will grow without the technology

Boundary line of tech and nature world

We're lost

F. Yours Truly:



Appendix 15 (cont)

Response to Stuart walker

Peeping the doc

Communication means change in methods

Insecure connections

Romantic

Pixelated

No address, couldn't send

Would have to be hand delivered

Could just talk if the purpose was to be more personal

From Lisa, the seal has an L on it

Confidential

Looks expensive

Very personal

The seal looks like harry potter

Valuable

Kings and castles with the seal

We can sneak in from the sides

What would it say?

A shame to open it

It's not easy to reproduce

It feels nice

Where is the horse and the messenger?

Its historical an modern at the same time

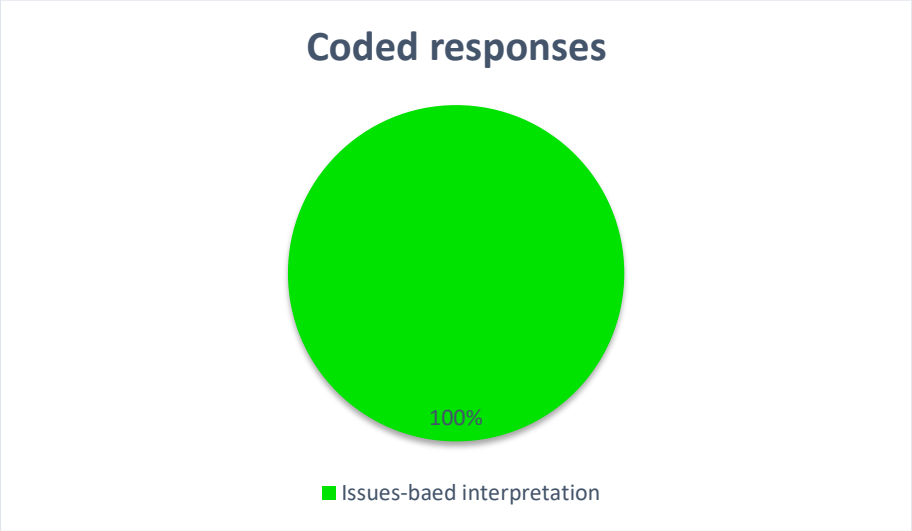
It would also be slower and more sustainable. Well, is it? Not really. Maybe.

We would be more careful with what we send

G. Analysis of "inquisitive" responses:

Appendix 15 (cont)

H. Analysis of "symbolic" responses:



Communication means change in methods

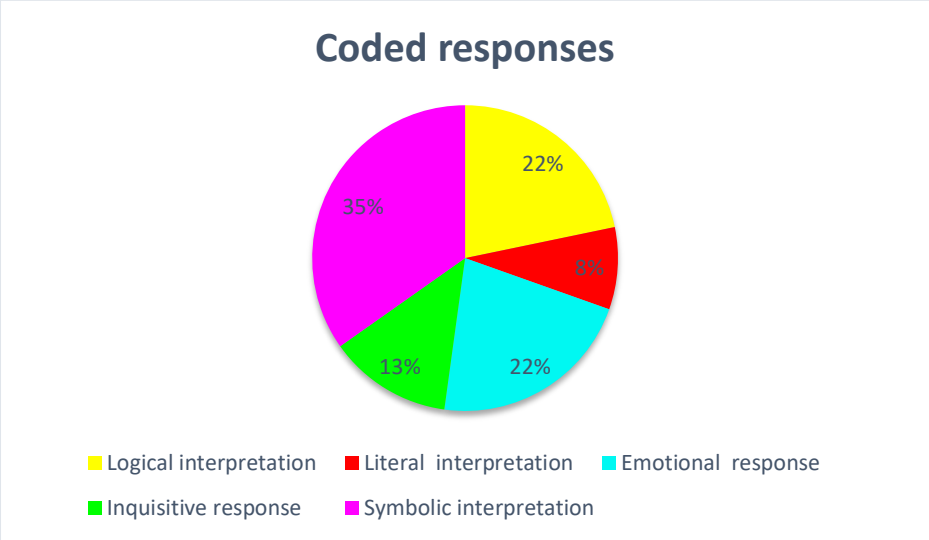
Insecure connections

Could just talk if the purpose was to be more personal

It would also be slower and more sustainable. Well, is it? Not really. Maybe.

We would be more careful with what we send

I. Google Diary:



The biggest revealed diary.

Big brother

Appendix 15 (cont)

Everyone knows all things being searched

Being online is unsustainable

Google “knows”

Repetition

Too much info

Searching for a better life through google

Made me laugh

Smells great

Good humour

How long did it take to fill this?

You wonder where it is all stored

Fantasy

That’s how much google knows

It looks like a digital bible

What do you need it for?

Appendix 15 (cont.)

Oh god

Diary of your life

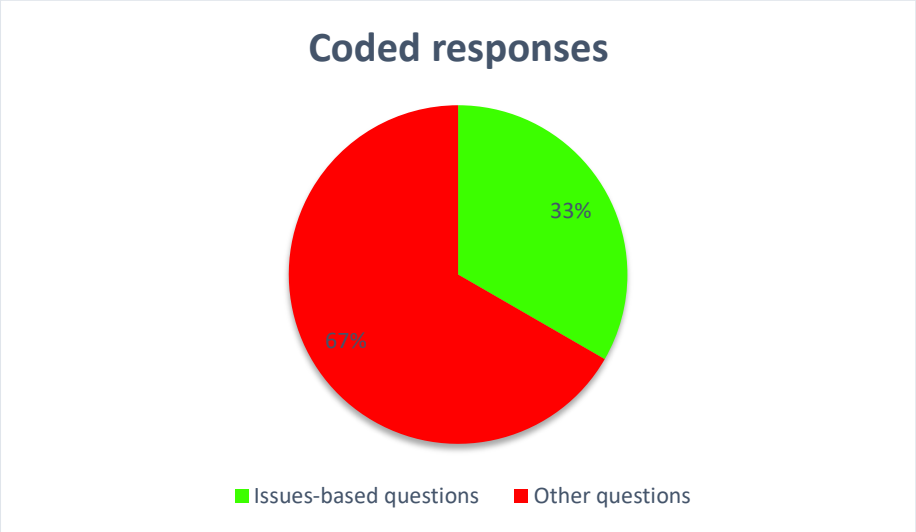
Natural organic material

It’s like a personal profile

It’s all of her searches

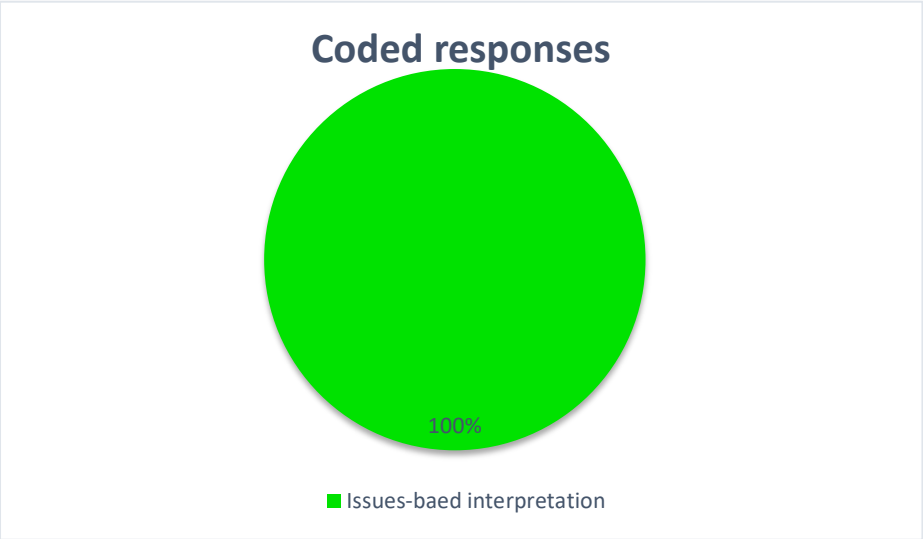
It is scary

J. Analysis of “inquisitive” responses:



Appendix 15 (cont)

K. Analysis of symbolic responses:



Big brother

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Being online is unsustainable

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Repetition

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Searching for a better life through google

That’s how much google knows

L. Analysis of “emotional” responses:

Made me laugh

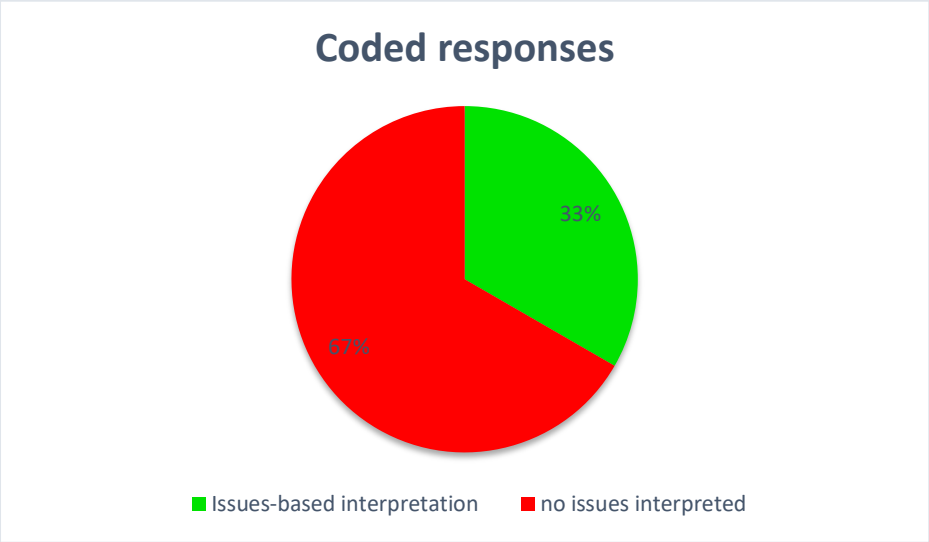
Smells great

Good humour

Oh god

It is scary

Appendix 15 (cont)



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You wonder where it is all stored

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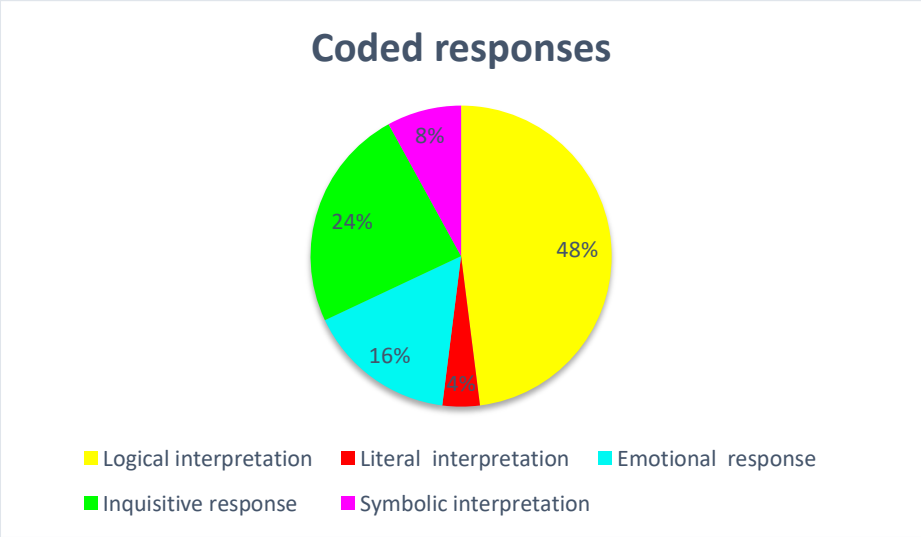
M. Lakeland Data Stone:



Can nature be stored in a SIM? Memory card?

