Tim Cooper

Inadequate Life? Evidence of Consumer Attitudes to Product Obsolescence

ABSTRACT. Public interest in the durability of household appliances may be traced back 40 years to criticism of planned obsolescence raised by an emerging consumer movement. A recent revival of interest in product life spans has taken place in the context of increasing waste generation and debate prompted by proposed producer responsibility legislation, but data on the age of discarded products and consumer attitudes to product life spans have been lacking. This paper draws upon recent data from research into discarded household appliances in the UK to enhance a theoretical model of product obsolescence and explore some implications for marketing and public policy. A survey of over 800 households provided quantitative data on consumer attitudes and behaviour relating to appliance life spans and a subsequent series of focus groups enriched this data with personal narratives. Respondents were evenly divided on whether or not appliance life spans are adequate. Variations in behaviour demonstrated how users may influence appliance life spans. Overall, the results suggest that consumers have an important role in reversing the trend toward increased appliance waste but currently face economic disincentives and lack adequate product information.

The growth in household waste arising from unsustainable consumption patterns needs to be curtailed if industrialised nations are to make substantial progress towards sustainable development (Redclift, 1996). Research into factors that have created the "throwaway society" is, however, surprising weak and planned obsolescence, though often disparaged, has long been tolerated.

Twenty years ago a report commissioned by the Organisation for Economic Co-operation and Development (OECD) brought together some limited secondary data on product life spans. The authors admitted that their report was inconclusive, blaming the breadth of the topic and the "extremely limited information that is available" (OECD, 1982, p. 79). A literature search a decade later revealed little new data and only anecdotal evidence to support a popular assertion that consumers would prefer products to last longer (Cooper, 1994a). Consumers were rarely asked by market researchers for their opinions on the durability of products and marketing academics showed little

Journal of Consumer Policy **27:** 421–449, 2004.

interest in the subject. Nor had interest been stimulated by environmental concern. A small body of research on "disposition behaviour" had identified some key determinants of decisions to discard products (Antonides, 1990; Box, 1983; Hanson, 1980; Harrell & McConocha, 1992; Jacoby, Berning & Dietvorst, 1977), but most waste-related research focused on packaging.

More recently, the growing importance of sustainable product design, integrated product policy, and sustainable consumption has revived interest in product life. Research by academic researchers and practitioners has suggested that product life spans are determined by a complex range of factors that include design, technological change, the cost of repair and availability of parts, household affluence, residual resale values, aesthetic and functional quality, fashion, advertising, and social pressure (Cooper, 1994a; Falkman, 1996; Granberg, 1997; Heiskanen, 1996; Kostecki, 1998; Stahel & Jackson, 1993; van Hinte, 1997; van Nes, 2003).

Notwithstanding the lack of data, there have been pleas for policies to increase product life spans. The OECD (1982) proposed longer and more stringent guarantees, or warranties, an approach subsequently endorsed by Cooper (1994a) and Heiskanen (1996). Ecological tax reform to make repair work more attractive has been advocated, as has improved product life labelling (Cooper, 1994a; Heiskanen, 1996; Kostecki, 1998).

Empirical evidence, however, remained scarce until proposals emerged in the European Union for a Directive on Waste Electrical and Electronic Equipment (the "WEEE Directive") (Cooper, 2000). The proposed legislation prompted a consortium of companies in the UK to seek greater understanding of consumer behaviour relating to the use and disposal of household appliances, a project labelled E-SCOPE (Electronics industry — Social Considerations Of Product End-of-life). Once implemented, the WEEE Directive (2002/96/EC) will make manufacturers and importers financially responsible for waste from discarded appliances from August 2005, and it also has implications for retailers, waste companies, and local authorities. The E-SCOPE project generated comprehensive data on waste volumes from discarded appliances that is summarised in an industry report (Cooper & Mayers, 2000). This paper explores the project's key findings relating to consumer attitudes and behaviour in the context of academic discourse on product obsolescence, marketing, and public policy.

Although there is a popular belief that appliance life spans have long been in decline and consumers would prefer appliances to last longer, firm evidence has been lacking. There are no historical data, which means that trends cannot be identified, and no published research on consumers' opinions about what constitutes a reasonable life span. The case for action to promote longer lasting appliances, whether through innovative marketing strategies or public policy measures, must be based on informed judgement, which requires empirical data on the extent to which people are satisfied with appliance life spans and on their acquisition, maintenance, and disposal of appliances.

Any discussion of new marketing approaches or public sector intervention also requires an understanding of who is responsible for waste, the volume of which continues to rise (DEFRA, 2000). One key indicator is the condition of discarded appliances, as obsolescence resulting from a consumer's decision to replace a functional product ("relative" obsolescence) needs to be distinguished from that arising from product failure ("absolute" obsolescence). The different forms of relative obsolescence are discussed below. Decisions to discard functional products are often complex and vary according to the type of product.

Data on the condition of discarded items, together with data relating to purchase and maintenance, are necessary to establish the level of responsibility of consumers and producers and thus select appropriate strategies. If responsibility primarily rests with the consumer, then government and industry may need to increase consumer awareness through educative measures and environmental labelling and to introduce economic incentives to good practice such as "pay as you throw" waste strategies. If responsibility lies more with producers, new approaches to marketing and better warranty provision may be required and there may be a case for tighter regulation of product standards.

RECENT ANALYSES OF OBSOLESCENCE

Several typologies for describing the determinants of product life spans have been proposed. Packard (1960) popularised the concept of "planned obsolescence," the deliberate curtailment of product life spans, in his seminal work *The Waste Makers* in which he distinguished obsolescence of function, quality, and desirability. He described obsolescence of function, a situation in which "an existing product becomes outmoded when a product is introduced that performs the

function better,'' as laudable. His criticism was reserved for obsolescence of quality, when through deliberate intent ''a product breaks down or wears out at a given time, usually not too distant,'' and obsolescence of desirability, when ''a product that is still sound in terms of quality or performance becomes 'worn out' in our minds because a styling or other change makes it seem less desirable.'' The latter he also termed ''psychological obsolescence'' (Packard, 1960, pp. 58–59).

A subsequent report by the OECD somewhat crudely distinguished the influence of producers and consumers, asserting that ''with technical life determined by the producer, households will determine both repair and maintenance policy and time for replacement'' (OECD, 1982, p. 19). The report suggested that consumers' decisions relating to demand for durability were based on ''life-cycle costs'' (i.e., purchase price and service or maintenance costs), ''social factors'' (i.e., comparisons of the quality and quantity of consumer durables with immediate neighbouring families) and ''psychological factors'' (i.e., replacement purchases made in response to cosmetic changes in design, special offers, and higher trade-in allowances). Noting a ''total paucity of information from manufacturers on durability and on the expected lifetime of their products under various conditions of use,'' the OECD suggested that an apparent lack of interest in product life among consumers might reflect this lack of information. Thus, its report argued, ''the empirical evidence on consumer demand for more or less durable goods is not conclusive'' (OECD, 1982, p. 24).

