Wrapped Attention: Designing Products for Evolving Permanence and Enduring Meaning

Stuart Walker

Introduction

If we were to walk down a busy street, sit in an airport departure lounge, or take a journey on a train, we would be certain to see many people using a variety of small electronic goods. They might be listening to music on headphones, having a conversation on a mobile phone, taking a photograph with a digital camera, or sending an e-mail on a laptop computer. Sometimes, people engage in several activities at the same time (see Figure 1). Such sights have become ubiquitous, and they raise a number of issues related to our current conceptions of products. The conventions that underlie how electronic products are designed are not only linked to how they are made, the longevity of their use, and what happens to them after their useful life has ended, but also to how these products are used and the kinds of use they encourage. All these factors have implications for the responsibilities of industrial design in the twenty-first century, not only in addressing concerns about sustainability but also in terms of how our conceptions of products are related to understandings of human purpose and fulfilment.

This discussion begins with an examination of the triple bottom line of sustainability, which it expands to include "personal meaning." The relevance of this fourth element becomes evident in light of recent research that suggests multitasking and partial attention, as are common in the use of electronic devices, can have detrimental effects on behaviors and values that are related not only to social responsibility and environmental stewardship, but also to substantive notions of meaning. We consider the design challenges raised by these issues, which then leads to the development of a set of new design priorities that seek compatibility both with sustainability, through more distributed production/service enterprise models, and with more reflective product use patterns. We then explore the implications of these priorities via a series of conceptual designs.

The propositional designs that emerge from this study, which are not intended to be commercially viable products, transform general principles into specific, tangible objects. Naturally, many other design outcomes are possible. However, it is hoped that the examples presented here serve to illustrate the potential of an

Figure 1
Multitasking—talking on the phone and searching on an MP3 player while walking

alternative direction—one that not only appears to offer a fruitful way forward that is more localized, more flexible, more enduring, and less socially and environmentally damaging but also is in accord with enduring notions of personal meaning.

Beyond the Triple Bottom Line

Sustainability is commonly expressed in terms of the triple bottom line, which refers to the interdependent economic, environmental, and social factors associated with human activities.[1] In recent years, some have suggested that a fourth element is needed, but there seems little agreement on what it should be; it often appears to be determined by the particular roles of those suggesting it. Some, among them local governments, have proposed a quadruple bottom line that includes "culture,"[2, 3] others identify the missing ingredient as "governance,"[4, 5] and still others suggest "culture/ethics."[6] Although these options might add a useful focus for certain sectors, none are especially valuable in advancing a more personally compelling understanding of sustainability, nor do they address the relationship between our activities and more profound notions of human purpose and fulfilment. Indeed, all these propositions can be subsumed within the triple bottom line. Aspects of governance, culture, and ethics are related to social relationships and the development and well-being of communities and therefore can be included in the social and/or economic considerations of sustainability. What is missing from the triple bottom line is explicit recognition that human beings are not only gregarious creatures, but also individuals. Further still, we are individuals who are meaning-seekers.[7]

To ensure that our activities are both relevant to us as individuals and substantive, we must include an additional element in our conception of sustainability that recognizes the importance of this inner, more profound characteristic.[8] To this end, some have suggested that the fourth ingredient should be spirituality,[9] and it is certainly true that this term conveys an expansive range of understandings and practices that are intimately related to meaning and the individual. However, for some, this term may be unacceptable because of its close associations with the soul, the sacred, and religion. For this reason, and recognizing the importance of substantive values in linking sustainability with the individual, the fourth element of a quadruple bottom line for sustainability proposed here is "personal meaning"—a term acknowledging that sustainability has to be relevant and meaningful to the individual person, as well as socially responsible, and it is broad enough to include a wide range of activities that different people find meaningful and enriching. This is *not* to say that any and all activities will be meaningful; the emphasis here is on those choices that are congruent with deeper values[10] and those more profound, meaning-seeking aspects of our humanity. Through advertising and marketing, we

1 Tracy Bhamra and Vicky Lofthouse, *Design for Sustainability: A Practical Approach* (Aldershot, UK: Gower, 2007), 15.

2 "Sustainability and QBL," City of Norwood Payneham and St. Peters, Australia, (2009): http://www.npsp.sa.gov.au/site/page.cfm?u=1608 (accessed 9/18/2009).

3 "Reporting on the Triple or Quadruple Bottom Line," Creative Decisions Ltd., Auckland, New Zealand, (2009): http://www.creativedecisions.co.nz/sustainable_development/reporting.cfm#faq130995 (accessed 9/18/2009).

4 "QBL—Governance, Economic, Social and Environment," Wingecarribee Shire Council, Moss Vale, NSW, Australia, (2007): http://www.wsc.nsw.gov.au/environment/1176/3953.html (accessed 9/18/2009).

5 "ToolBox 12 Reference – Quadruple Bottom Line, Department of Infrastructure and Planning," Queensland Government, Brisbane, Australia, (2005): http://www.localgovernment.qld.gov.au/docs/corporate/publications/local_govt/plan_and_deliver/toolbox_12_reference.pdf (accessed 9/18/2009).