Impractical

Forced

Laughing again

Too heavy

Gimmick – wouldn't work

It's heavy to carry this stick

Real natural, technical gadget

It's the connector between tech and nature

Rock hard, awkward, heavy

Reprogramme environment

Making nature fit in a pen drive?

Reinstalling earth

The motherboard piece looks like braille

The balance – vibration is really nice

This makes sense because a stone itself could be memory

Memory from a country walk

The memory now stores memory

Does it really work?

From stone age?

How do you put this in a computer?

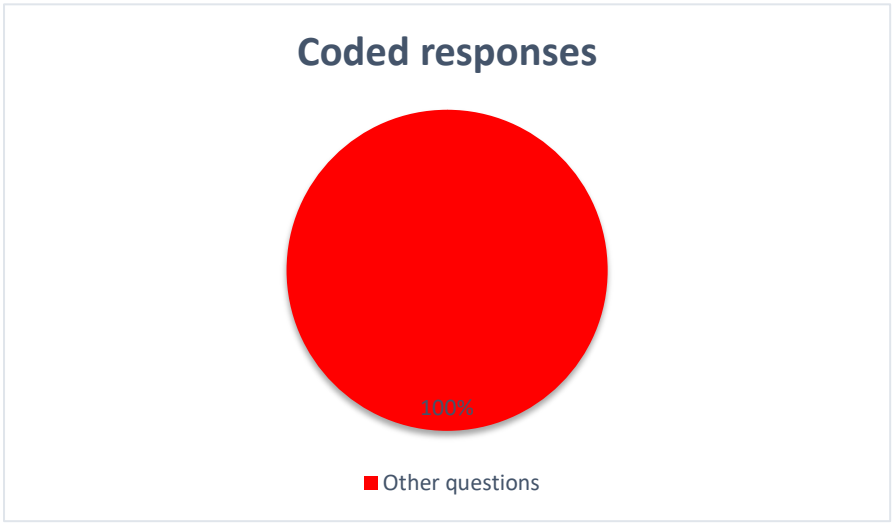
There is no actual connection

This object feels more genuine than others

This one makes me feel much better than the others

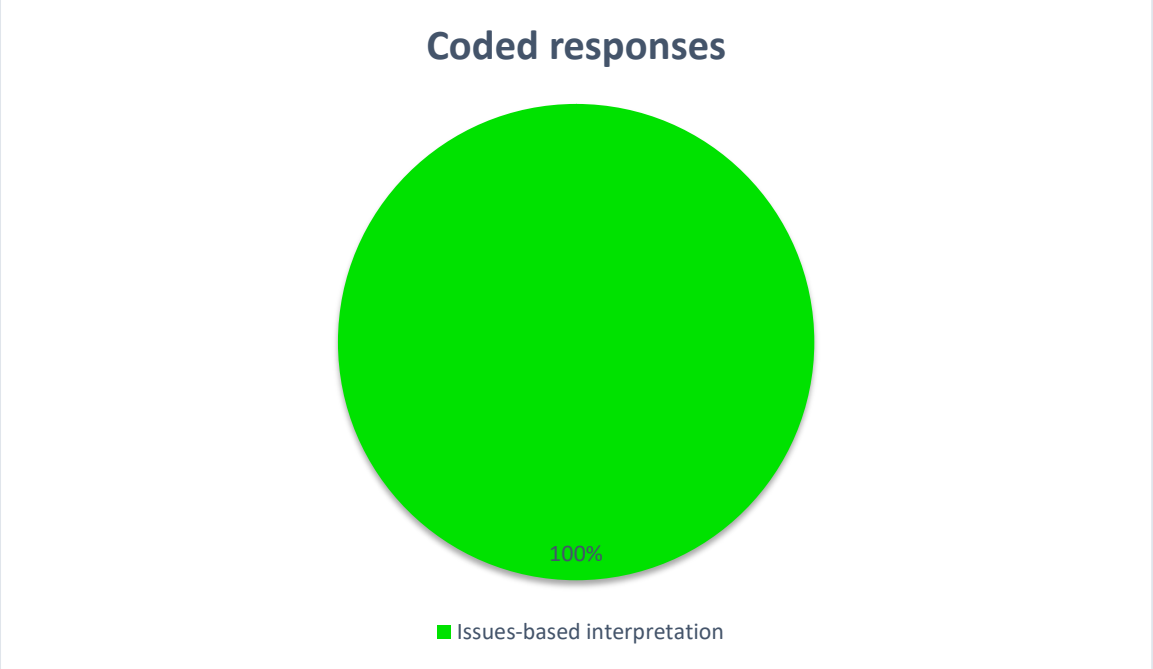
Maybe it could be displayed in a museum containing data from our age.

N. Analysis of "inquisitive" responses



Appendix 15 (cont)

O. Analysis of "symbolic" responses:



Reprogramme environment

Reinstalling earth

P. Analysis of "emotional" responses

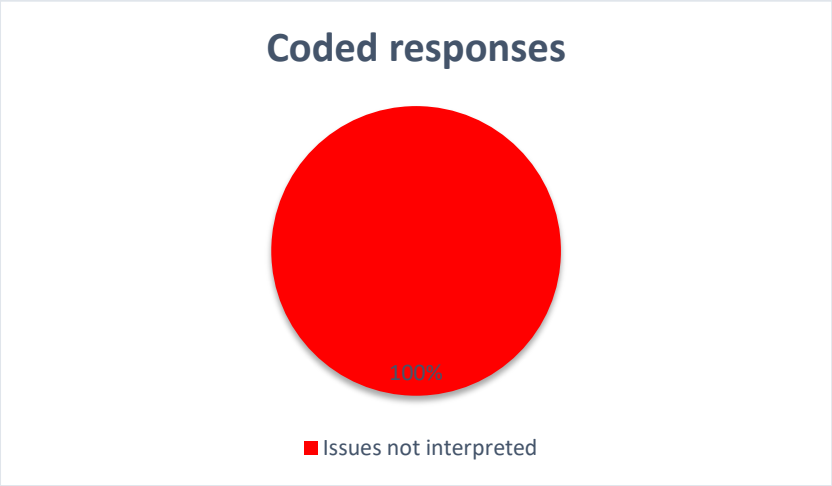
Laughing again

The balance – vibration is really nice

This object feels more genuine than others

This one makes me feel much better than the others

Appendix 15 (cont)



Can nature be stored in a SIM? Memory card?

Making nature fit in a pen drive?

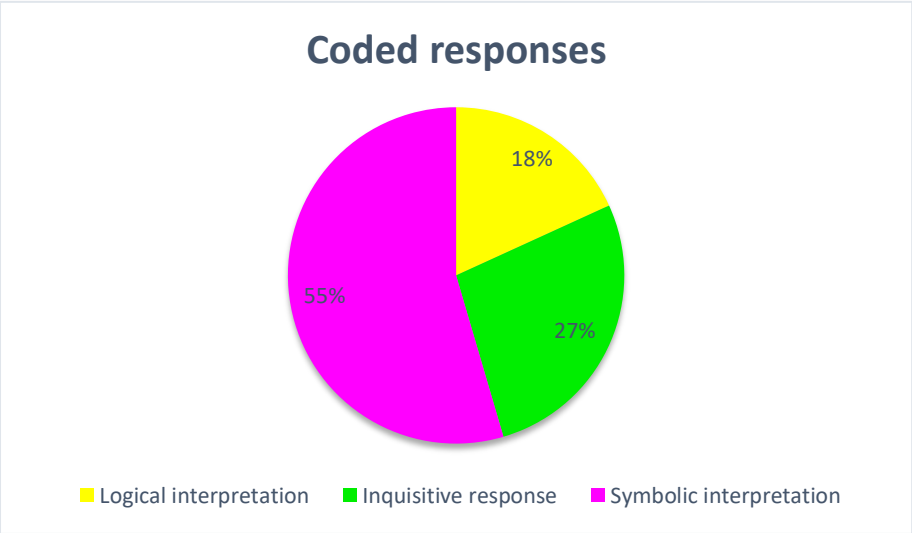
Does it really work?

From stone age?

How do you put this in a computer?

Maybe it could be displayed in a museum containing data from our age.

Q. Anaesthesia:



Keep away from babies and children.

You do stuff unconsciously

Does a tablet mean anything if it doesn't work?

Why is it called anaesthesia?

Is it obsolete?

As if the tablet is an anaesthetic

This thing does the same with your life as anaesthetics

Shall we open it?

Detached from human aspects

They're all about digital life but they don't work

Association with health trackers

Medication

The tablet takes you out of your life, just like anaesthetics

Is not working

We have been anesthetised

Do we need to fix it?

What is ill and why?