In discussing the influence of producers in curtailing product life spans, the report highlighted technological obsolescence involving modifications ''often of a minor nature'' and psychological obsolescence in the form of ''purely cosmetic or decorative change'' (OECD, 1982, p. 25). It noted the particular importance of advertising to producers who sought to encourage consumers to replace functioning products. The OECD found independent evidence of the behaviour of firms hard to obtain, although it noted the development of non-repairable and non-maintainable versions of durable goods (such as ballpoint pens and wet razors) and reported claims that life-lengthening innovations had been suppressed (notably one regarding fluorescent light bulbs). The report described the costs and ease of repair and maintenance as ''of some consequence in determining the useful life of a durable good,'' but again found empirical evidence lacking (OECD, 1982, p. 30).

Interest in obsolescence subsequently waned but was reinvigorated in the mid 1990s by the discussion on sustainable development. A

study of product life extension by Heiskanen (1996) identified three categories of obsolescence to explain why people replace products: failure, dissatisfaction, and a change in consumer needs. The first of these concerns influences upon the technical life span specified by manufacturers (e.g., the market structure and whether supply is through rental or sale) and related consumer behaviour (e.g., the consumers' discounting practices and decisions to repair or replace). The second embraces relative obsolescence prompted by product innovations, incremental changes in features (i.e., styling), accelerated fashion cycles, and lifestyle changes. These result in "discretionary replacement" in which consumers are not necessarily motivated by rational cost-benefit considerations relating to product functionality. The third arises from new personal circumstances, as when people move house or children grow older. This often results in reuse.

Examining the process through which consumers periodically re-evaluate their products, Granberg (1997) noted the fundamental distinction between absolute obsolescence and relative obsolescence. Discussing the former, he points out that intrinsic durability depends upon an ability to resist "wear and tear" and material degradation (e.g., when rubber dries and cracks), process quality (i.e., product consistency in manufacturing), and factors relating to maintenance (i.e., ease of repair, availability of parts). These are primarily a manufacturer's responsibility (though consumers choose whether or not to maintain their products effectively). By contrast, relative obsolescence arises from an evaluation of existing products in comparison with new models and from this Granberg distinguishes "functional" and "psychological" forms of obsolescence. Functional obsolescence occurs when a decision to replace a product is made using objective criteria such as economic depreciation, technological change, and new situations that affect "need" (for example, different family circumstances), whereas psychological obsolescence originates from a subjective change in the user's perception of a product and is associated with learned experience, status achievement, fashion, and aesthetic quality.

Kostecki (1998) proposes many explanations for a downward trend in the average life span of consumer durables (though, evidently, without empirical evidence that such a trend exists). In discussing marketing strategies for optimising product use, he classifies determinants of durability (the obverse of obsolescence) as functional, economic, and symbolic. Functional durability refers to a product's effectiveness in relation to other products, economic durability to a

product's performance/cost ratio compared with alternatives, and symbolic durability to the ability of products to meet abstract needs relating to a consumer's image.

Such attempts to categorise the factors that determine product life spans offer a preliminary theoretical context for research into obsolescence, though none are without flaws. Early formulations by Packard and the OECD do not adequately acknowledge the economic pressures in the global market which increasingly influence supplier provision and consumer demand. The economic context is noted in subsequent work by Heiskanen and Kostecki who offer important contributions but neither offers a comprehensive analysis of obsolescence backed by empirical data. Granberg acknowledges that his model simplifies some complex relationships between owners and their possessions and the economic and technological context.

Building on the earlier work reviewed above, three categories of relative obsolescence, psychological, economic and technological, are proposed for a conceptual model through which to explore empirical data from this project. The categories, based on form and sources, are presented in Figure 1. Psychological obsolescence is abstract and subjective; it arises when we are no longer attracted to products or satisfied by them. Economic obsolescence occurs when there are financial factors that cause products to be considered no longer worth keeping. Technological obsolescence is caused when the functional qualities of existing products are inferior to newer models. Relative obsolescence thus occurs in three domains, which may be expressed as mind, money, and matter. This model does not include absolute obsolescence, as the research did not address the technical issues that influence intrinsic durability.

In this article, some data of relevance to the debate about the importance of the different forms of obsolescence and about policies for increasing life spans will be presented. These data concern consumers' attitudes to obsolescence and their related discarding behaviour, aspects that have been given little attention in previous research.

METHODOLOGY

The methods used in this research comprised face-to-face householder interviews and focus groups, the qualitative element being designed to aid the interpretation of the quantitative data (Robson, 1993). Sam-

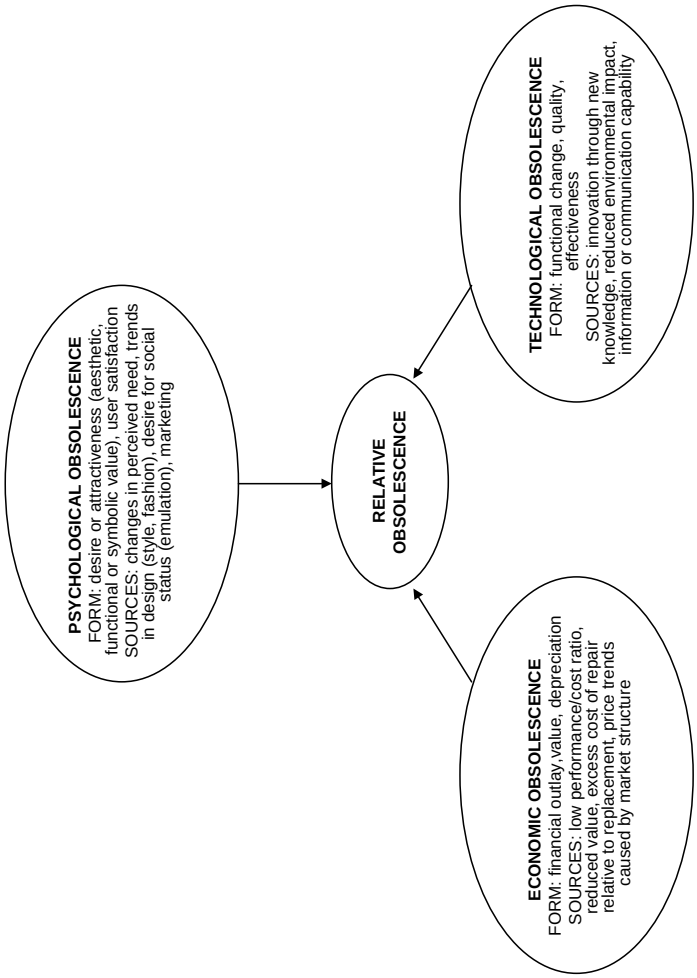

Figure 1. Types of relative obsolescence.

ples were selected for each phase using stratification to represent the demographics of the UK population and quota sampling to avoid the possibility of distortion caused by refusals.