6 Valere Tjolle, "Your Quadruple Bottom Line: Sustainable Tourism Opportunity," (presented at the SMILE Conference 2008, Guinness Storehouse, Dublin, Ireland, 5/27/2008) http://www.smileconference.com/downloads.html (accessed 9/18/2009).

7 Karen Armstrong, *The Great Transformation* (London: Atlantic Books, 2006), xi.

8 Peter Senge, et al., *Presence: Exploring Profound Change in People, Organizations and Society* (London: Nicholas Brealey Publishing, 2005), 56.

9 Sohail Inayatullah, "Spirituality as the Fourth Bottom Line," Tamkang University, Sunshine Coast University, Queensland University of Technology, Australia, (2009): http://www.metafuture.org/Articles/spirituality_bottom_line.htm (accessed 9/18/2009).

10 Colby Stuart, "How People Make Decisions," (presentation at the European Futurists Conference 2009, Luzern, Switzerland, 10/16/2009) http://www.european-futurists.org/wEnglisch/programm/Programm2009/programm2009.php (accessed 10/19/2009).

are constantly urged toward self-indulgence and pleasure-seeking. However, since the time of Plato and Aristotle, self-discipline, contemplation, and virtue have all been essential aspects of the meaningful life and substantive notions of human happiness. It is also important to note the connection between personal meaning and the other elements of sustainability. For example, deteriorating ecosystems have been linked to a degradation of spiritual fulfilment, cultural identity, and various other factors related to the well-being of the individual.[11]

It is this notion of personal meaning that I would like to explore here in relation to the design and use of electronic goods. By considering how this factor might inform the priorities of design, it becomes apparent that a remarkable synergy can be reached among economic imperatives, environmental responsibilities, social concerns, and substantive matters of personal meaning—a synergy that suggests a systemic shift in how we conceive, manufacture, use, and andre-manufacture or dispose of electronic products.

The Banality of a Shallow Blindness

It was mentioned above that people often use electronic products in conjunction with other activities, such as listening to music on headphones and typing on a laptop computer while sipping coffee as one travels on a train. When we engage in these kinds of activities, we not only cut ourselves off from our immediate environment but also divide our attention; our mind flits from one thing to another in a rather superficial, unreflective manner. In this example, it might be said that we do not allow ourselves the opportunity to be fully cognizant of our surroundings and other people, we do not fully appreciate the music or the taste of the coffee, and we do not fully concentrate on the activity in which we are engaged on the laptop computer.

Findings from neuroscience research indicate that when two tasks are performed simultaneously, we devote fewer resources to each one, and distractions can affect how information is learned, resulting in the information's being less useful in the future. Although it has been conjectured that the brain can adapt, balancing multitasking with extended periods of concentration, there is little evidence to show that this capacity to balance is actually possible.[12] The effects of multitasking on concentration have been recognized for many years, for example, in areas such as driving, where mobile phone use can significantly increase the risk of accidents.[13, 14] Recent studies have indicated that information overload and multitasking can adversely affect our ability to be empathetic, ethically responsive, compassionate, and tolerant and to develop emotional stability—all traits that, traditionally, have been associated with the term "wisdom." Our capacity for empathy, to be inspired, or to be ethically concerned has been linked to the slower acting parts of the brain that require time to reflect on the information received, and

11 Walter V. Reid et al., *Ecosystems and Human Well-being: Synthesis, A Millennium Ecosystem Assessment Report*, (Washington DC: World Resources Institute, Island Press, 2005) http://www.millenniumassessment.org/documents/document.356.aspx.pdf (accessed 9/18/2009), 46.

12 Ulla G. Foehr, *Media Multitasking Among American Youth: Prevalence, Predictors and Pairings*, (Menlo Park, California: The Henry J. Family Foundation, 2006), http://www.kff.org/entmedia/upload/7592.pdf (accessed 9/18/2009), 24.

13 M. Ritchell, "In the Car, on the Mobile Phone and Headed for Trouble," *International Herald Tribune*, European edition, 7/20/2009, 2.

14 Dave Lamble et al., "Cognitive Load and Detection Thresholds in Car Following Situations: Safety Implications for Using Mobile (cellular) Telephones While Driving," *Accident Analysis and Prevention* 31, (1999): 617–623 http://virtual.vtt.fi/virtual/proj6/fits/impacts/Lamble_Kauranen_Laakso_Summala_1999.pdf (accessed 7/22/2009).

15 John Naish, "Warning: Brain Overload," *The Times*, London, online edition, 6/2/2009, http://women.timesonline.co.uk/tol/life_and_style/women/the_way_we_live/article6409208.ece (accessed 6/2/2009).

it is these parts that appear to be circumvented when we engage in multiple activities simultaneously. Prolonged periods of multitasking via technological products have also been linked to an increase in anxiety and depression and a reduction in attention, intellectual ability, and workplace productivity.[15, 16, 17] In addition, research into mobile phone use among young people aged 18 to 25 indicates that many are using their phones for several hours a day. They become upset if their calls and messages are not answered, often neglect important activities, become distanced from friends and family, and can experience problems in developing social relationships. They also feel the need to be constantly connected, becoming distressed and anxious if they do not have access to their phone.[18]

An associated concern, related to the drive to expand the development and use of services enabled by digital technologies (e.g., Digital Britain[19]), is that these technologies offer only a filtered and unsubstantive version of reality. Despite offering "connection," they have the effect of separating us from a direct interaction with, and awareness of, our world, which serves to add to our "blindness."[20] This separating effect also applies to our interactions with other people. Caller identification allows us to choose with whom we talk, and e-mail enables us to control when and with whom we communicate; this control increases the distance between ourselves and the other—whether a friend or a stranger.[21] Text-based communications, bereft as they are of tone of voice, facial expression, and other, often subtle forms of nonverbal communication, can also lead to misinterpretations and misjudgements.