The broken tech and person

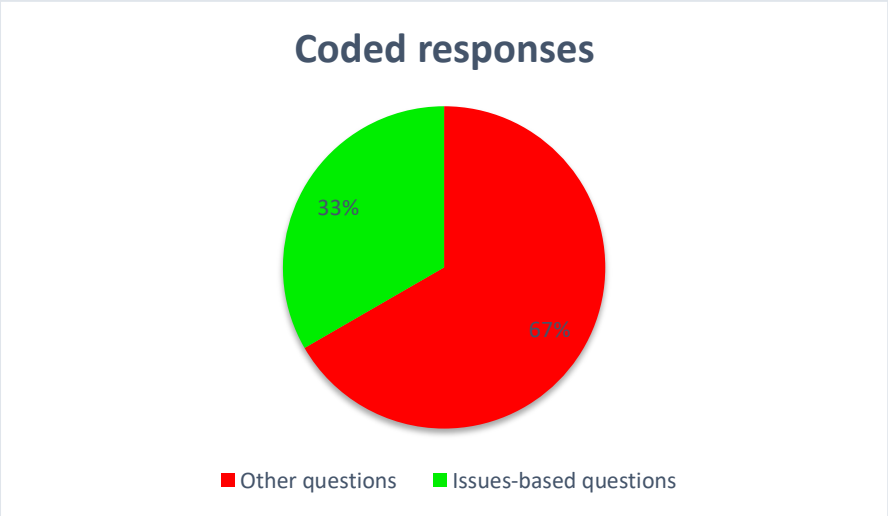
Virtually ill

Technology making users numb

Unconscious decisions

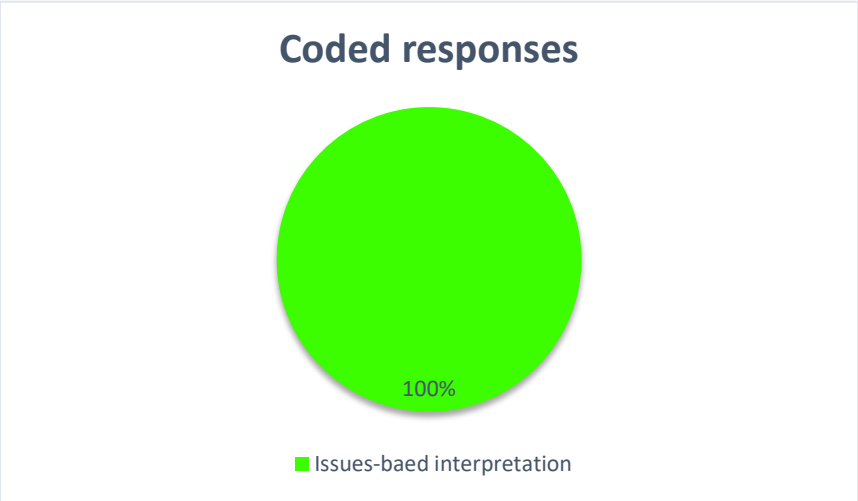
Digital numbness?

R. Analysis of "inquisitive" responses:



Appendix 15 (cont)

S. Analysis of "symbolic" responses:



Keep away from babies and children.

You do stuff unconsciously

As if the tablet is an anaesthetic

This thing does the same with your life as anaesthetics

Detached from human aspects

The tablet takes you out of your life, just like anaesthetics

We have been anaesthetised

The broken tech and person

Virtually ill

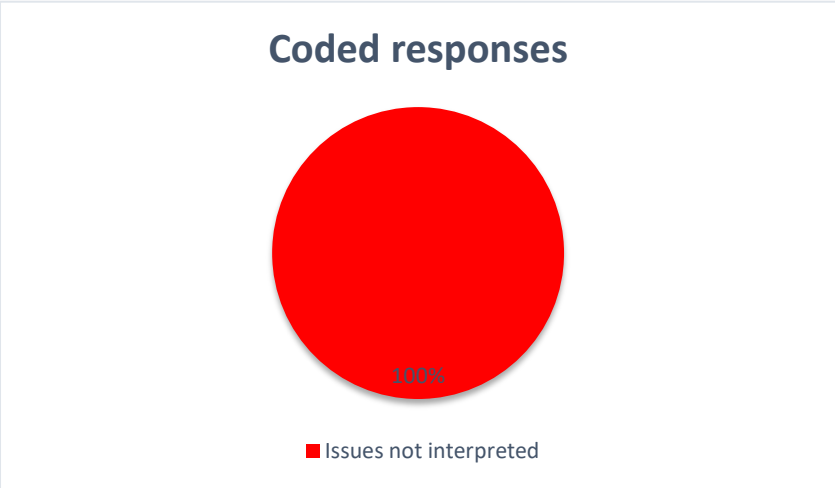
Technology making users numb

Unconscious decisions

Digital numbness?

Appendix 15 (cont)

T. Analysis of "inquisitive" responses:



Does a tablet mean anything if it doesn't work?

Why is it called anaesthesia?

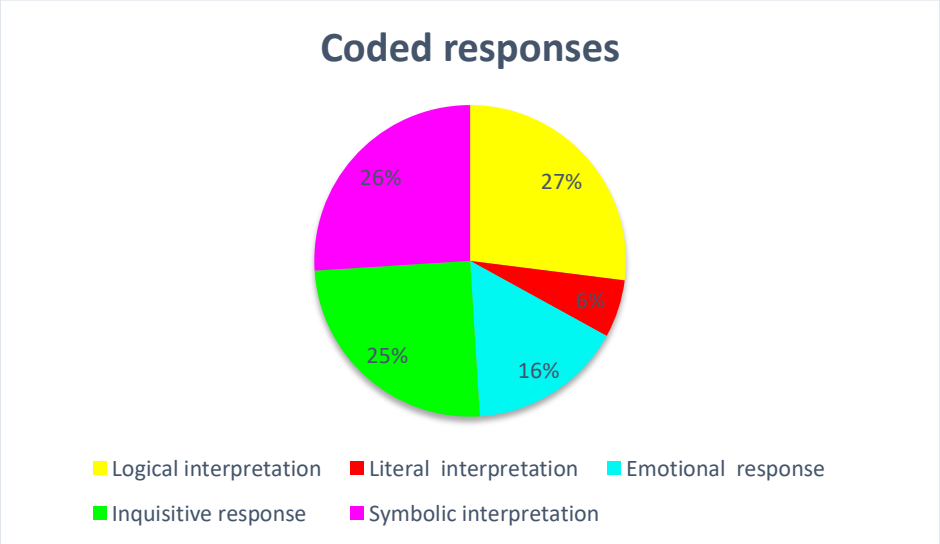
Is it obsolete?

Shall we open it?

Do we need to fix it?

What is ill and why?

U. Total responses:

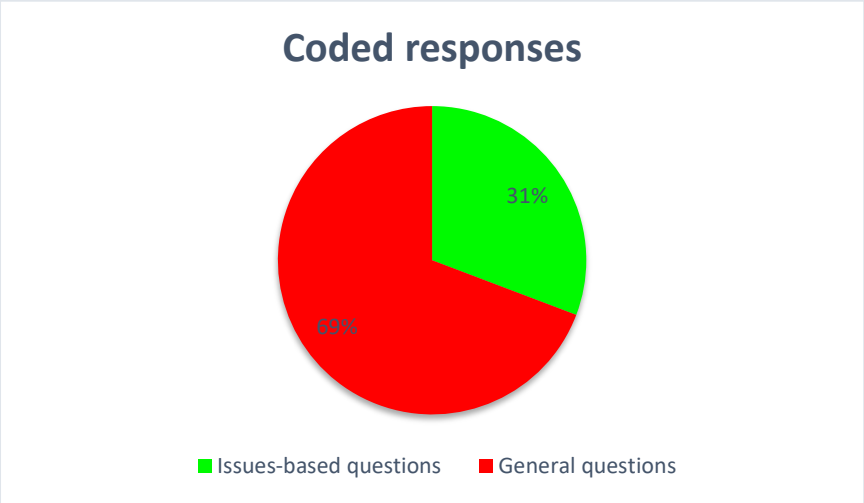


Appendix 15 (cont)

V. Total "inquisitive" responses:

Artefact	8 Issues-based questions	18 General questions
KintsugiPhone	What is the value and purpose of this broken stuff? Will break again? Failures and fixtures. Is it a good idea to waste more resources on waste?	I wonder if it still works? Kintsugi – is that the Japanese art of imperfection? What would it look like if it still worked? Is it still functionable?
Earth Re-charger	What do we understand? What is the relationship between our perception and the digital? What is the right way of using tech? Is technology making us shift from reality?	The plate looks specific, does it mean anything? Could it be somewhere else? Coriander label shows the future, why are they connected? Are they heating coriander? Can the seeds grow up through the electronics?
Yours Truly		What would it say?
Google Diary	You wonder where it is all stored?	How long did it take to fill this? What do you need it for?
Lakeland Data Stone		Can nature be stored in a SIM? Memory card? Making nature fit in a pen drive? Does it really work? From stone age? How do you put this in a computer? Maybe it could be displayed in a museum containing data from our age.

Appendix 15 (cont)



Appendix 16: Coding of individual exercise at university no.2

Section A:

1) What were your initial thoughts about the portfolio of critical artefacts?

P1: Very well-crafted objects; very well thought through. Objects were very expressive, served as provocation and reflection – however too little time for any discussions.

P2: Very thoughtful and interesting objects. Couldn't help but feel it would be nice if they worked in a conventional, functional way as well as reflective. I would say it is art at this stage. Some not all.

P3: I found them fascinating, especially the Google Diary. It is a nice experience to question things and find out what the object is about. Especially the first one or two minutes are therefore fascinating. After that they do become less interesting, as that realisation is so interesting.

P4: Visually interesting all of them. They wanted a second reading. They looked more like pieces of art. I can see them in a gallery.

P5: I found it interesting, especially how the artefacts are various and made me think about things and how they processed in a different way – stone as a memory and google which is digital turn into paper.

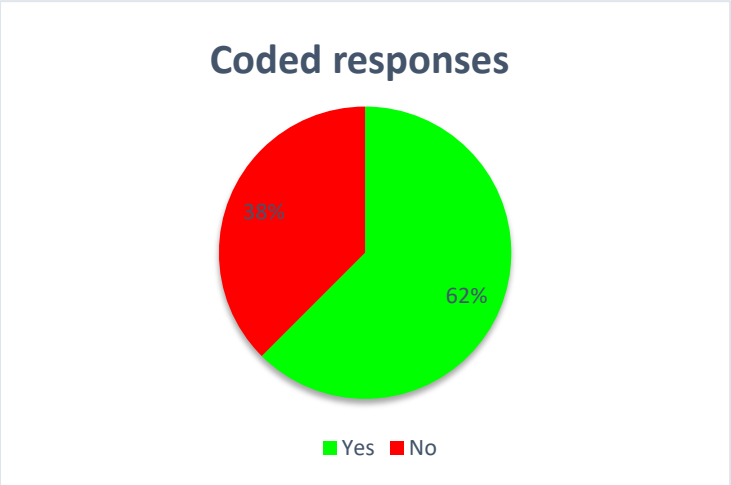
P6: Something new to think about. Most of my thoughts were related to more futuristic approach to design and how technology is making us consume more and think less.

P7: I was really excited. The artefacts are somehow related to my essay topic. I have been researching about this kind of objects. Have chance to read Stuart walker's book and it was really engaging to think about these artefacts and their relations with sustainability and unsustainability.