In the quantitative research 802 households were selected for face-to-face interviews in over 180 locations across the UK. The sample size was selected to give 95% confidence limits of $\pm 3.5\%$ (slightly less than that required to be statistically representative at the level of confidence of a typical government poll, 95% confidence limits of $\pm 3\%$, due to limited resources). The survey questionnaire was divided into five main sections that addressed environmental attitudes, appliance ownership and use, appliance disposal, future appliances and services, and demographic information. Fifteen appliance categories were identified and visual aids were used in the form of picture cards that displayed each grouping for ease of recognition. Data were sought on householder attitudes and behaviour, including the number, age, and condition of discarded appliances over a five-year period ending in December 1998. The questionnaire was developed through a pilot survey of 30 households outside of the main sample. In determining the statistical significance of the results, χ^2 and contingency tests were used. These were suitable as all of the results were recorded as frequency data from which observed and expected results could be calculated.

The qualitative research involved five focus groups which were run with experienced facilitators; each comprised 10 householders. Three groups were selected by socio-economic group (AB, C1C2D, E) and the other two were in an urban location (Sheffield) and a rural location (Porth, South Wales). The focus group protocol was developed after a preliminary analysis of the survey results and was pre-tested on a pilot group. It used open-ended questions that related to those asked in the survey, the intention being to enhance understanding of the attitudes and behaviour revealed through the quantitative research. The focus group discussions were transcribed in full and relevant quotes taken *verbatim* for use in analysis.

FINDINGS

Consumer Attitudes and Appliance Life

Insights from people's experience of appliance life spans were sought. Householders were asked in the survey whether they generally find

that appliances last as long as they would like. The survey also invited them to suggest a "reasonable" life span for appliances in each category and identify the categories in which appliances "should last longer than at present." The quantitative data were then explored further through focus group discussion.

Householders were fairly evenly divided between those who considered that appliances generally last as long as they would like (50%) and those who did not (45%) when considering the period "from purchase to being beyond repair" (5% expressed no opinion). This result was tested against their views on the importance of environmental issues, waste reduction or recycling, but no significant statistical relationship was identified.

TABLE I
Age of Discarded Appliances and Life Spans Considered "Reasonable"

Product category	Life span considered "reasonable" (mean)	Age of appliances discarded in disrepair (mean)	Age of all discarded appliances (mean)
Electric cookers	13	12	12
Refrigerators and freezers	12	11	11
Televisions	11	10	10
Washing machines, dishwashers, and tumble dryers	10	9	9
Hi-fi and stereo	11	8	9
Vacuum cleaners and carpet cleaners	9	7	8
Video equipment	10	7	7
Home and garden tools	10	7	7
Microwave ovens	9	6	7
Computers and peripherals	9	7	6
Telephones, faxes, and answer machines	10	5	6
Radio and personal radio, stereo, and CD	8	5	6
Small work or personal care appliances	6	4	4
Mobile phones and pagers	6	4	4
Toys	6	4	4

The respondents considered a reasonable life span for cookers, fridges and freezers, and televisions and hi-fi systems to be between 11 and 13 years. By contrast, a reasonable life span for small work or personal care appliances, mobile phones, and toys was thought to be 6 years. Other appliances were expected to last between 7 and 10 years (Table I). These data were compared with the average age of appliances discarded in disrepair for each appliance category; in every case they were below the life span identified as reasonable. The average life span of telephones, faxes and answer machines, and toys discarded in disrepair was only one-half of that considered reasonable (5 years rather than 10 years) and that of most other types of small appliance around two-thirds. At the other end of the spectrum, the average life span of large kitchen appliances and televisions was close to that considered reasonable.

Some householders had relatively high expectations. Over one-quarter of respondents thought that cookers, fridges and freezers, hi-fi systems, telephones, faxes and answer machines, and home and garden tools should last at least 15 years and more than one-tenth considered a reasonable life span to be over 20 years (Table II). The

TABLE II
Appliance Life Spans Considered "Reasonable"

Product category	% All householders (n = 802)	
	At least 15 years	At least 20 years
Electric cookers	42	17
Microwave ovens	14	4
Refrigerators and freezers	34	12
Washing machines, dishwashers, and tumble dryers	18	4
Vacuum cleaners and carpet cleaners	15	6
Small work or personal care appliances	5	2
Hi-fi and stereo	27	11
Radio and personal radio, stereo, and CD	10	4
Televisions	27	7
Video equipment	17	4
Telephones, faxes, and answer machines	26	14
Mobile phones and pagers	4	2
Computers and peripherals	14	6
Toys	3	1
Home and garden tools	25	12

highest expectations were for cookers, with 42% of householders stating that cookers should last at least 15 years, whereas the proportion of discarded items that were this old was rather lower (34%). In this comparison the greatest contrast was for telephones, faxes and answer machines, as 26% of householders stated that they should last at least 15 years whereas only 8% of discarded items had reached that age.

Asked to specify which, if any, appliances should last longer than at present, for each category at least a quarter of householders replied in the affirmative, although the greatest proportion was barely one-half (Figure 2). Washing machines, dishwashers, and tumble driers were specified most frequently, by 52% of householders. Small work or personal care appliances were mentioned by 51%, whereas only 26% specified telephones, faxes and answer machines, and mobile phones. Just over one in five (22%) appeared completely satisfied, replying that none of the appliances should last longer, whereas almost one in six (16%) stated that all of them should.

As people's expectations are partly based on their past experience, the focus groups explored this aspect. Discussions revealed the belief of some participants that appliances do not last as long as in the past, although a few disagreed:

> *Things have changed. I think they are made more disposable these days, and ... probably they have sealed units that can't be repaired. Things used to last a lot longer.* - Margaret, age 56, unemployed

> *How often have people said 'I wish I had my old one back; this one is rubbish?' How many times have we said that? I know I've said it a lot of times.* - Phil, age 65, retired analyst

> *I've only been married 15 years and I've been through 3 washing machines ... I have been told by manufacturers – each time they have come out to repair them – that they are not made to be used a lot.* - Moira, age 38, company director

> *It's not the electrical components, it's the mechanical parts of things that aren't made as sturdy now. They cut corners trying to cut costs, make metal thinner or whatever ... The electrical stuff is just as reliable if not more nowadays.* - Roger, age 52, telecommunications engineer

> *Things are built better and stronger than ever before.* - Jeff, age 33, television presenter