Of course, the various concerns associated with these goods cannot be addressed solely by product design. The modes of behavior that technological goods enable are partly a function of how these products are conceived and designed and partly a function of personal choice. Nevertheless, the knowledge and creative skills of the designer can play an important role in envisioning a different path—one that not only is more environmentally benign, socially responsible, and economically equitable but also, potentially, is more personally meaningful to users of these products. However, on the whole, the profession is not facing up to these issues. One critic has suggested that industrial design has been reduced to toying with the surfaces of technological products and has failed to live up to its responsibilities.[22] Another suggests that making "stuff" and the creativity related to making new "stuff" represent the past paradigm.[23] Thus, if industrial design is to address these considerable challenges, it needs to be reinvigorated with a new sense of purpose.

New Directions and the Role of Speculative Design

To confront these issues, we must find ways to renew the profession by developing agendas and propositions that envision what is desirable, meaningful, and sustainable; the responsibility to do so

16 Mary H. Immordino-Yang et al., "Neural Correlates of Admiration and Compassion," *Proceedings of the National Academy of Sciences,* 106:19 (2009), 8021–8026, available at: http://www.pnas.org/content/early/2009/04/17/0810363106.full.pdf+html (accessed 11/23/2009).

17 Christine Rosen, "The Myth of Multitasking," *The New Atlantis: A Journal of Technology and Society*, Washington D.C., (Spring 2008), 105–110, http://www.thenewatlantis.com/docLib/20080605_TNA20Rosen.pdf (accessed 6/5/2009).

18 Francisca L. Torrecilals, "Four in Ten Young Adults are Mobile-phone Addicts, a Behaviour That Can Cause Severe Psychological Disorders," *Science News*, University of Granada, Spain, 2/25/2007, http://prensa.ugr.es/prensa/research/verNota/prensa.php?nota=434 (accessed 7/13/2009).

19 *Digital Britain—The Interim Report* (London: Department for Culture, Media and Sport and Department for Business, Enterprise and Regulatory Reform, UK Government, ISBN: 9 78 010175 4828, January 2009), http://www.culture.gov.uk/images/publications/digital_britain_interimreportjan09.pdf (accessed 6/27/2009).

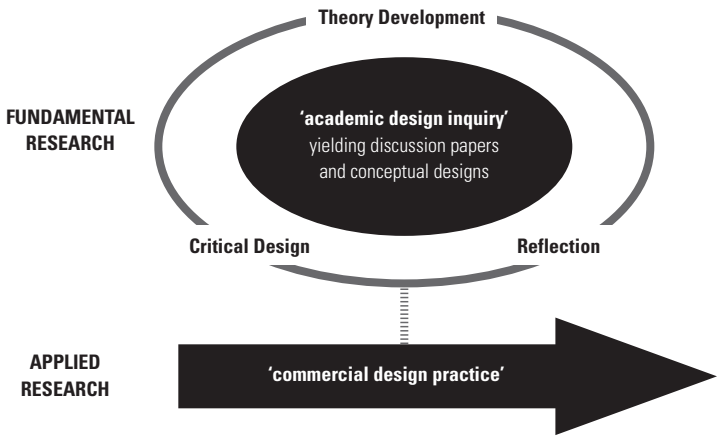
20 John Thackara, "Design and Ecology," (presentation at the LiftFrance09 Conference, Marseille, France, 6/18/2009–6/19/2009), http://www.liftconference.com/person/john-thackara (accessed: 6/27/2009).

21 Albert Borgmann, "Society in the Postmodern Era," *The Washington Quarterly*, 23:1 (Winter 2000), 189–200, http://muse.jhu.edu/journals/washington_quarterly/v023/23.1borgmann.html (accessed 9/18/2009).

22 Albert Borgmann, "Opaque and Articulate Design," *International Journal of Technology and Design Education*11, (2001), 5–11.

23 John Thackara, "Design and Ecology," 2009.

Figure 2
Fundamental design research in academia



lies partly with those in the profession itself and partly with the academic institutions that educate and train its future participants. Design in academia has the opportunity to focus on fundamental, conceptual design in ways that are often more difficult to justify in corporate culture. Design at universities has the capacity and freedom to critique current approaches, examine their insufficiencies, and explore new possibilities in ways that are removed from the day-to-day priorities of design consultancy (see Figure 2), and, in view of the urgent requirement for alternative, more benign ways forward, it has an obligation to do so.

