Design for Sustainable Consumption

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This paper critiques current eco-design approaches that focus on eco-efficiency strategies. It attempts to demonstrate how such strategies fail to address emergent issues of sustainability, in particular unsustainable consumption, by ignoring the relationship between micro and macro socioeconomic factors. The paper explores product obsolescence, eco-efficiency and rebound effects - where demand overrides efficiency and emergent design practice for sustainable consumption.

Three interrelated questions are considered:

1. Why is sustainable consumption of such importance to the design and production of manufactured goods?

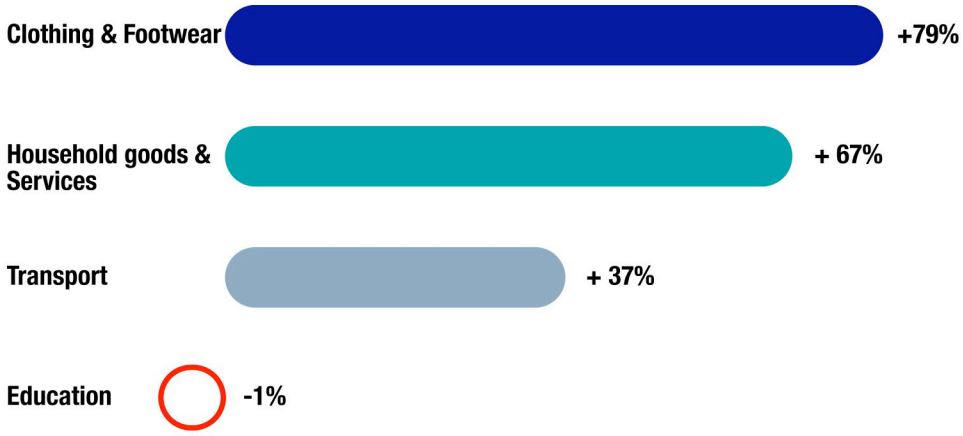
2. Why do current eco-design initiatives fail, or do not go far enough in addressing central issues of sustainability - in particular the emergent issue of unsustainable consumption?

3. Which design methodologies and practices offer a means of addressing sustainable consumption?

The methodology for this research includes: surveys of relevant literature in the field of sustainable consumption, qualitative interviews with UK-based design and sustainability professionals, and a comparison of emerging and progressive models for sustainable product design.

Consuming issues

Issues related to the rising consumption of materials and energy have now risen to the top of the sustainability agenda. In industrialised societies the linear ‘take, make, waste’ consumption of materials through fuel, structural materials, manufactured goods and food is rising exponentially (Linstead et al, 2003). During the last decade alone, consumption of household goods and services in the UK has risen by 67%, and household energy consumption by 7% (Ginn, 2004). Consumption is not only growing in magnitude, but the throughput of manufactured goods is speeding up. The pattern of consumption with many types of consumer goods is shortening functional lives – goods are predestined as waste. Each year we condemn 7.5 billion clothing items to landfill (Ginn, 2004).

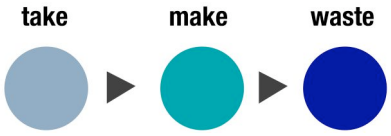


% increase in UK household consumption, 1993 – 2002

(UK Office of National Statistics citied in Ginn, 2004)

Industrialised societies only represent 20% of the world's population but consume 60% of global energy and 80% of global car and paper production (New Internationalist, 2000). Many in developing nations aspire to 'western' values of private material wealth - against a backdrop of dramatic and growing inequality within their own societies. With many transnational companies focusing on the development in India and China of "western" style material affluence and consumption, the imperative to address consumption will become acute.

Current consumption operates within a linear production-consumption system that takes resources, makes them into products, then discards or wastes them.



These 'mass-flows' are often hidden from the consumer (as embodied energy within manufactured goods and by-product production waste) or are incremental and cumulative (eg stand-by power consumption and escalating landfill). Current consumption patterns are 'hard-wired' into the socioeconomic systems of industrialised economies (Robins, 1999, p 15).