P8: Its weird and strange portfolio. [Unusual to have actual objects rather than a 2d representation of them]

Section B:

2) The critical artefacts were developed in order to explore the relationship between digital culture and sustainability *through* the medium of design - did the portfolio lead to any discussion about how digital culture relates to sustainability? Please explain…



Appendix 16 (cont)

P1: Very little discussion of issues of sustainability due to time restrictions and too much focus on what the objects mean rather than reflecting on sustainability issues.

P2: In order to be more realistic, I think they need to be more accepting of technology as a part of our culture which is here to stay. The Google diary is really strong because it isn't so luddite, it accepts and allows us to google but makes us think. The others seem to be saying stop using technology it's not nice.

P3: Not necessarily, mostly digital culture and the human aspect, although that is closely related to sustainability. So mostly how digital culture influences the human capabilities and values. With the seed-on-a-plate one the discussion was about sustainability.

P4: It is a very big issue. Technology has assisted us to be what we are but at the same time has created a negative impact on us and the environment. It can be used both ways. Knowledge and technology are tools. We need to find our goals and aims.

P5: Yes, digital culture should not be ignored. It is something that is impossible to live without these days so how make technology support sustainability?

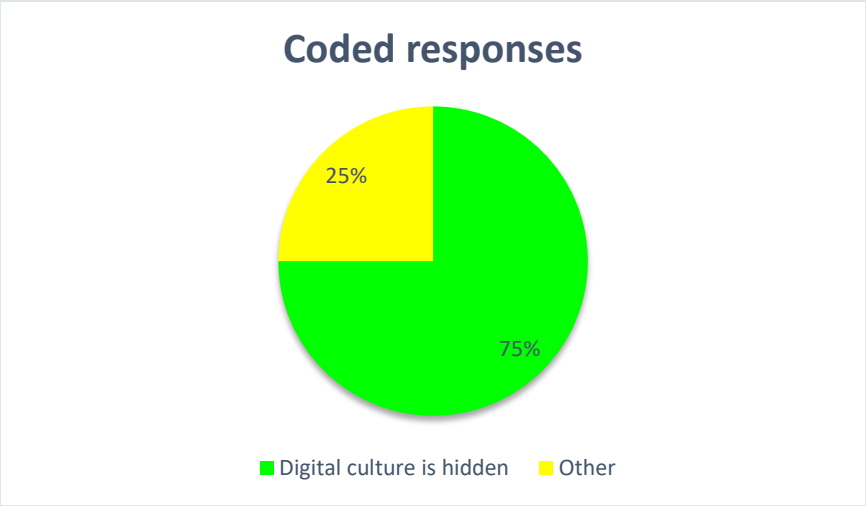
P6: Most of the unsustainable issues around today are based on digital culture adoption. Technology being an answer to all the solutions was quite clear in the presentation.

P7: Definitely did. We don't think really about our daily actions in the digital world. We take them for granted. I was really surprised when I discovered a google search has a carbon emission. And today google diary opened my horizons a bit more.

P8: When it comes to digital culture it is easy to forget sustainability issues. But the portfolio absolutely lead to sustainability due to the materials. And golden phone lead to think how can I use mobile more sustainably.

Section C:

Further analysis of "yes" answers



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P8: When it comes to digital culture it is easy to forget sustainability issues. But the portfolio absolutely lead to sustainability due to the materials. And golden phone lead to think how can I use mobile more sustainably.

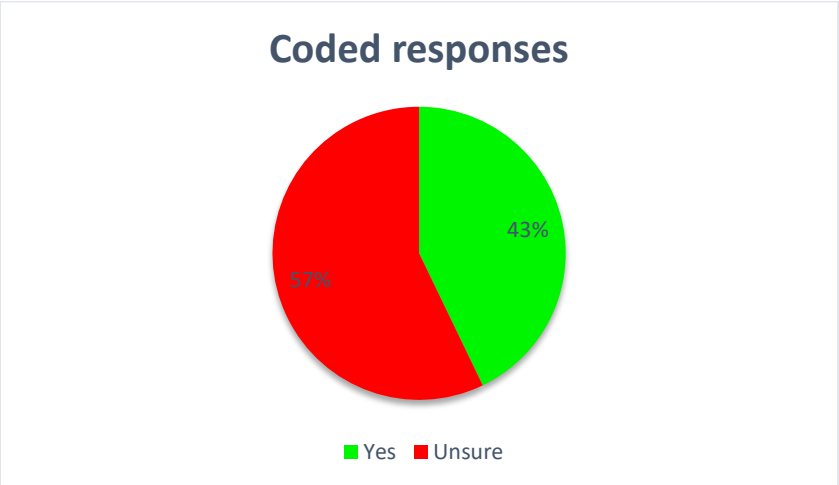
Section D:

3) Following today's session, do you think you might experiment with Critical Design practice *as a means of investigating issues* within your own design projects? Please explain.

Yes

No

Unsure



P1: Having worked professionally in technology development it is difficult to see how the philosophical-critical approach to the design process could be reconciled with the technology-market driven development and design practices in industry. How would that work?

Appendix 16 (cont)

P2: Have done in a project at the beginning of the year. I believe it's a very important part of contemporary design. But… I don't think its best audience is designers if they are to have impact. I think the real value would be in discussions with non-designers, People who aren't traditionally critical of design.

P3: Yes, although I have been thinking of that previously already. I have quite mixed feelings about it as I also have the concern – that was also discussed today that it sometimes tends not to have 'sense' or 'purpose' so I did not yet make my mind up on that.

P4: I might do.

P5: In some maybe but generally not because I'm focusing on learning methods in design education.

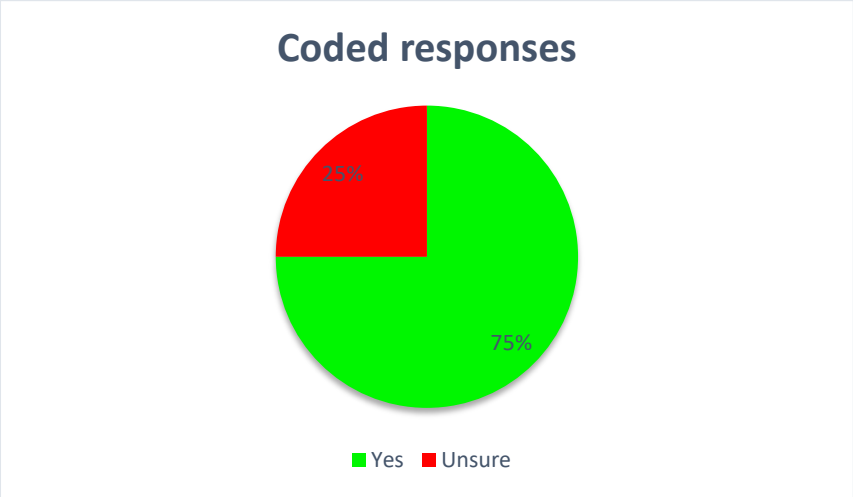
P6: It might help in my major project proposal. This is an engaging way of getting feedback from audience and those participating in the research.

P7: Yes. I didn't know much about Critical Design. It looks very related to issues around sustainability.

P8: Yes, using physical and touchable stuff encourage audience to engage and take participation effectively.

Section E:

4) Have the artefacts you have seen today developed your understanding of designing for sustainability in any way? Please explain…



P1: Yes, but it leaves many questions open. How can we incorporate values-focused design into existing design practices?

P2: No response.

P3: In a way they did as I have felt distant towards Critical Design earlier, and this session made it closer to me. Probably also because of genuine doubt about things you seem to have (such as the purpose of Critical Design) so that really appealed to me and made it much more appealing to me.

P4: The theory behind them did. The objects are one-offs or even 'prototypes' and as such have a minimum impact. They can initiate thoughts.

P5: Yes of course. Today's presentation showed philosophy of tech and its relation with design and how to consider human values in all this process.

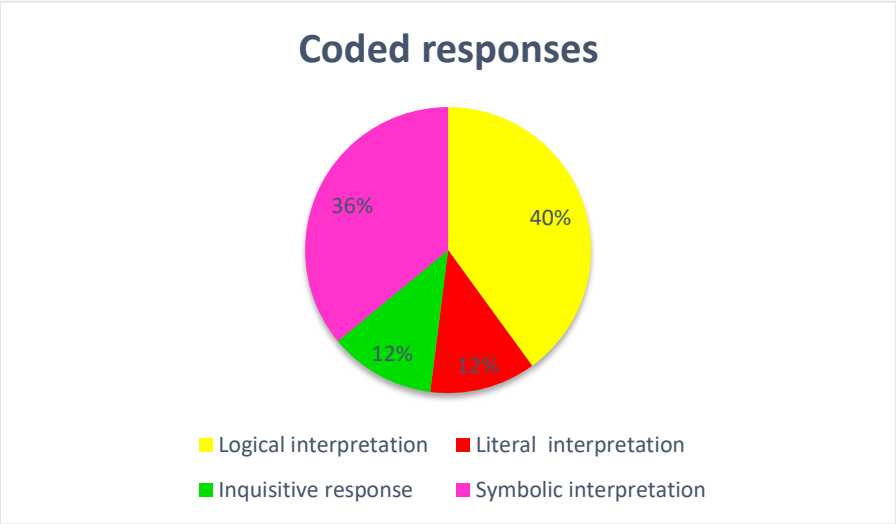
P6: It's a different approach to sustainability. I believe in sustainability which allows people to get away [dispose of I think?] with their products. But this is more like emotional products making people attached to their past.

P7: I believe designing more meaningful objects will postpone the object disposal and shift us from having to being with what we have.

P8: The paper which given along with stuff could be explained more about the meaning or values, instead of quote.

Appendix 17: Coding of group exercise at university no.3

A. Earth Re-charger:



Packet of seeds - phone battery - bowl of dirt.

Ideas are the seed, technology helps them grow.

It doesn't look plausible.

Seeds being fed in - artificially engineered – futuristic.

That's a Nokia battery.

Electronic feed implementation.

Catalyst.

You'd think it would be held together much more.

Link from technology to nature.

Technology to grow.

The plate is the beginning.

The plate represents presentation.

Technology is the key.

Moving away from tradition.

Nature

Beginning

Farms

Growth

Soil

The result could be not the one we see.

Nature vs nurture

Technology is becoming used in such a natural progression

Difficult to tell what influences what it is – seeds and battery + growth?

Is it the grown plants that are still connected to the seeds?