For the contribution of design to be worthwhile and meaningful, it cannot simply produce difference and novelty as a way of stimulating sales. This perspective would diminish the discipline to a tool of capitalism and deny its responsibility and potentialto influence the common good; as we have seen, and as some have argued, this diminution is just what has happened to industrial design. Going forward, the outcomes of design not only have to offer some pragmatic benefit or usefulness, which in the case of contemporary electronic products is predominantly based on the work of scientists and technologists, but should also be conceptually in accord with sustainability and facilitate forms of use that are responsible and considered.

It is also important to recognize that the contribution of speculative design work within academia is not to develop potentially viable "solutions" that can be tested or measured against some predetermined, pragmatic criteria. Rather, its purpose is to probe and challenge our assumptions and to explore other, imaginative avenues that appear to be worthwhile. The objective of this kind of work is not necessarily to convince but to raise questions by exploring new design directions based on sound reasoning, which can be informed by emerging research in other fields. Such creativity-based research is driven by envisioning new possibilities, and differs in emphasis and purpose from reactive problem solving.[24] Although this kind of work represents a particular opportunity for design

24 Peter Senge et al., *The Necessary Revolution: How Individuals and Organizations are Working Together to Create a Sustainable World*, (London: Nicholas Brealey Publishing, 2008), 50.

within academia, some companies (e.g., Philips in the Netherlands) also dedicate resources to such speculative inquiry, developing creative "design probes" that explore new potential directions and challenge our assumptions.[25, 26]

Sustainability, Production, and Product Meaning

Let us now consider some of the principal inadequacies of our current approaches, especially those linked to sustainability, production, and the nature of the product. This survey will allow us to identify new priorities for industrial design, and these priorities can, in turn, provide a basis for conceptual exploration:

Sustainability: Activities that aim to conform to the principles of "sustainability" must take into account the interrelated elements of the triple bottom line or, as has been argued here, the quadruple bottom line. The notion of sustainability requires us to explore avenues by which its various elements are addressed *concurrently* and in ways that are mutually reifying. Currently, we are a long way from this perspective. Instead, the more common interpretation of sustainability considers the damaging consequences of our endeavours as separate issues that require discrete actions. We try to offset the negative effects from one activity by engaging in another, which is entirely removed from the problem and its cause. For instance, one London-based organization offers people the opportunity to offset the negative environmental effects of using an iPod by planting a tree in New Zealand.[27] These kinds of initiatives can be a convenient substitute for carefully examining and reforming one's own practices.

Production: If we are to focus on the heart of the problem, the issues that arise from our specific, problematic activities have to be considered in relation to the priorities of sustainability and dealt with directly. In recent years, for example, mobile phone use has grown enormously all over the world, with tens of millions of units being manufactured and shipped each year. Although their compact size offers portability and a convenient means of staying in touch, their relationship to sustainability raises many concerns, not least in the ways in which they are produced. A brief outline of the main concerns will suffice in this context. For example, in terms of the economic considerations, manufacturers of these devices accrue significant annual profits.[28] Such profits are possible because first, in the manufacturing plants, employees are frequently expected to work excessive hours for low wages, with few basic rights.[29] Second, the environmental consequences of their production, shipping, use, and disposal are not included in the accounting but are designated "externalities." Moreover,

25 Clive van Heerden, "Future of Lifestyle," (presentation at the European Futurists Conference, Luzern, Switzerland, October 15, 2009), http://www.european-futurists.org/wEnglisch/programm/Programm2009/programm2009.php (accessed 10/19/2009).

26 "Electronic Tattoo: Philips Design Probe," (2008): http://www.youtube.com/watch?v=NM1VuN5Iouc (accessed 10/21/2009).

27 "We love our iPods, we love our planet. Help plant a tree to offset your iPod," (2009): http://acornhq.net/ (accessed 7/15/2009).

28 "China heads list of mobile phone manufacturing bases," C114.NET, Shanghai, China, 1/1/2009, http://www.cn-c114.net/578/a374763.html (accessed 9/18/2009).

29 Jenny Chan et al., *Silenced to Deliver: Mobile phone manufacturing in China and the Philippines* (Stockholm, Sweden: SOMO and SwedWatch, September 2008), http://www.germanwatch.org/corp/it-chph08.pdf (accessed 10/12/2009).

even where legislation exists to help prevent companies "externalizing" factors that have damaging environmental and social consequences,[30] illegal practices often result in toxic electronic waste being dumped in poorer countries.[31]

The Product: If we consider the nature of the product itself, further concerns can be raised. Even though many different companies manufacture mobile phones, these products all reflect a similar set of design priorities; conceptually, there is little to choose between them. They are all compact, fairly robust devices that are easy to use and convenient to carry on one's person, and they all offer a host of functions, in addition to being able to make and receive calls. On the face of it, these product features seem logical, reasonable, and desirable, but let us examine in more detail what these seemingly universally embedded notions of "mobile phone" connote in terms of the quadruple bottom line. This examination allows us to develop a reformed set of priorities and establish a basis for exploring an alternative way forward.