> *I've got two boys. They are always using the kettle and the toaster and if you think of how much they're used, when they actually go wrong it isn't such a big deal ... It's been used a dozen times every day, every day of its life for 4 years; well, it's not done bad.* - Les, age 44, vehicle administrator

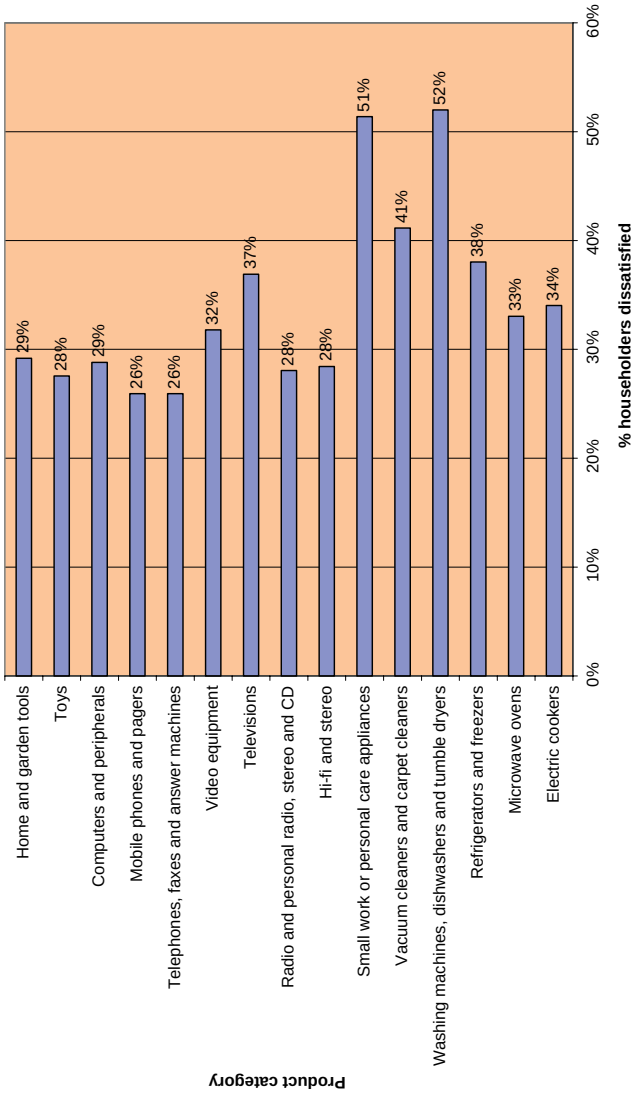

Figure 2. Householders responding that appliances "should last longer."

In order to identify opportunities for reducing waste, focus group participants were asked whom they considered responsible for how long appliances last. Some considered that they would never be satisfied, while others blamed manufacturers:

> *I don't think they ever last as long as you'd like ... When you buy something, obviously you want to get the maximum amount of use out of it and whenever it goes wrong – even if it's after a good length of time – you always want it to last longer.* - Roger, age 52, telecommunications engineer

> *A lot of them are made to break down eventually because otherwise, if they didn't ... then they wouldn't have a market, would they?* - Harold, age 68, retired sales supervisor

> *Video players – I used to have a Betamax one and then all of a sudden you can't get the tapes for those and then you have to buy the VHS one. So you're pushed into buying these things.* - Colin, age 54, carer

Consumer Behaviour and Appliance Life

The age profile of the current stock of appliances and people's ability and willingness to select models designed for longevity and to get faulty items repaired were investigated.

Data on the age of the current stock of appliances revealed a majority (57%) to be under 5 years old, with 12% over 10 years old and a mere 3% over 15 years old (Table III). More than three-quarters of computers and mobile phones were under 5 years old.

Asked to identify the quality of appliances that they generally purchase, only 22% of householders claimed to select "premium quality" models. Most indicated that instead they chose "middle range" (59%) or "budget priced" (17%) models (2% did not respond). Those in socio-economic group AB were more likely than others to purchase premium quality models, a relationship that was highly significant ($p < 0.001$***, $\chi^2 = 64.375$, df = 8). The same was true for householders who considered environmental issues to be "very important" ($p < 0.001$***, $\chi^2 = 34.377$, df = 8). In each case over 30% claimed to purchase premium quality models. Householders were likewise significantly more likely to buy premium quality models if they considered the need to reduce waste to be "very important" ($p < 0.001$***, $\chi^2 = 28.196$, df = 8).

Some focus group participants said that people would be willing to pay higher prices for longer lasting appliances, although several were

TABLE III
Age of Stock of Household Appliances

Product category	Aged under 5 years (%)	Aged 6–10 years (%)	Aged 10–15 years (%)	Aged over 15 years (%)
Electric cookers	37	37	15	11
Microwave ovens	48	38	11	3
Refrigerators and freezers	43	37	14	7
Washing machines, dishwashers, and tumble dryers	50	36	11	3
Vacuum cleaners and carpet cleaners	55	32	9	4
Small work or personal care appliances	57	33	8	2
Hi-fi and stereo	58	29	9	4
Radio and personal radio, stereo, and CD	63	29	6	2
Televisions	54	33	10	4
Video equipment	62	31	6	1
Telephones, faxes, and answer machines	67	26	5	2
Mobile phones and pagers	85	13	2	0
Computers and peripherals	75	21	4	0
Toys	77	20	3	1
Home and garden tools	48	34	12	7
All products	57	31	9	3

not convinced that more expensive items necessarily last longer. Indeed no statistical relationship was found between the quality of appliances purchased and the life spans suggested as reasonable. Several focus group participants thought that the type of appliance would influence their decision:

> *People will pay if it's good quality and they know it's a good appliance.* - Phil, age 65, retired computer analyst

> *It doesn't matter what model you buy, the average life span of a washing machine is between 5 and 7 years.* - Lorraine, age 39, general manager

> *I can't see a good one lasting longer than a basic.* - Shirley, age 45–64, retired

Cookers and washers, if they were guaranteed to last 25 years, then you would possibly pay that little bit more ... But if it's a hi-fi system, or something like that, then there is a chance that you might not be able to get the disks or the tape, so you won't. - Sue, age 36, self employed groom

It probably depends on the total price of the item. If it was a high priced item you would pay more. If it was a hairdryer or something you might think, well, I can throw it away after a year if it's not up to it. Or a kettle or an iron – they're not in the same league, are they? But a TV – I think you would pay more for a longer life span. - Pete, age 52, computer programmer

Householders were asked to identify from a range of options the main disadvantage of purchasing appliances "designed to last a long time." The reason most frequently cited, by 30% of respondents, was concern that such appliances "may become out of date after a few years," while 23% cited purchase price and 16% repair and maintenance expenditure (Figure 3). This outcome was explored further in the focus groups. In particular, it was necessary to consider how the phrase "out of date" might have been interpreted. Focus group discussion revealed that many participants viewed technological change and fashion as problematic:

I was told in a computer shop ...'They are manufacturing another one to take its place … Every time you're buying one they're ready to bring another one out ... I think that is so unfair. - Elaine, age 52, administration assistant

The trouble with computers is as soon as you've bought one they are out of date, so you never get on top of them. - Steve, age 24, technical development manger

When that television goes out of fashion you've gotta change, otherwise you're talked about. - Peter, age 60, retired steel worker

I don't buy anything new unless it breaks down or stops. I don't buy anything for fashion, but if I had young children it might be different. - Phil, age 61, motor mechanic

Some felt that models were changed too frequently and that extra functions were unnecessary or likely to decrease reliability:

You get these extras on there which you are paying for and yet you don't use half of them. - Harold, age 68, retired sales supervisor

There's so many new gadgets and things on them and so much more to go wrong. - Sue, age 36, self employed groom

Sometimes ... the ones that are leading the edge in technology are the ones that are at the back of the queue when it comes to how long the goods will last. - Betty, age 68, retired

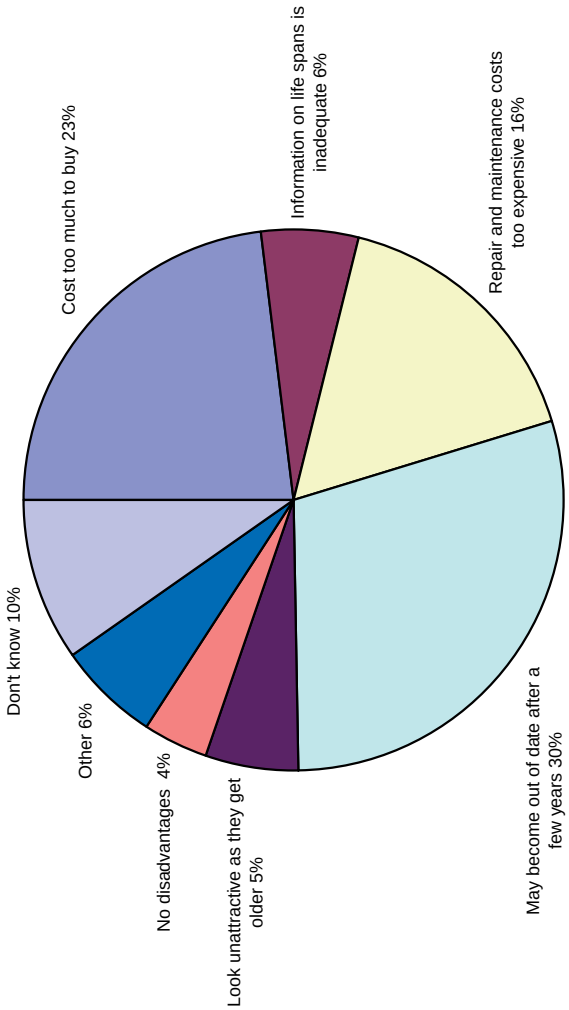

Figure 3. Disadvantages of appliances "designed to last a long time."

I just thought it looked a bit dated and the other one looks nice, but it doesn't work as well. - Ann, age 67, retired

In order to explore the influence of householders upon appliance life spans, the extent to which repair work was undertaken and the condition of discarded items were investigated.

A high proportion of householders said that they "rarely" or "never" had their appliances repaired (38%). Only 26% "usually" had their appliances repaired, while 33% replied that they "sometimes" had them repaired (3% did not respond). The reason cited most frequently as one of the factors discouraging them from repair work was cost, which was identified by over two-thirds of respondents. There was no evidence of a relationship between householders who considered environmental issues or waste reduction to be very important and the extent to which they had their appliances repaired.

Householders were also asked to classify appliances that they had discarded over the previous five years according to their condition. One-third of discarded appliances (33%) were reported to be "still functioning," just over one in five (21%) were considered "in need of repair," and slightly less than one-half (46%) "broken beyond repair." There were noteworthy variations between different categories of appliance (Table IV). A majority of discarded washing machines, dishwashers and tumble driers, vacuum cleaners, small work or personal care appliances, radios and personal stereo equipment, and home and garden tools were broken beyond repair. By contrast, nearly 60% of discarded computers and mobile phones and almost one-half of cookers and hi-fi systems were still functional. A considerable amount of reuse evidently took place: overall, one-quarter of discarded appliances were either donated to other people or sold for reuse. In the case of discarded computers, around two-thirds were passed on in this way, some of them in need of repair.

Analysis of the data revealed significant relationships between householders' behaviour and their satisfaction with appliance life spans. Householders who indicated that they usually purchased premium quality models were significantly more likely to state that appliances generally last as long as they would like ($p < 0.05$*, $\chi^2 = 9.636$, df = 4). The same was true for householders who usually had their appliances repaired, a relationship that was highly significant ($p < 0.001$***, $\chi^2 = 32.841$, df = 8).

TABLE IV
Condition of Discarded Appliances

Product category	Beyond repair (%)	In need of repair (%)	Still functioning (%)
Electric cookers	29	23	48
Microwave ovens	36	22	42
Refrigerators and freezers	43	19	37
Washing machines, dishwashers, and tumble dryers	52	26	22
Vacuum cleaners and carpet cleaners	53	21	26
Small work or personal care appliances	66	19	15
Hi-fi and stereo	30	21	49
Radio and personal radio, stereo, and CD	54	20	27
Televisions	43	24	33
Video equipment	41	25	34
Telephones, faxes, and answer machines	40	16	44
Mobile phones and pagers	27	13	59
Computers and peripherals	29	12	59
Toys	42	17	41
Home and garden tools	61	17	21
All products	46	21	33

Variations in Attitudes and Behaviour

Attitudes and behaviour towards appliance life spans were explored in the context of the gender, age, and socio-economic group of survey respondents in order to deepen understanding of factors that might influence them.

Asked whether appliances generally last as long as they would like, women were significantly more inclined than men to express dissatisfaction ($p < 0.05$*, $\chi^2 = 6.538$, df = 2). Relationships between gender and life spans considered reasonable for specified categories of appliance were mostly not significant. Exceptions were washing machines, dishwashers, and tumble driers, for which life spans considered reasonable were significantly greater for men than women ($0.001 < p < 0.01$**, $\chi^2 = 12.381$, df = 3), and likewise cookers ($p < 0.05$*, $\chi^2 = 9.259$, df = 3). Focus group discussion suggested that the kitchen might be an area in which women are more likely to want to update items regularly:

I'm quite happy to buy something that lasts forever and keeps going. I've got a wife that says 'I want a change ... I think the wife's influence is a little bit different to mine. I just want a kettle that boils cup of water. She wants one that looks nice as well. - Les, age 44, vehicle administrator

Age exerted an influence on satisfaction with appliance life spans. People aged 55–64 tended to be less satisfied than those in other age groups. They were significantly more likely to state that appliances generally do not last as long as they would like ($p < 0.05$*, $\chi^2 = 24.180$, df = 10) and had significantly higher expectations of what constituted a reasonable life in most appliance categories (the exceptions being televisions, video equipment, mobile phones, computers, and toys). In addition to this age group, people aged under 35 were more inclined to be dissatisfied. There was, however, no evidence of a relationship between the age of respondents and the condition of discarded items.