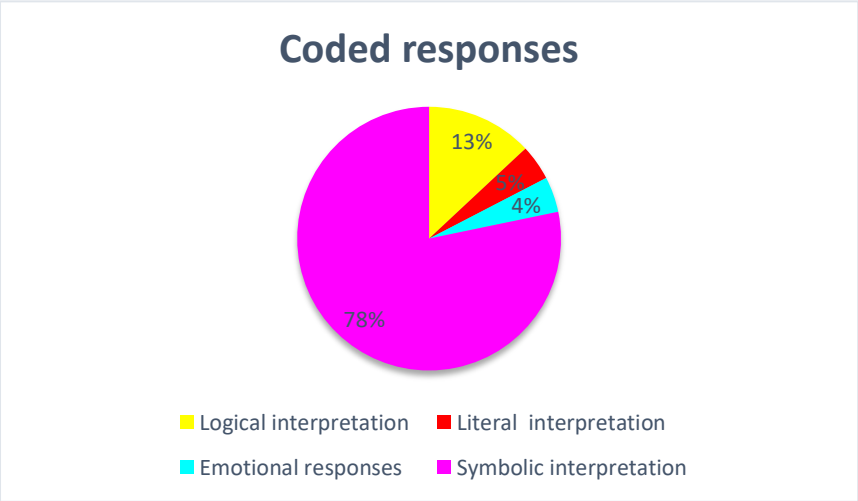
Is it about results or connections? Network, download

Wires circuit

Transition – nature to technology.

Visual reflection of what it is but not the actual seed or plant – this what we see seeds fed by battery, battery shows the plant in the future.

B. Anaesthesia:



When they get loud give them this tablet to calm them down.

Anaesthesia for kids?

Being put to sleep – people use them before bed.

This thing has a HDMI port – what on earth?

Open up a sleeve in your arm and slip it in.

You're not going to put that inside you, are you?

People are self-prescribing using the web?

Confused – I get it now. Technology is making us numb to the real world.

Technology stored.

Tablet and medication tablet linked.

Technology is a drug.

Addiction.

Technology is taking away social interaction.

The power of technology to make us lose feelings of the world around us.

Appendix 17 (cont)

Dependency

Hypnotic

Easy, addictive

Dangerous

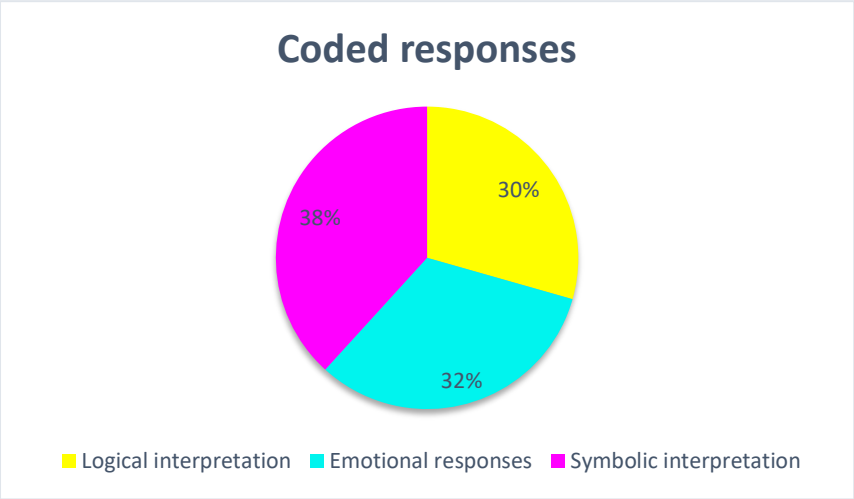
Seductive

Technology is beginning to take over everyday life and control us.

Distraction

A tool – reinforcing

C. Google Diary:



Probably most interesting.

Used for advertising.

I feel wrong looking through it – only because I know the person (prob who the person is).

Search history tells a lot about a person.

If it was my search history, it would be a minefield.

It's locked.

Nice finish.

You can see the outline of someone's life through Google searches.

You can tell what you did in a day just from Google searches.

No lock just a key 'privacy'

You feel like what you put into Google is private, but it isn't.

Can tell what you did each day. Could almost work out personal info.

Holy book (bible)

Appendix 17 (cont)

History

Memory

Blog in form of book.

Past experiences.

Mystery

Religion

History

Exciting

Curious

Interesting

Log of one's life

Knowledge

Intimidating

Physical – makes it real, frightening.

Humbling – we are facts and figures

Useful

Self-knowledge – you can see what you were interested in for a year.

Unbelievable amount of info. Huge.

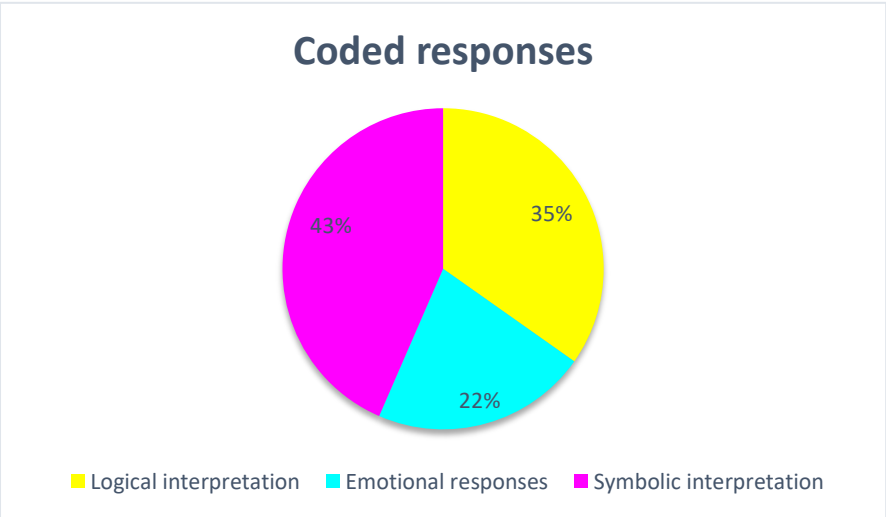
Is this all you will remember?

Dependable

All world in google (google it – our answer to all questions)

How google is the modern day secret keeper

D. KintsugiPhone:



Interesting.

Cool.

Traditional technique used on a modern object.

Best of a bad situation.

Seriously, that's awesome – an old concept in something so modern.

Valuing damage – interesting take as usually damage depreciates value – scars stories.

I have a 3-year-old iPhone – I like the fact it has lasted so long.

Broken phone

Nothing last forever

End of life

Common

Appendix 17 (cont.)

Distraction

Change in technology

The value of technology

Taken for granted.

No value – replaceable tool.

Historical value

Gold=wealth

Something that used to be very valuable then damaged so no longer valuable or worth anything. Gold added then suddenly important again.

Connection to the past

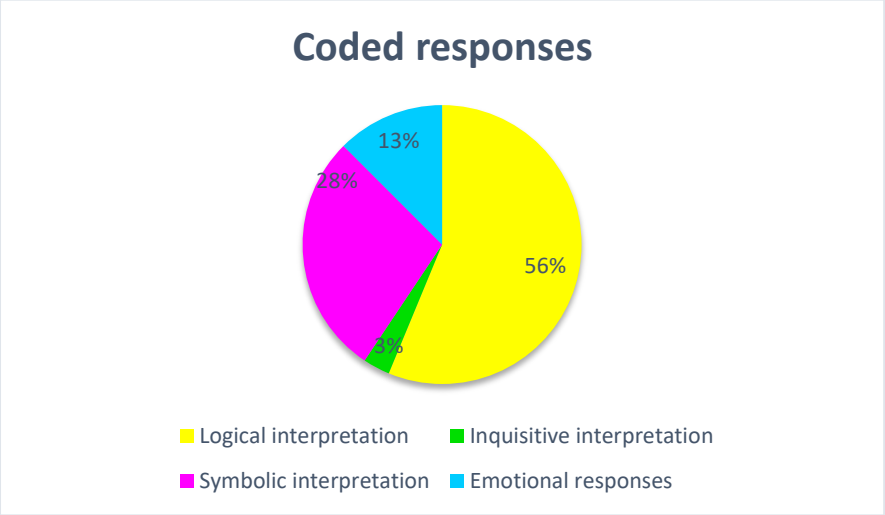
Adding value and culture to the present

Beauty

Everything can be re-used.

Appendix 17 (cont)

E. Yours Truly:



Can't be opened - once read broken the seal.

It's already happened once you put on the seal

Old takes on new tech, obsolete use.

I like the seal.

Traditional seal on modern communication – like the 'read' 'unread' function of email

Email kept traditionally.

Technology stored in an old way.

Locked away email.

Safely stored.

Traditionally kept safe.

Old fashioned.

A form of technology stored physically.

Personal items.

All have a history.

Most memories are stored digitally.

Trying to bring back old traditions.

Valuable

Grabs your attention

Official

Expectation of importance (important information)

Tactile

It makes you want to keep it.

Keepsake?

Uncontrollable flow of information

Cannot exist without phone or tablet

Digital life

90% junk! 10% value

Vulnerable

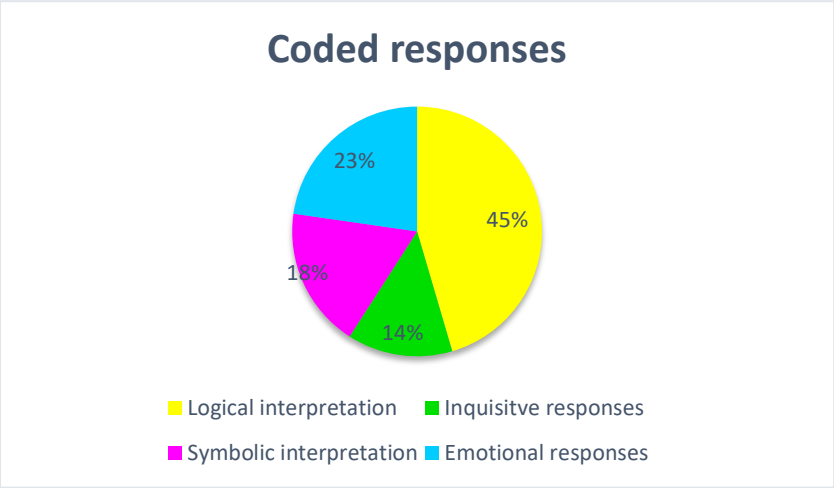
Cautious

Personal security.

Something that is simple communication.

Connections between past and present.

F. Lakeland Data Stone:



How is this made? Does it work?

Why? Should this even exist?

It's just a stone and a memory stick. Why is it cool?

Nature and technology combined.

Link between technology and nature.

You probably won't forget it, leave it plugged in

is it art?

Digging deep into history to find memory (memory stone, google diary)

Stone age storing memory

Fragments storing memory

High value

Meaningful, valuable.

Precious.

What comes from the ground goes back to the ground.

Appendix 17 (cont)

What is a value of our life?

Interesting through contrasts

Surprising how well the natural and the human-made come together.

Tactile.

