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Consumer perspectives on longevity and reliability: a national study of purchasing factors across eighteen product categories

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Abstract

Increasing global demand for durable goods prevents the decoupling of economic growth from natural resource use required to achieve sustainable consumption and production. Presently, most consumers in the United Kingdom (UK) exhibit a strong preference for purchasing new durable goods. Therefore, short-to-medium term strategies that seek to engender sustainable consumption of durable goods should focus on encouraging consumers to choose longer-lasting, reliable products. This paper outlines the importance consumers place on six purchasing factors (appearance, brand, guarantee length, longevity, price and reliability) across eighteen categories of durable goods. Data was collected from a UK national survey of consumer satisfaction with product lifetimes (n=2207). The research identified that most consumers consistently emphasise the importance of longevity and reliability when purchasing new products. If consumer preference for longer-lasting, reliable products can be translated into purchasing behaviour, progress can be made towards engendering sustainable consumption, enacting the circular economy and reducing national ecological footprints.

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Keywords: Consumer survey; Durable goods; Longer-lasting products; Purchasing factors; Sustainable consumption and production.

1. Introduction

Life cycle engineering (LCE), with its emphasis on reducing the detrimental economic, environmental and social impacts of goods and services across their lifetime [1], has a fundamental role to play in attainment of many of the United Nations Sustainable Development Goals (UNSDGs) [2]. Sustainable Development Goal twelve, the promotion of sustainable consumption and production [3], is of particular interest to LCE, as increases in the lifetime of durable goods present an opportunity to reduce the detrimental impacts of rampant consumption in increasingly 'throwaway societies' [4]. Increasing the lifetime of products by developing more durable and reliable goods [5] ensures critical raw materials are used more efficiently and resource loops are slowed [6], limiting detrimental impacts as much as possible. By increasing consumer uptake of longer-lasting products, the aspirations of UNSDG twelve can be met, substantially reducing waste generation by prevention, and sustainably managing the use of natural resources by 2030 [7].

The study of purchasing factors can assist designers, manufacturers, retailers and marketers in uncovering consumers' buying intentions, revealing market trends that merit exploitation [8]. Research has established that consumers are generally interested in purchasing longer-lasting, reliable products [9,10]. However while purchasing factors such as longevity and reliability have received attention in the literature on clothing [11], furniture [9], and electrical and electronic equipment (EEE) [10], little is known about these purchasing factors with regards to other product categories such as kitchenware and space heating among others [12]. If product categories can be identified where consumers place the greatest importance on longevity and reliability, this can provide opportunities for LCE to prioritise products for developing the longevity of durable goods.

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This study outlines the findings of a national survey of consumer purchasing factors across eighteen product categories. As the study of purchasing factors in relation to longevity and reliability is inconsistent across product categories, this research sought to develop an understanding of these factors across an exhaustive range of durable goods. This would expose product categories which present opportunities for further research, policy development and subsequent product innovation.

The paper establishes the requirement to increase the uptake of durable goods with extended product lifetimes if the aspirations of LCE are to be fully-realised in the context of the circular economy, resource scarcity and climate change. The relationship between purchasing factors, intentions and buying behaviour is explored and the research methods are summarised. The study findings are reported and the differences in purchasing factors across the eighteen product categories are outlined. Finally, product category-specific opportunities for LCE and other actors to increase the uptake of longer-lasting products are discussed, so that detrimental sustainability impacts of products across their lifetime can be minimised and beneficial outcomes for the economy, environment and society can be maximised.

2. Meeting challenges to sustainable consumption and production with longer-lasting products

The design, manufacture, distribution, use and disposal of durable goods accounts for a significant proportion of industrialised nations' energy and material demand [13,14]. Durable goods are defined in the United Nations' *System of National Accounts 2008* [15] as products "that may be used repeatedly or continuously over a period of more than a year" (p.184). However, decreasing lifetimes of durable goods across the globe [16], coupled with increasing global populations and affluence are placing ever-increasing demands on the planet's resources [17]. If it is the aspiration of LCE to operate within biophysical planetary boundaries while furthering human prosperity and social equity [18,19], then efforts towards mitigating the detrimental economic, environmental and social impacts of short-lived durable goods must be addressed.

In addition, to reducing the detrimental environmental impacts of human consumption [5], longer-lasting products also have the potential to benefit both the economy and society. Montalvo et al. [20] has identified that an increase in economic activity related to longer lasting products, including their extended use, maintenance, repair and rental services would have the effect of adding 7.9 billion Euros per year to Europe's economy. Furthermore, if appropriate finance mechanisms can be identified [21], longer-lasting products have the potential to improve the affordability of costly consumer durables (e.g. large kitchen appliances) over time, ensuring their accessibility to all in society.

It is acknowledged that in the case of some energy-using products, incremental innovations in their design and manufacture can reduce total energy demand over the product's lifetime [22,23]. Nevertheless, it is important to acknowledge resource scarcity, particularly the declining availability of critical raw materials, poses a challenge for sustainability [24].