When we decide to buy a mobile phone, we are faced with hundreds of different models. Prices vary considerably between the simplest phones and those offering a greater number of functions, and some allow the product to be tailored to one's personal requirements by downloading applications from the Internet. However, in all cases the physical product is a small, hand-held device that is a discrete, fixed manifestation of a particular stage of technological development. We can choose between a touch screen and a keypad, and between a keypad on the front of the phone and a slide or flip design feature, and we can choose from a variety of colors, but such differences are relatively trivial. We are also aware that, whichever phone we select, within a few years, it will be outmoded and of little monetary or functional value. At this point, it will more than likely be discarded and replaced with a more up-to-date model, which will be another fixed entity that represents a slightly more advanced stage of technological development. In addition, when we purchase such a product, we need have little understanding of the technology on which it is based, where it comes from, or the effects of its manufacture, use, and disposal.

While the intricacies of digital technologies are highly complex and may well be beyond the interests of most people, it is possible to consider the design of electronic goods in ways that allow our decisions to be more closely associated with their consequences and that help foster a more enduring and more meaningful notion of material culture. For instance, we currently cannot purchase a phone

30 "Waste Electrical and Electronic Equipment (WEEE)," Environmental Agency, UK, (2007): http://www.environment-agency.gov.uk/business/topics/waste/32084.aspx (accessed 7/22/2009).

31 Jonathan Clayton, "MoD Computers at Centre of Dangerous Trade in the Slums," *The Times*, London, 7/18/2009, 7.

that will last for many years, that allows us to update the hardware as new technological advancements develop, and that could be considered an heirloom object that has the potential to be trans-generational in its appeal and its usefulness. We cannot select a phone that is capable of being incrementally modified in terms of its parts as our needs change, or that we can update aesthetically from locally made, culturally relevant components.

And we cannot choose among phones that are conceptually diverse in terms of how their functional benefits are objectified. These various possibilities, none of which are available, could all contribute to a more enduring rendition of electronic products, increased opportunities for understanding and personal control of one's material goods, and greater levels of attachment. Such possibilities might also substantially reduce electronic waste and pollution and their associated consequences because individual components could be exchanged and upgraded rather than requiring users to discard and replace whole products.

In terms of their use, the kinds of phones currently available enable forms of interaction that can contribute to problems associated with information overload and multitasking. The very design priorities that emphasize convenience also facilitate impulsive, unreflective use patterns that interrupt thoughts and tasks. For example, many phones include a variety of electronic games and internet functions that provide endless opportunities for distraction, and as discussed above, constantly browsing websites and checking for messages or e-mails can lead to addictive and addiction-like behaviors.

This survey offers clear illustrations of how our current conceptions of electronic goods, and perhaps the mobile phone in particular, support production practices that, although highly profitable, are associated with considerable environmental consequences, social inequity, ethically questionable employment regimes, and massive amounts of toxic electronic waste often dumped either illegally or in politically or economically powerless regions. Moreover, the patterns of use with which such products are associated appear to contribute to an erosion of empathy and ethical concern, as well as compulsive behaviors that have been linked to a variety of psychological disorders.

Although market competitiveness is a critical factor in defining the physical characteristics of a product, when manufacturers all compete by producing essentially the same kinds of goods, there little market distinctiveness, as well as few opportunities for people to select products that, potentially, represent a more positive

way forward. Despite significant public awareness of the negative environmental and social consequences of consumerism, people are not being offered choices that emerge from a more meaningful and sustainable ethos. The characteristics and conventions of a production/consumption system that leads to damaging practices and harmful effects, and products that foster unreflective use patterns, are also those that restrict genuine choice. For significant change to occur, therefore, new kinds of product designs are needed, along with new kinds of enterprise models—models that not only allow for greater participation in the development and definition of products but also potentially improve community cohesion and capacity[32] and increase personal influence and product understanding.

New Design Values for the Quadruple Bottom Line

To tackle these various shortcomings, design and production need to develop ways forward that are capable of taking full advantage of the opportunities made possible by technological advance while attending not only to the social, environmental, and economic requirements of sustainability but also to more substantive questions of personal meaning and fulfilment. To address these interrelated factors, design priorities are required that allow electronic products to:

Evolve continuously as technology progresses, aesthetic tastes change, and new possibilities are developed, thereby benefiting from scientific advance and new forms of visual expression.

Accommodate new hardware components whose future volumetric requirements are both unknown and unpredictable, thus enabling incremental change through replacement of individual components, rather than whole product disposal and replacement. This flexibility would decrease environmental burdens by reducing waste and pollution, as well as energy use, acquisition of virgin resources, shipping and packaging, and other costs.

Be maintained, repaired, and upgraded locally and, where possible, incorporate culturally relevant design, aesthetic expression, and materials. Such priorities create possibilities for local employment, development of skills and knowledge, and cultural identity. They would make important contributions to localization, socio-economic equity, and self-reliance and to the creation of diverse, robust local economies—all elements of sustainability. Such product design contributes to the development of a more lasting, culturally relevant, and personally meaningful material culture while reducing shipping, packaging, and whole product disposal.

32 Alastair Fuad-Luke, *Design Activism*, (London: Earthscan, 2009), 193.

Foster more considered, less distracting use patterns. Electronic products whose design enables a focused mode of use, with fewer diversions and interruptions, would create genuine choice and contribute to more meaningful relationships with such goods. The benefits of the digital economy thus would be in closer accord with enduring understandings of personal meaning and fulfilment.