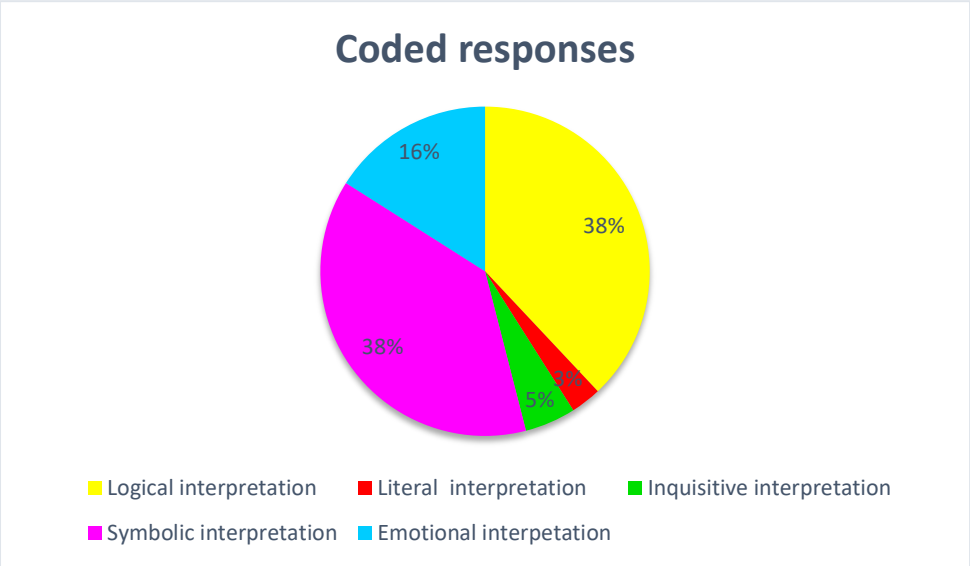
Calming (?) cannot explain it – natural.

Around for years the dents and chips store and show its history and memories.

Memory chips – holds and stores memories.

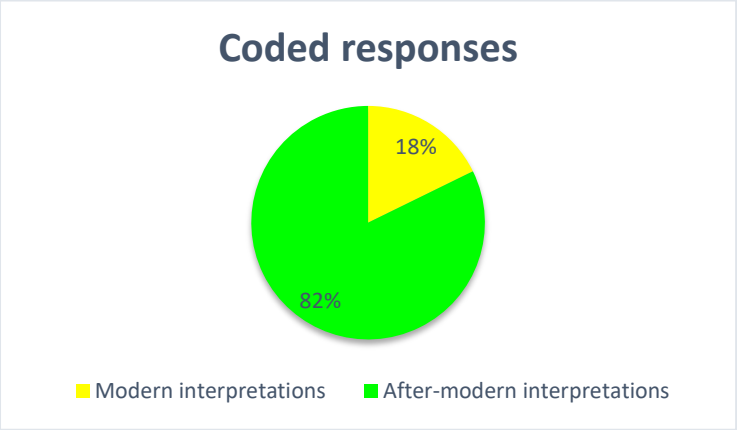
New vs old.

G. Total responses:



Appendix 17 (cont)

H. Total “symbolic” responses:



Artefact	Modern	After-modern – recognise critique?
KintsugiPhone	The value of technology Taken for granted. No value – replaceable tool. Nothing last forever End of life	Valuing damage – interesting take as usually damage depreciates value – scars+stories. Adding value and culture to the present Everything can be re-used. Distraction Connection to the past
Earth Re-charger	Ideas are the seed, technology helps them grow. Technology is the key. Seeds being fed in - artificially engineered – futuristic. Technology to grow.	Moving away from tradition. Technology is becoming used in such a natural progression Nature vs nurture The result could be not the one we see. Transition – nature to technology.
Yours Truly		Traditionally kept safe. Trying to bring back old traditions. Uncontrollable flow of information Cannot exist without phone or tablet 90% junk! 10% value Vulnerable Cautious Personal security. Most memories are stored digitally.

Google Diary	Self-knowledge – you can see what you were interested in for a year. Dependable	Search history tells a lot about a person. You can see the outline of someone's life through Google searches. You can tell what you did in a day just from Google searches. No lock just a key 'privacy' You feel like what you put into Google is private, but it isn't. Can tell what you did each day. Could almost work out personal info. Log of one's life Humbling – we are facts and figures All world in google (google it – our answer to all questions) How google is the modern-day secret keeper
Lakeland Data Stone		Link between technology and nature. Meaningful, valuable. Precious. Around for years the dents and chips store and show its history and memories. What comes from the ground goes back to the ground. What is a value of our life? New vs old.
Anaesthesia	Being put to sleep – people use them before bed.	When they get loud give them this tablet to calm them down. Anaesthesia for kids? People are self-prescribing using the web? Confused – I get it now. Technology is making us numb to the real world. Technology is a drug. Addiction. Technology is taking away social interaction. The power of technology to make us lose feelings of the world around us. Dependency Hypnotic Easy, addictive Technology is beginning to take over everyday life and control us. Distraction Dangerous Seductive

Appendix 18: Coding of individual exercise at university no.3

Section A:

1. What were your initial thoughts about the portfolio of Critical Design practice?

P1: quite thought-provoking and design-centred, innovative thinking was a part of it too. Modern technology fused with nature and traditional items.

P3: It was unexpected. It had a very new feel to it, very thought-provoking. I found it very interesting to see so many concepts / elements come together like that. The concepts for the objects very unexpected, but the objects themselves looked very plausible, which made me consider the possibility that this might be how our future / the future of design could look in some cases.

P4: Thought-provoking. The connection between the objects draws your attention. All objects have some digital nature to them. The iPad and iPhone are certainly important anaesthesia devices.

P5: linking factors of technology. Lots of discussion on nature's relationship with technology.

P6: I thought the Critical Design practice is an item that I have to look after for the next four weeks, however it is something that is personal.

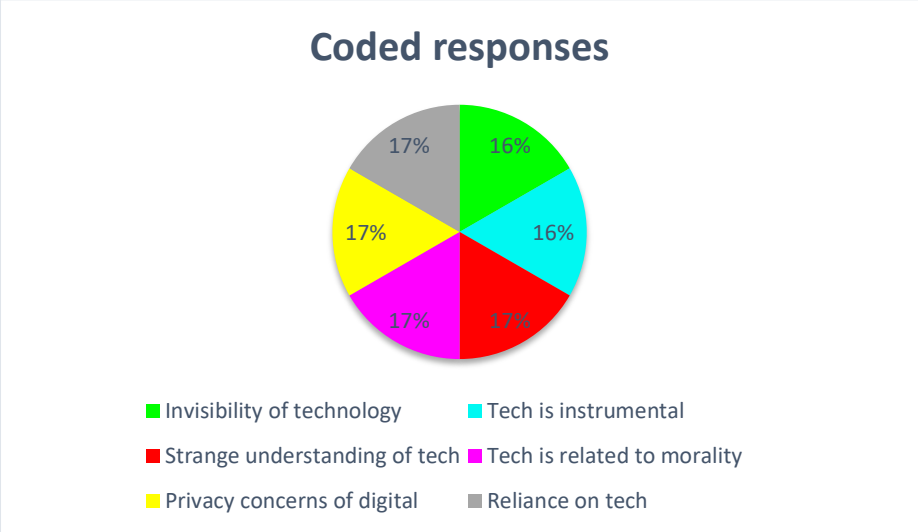
P7: It made me think. I first thought how they relate from both past and present and how things have much more contrast.

P9: Initial confusion – questioning. Realisation of Critical Design. Searching for meanings – very wide array of artefacts and meanings.

Appendix 18 (cont)

Section B:

2. What (if anything) has the portfolio led you to think about?



P1 The way old things and new things can be together and exist in the same plain, almost like a loop of being, we constantly come up with new ideas for the same concept over and over again. This will happen forever. (this is really interesting - seems to be getting at the folly of what we do? Hints at do we really need to do the things we do – this links with historical context – productivity, efficiency etc)

P3 mainly about the way technology has managed to blend in so perfectly in our environment (and the extent to which it has done it). It made me more aware of just how intrusive technology is.

P4 Spot broken iPhone screens in people's hands and how they look. They lose this meaning of precious thing – they look ugly but many people not repairing them. (objects led to awareness of environment to some extent and consideration of phenomena – phones are not valued or repaired)

P6 Memories and history of each personal item that was presented, how each one has a history behind it. It led me to think about how much we rely on technology in our lives. (realisation of technology)

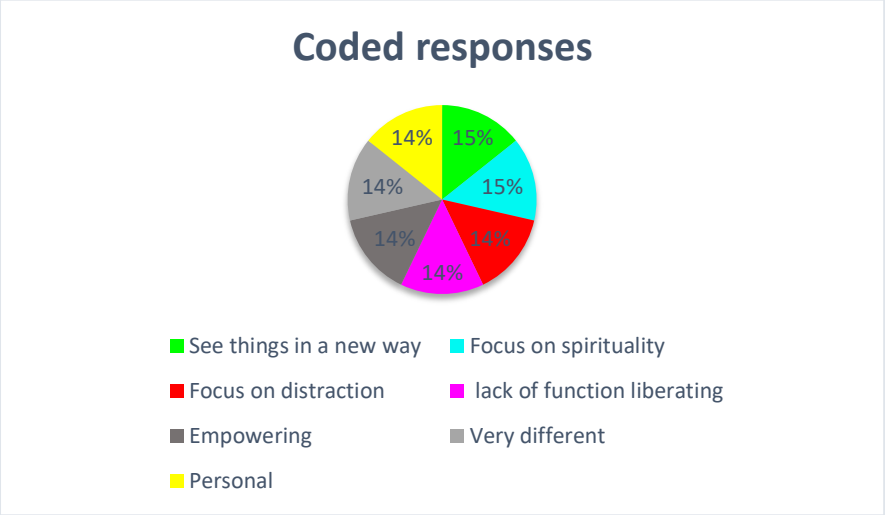
Appendix 18 (cont)

P7 How we are changing and adapting morally and technology-wise as well. (link made between tech and morality)

P9 Issues of privacy on the web (Google diary)

Section C:

3. How do you feel about the prospect of making your own critical artefact?



P1: Quite a task, there's so much stuff I can do its almost limiting to think about. Distraction seemed like an interesting topic.

P3 Excited. It seems like an opportunity to re-analyse the world around me and come out of it with a clearer picture out of it. Either way, it's a chance to offer input about the world around me through design, if nothing else. It's a challenge that I'm more than happy to answer to.

P4: Confused because I don't know what to focus upon. Maybe spirituality.

P5: Excited. It seems almost like an art brief – we need to come up with something, but it doesn't necessarily have a use.

P6: I have not thought about it – I feel it would be really complicated and personal.

P7: Excited as it gives me the opportunity to be creative and make a statement. Makes me think and develop my ideas.