Linear production-consumption is linked to resource scarcity, global environmental degradation and social inequality. The United Nations Environmental Programme (UNEP) conservatively estimates that we will need two Earths by 2050 to keep up with current resource demand (UNEP Sustainable Consumption, www.uneptie.org/pc/sustain, accessed 13.11.03). The non-profit organisation, The Natural Step, describes how the Earth's life-support systems are being systematically eroded, with dangerous levels of materials from the Earth's crust being concentrated in the biosphere (www.naturalstep.org,

accessed 22.11.03). To illustrate: because the burning of fossil fuels releases enormous amounts of 'locked up' CO_2 and particulates into the atmosphere, the subsequent social and environmental impacts range from the local (urban air pollution) to the global (climate change).

Apart from resource shortages, inequality and environmental impacts, there is also a social cost to consumption. Material wealth is not making us any happier (James, 2003, pp 20-22). Subjective wellbeing indicators (SWB) - a method of assessing happiness as opposed to the more conventional means of assessing progress (gross domestic product (GDP)) - are not improving in the UK and other European countries and indicate that things are getting worse in the US, despite a doubling in levels of income and consumption (Reeves, 2003, p 6). Fuelling our desire for material wealth is the seemingly instant availability of credit and a doubling in advertising spending (UK) over the last 10 years (Ginn, 2004, p 4). British consumers borrow around £1m every four minutes. Personal debt in Britain is now over 1 trillion pounds, eclipsing the total amount owed by Africa, Asia and Latin America to international lenders (Bank of England cited in The Guardian, 2004). While mass production techniques have 'democratised' consumption and improved the quality of life for many people, it comes at a significant cost (Linstead et al, 2003). Our current appetite for the consumption of manufactured goods is clearly unsustainable (Van Hinte, 1997; Robins, 1999; McDonough & Braungart, 2002).

Product lives

In 1962 Vince Packard stated that post-war economic growth had led to ever-increasing wasteful consumption (Packard, 1962). He coined the terms 'planned obsolescence' and 'throwaway society' and observed that escalating consumption would lead to serious social, economic and environmental consequences.

Despite the notion of a conspiracy of manufacturers colluding to planned obsolescence, European statistics show that 25% of vacuum cleaners, 60% of sound systems (stereos) and up to 90% of computers are still in functional order when discarded (Van Hinte, 1997, p 19). This suggests that the reasons for obsolescence are more complex than simply a matter of shoddy goods breaking down.

The different types of product obsolescence have been well-documented (Scholten & Kansis, cited in Heiskanen, 1996, p 397; Van Hinte, 1997; Cooper, 1994; Cooper & Mayers, 2000). Tim Cooper from the Centre for Sustainable Consumption defines three broad categories of product obsolescence:

- Functional obsolescence (product failure)
- Technological obsolescence
- Fashion obsolescence (an increasingly significant factor)

John Kenneth Galbraith, a contemporary of Packard, remarked that consumption is skewed unfavourably, being a combination “of private affluence and public squalor” (Galbraith, cited in Robins, 1999, p 9). Although both books were reprinted many times, little serious attention was paid by industry and governments to the issues they raised (Robins, 1999, p 9). While Packard and Galbraith’s analyses seem dated, many would agree that their predictions have as much currency today as when they were written forty years ago.

More recently, literature on consumption has emanated from economic theory and the social sciences - Elizabeth Shove ((2003) environmental sociology) and Don Slater ((1997) sociology of consumer culture) - with some contributions from design historians such as Tony Fry ((1999) design philosophy) and Adrian Forty ((1986) design historian). Shove observes that “critiques of consumption and sustainability have been chopped up and addressed from a variety of perspectives. The bit that ‘gets left out’ or put in the background is often ‘everyday life’” - the link between the macro (policy and planning of consumption) and the micro (everyday behaviour) (Shove, www.comp.lancs.ac.uk/sociology, (accessed. 12.03.04). Consumers, retailers, advertisers, all the way up to political policy makers and legislators have a vital role to play. Sian Evans and Tim Cooper agree that efforts to tackle consumption are unco-ordinated. There is little evidence of the ‘joined-up thinking’ that will be required if we are to understand and respond to these issues (Evans & Cooper, 2003). As a consequence, many initiatives have had limited impact. Designers have paid little attention to the issue of sustainable consumption. The predominant response by designers to tangential issues has been through eco-design practices, but these are often based upon narrowly defined, short-term and directly connected environmental concerns. One particular strategy of eco-design is eco-efficiency - the premise being that by making products more energy- and material-efficient, environmental impacts can be reduced.