Reflect emerging enterprise models in which considerations related to sustainability are internalized and core to the activities. For example, business models that include product repair and upgrade services lead to meaningful, enduring, and mutually beneficial relationships between producers and the people who use their products. Distributed forms of innovation, production, remanufacture, and recycling create local employment and locally relevant solutions, and they draw on a wealth of imaginative possibilities while resulting in more environmentally benign and more equitable service-oriented solutions. Moreover, these electronic products could be conceived as reliable, long-lasting tools—basic workhorses whose hardware can be intermittently upgraded and supplemented with software and services provided via standard interfaces.

These design priorities emerged from a consideration of electronic products in relation to the priorities of sustainability. However, they are congruent with the results of a recent study that drew on the views of four consultative groups that included a futures panel, a design panel, a clients panel, and a policymakers panel. Among other things, these groups identified the following as the most pressing issues for design in the twenty-first century: sustainability and ecological design; design with responsibility; personalized design so that products can evolve and adapt with you; more meaningful products and services and self-actualization design (i.e., greater emphasis on personal meaning); and localization of design and production.[33]

The Conceptual Design of a Mobile Phone

For illustrative purposes, alternative concepts for a mobile phone have been developed that explore and encapsulate the implications of the criteria listed. These propositions are not intended to be viable products for the market. Instead, they represent how these general criteria might be translated into physical artifacts. Their purpose is to indicate potential directions for creating electronic goods that respond to sustainability critiques of technological products and to the detrimental effects of multitasking and unreflective, often addiction-like use patterns. However, the concepts presented here also fully recognize the importance of scientific and technological advance

33 A. Willliams et al., "Design 2020: An Investigation into the Future for the Design Profession," *Designing for the 21st Century: Research Projects*, ed. Tom Inns, (Farnham, UK: Ashgate, 2009).

Figure 3 (above left)
Pouch Phone concept

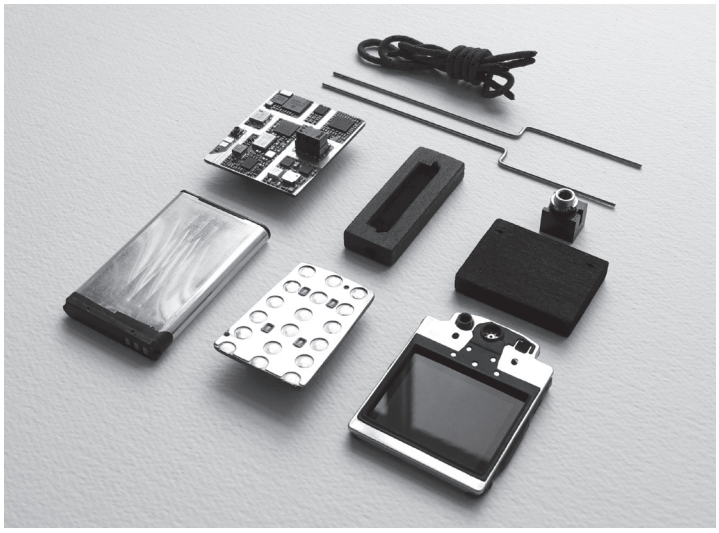


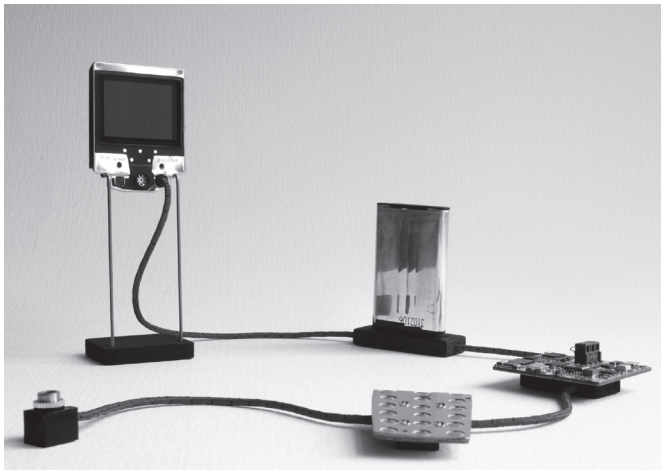
Figure 4 (above right)
Separate components of the Pouch Phone concept

and their contributions to improving our material culture and living standards.

To conform to the requirements outlined, the product has to be designed in a manner that enables its constituent elements to be incrementally changed over time, for purposes of repair or upgrading. Developing such a design requires a shift in how we think about the product: we have to move away from seeing it as a fixed commodity that is locked in a particular timeframe and therefore is subject to obsolescence. Instead, we must begin to conceive of it as an object in a continual state of flux—as an ever-present but ever-changing, provisional product. When we consider a product as fixed, we see the current product as the latest version. Earlier versions came before, and more advanced ones will be available in the future. This conception is fundamentally unsustainable because the earlier models usually end up in landfills[34] and future versions require new resources and energy, with all the environmental consequences their extraction, processing, and shipping entail. In contrast, when we consider a product as a continually evolving one that we can keep, individual parts can be exchanged and upgraded to take advantage of new technological developments, with considerable reductions in waste, pollution, and resource use.