P9: Excited (Critical Design is relatively new to me so excited about exploring it). Slightly apprehensive – very different to design I am used to so have to try something new.

Appendix 19: Reflective account of participant no.2 at university no.3

1. Over the years, designers and inventors came up with revolutionary ideas to help people with everyday problems, for example cars. The purpose of a car is to travel to other places very quickly. Cars is one of the biggest problems in the world, because of how much its contributing to global warming. It is polluting the air which is causing deaths in many places and changing the climate. Climate change and deaths of many species could have been prevented if only designers and inventors applied sustainable design into their ideas from the beginning. The reason why I think sustainable design is important because it makes designers and myself think about the safety of the environment, surroundings, users, and the future.
2. I was investigating on how I spent my childhood play time, compare to children in this era. The artefact I created is a tablet case because every child in this era are on tablets, playing games or browsing you tube. I was raised in the 90s, I did not have any tablets, I had action figures such as, hulk, power rangers, thunderbirds and many colourful toys. I wanted to share my experiences, feelings and imagination through this case. My intention was to make children in this era to buy similar toys and play, which will make them free from this tablet that they are imprisoned. The tablet case I have created is weak because all the pictures of the toys are back of the case. First thing when you hold a tablet, you see the screen and children get too excited which makes them forget about the back. To make the children look at these toys, I must develop this by turning the case into a flip case, so to access the tablet children must look at the toys on the front of the flip case and then accesses the tablet, therefore it should catch their attention.

3. I think creating an artefact is a very useful way to conduct an investigation because, it helps me to understand problems and solve them at first hand. It helps me to think more openly. I remember and learn more when I do stuff practically instead of researching on the internet and writing reports.
4. The main challenge was for me is, how can I free a child from this tablet that they are imprisoned by.
5. I think it has expanded my understanding in sustainable design. Sustainable design is about how users react to the artefact/product. I have put meaning and a story to my artefact which will help adults to free their child from this tablet.
6. I make artefact all the time, to help me find innovative solutions to complex problems. I create artefacts/models in every stage of my project because, I get more real results than doing questionnaires.
7. It has deepened my thinking because before I use to design ideas without a meaning but after this mini project, I consider how can my artefacts inspire others and giving it purpose so it's not a blank object.

8. I used the portfolio of critical artefacts to give me basic idea. Most of the artefacts were related to something personal and technology. This helped me to find something personal to me, which are toys, that explores and communicates the relationship between technology.

I enjoyed everything because it was something new and challenging. I got frustrated at one point because I was running out of time but the set of artefacts helped me to generate an idea, overall a had a fantastic time.

Appendix 20: Reflective account of participant no.3 at university no.3

The desired end result for this project was for us to create a critical artefact that explores and communicates the relationship between technology and, in my case, health (but also industrialisation, climate change and the effects of big-scale pollution).
My interest was directed towards air pollution as a result of heavy industrialisation, especially in areas such as China and Mongolia. More specifically, what caught my attention was the gravity of the issues, which has reached a level most everyday people would have a hard time believing, and the fact that the destructive behaviour responsible for the problem is still allowed to continue with little-to-no repercussions.
On the matter of sustainable design there are two main points I feel strongly about: there can be no true progress in the way we build our world without sustainability, and sustainable design could very well be the best way to avoid the complete destruction of our environment.
What I found interesting working on this project was the realisation that we were not investigating simply sustainable designs, but also sustainable behaviour and how to promote it. In the end, the most important thing to consider in the making of my critical artefact was not the technology or effectiveness of it as a design, but rather the way it might influence human behaviour and the message it would send.
In truth, it was making sure that I sent the right message through my design that was likely the biggest challenge for me in the realisation of this project. In involved me spending a large amount of time dissecting the issue I was trying to address and all the ways my design might be interpreted. A significant part of my design process for this particular project was reflective, more so than I was used to.
The project, maybe because of this, felt like less of a job to do and more of an opportunity for personal expression. The process we had to undertake in the making of this project was also useful for my personal growth, in a way, as it forced me to carefully consider what I thought was the one most important issue I wanted to addressed when it comes to people's interaction with technology. In the end, what was most important to me was to address the fact that technology can take away from people's lives. I do not think technology is a bad thing, I simply think that it is sometimes used unconstructively. It takes away from the human experience, it can prevent people from living their full lives (emotionally and physically), and it can make them selfish.

I found it very freeing that the focus of the design process in this instance was not on the actual product or the technology behind it, but on expressing our take on a current issue. The fact that we investigated said issue through the making of an actual object instead of writing or reading about it was also very unique and, I believe, useful. What this accomplished was that it forced me to ask myself about the actual purpose of my design and the larger implications it might have in everyday life. It made me question the end-result I actually want to achieve by creating this product: is it about creating something marketable, or is it that I want to create something and that will have a positive impact on our society?

I personally found that the more hands-on approach to design we applied for this project was a more efficient way of doing research/ understanding a topic. It is mostly because the academically way of researching results in a large volume of date of usually good quality, out of which only a certain amount can be absorbed properly, while by actually making an artefact and getting personally involved in a project leaves a more lasting impression. It is because through creating something we make use of our emotional memory, not to mention there is much less information to get lost into, that it is can be very impactful experience. I did use box; it was good to have actual, visual examples of what our projects might be. I would have been harder for me to know where to start on making my own artefact without it.

I can safely say that I feel like I have learnt more about what it means to be a designer (and most importantly, help me to understand who I am as a designer), design for sustainability and design responsibility because of this project, and that I would enjoy doing something similar in the future. I feel more aware of the power and responsibilities as a designer, and I strongly believe that any and all designers should try to work through a project the way we did at least a few times in their lives, in order to gain better perspective and insight into what they truly want to express through their designs.

Appendix 21: Reflective account of participant no.4 at university no.3

1. Designing for sustainability became important to me just few month ago. I am still investigating and trying to understand what it is all about. I see that our world is gradually moving from industrial revolution approach towards cleaner and more thoughtful use of resources. I do believe that my knowledge as an individual how to design more sustainable solutions will be a bonus to the general sustainability movement.
2. I was investigating how technology increases our distraction and reduces our focus and concentration levels. I analysed how I get distracted by my laptop and mobile phone. I found that there 3 factors of distraction that influences personally me. One of them is a visual distractions, such as many tabs opened in one go, or pop-ups on my laptop such as notifications and advertisement, there is also the temptation to go on social media websites or browsing from one site to another in search for some mysterious idea fulfilment. Another type of distraction are sounds of notifications, alerts, and calls that come in their majority from my phone. Every sound transform non urgent things into more urgent and asks for an immediate attention. Last type of distraction is a physical one that comes from our environment and things we cannot influence such as other people switching on TV or other technology. I also looked for solutions and found many interesting ways I can help myself to stay more focused. I actually analysed my phone first time since I have got my first android 5 years ago and discovered many useful features that I never thought of existed. For example, I found that I can block notifications from most of my apps and they will stop bother me by sound. I also came up with some phone case design which will cover left top corner: the part which is the main cause of my distraction. I also examined my work while using my laptop and discovered that there many applications exist that block you from visiting selected websites. I found extension for Google called StayFocusd that I want to use myself in nearest future.
3. I think that the process of creating artefact was very useful way to conduct investigation. By actually physically creating the object it allowed me experiment with possible design ideas. When I arrived at the point of creating a prototype I start to come up with ideas of varieties of a different possible materials and actual items for my survival kit. It is clear to me now, that if I started little bit earlier with actual work on design, perhaps I could have made final artefact even better.
4. I had many design ideas around main idea of First Aid Digital day-off kit, but I struggled of rounding them up. Thought of creating fully functional, problem solving object was distracting me from Critical Design. The other challenge was my time keeping. Feeling overwhelmed because of all other projects I had to do. Another one the desire of creating by myself but realising that there not much time left, finding substitutes for the prototypes.
5. Certainly yes. If the product designed, such as my phone for example, causing distraction and uncomfortable to use, it is unsustainable. When designing in future I will pay more attention to the aspects of sustainability of my designs.

6. The project certainly evoke my interest for Critical Design and I think I would happily create some critical artefacts in a future. I found some interesting facts about history of a Critical Design and Anthony Dunne and Fiona Raby who popularised Critical Design.
7. Yes, I look at my projects from different angles now. I am asking different questions in a process of a designing, Before I just were making something I liked without deep understanding of the purpose, sustainability, etc.
8. I opened box 4 times. First, right at the start. Second on the second session, then once on our break and last time 2 days before the presentation of the project. Each time it was like the 1 st time. I was discovering something new. I always need to look at something few times before I fully digest the message. I used it as a reminder that my design has to carry message, but it does not need to be functional.
9. I did enjoy how the process was designed. I think the information was presented was very interesting and presentations were engaging and rich that gave lots of food for thoughts. The project helped me to look into what causes my own distraction. I also identified the triggers that cause my distraction, as there are is not just the technology that is a reason for my problem with staying focused but also physical and psychological factors. This project allowed me to dedicate some of the precious time to actually understanding my own focus problems and finding some interesting solutions

Appendix 22: Reflective account of participant no.5 at university no.3

Is designing for sustainability important to you?

I feel very strongly about sustainability seeing as we are all aware of how much damage is being done to the planet and how fast we are running out of certain resources. There are so many consuming forces in the world and we really need to watch how much we consume through sustainability.

What were you investigating through the process of creating a critical artefact?

This critical artefact is an exploration into the relationship between technology and traditional notions of childhood.

Do you think that creating an artefact was a useful way to conduct an investigation?

I think creating this artefact is a good way of casting a critical eye and putting across your personal viewpoint on a subject area, which seems basically what you would do in a report. So in essence it is very much like a report but responding in a much more visual and physical way. It is a rather useful way of looking at a subject area as in the creation of your critical object you have to really think about what you are trying to say about your topic and pick out what is bad and what is good. When creating a critical object there is a lot of freedom to be funny, maybe create something very sarcastic, which very much plays to my sense of humour.

What were the main challenges you faced in this project?

The main challenge I faced I think was trying to stick within an area within technology, for instance I kept coming up with ideas that linked to technology but didn't link to the area of childhood. It is often the case that you may hear about other people's work and immediately get a few ideas for what they could do but then coming up with ideas for your own work can sometimes be more difficult. At first thinking of only the relationship between technology and childhood was hard but it took some focussing and asking questions to myself about the relationship between kids and technology.

Has creating a critical artefact enriched and/or expanded your understanding of designing for sustainability?