The eco–efficiency agenda

At the 1992 Earth Summit in Rio, industry participants agreed to adopt a strategy of pursuing eco-efficiency, underpinned by technological innovation. The World Business Council for Sustainable Development (WBCSD) first coined the term ‘eco-efficiency’ in 1992. They define eco-efficiency as “being achieved by the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life cycle, to a level at least in line with the Earth’s estimated carrying capacity” (WBCSD, www.wbcsd.ch, accessed 12.03.04). Industry would be cleaner and leaner, more ‘environmentally friendly’, but without compromising profits.

Eco-design strategies sit comfortably within this loose definition. One of the primary aims of eco-design is efficiency. Simply put, the aim is to do more with

less. The influential publication *Factor 4; Doubling wealth Halving Resource Use* (Von Weizacker et al, 1997) encourages designers to pursue the goal of up to fourfold levels of increased efficiency through technological product innovation. Many believe that even Factor-10 efficiencies could be gained through applying similar strategies.

Designers have long appreciated that efficiency is desirable. Indeed, efficiency is nothing new: for many years engineers have practised forms of 'value analysis' as a means of maximising the efficiency of a design. The pre-modernist production ideologies of Fordism and Taylorism are studies of efficiency in the workplace - synchronising time, labour and inventory in a form of applied militarism (Fry, 1999, p 86). For the modernists the mantra 'less is more' suggests a desire for efficiency, simplicity and honesty in design. In post-WW2 Britain, material and energy shortages, coupled with high demand for household goods, led to the emergence of a design for austerity movement. Material efficiency is an important feature found in many manufactured products from this period, such as the utility furniture of Ernest Race (Dormer, 1993, p 125).

Less is more!

Today, the eco-design discourse continues to revolve around eco-efficiency, the benefits of which are easier to sell to business than the thornier issue of sustainability – because they balance social and environmental responsibilities with economic agendas. Eco-efficiency produced through eco-design - for example a de-materialisation or energy-efficient innovation strategy - will often save money for both the producer and the customer. Polluting manufacturing processes can be mitigated, toxic substances eliminated and many products are much more energy-efficient than their predecessors. Through eco-efficiency, manufactured goods can be produced faster for less money, and thus brought faster to market.

By contrast the benefits of sustainable design are not so clear-cut and therefore not so easy to sell. Evidence suggests that eco-design strategies solely based upon eco-efficient, technocratic approaches can, however, rebound: environmental impacts unintentionally increase, not decrease (Kane, 2003). Put simply, the problem is that demand overrides eco-efficiency. The demand and consumption of goods and services override eco-efficiency initiatives (Scherhorn, 2004, p 1).

The problem: Demand for goods overrides eco-efficiency

Prof. Dr. Gerhard Scherhorn, Wuppertal Institute

Rebound effects

Increased ecological impact as a result of eco-efficiency strategies can be described as a 'rebound effect'. Rebound effect occurs where 'designed in' energy and material savings of a product results in an actual increase in resource and energy consumption. It can be loosely defined as the difference between the projected and actual savings (or losses) due to increased efficiency. Economists first coined the term while studying market dynamics in the energy sector during the 1980s (Khazzoom, cited in Greening et al, 2000, p 390). Rebound effects may be categorized as consisting of direct, indirect and macro-economic effects.

Direct Effects – The way a product is used (behavioural factors) can cause direct rebounds. Most examples revolve around the way eco-efficient products are actually used. Water-saving showerheads can alter behaviour by encouraging longer showers. An owner driving a fuel-efficient car may apply the same reasoning: "Because I'm saving on fuel costs, I can drive more often and faster."