Significantly, because technology is in a continual state of development, it is not possible to predict exactly what the upgrade components will be—the technologies they will use or their size and shape. Thus, rather than creating a rigid enclosure to contain the various parts, it becomes necessary to develop solutions in which the parts are more loosely connected. In this way, as the product changes and evolves over its extended useful life, more advanced parts can be substituted. This type of evolution also suggests that any form of encasement should be flexible enough to accommodate these changing forms and sizes of components.

34 Peter Senge et al., *The Necessary Revolution: How Individuals and Organizations are Working Together to Create a Sustainable World*, (London: Nicholas Brealey Publishing, 2008), 16.



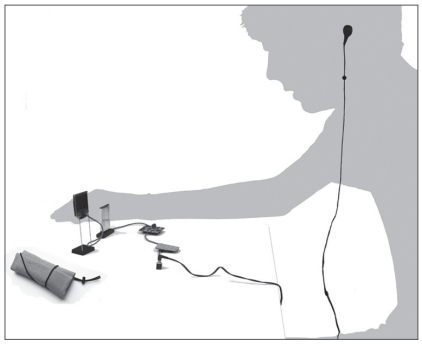


Figure 5 (above left)
Pouch Phone concept assembled for use

Figure 6 (above right)
Pouch Phone concept in use—focused attention

In the first concept developed here, the Pouch Phone in Figure 3, a simple fabric wrap contains the separate components of a mobile phone (see also Figure 4). This design allows the product to be incrementally upgraded as technology advances, and the flexible wrap does not constrain the inclusion of new components that may be volumetrically dissimilar to those that went before. In this disassembled state it is not a mobile phone but simply a collection of parts. Thus, it would not interrupt or intrude upon the owner's thoughts or current activities; incoming calls would simply be transferred to a message service.

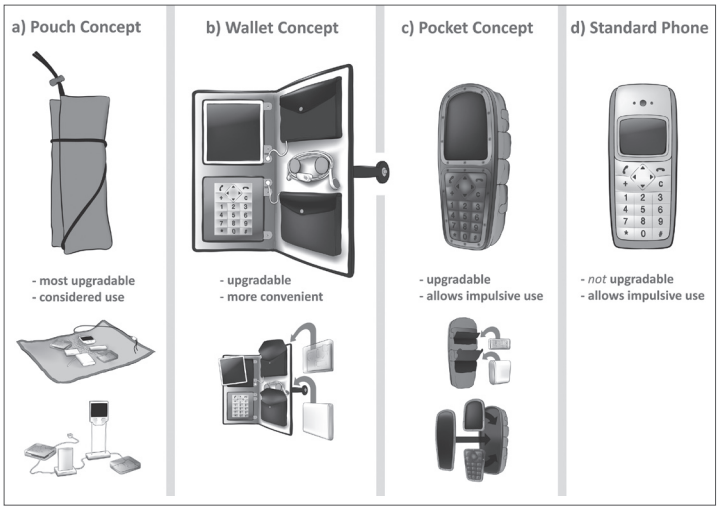
To make a call, send a text, or attend to stored messages when these activities can be given dedicated attention, the phone can be quickly assembled to create a functional arrangement (see Figure 5). This assembly can be done quickly, but it does require a conscious decision to use the phone. When assembled, the user can attend to messages and calls as *a focused activity* (Figure 6). When these tasks are complete, the parts are again stored in the wrap. Thus, through its essential design as an object, this concept offers a form of use that eliminates unwanted disruptions to ongoing activities. It does not disturb face-to-face conversations or ring unexpectedly in a meeting or at a theater performance. It also reduces the potential for impulsive use because the small amount of effort required to assemble the phone may be enough to create pause, to consider the necessity of making a call at a particular time, compared to continuing one's current activity. Thus, in this concept, the requirement for assembly prioritizes considered use over convenience and mitigates unreflective use patterns.

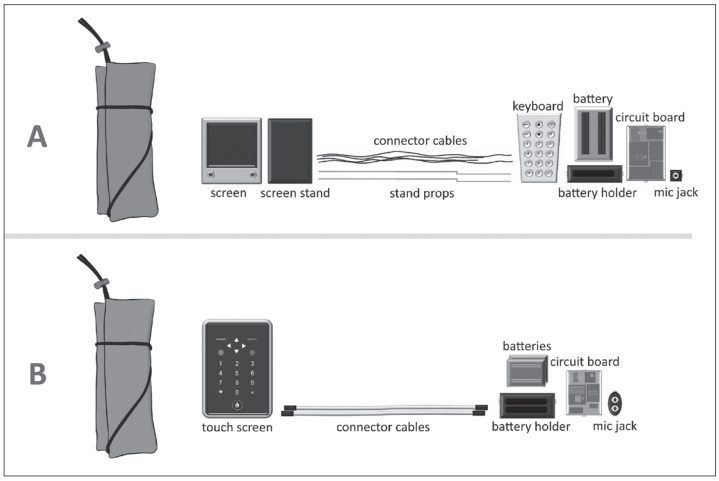
The Pouch Phone concept (Figure 7a) represents one way of encapsulating priorities of continual upgrade and considered use. However, the same principles can be expressed in very different