No significant relationship was found between satisfaction with appliance life spans in general and socio-economic group, although when appliances were specified people in groups C2, D, and E were significantly more likely to state that hi-fi systems, radios and personal stereo equipment, televisions, mobile phones, toys, and home and garden tools should last longer.

Women perceived the disadvantages of purchasing appliances designed to last a long time differently from men. Women were significantly more concerned about economic factors such as the costs of purchase and repair and maintenance, whereas men worried that longer lasting appliances may become out of date after a few years ($p < 0.05$*, $\chi^2 = 9.646$, df = 4). Analysed by socio-economic group, the factor most likely to deter people in groups AB and C1 was concern that such items may become out of date, whereas those in groups D and E (and to a lesser extent C2) were deterred by the cost of purchase, relationships that were highly significant ($0.001 < p < 0.01$**, $\chi^2 = 38.420$, df = 20).

Information on Expected Appliance Life

Householders need information on the design life of appliances before making a purchase if they are to be able to select longer lasting models. The survey asked how important they considered such information to be and about the adequacy of the information currently available.

Almost three-quarters of respondents considered accurate information on the expected life span of appliances to be either "extremely important" (32%) or "very important" (41%). Only 4% stated that it was "not important," while 22% replied "fairly important" (1% had no opinion). However, a majority regarded the information on expected life spans that is currently available as "inadequate" (30%) or "barely adequate" (24%). A mere 4% stated that it was "very adequate" and 37% "reasonably adequate" (5% had no opinion).

No significant relationships were found between demographic factors and the importance or adequacy of life span information. However, there was a highly significant relationship between considering environmental issues to be important and regarding information on life spans as "extremely" or "very" important ($p < 0.001$***, $\chi^2 = 61.568$, df = 12); a similar result was found for those who considered waste reduction important ($p < 0.001$***, $\chi^2 = 39.264$, df = 12). In addition, householders who stated that appliances generally do not last long enough were significantly more likely to regard current information on life spans as inadequate ($p < 0.001$***, $\chi^2 = 49.163$, df = 8).

DISCUSSION

Insights Into Obsolescence

Obsolescence occurs when products become "out of use" or "out of date." The results from this research project on household appliances suggest that absolute obsolescence, which arises from technical failure, is exerting less influence upon life spans than relative obsolescence. These two types of obsolescence are considered in turn below and the implications for future appliance life spans are then discussed.

The quantitative research revealed the limited extent to which appliance life spans are currently determined by technical failure (i.e., absolute obsolescence). Discarded appliances that were described as broken beyond repair were in a minority; most were thrown away because they were no longer wanted or needed some repair work. Although the distinction between appliances "broken beyond repair" and "in need of repair" required a degree of subjective judgement by householders, their responses gave an indication of the level of disrepair. The fact that a third of the discarded appliances that did not

function were considered repairable suggests that much waste is unnecessary.

The variation between different applicance categories in the condition of discarded items reinforces the argument that psychological, technological, and economic factors exert as much influence on life spans as technical reliability. For example, the fact that computers and mobile phones were the appliances most likely to be functional when discarded demonstrates the impact of technological obsolescence.

Despite evidence from the survey that technical failure is no longer the main explanation for appliance replacement, many focus group participants said that they did not believe that appliances are as durable as in the past and blamed manufacturers. Some of these critics noted the underlying economic influences, however, arguing that appliances have only become less ''sturdy'' because manufacturers have had to cut costs.

The main research findings concern relative obsolescence and the data are now discussed in the context of the three categories of obsolescence described earlier: technological, economic and psychological (Figure 1).

Technological obsolescence. This kind of obsolescence arises when people are attracted to functions in newer models added or changed as a result of advances in knowledge. The influence of technological factors upon decisions relating to the acquisition and disposal of appliances was demonstrated through the survey and these findings were amplified in focus group discussions.

Survey respondents were less likely to express dissatisfaction with the life span of those appliances that are most subject to technological innovation; the fact that such appliances were most likely to be still functional when discarded is clearly consistent with this. The survey also revealed that a substantial proportion of householders, especially men, would be deterred from buying longer lasting appliances out of concern that they become out of date.

Such findings suggest that many people are wary of being locked into the prevailing technology. The focus group discussions, on the other hand, revealed an ambiguity in attitudes towards technology, with some participants indicating that they felt forced to keep up with technological change. Although most associated advances in technology with ''progress,'' many expressed dissatisfaction at a personal level

because of the frequency with which they felt obliged to replace appliances or the poor quality of new, supposedly "leading edge," models.

Economic obsolescence. This kind of obsolescence occurs when householders attribute little or no value to an existing appliance and conclude that it is no longer worth keeping in use. They might be influenced by the cost of new replacement models, which may be more energy-efficient and cheaper to maintain, or by the expense of repair work.

The fact that only a fifth of householders in the survey purchased appliances that they considered to be of premium quality suggests that many consumers do not regard durability as a major priority or are not convinced that premium priced models last longer. Moreover, although premium quality may imply greater durability, some consumers who purchase premium-priced models are seeking other aspects of quality. Survey respondents who generally bought premium quality models did not have significantly higher expectations of appliance life spans. It follows that many consumers who want longer lasting appliances do not generally purchase premium quality models. One explanation is that price alone does not enable consumers to identify appliances designed for longevity, as the relationship between price and quality is not consistent (Alpert, Wilson, & Elliott, 1993; Dardis & Gieser, 1980; Sproles, 1977).

Respondents who chose premium quality models were more likely to be in the higher socio-economic groups, consistent with data indicating that the cost of purchase would deter many people from choosing appliances designed for longevity. Less predictable was evidence that one in six people consider repair and maintenance costs as a major deterrent to purchasing longer lasting appliances. This may be the result of experience, as around one-third of appliances discarded in a broken state were considered repairable and cost was the main factor that discouraged people from having such appliances repaired.

Psychological obsolescence. This kind of obsolescence, which occurs when people are no longer attracted to a product or satisfied by it, was primarily addressed in the research in focus group discussion. These narratives provided insights into influences upon participants' behaviour such as peer group pressure, fashion, and marketing. People responded differently. Thus while one participant was concerned that

colleagues might sneer if his television was outmoded, another said that he did not buy anything for fashion and would only do so if he had children.