Indirect Effects - Savings made through ownership of eco-efficient goods can be spent on other goods or services that may have a greater environmental impact. For example, owning a fuel-efficient car may result in cost savings (excluding any direct rebound effects outlined above). These savings may be offset and spent on other goods, such as buying a second car or more consumer electronic goods.

Indirect rebound effects are not just exclusive to consumer behaviour. Within product development, savings made in one aspect of a design may be squandered elsewhere. For example, car weights are steadily increasing while engine technology developments offer greater fuel efficiency. The new VW Golf Mk 5 weighs almost double the original Golf Mk 1. Despite dramatic improvements in engine efficiency since the Golf Mk 1, the potential for fuel savings has been lost to increased weight.
(http://www.vw.com/golf/engspecs.htm, accessed 21.04.2004).

Macro-economic (Market or Dynamic) Effects – Eco-efficient goods may lead to a decreased demand for a resource, resulting in a price drop. This makes new uses for the resource economically viable. For example, residential electricity was initially designated for lighting. As the price of electricity dropped many new electrical devices became common. Likewise, where a product is produced, delivered and consumed efficiently, it can drive greater demand for that type of product, causing a rebound. This is often the most difficult aspect of the rebound effect to predict - the combination of complex interactions between individual behaviour, market dynamics, regulatory regimes and technological factors. No rigorous theoretical framework currently exists within which to study this phenomenon (Gottron, 2001, p 2).

Emergent models for sustainable design practice

Design has an important role to play in achieving sustainable consumption. A survey of recent literature and interviews with design and sustainability professionals offer a picture of how design might meaningfully engage with these issues.

John Broadbent's paper *Generations in Design Methodology* (presented at the DRS 2002 conference) offers an historical as well as a predictive view of design models. He maps the evolution of design methodologies from early craft to next generation design methodologies. Features of his proposed evolutionary, next generation, broadening socio-cultural design methodology (Broadbent, 2002, p 11) demonstrate a remarkable synergy with many of the core values of sustainability, and mirror elements of emergent sustainable design models that go beyond technocentric, eco-design approaches.

Charter & Tischner (2001, p 130) review a range of sustainable product design methodologies in *Sustainable Solutions*. They argue that wider issues, including social, ethical, complex systems, technology and supply chains, have not been adequately dealt with in current ecologically oriented design models. Fry (1999, p 287) concurs in a philosophical context that design for sustainability has mostly been ecologically oriented and is inadequate as an explanation of the 'crisis of sustainability'.

Edwin Datschefski (2001) has developed five design requirements for sustainable products. The model is convenient and very accessible, offering a mechanism by which to choose and compare products on performance of the five generic criteria: Cyclic, Solar, Safe, Efficient and Social. While the model captures social issues, behavioural and consumption issues are not directly considered.

In their book *Cradle to Cradle* (2002), William McDonough and Michael Braungart argue that eco-efficiency is of limited benefit to reversing environmental damage: it does not reach deep enough and is not a strategy for the long-term. Fundamentally, eco-efficiency works within the same system (linear production - consumption system), which caused the problems in the first place (McDonough cited in Charter & Tischner, 2001, p 141). McDonough and Braungart reason that we should learn from natural systems where waste = food. Nature's systems are cyclic. Nutrients are cycled in closed loops in rich and diverse ways, nothing is wasted and the interrelating systems remain balanced and self-regulating. Industrial systems, too, should be based upon renewable and

cyclic mass-flows - in closed loops: an ‘industrial ecology’ mirroring Nature’s system design.

McDonough and Braungart (*Cradle to Cradle* (2002)) present a model of a cyclic production-consumption economy based on parallel systems where both biological and technical nutrients (synthetic materials) are cycled in closed loops. A set of design principles is described backed by tangible design examples that illustrate how sustainable consumption may be achieved. They argue that we need to design ‘eco-effective’ solutions that embrace a rich mix of considerations and desires (McDonough & Braungart, 2002, p 72). The concept for transforming a linear production/consumption system into a cyclic production/consumption model based on natural systems is compelling, but will require fundamental changes to economic, political and social values. (Robins, 1999, p 19).