Creating a critical artefact probably hasn't expanded my understanding of designing for sustainability, I found it quite difficult to see the link between sustainability and my critical object. Possibly because when creating my object I almost went out of my way to create something to almost give kids a reason not to go outside or talk to each other face to face. I guess in a way it could give children a more sustainable way of doing outdoor activities through not having to leave their house and doing these activities on a format they are used to, a screen hooked up to a games console. Also in another way my critical artefact was very unsustainable as it doesn't really serve a great purpose it is possibly a waste of more resources, adding to the market of all the crap that is available. So perhaps it is important to think when designing something, "is this going to add anything worthwhile to the world?"

How likely are you to create critical artefacts as a means of investigating issues in the future?

I would like to create critical artefacts as a means of investigation in the future, it could throw up some interesting ideas quite possibly within a bigger design process. Through creating a critical artefact you have more freedom to come up with ideas that are maybe more outlandish and unrealistic you can really ask questions like "what if?" It is then quite possible for one to reflect on the critical artefact and maybe gain inspiration for an idea that is more realistic and that could work in today's society. I would like to think of the kinds of ideas for critical artefacts I could have come up with for the 'Death project' and see how that could have fed into more ideas for a possible outcome.

Has the process of creating a critical artefact deepened your thinking about designing in general?

This process of creating a critical artefact has made me think more about my design process more. Perhaps during the researching stages of projects I could come up with ideas for critical objects just as a quick response in the hope that I can further reflect on these objects and make something better suited for whatever brief I am tackling.

In what ways did you use the portfolio of critical artefacts that you were provided with at the beginning of the project?

In all honesty I feel like I could have maybe used the portfolio of critical objects much more effectively than I did. For instance at the beginning of the brief I did look through the pieces to look at what were the links between them, and whether there was a theme or not. I also looked a few days later to see what kind of finish they were, and how they were executed which made me think "what do I need to do to get to this stage?", "how finished does it need to look?". But pretty much from when I had decided my subject area I really didn't utilise them. This was possibly because I felt my outcome was focussing on a different area and that I felt I just needed to focus on the area of childhood.

What did you enjoy and not enjoy about the project?

There was a lot to enjoy about this project, it is a very freeing prospect to almost pick out problems but with no pressure to solve them. From what I understand of Critical design now is that it is more about the finding of the problem rather than solving it. With critical design you are free almost to imagine about dystopian futures and design for those, rather than just for today's problems, but these imaginary dystopian futures may also be an amplified version of actual problems that are happening today, making it easier to relate to.

Appendix 23: Reflective account of participant no.6 at university no.3

Designing for sustainability is really important to me because we have been left with the Earth in a state where it really need to be carefully looked after and new inventions that are very resource wasteful or damaging to our planet are not acceptable. It will only make living condition worst, not just to our generation, to all the generation in down the line.

I was investigation about the relation of privacy and technology.

The process of creating an artefact helped me understand what my topic is really about by making me think of all the different aspect of my topic, and majority of it I never would have considered if I were doing research on the internet and writing an academic report about the same topic.

There two main challenges I faced in this project. One was deciding on a specific topic because the brief was very broad. The other major challenge was thinking, how I can create something that translate everything I want to say into one artefact.

Creating a critical artefact has made me think of what resources would be the best to translate what I want to say to the audience through the artefact. It also made me think, if I would to mass produce this artefact, what material I would use for a more environmentally friendly approach, something that is recyclable definitely.

For something that is really complex, and I want to improve a certain product for any reason such as power efficiency or sustainability. It would definitely worth creating a critical artefact, so I can see the process of creating the product and all the material used.

The process of creating a critical artefact has made clear to me that there are million possible ways of designing something and no matter how bad you think the end result will be, it might not be what other people think and it likely to be better than what you originally thought. So, don't be afraid to make something.

I used the portfolio of critical artefact as inspiration and idea to create my own artefact.

I enjoyed the majority of this project such as creating the artefact and the freedom to choose my own topic. I enjoyed the lack of academic writing and documentation of this project. There was not really anything that I did not enjoy about this project. If I do have to say something, it would be the PowerPoint presentation we had to sit through.

Appendix 24: Reflective account of participant no.7 at university no.3

1. Yes, I personally feel that design sustainability is important to me as if we were not to design in a sustainable manner, we would not be doing what is right morally and environmentally. If we were to create something that works as a design but is damaging to social, economical and ecological welfare, then we have failed as designers as we are not being sustainable, we are being wasteful.

2. I studied the relationship between technology and medicine. The theme that I pursued was the fact that socially we are now becoming more dependent on medicine for simple things such as colds and flus. When we are more than capable as human beings to recover from these illnesses without buying and consuming technologically made medicine. The simple solution to this would be to be healthier and eat healthier and consume multi-vitamins and organic products to boost our immune system.

3. I think that creating the artefact was a great way to explain and conduct our investigation as it gave us a huge sense of freedom and allowed us to be creative and physically express our ideas. It also was very different to what we usually do we either have to write a report or create a written explanation of what we would create. This has given us the ability to grow as designers as we have actually physically been able to make the object and allowed us to use our train of thoughts and problem solve to create an object all the way to the end, not just in theory.

4. Main Challenges-
Making the object, finding the right material and problem solving and developing the object.
Being able to correctly express our theme through the object so the viewer would be able to understand the reason for the object.

5. It has enriched my understanding of design for sustainability, as the freedom of being able to choose my own topic meant that I was excited to research and learn about the topic. Which therefore made me understand the sustainability which designers need to think through.

6. I will most definitely create a critical artefact in the future to express future designs as I found there was a lot more freedom to be creative and an actual designer rather than just creating the same old reports, and never fully understanding the whole process of designing.

7. Yes, it has deepened my thinking as I had to think about all the aspects of creating an object and designing an artefact other than just thinking of an idea and then theoretically thought of the problems that might occur.

8. The box was very helpful for me as it helped me to think of a theme and think of what kind of artefact that I might want to create. It was very inspirational because the objects were so unique and interesting, such great ideas with deep meanings displayed so simplistically and portrayed the message very well.

9. I enjoyed the freedom of the project and feel that this has been my favourite and most fulfilling project throughout the year, as it has allowed me to express myself. As this has been one of the few projects we had such individual freedom on.

Appendix 25: Reflective account of participant no.8 at university no.3

1. It is important for me to take sustainability into consideration when designing as it's vital to be aware of your surrounding environment particularly if we want natural resources to sustain.

2. I investigated the relationship between technology and human relationships. I was looking into how technology has become quite overpowering as we practically live on our mobile phone. I was paying particular attention into how difficult long distance relationships can be a struggle to maintain with the use of technology.

3. I certainly preferred creating a critical artefact rather than most methods as it certainly enables you to think and ask questions more. Overall, I found it extremely useful as it has opened my eyes to new kinds of challenges we have to face as designers.

4. I faced a few difficult moments throughout the project, the most obvious being that my chosen subject was very personal which made it hard for me to think of ways to get the message across. Actually, constructing my artefact was tough as I found it difficult how I was to show the indication of a relationship breaking down over time, which I decided to go with the idea of the cracked phone.

5. Creating my artefact certainly has opened my eyes to the relationship between technology, human-relationships and sustainability. Particularly the way I have shown the link between the 3, I feel as though there are many possibilities in sustainable design

6. I am likely to use this method again as like I mentioned earlier, I found it useful to be able to look at a physical object and analyse what it could without having read anything. This way it generates ideas and thoughts a lot quicker.

7. It has certainly deepened my thought as to say if I was to come up with a design, I would certainly want to create something which made people think and wonder whether there is message being told and what it means. To focus a lot more on the story behind it.

8. I was very intrigued by the Critical Design practise portfolio. I liked the fact that we were able to guess and to question what each artefact was. It was almost as though each artefact had many meanings. They helped my thought process when I came round to creating my own artefact.

9. I liked the fact we could be out of the ordinary with our artefacts. However, I don't like it when the brief it too open to the point where we can design absolutely anything. I am kind of contradicting myself by saying

that but in general, I thoroughly enjoyed this project and it gave me a good insight into the design approach a little bit more.

10. I was very intrigued by the Critical Design practise portfolio. I liked the fact that we were able to guess and to question what each artefact was. It was almost as though each artefact had many meanings.

Appendix 26: Reflective account of participant no.9 at university no.3

Design for sustainability is something that I am interested in and thought at the start of the year thought I had a good understanding of. Until recently, during the year I have discovered sustainability is much more complex than I previously believed and practices I believed to be sustainable have been proven to be unsustainable. Design for sustainability is important to me as, it is what could save the planet, but it is something that I need to look at further and look at the true complexity of it. My Investigation was between technology and sleep, I felt that technology was more and more brought into places where it was not necessary, like the bedroom, smartphones replacing the alarm clock. Technology is being seen as the obvious solution to most design issues and as such I feel is becoming a distraction and intruding things like sleep instead of having the positive effects expected. Creating a critical object was useful when investigating this field, it allowed me look at the problem from a personal point of view, I was not reliant on research and points of views of more experienced people, I was able to think about the issue from a purely personal view point. As such the artefact produced was more an expression of my thoughts than an embodiment of other people's research and ideas. This is different to how most work I have produced and this allows me to express different thoughts in a more interesting and enjoyable way and gives a very different output that allows me to express my feels and is a link to thoughts and points of views. The process was no less difficult or educational than more traditional work methods but the actual output to me only a few minutes to knock up and is still a very thought-provoking object. The challenge I found producing an object of Critical Design was defining the issue I want to address, I found I spent the majority of the time figuring out exactly what the issue was that I wanted to address was. Once I had the issue completely defined, coming up with ideas for the artefact was relatively straight forwards. I feel like I do know more about design for sustainability but without feeling like I have been studying it. I released design for sustainability was a much larger than just an environmental concern and by working in a social field of design I have gained an appreciation for this side of the field. I hope to do more Critical Design in the future, it's a field that since September is new to me but something I have fund really interesting, and now knowing it can be used as a tool for investigating a field means I will endeavour to use it in the future, as a tool but hopefully as a final output. I find it far more interesting than traditional research methods, it does gather different results though which means it would work well alongside more traditional methods to gain a much wider base of information. I feel I have been opened up to a new field of design that I did not know about until recently and when I did think was quite exclusive. I hope to use Critical Design more in the hope its philosophy filters down into my design practices. The artefacts you provide helped me to further understand what Critical Design is. It is still relatively new to me and despite researching it and writing a report about it, I think the artefacts helped me better understand Critical Design and having them helped me see what I was aiming for. I had thought Critical Design was this exclusive gallery setting practice, but these artefacts opened Critical Design up to me, showing me it was an obtainable thing. The project was very enjoyable as it let me explore a field of design that was alien to me but I am interested to learn about. Also having the opportunity to build something and work alone on a project was quite refreshing. Looking back on the project and reflecting on the

piece was also really useful and interesting, it opened me up to different ways of looking at my artefact and made my interest in Critical Design grow even more.