It was apparent during these discussions that for some participants the appearance of an appliance mattered as much as its functionality. Several revealed that they replaced appliances to avoid giving a negative impression to other people, or for aesthetic reasons (especially when renovating their kitchen). Others, by contrast, valued appliances primarily as functional items.

These findings point to areas which need to be addressed if relative obsolescence is to be less pervasive: upgradeable appliances to embrace technological advance, tax reform to make repair work less unattractive, and education to give people confidence in responding to peer group pressure and advertising.

The Potential for Increased Product Life

The potential of longer lasting appliances to reduce the environmental impact of modern consumerism has been recognised by government and industry as well as environmental campaigners (DEFRA, 2000; Department of the Environment, 1995; Falkman, 1996; McLaren, Bullock, & Yousuf, 1998). Achieving such change, however, depends on the ability to modify attitudes and behaviour. This section assesses the data on appliance life spans, discusses people's expectations and behaviour, and considers the implications for marketing and public policy.

The survey found that the average life span of appliances ranged from 4 to 12 years, depending upon type. As these data are historic, it is possible that appliance life spans in the current stock will differ because of changes in design or consumer behaviour. The focus group discussions indicated that there may be a decline in the life span of items subject to sustained technological innovation.

As the data were obtained from householders' estimates of the age of items discarded over a 5 year period, their accuracy is dependent on people's memories, which means that it may be susceptible to bias. However the disposal of an appliance is a relatively rare event (occurring on average three times per year) and tends to be memorable, especially if replacement involves a costly purchase. Another concern, given that many people believe that appliances lasted longer in the past (e.g., Kostecki, 1998), is that there might have been a

"nostalgia effect" through which survey respondents overstated the life spans of discarded appliances. No evidence was found to substantiate this. The data proved internally consistent and comparable with estimates from sales and market penetration data (AEA Technology, 1997). Although no comparable data exist that would enable a historical trend to be identified, data from this survey could be used as a benchmark in future research.

Whatever the past, the survey revealed that householders are divided, almost evenly, on whether appliances currently last long enough. Gender and age exert significant influence. Women tend to be more dissatisfied with appliance life spans than men but cost would deter them from purchasing longer lasting models (whereas men are more concerned that such appliances may become out of date). The fact that people aged between 55 and 64 are especially likely to be dissatisfied with appliance life spans may reflect the fact that many married and set up home prior to the consumer boom of the 1960s, from which period planned obsolescence was increasingly tolerated. The relationship between satisfaction with appliance life spans and the quality of models purchased was significant whereas people's socio-economic group did not affect their level of satisfaction, which suggests that personal experience influences expectations more than does social interaction.

In order to explore people's expectations, householders were asked to suggest a reasonable life span for appliances and these data were compared with the actual life of discarded items. As there are no published data on life spans to shape consumer expectations, people are likely to judge a reasonable life span by their past experience and that of family and friends, together with factors such as anticipated intensity of use and technological advance. Data analysis revealed that, overall, discarded items last around two-thirds of a life span considered reasonable, the shortfall being greatest for smaller appliances. If, when considering what is reasonable, respondents interpreted an appliance life span as the period before it is discarded, whatever its condition, their expectations are evidently not being met. Some, however, may have interpreted it as a product's total service life, in which case the shortfall partly reflects the fact that many appliances are discarded while reparable or functional.

Intensity of use is an important consideration in the context of life spans, as the amount of service provided by an appliance may be as

important as the period over which it functions. The use of washing machines, for example, varies considerably according to the size and age profile of households and it is reasonable to suppose that if people anticipate more intensive use they will not expect their washing machines to last as long. There is also an environmental dimension. If technological progress enables greater energy efficiency, the intensive use of appliances that consequently have shorter life spans may be preferable to less intensive use, as the latter results in longer life but prolonged use of an inefficient technology. Following through the example of washing machines, such reasoning might make launderettes an environmentally attractive option.

The level of dissatisfaction with appliance life spans suggests that industry should assess the possibility that latent demand exists for longer lasting appliances and governments should consider public policy options (Cooper, 1994b; Falkman, 1996; Kostecki, 1998).

A high proportion of dissatisfied people does not of itself prove that there is a ready market for longer lasting appliances. Effective demand depends on a willingness and an ability to pay the market price and there is a danger of generalisation. Manufacturers and retailers should note that the data suggest that the short life span of many small work or personal care appliances concerns many householders. Around one-half of survey respondents specified that such items ought to last longer and their average life span of 4 years was only two-thirds of that considered reasonable.

Data for some of the other appliances are rather less easy to interpret. There was a similarly high level of dissatisfaction with wet appliances (i.e., washing machines, dishwashers, and tumble dryers) and yet their average age when discarded was close to that considered reasonable. It may be that respondents interpreted ''reasonable'' within the context of current norms, whereas ''should last longer'' is more prescriptive and implies an ideal standard. The apparent discrepancy may also reflect the fact that wet appliances are essential items that tend to be broken when discarded, causing replacements to be ''distress purchases.''

Another example is provided by data on appliances that are particularly subject to innovation. Although relatively few respondents stated that computers, mobile phones and telephones, and faxes and answer machines ought to last longer, the average life span of these appliances when discarded was sometimes well below that identified as reasonable. For example, telephones as well as faxes and answer ma-

chines lasted, on average, five years less than the life span considered reasonable and yet barely one-quarter of respondents said that such items should last longer. Evidently people are adjusting their expectations in the light of technological change. This suggests that marketing these appliances on the basis of longevity will prove counterproductive unless upgradeability is integrated into product design.

If producers plan to market longer lasting appliances they need to consider whether consumers are more likely to be attracted by value for money or by reduced environmental impact. Focus group discussion suggested that people are likely to view life span as an issue of product quality rather than an environmental concern. This supports evidence from the survey that people who consider environmental issues to be very important are not more likely to be dissatisfied with appliance life spans. Nor, apparently, does concern about the environment or waste make people more likely to have their appliances repaired. Until there is greater public awareness of the environmental impact of short-lived appliances, the scope for marketing longer-lasting appliances on environmental grounds appears to be limited. Producers would be better advised to use demographic evidence from the survey that people in their late 50s and early 60s are particularly dissatisfied with life spans and that women are more dissatisfied than men. They should also note that consumers who purchase premium quality models or maintain their appliances by undertaking repairs when necessary appear to be rewarded by greater satisfaction with life spans.

The case for increased public access to information about the design life of appliances has long been argued (Antonides, 1990; Box, 1983; Conn, 1997; Cooper 1994a; OECD, 1982). Householders concerned about environmental issues were more likely to view information on life spans as important, indicating a desire to make informed decisions, and several focus group participants complained that they found it hard when purchasing appliances to differentiate between models on the basis of life span. The survey confirmed past research which revealed that many people consider life span information to be inadequate (National Consumer Council, 1989). They may favour increased information without any commitment to utilising it, but the fact that three-quarters of respondents considered life span information to be "extremely" or "very" important suggests a genuine interest.