Slowing consumption offers a direct response to unsustainable consumption. By slowing the mass flows in the linear production-consumption economy a level of sustainability could be achieved. The Eternally Yours foundation have been proposing design solutions and offering creative opportunities for designers to consider design for product endurance (Van Hinte, 1997). An emerging body of work is starting to articulate an understanding of, and design approaches to, extending product life (Fuad-Luke, 2004; Van Hinte, 1997; Park, 2003; Cooper & Mayers, 2000; Chalkley et al, 2001).

Product service systems (PSS) also promise a means to move towards sustainable consumption, not just through the displacement of the consumption of physical products by services, but also by considering the actual behavioural aspects of how goods and services are consumed. User scenarios or design-orienting scenarios (Manzini, 2002, p 1) may play an important role in assisting designers to understand the behaviour of consumption and articulate what a sustainable society might look like.

Within industry, especially within larger companies, there is a trend towards integrating sustainability in specially appointed posts that work across the organisation and not within design teams. This suggests more of a design management role for sustainability rather than an operational, eco-design approach as articulated through practices well documented by Lewis & Gertsakis (2001) and Tischner et al (2000). Corporate Social Responsibility (CSR) is currently the popular umbrella under which many larger organisations integrate and communicate sustainability across their activities. Jake McLaren (2003), an environmental specialist at Nokia UK, stated that environmental and social responsibility was being developed as a specialist activity within Nokia to assist design teams, in much the same way that engineering or marketing teams might provide input and support. This trend marks a move away from focusing upon environmental issues towards a more inclusive model: recognising the need to manage social issues associated with supply chains, employee rights and social responsibility (Charter, 2004).

A sample, qualitative survey of UK-based product design consultancies suggests that the relationship between design and sustainability could be at best described as incremental - typified by a reactive rather than a strategic approach. Ingrid Barton (2003), senior designer with IDEO UK, states "I have never, ever had a client come to me asking for sustainable design." Previously, as a designer at Electrolux, she did encounter the sustainability agenda, but many corporations see sustainability only as risk management against impending legislation. Likewise, Katrina Kartofler (2003) from the Design Council UK observes that most companies still view environmental management as risk management and the predominant emotion associated with it is fear. Adrian Berry (2003), founding partner of Factory Design, added that when clients had been willing to consider sustainability, they were resistant when it came to investment and expenditure.

The current roll-out of European (EU) directives (WEEE, RoHS and EuP[1]) to tackle end-of-life waste (e-waste), certain toxic materials and energy efficiency in the electrical goods sector (Envirowise, 2003), will test whether companies take a risk management approach or a more strategic approach to product development. The threat of litigation for non-compliance will force many to re-appraise their product portfolios. As a consequence, such legislative instruments might establish frameworks and drivers for a more formalised design response to unsustainable consumption.

Conclusion

There exist many shortcomings with current eco-design practices based on technocratic, eco-efficiency approaches, not least their inability to address social and behavioural issues, which are central to understanding patterns of consumption. Eco-design usually functions at an operational level and is unlikely to hold much potential for radical change (Lofthouse, 2004, p 225) because it works within the same thinking that caused the problems in the first place (McDonough & Braungart, 2002) and is prone to rebound effects (Kane, 2003).

Progressive models of sustainable product design will require new tools, metrics as well as more robust design methodologies (Charter & Tischner, 2001, p 137). Designers and decision-makers will need to be empowered to address emergent issues of sustainability.

Sustainable consumption is unlikely to be achieved through re-designing the product without considering the wider context. The ‘hidden wiring’ of the current linear production-consumption system needs to be challenged (Robins, 1999 p 15). The link between economic growth and environmental and social degradation needs to be confronted; equally, understanding consumer behaviour is essential to avoiding rebounds. Design needs to become part of the ‘joined-up thinking’, linking the macro (planning and policy instruments) with the micro (everyday behaviour) to strategically address consumption.

1. EU Directives acronyms: WEEE - Waste Electrical and Electrical and Electronic Equipment, RoHS – Reduction of Hazardous Substances and EuP - Energy using Products.

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