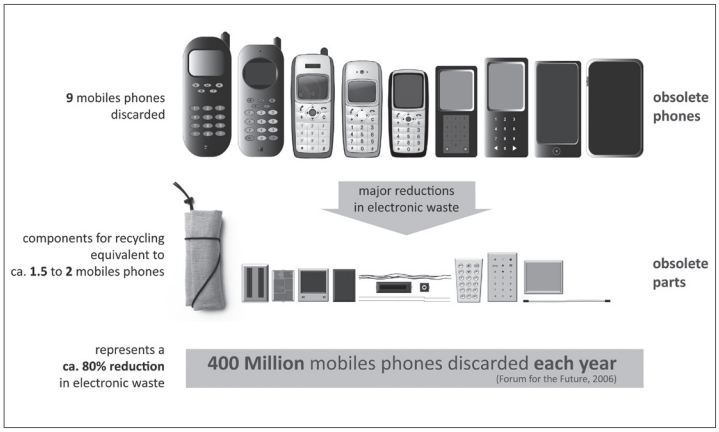
Figure 7 (top)
Meaningful Choice—concepts offer varying degrees of upgradability and considered use

Figure 8 (middle)
Nine stages of incremental upgrading transform Phone A to Phone J

Figure 9 (bottom)
Environmental benefits of an incrementally upgradable phone concept, compared to disposal and replacement of regular mobile phones







ways. The Wallet Phone concept (see Figure 7b) can also be incrementally upgraded but does not require assembly. It imposes somewhat tighter volumetric restrictions on component upgrades than the Pouch Phone but allows for rather more convenient use. The Pocket Phone concept (Figure 7c) is similar to a regular mobile phone, but with the advantage that individual components can be upgraded over time. Thus, these concepts offer a range of meaningful choices that encourage varying degrees of considered use, and they offer product-service solutions in which selected parts manufacturing and component upgrades can be provided at the local level.

Such concepts have considerable environmental benefits. For example, if we consider nine incremental stages of product upgrade over a period of years, Pouch Phone A can be transformed into Pouch Phone J, with minimum waste (see Figure 8). Rather than discarding nine full mobile phones over the same time period, users exchange only those parts required to upgrade the product. Through these stages, a number of individual parts (e.g., the screen, the circuit board, the battery, and the keyboard) will need replacement, either because of wear or because they become technologically outmoded. As individual components, they could be more readily recycled than complete products. In the illustrated example, this design results in obsolete components equivalent to about one and a half to two mobile phones (see Figure 9)—an estimated 80 percent reduction in electronic waste, assuming that, with conventional designs, nine complete mobile phones would be discarded in the same period to gain the equivalent technological benefits. When we consider that 400 million mobile phones are discarded each year,[35] such a reduction in the disposal of mixed, toxic materials would be equivalent to about 320 million phones annually.

In terms of environmental and social gains, the benefits over conventional models are plentiful. Incremental component changes by local servicers reduces energy use and waste while creating local employment opportunities. Such incremental upgrading, along with a more service-based business model, has already been explored in other sectors. In principle, the Pouch Phone concept is not unlike the approach developed by Interface Incorporated, the world's largest manufacturer of modular floor coverings. In the 1990s, the company redirected its vision to align its business more closely with the principles of sustainability. Instead of manufacturing and selling conventional carpets, the company produces modular carpets, elements of which can be selectively changed via extended service provision, and each aspect of the company has been scrutinized to comply with the highest standards of sustainability.[36]

Purchasing an upgradable phone gives users a product that endures over an extended period of time and takes advantage of new technologies as they become available; it also can be maintained and reconstituted via locally available services. Although the electronic components would still be mass-produced,

35 Tom Berry, James Goodman, *Earth Calling: The Environmental Impacts of the Mobile Telecommunications Industry* (London: Forum for the Future, December 2006), http://www.forumforthefuture.org.uk/library/earth-calling (accessed 9/18/2009).

36 "Toward a More Sustainable Way of Business," Interface Incorporated, http://www.interfaceglobal.com/Sustainability.aspx (accessed 9/18/2009).

other parts (e.g., the carrying pouch and screen stand) could be made from a variety of materials available locally. Potentially, more complex components and tailored circuit boards could be produced using rapid prototyping and small-scale assembly technologies. Such a design contributes to the development of local enterprises and to the integration of local and mass-produced forms of production. It also reflects indigenous skills and cultural preferences and contributes to cultural identity. The product can become a more enduring element of a person's material possessions, giving a sense that it is something worth caring for. Conceptually, it would no longer be a fixed, and therefore transient, acquisition offering only temporary benefit until a more advanced model arrives on the market.

Although such concepts might not suit everyone's needs, they do illustrate an alternative path for the development of electronic goods that appears to fulfil many requirements of sustainability while encouraging forms of use that are more closely aligned with focused attention and understandings of personal meaning.

Acknowledgments

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