CONCLUSIONS

The annual growth in household waste arisings in Britain and other industrialised countries is a major source of environmental concern. Appliances account for an increasing proportion of this waste. The fact that a majority of appliances are less than 5 years old demonstrates the potential for further growth in waste volumes as the market penetration of new types of appliances increases.

The results from this research project reveal that people are divided over whether or not appliances should last longer. Those who favour increased durability would prefer appliances to have slightly longer life spans compared with their recent experience. Dissatisfaction is most clearly evident with small work or personal care appliances. Consumers are liable to be critical of manufacturers, but most accept that appliances subject to rapid innovation will be replaced relatively often. The potential environmental benefits of longer lasting appliances are not recognised by consumers, who in any case may be deterred from purchasing them by concern that they may become dated and or prove more costly. Even so, many consumers have a desire for more information on product life spans to guide their choices.

The results enhance understanding of the refined model of relative obsolescence presented at the outset and clearly demonstrate that appliance life spans are determined by consumer behaviour as much as by design specification. Consumers have an important role to play in reversing the trend towards increased appliance waste, but action is first needed by others if the apparently latent demand for longer lasting appliances is to be made effective. In the meantime technological advance leads to appliances being superseded, economic factors favour replacement over repair, and peer group pressure, fashion, and marketing generate dissatisfaction. Thus manufacturers and retailers need to review the commercial potential for appliances that are designed to be longer lasting, being intrinsically durable, repairable; and upgradeable. The Government has a vital role in promoting far greater awareness of the environmental impact of short-lived products and in developing policies that encourage durability, such as tax reforms to encourage repair work and measures to ensure that consumers have access to information on the design life of products.

Finally, further academic research is needed to explore the influences upon appliance life spans during the successive phases of acquisition,

use, and disposal. Consumer attitudes and behaviour throughout the product life cycle need to be better understood if appliance life is to be optimised. Specific areas worthy of investigation include product-specific research comparing the influence of different forms of obsolescence, consumer information on the design life of new products, the quality of second-hand products, and incentives to repair work.

REFERENCES

AEA Technology (1997). *Recovery of WEEE: Economic and Environmental Impacts*. Report produced for European Commission DG XI.

Alpert, F., Wilson, B., & Elliott, M. T. (1993). Price signalling: Does it ever work? *Journal of Consumer Marketing*, *10*(4), 4–14.

Antonides, G. (1990). *The lifetime of a durable good*. Dordrecht: Kluwer.

Box, J. M. F. (1983). Extending product lifetime: Prospects and opportunities. *European Journal of Marketing, 17*(4), 34–49.

Conn, W. D. (1977). Consumer product life extension in the context of materials and energy flows. In: D. W. Pearce & I. Walter (Eds.), *Resource conservation: Social and economic dimensions of recycling*, pp. 127–143. London: Longman.

Cooper, T. (1994a). *Beyond recycling: The longer life option*. London: New Economics Foundation.

Cooper, T. (1994b). The durability of consumer durables. *Business Strategy and the Environment*, *3*(1), 23–30.

Cooper, T. (2000). WEEE, WEEE, WEEE, WEEE, all the way home? *European Environment, 10*(3), 121–130.

Cooper, T., & Mayers, K. (2000). *Prospects for household appliances*. Halifax: Urban Mines.

Dardis, R., & Gieser, N. (1980). Price and quality of consumer goods: Are they more closely related in the seventies than in the sixties? *Journal of Consumer Policy*, *4*, 238–248.

DEFRA (Department for Environment, Food and Rural Affairs) (2000). *Waste strategy 2000 for England and Wales*. London: TSO. Cm. 4693.

Department of the Environment and the Welsh Office (1995). *Making waste work: A strategy for sustainable waste management in England and Wales*. London: HMSO. Cm 3040.

Falkman, E. G. (1996). *Sustainable production and consumption*. Geneva: World Business Council for Sustainable Development.

Granberg, B. (1997). *The quality re-evaluation process: Product obsolescence in a consumer-producer interaction framework*. Stockholm: University of Stockholm, Department of Economic History.

Hanson, J. (1980). A proposed paradigm for consumer product disposition processes. *Journal of Consumer Affairs*, *14*, 49–67.

Harrell, G. D., & McConocha, D. M. (1992). Personal Factors related to consumer product disposal tendencies. *Journal of Consumer Affairs*, *26*, 397–417.

Heiskanen, E. (1996). *Conditions for product life extension*. Helsinki: National Consumer Research Centre. Working Paper 23.

Jacoby, J., Berning, C., & Dietvorst, T. F. (1977). What about disposition? *Journal of Marketing*, *41*(2), 22–28.

Kostecki, M. (Ed.) (1998). *The durable use of consumer products*. Dordrecht: Kluwer.
McLaren, D., Bullock, S., & Yousuf, N. (1998). *Tomorrow's world*. London: Earthscan.
National Consumer Council (1989). *The consumer guarantee*. London: National Consumer Council.
OECD (1982). *Product durability and product-life extension*. Paris: Organisation for Economic Co-operation and Development.
Packard, V. (1960). *The waste makers*. Harmondsworth: Pelican.
Redclift, M. (1996). *Wasted: Counting the cost of global consumption*. London: Earthscan.
Robson, C. (1993). *Real world research*. Oxford: Blackwell.
Sproles, G. B. (1977). New evidence on price and product quality. *Journal of Consumer Affairs*, *11*(1), 63–77.
Stahel, W.R., & Jackson, T. (1993). Durability and optimal utilisation: Product-life extension in the service economy. In: T. Jackson (Ed.), *Clean production strategies*, pp. 262–291. Boca Raton, FL: Lewis.
van Hinte, E. (Ed.) (1997). *Eternally yours: Visions on product endurance*. Rotterdam: 010 Publishers.
van Nes, N. (2003). *Replacement of durables: Influencing product lifetime through product design*. Rotterdam: Erasmus University. PhD thesis.

THE AUTHOR

Tim Cooper is Head of the Centre for Sustainable Consumption, Sheffield Hallam University, Howard Street. Sheffield S1 1WB, UK. Fax: +44 (0) 114 225 3343 ; e-mail: t.h.cooper@shu.ac.uk.

The author acknowledges the contribution of Kieren Mayers (University of Surrey) to the development of the research methodology and for comments on the text. Comments from three anonymous referees were also much valued. The project was undertaken with financial support and technical assistance from Cleanaway, Dixons Stores Group, Domestic & General plc, the Greenbank Trust, Hewlett-Packard, Intex Computers, and Philips Electronics and was part-funded by landfill tax sponsorship.