Cooper [4] has previously argued that increased product lifetimes are required in order for the aspirations of sustainable production and consumption to be met. Cooper [4,5] identifies that both product durability and life extension strategies (i.e. repair and remanufacture) have the potential to increase product lifetimes, reducing the quantity of waste generated over time. Alongside increasing product lifetimes, strengthening the reuse of durable goods, extending their service lifetime [25], presents a complementary strategy for reducing material demand [26,27]. However, the acceptability of second-hand durable goods is varied across product categories [28]. Therefore, in the short-to-medium term, strategies that seek to enact sustainable production and consumption should focus on increasing the uptake of new longer-lasting, reliable durable goods.

Across durable goods sectors, the technical knowledge required to improve product durability, and thus physical lifetime, already exists as evidenced in many premium products [9,29]. However, barriers such as affordability [21], ease of access and desirability [30] can hinder the uptake of these products. Information provision and visibility [31], along with culture change [30] and advances in lifespan labelling [32] may serve to increase the uptake of longer-lasting products, meeting this challenge to sustainable consumption and production.

Previous research in fields such as environmental, health and social psychology has established a relationship between intention and behaviour [33–37]. Bai et al. [38] assert that purchasing behaviour can be inferred from purchasing intentions. Purchasing factors have been used in a number of consumer studies to predict intention to purchase products with particular characteristics [8,10]. Therefore, to evaluate the level of consumer demand for longer-lasting, reliable goods, this study sought to identify the importance consumers place on durability and reliability in comparison to other purchasing factors across an exhaustive range of durable goods.

3. Methods

The results reported in this paper were collected as part of a national online survey into consumer satisfaction with product lifetimes across a range of durable goods conducted in February 2017 in the United Kingdom (UK). Eighteen product categories, encompassing an exhaustive range of durable goods, were formulated from a review of the United Nations' Statistics Division's [39] Classification of Individual Consumption According to Purpose and Mintel academic market research intelligence (e.g. [40]). To reduce the impact of survey fatigue [41], each participant only answered questions on up to nine of the eighteen product categories.

A Likert-type scale, with options ranging from 'not at all important' to 'extremely important, was designed to assess the relative importance that participants assigned to five-to-six purchasing factors: Appearance, brand, guarantee length, longevity, price and reliability (Appendix A). The purchasing factors selected for this study were refined from research into consumer purchasing preferences conducted by Knight et al. [10]. A pilot study was conducted to select the most appropriate purchasing factors to use across the entire range of product categories under investigation. Ultimately, the six purchasing factors outlined above were found to be the most suitable.

Reliability was only assessed for products with complex electrical, electronic or mechanical parts (i.e. bicycles, cars, electronic goods, jewellery, clocks and watches, large kitchen appliances, power tools for the home and garden, small household appliances, and space heating and cooling products). Demographic information, such as age and gender, was also collected from survey participants to inform the sampling strategy.

A non-probability quota sample [42] of 2,207 participants was recruited by a market research company (JRA Research). Quotas were derived from the adult (18+) population of the UK [43] using gender and age intervals to recruit a sample indicative of the national population. The sample quotas deviated from the UK population by no more than +/- 5.000% (Appendix B), which the academic discipline of market research considers to be acceptable [44]. Additionally, as the deviation of the sample quotas from the population was minimal, no population weights were applied to the data. This is in accordance with recent consumer surveys into product lifetimes (e.g. [45,46]). Response rates for each product category ranged from between 635 for musical instruments to 1,212 for space heating and cooling products. For an extended discussion of the product category formulation and survey method see Gnanapragasam et al. [47].

The purchasing factor data was prepared for analysis by excluding data points where participants had stated they could not answer the question. Purchasing factor responses were numerically coded (i.e. from 1 for 'not at all important' to 5 for 'extremely important'). The median was calculated for each purchasing factor as it is the appropriate measure of central tendency for an ordinal, Likert-type scale [48] and provides an indication of the purchasing factors' relative importance to the sample.

Kendall's coefficient of concordance (W) [49,50] was used to compare responses to each product category in order to assess the level of agreement between participants with regards to the importance of purchasing factors. Kendall's W employs Cohen's guidelines [51] for interpreting effect size (i.e. $W \geq 0.100$ small effect, $W \geq 0.300$ moderate effect, $W \geq 0.500$ strong effect). For each product category, Dunn-Bonferroni post hoc pairwise tests [52] were carried out on each pair of purchasing factors to ascertain if there were any differences in the distribution of participants' responses to the two purchasing factors. Effect sizes (r) were calculated from the post hoc tests using Rosenthal's [53] formula. Cohen's guidelines [51], detailed above, were also used to interpret r. The level of statistical significance (p) at which to reject the null-hypothesis for both Kendall's W and the post hoc tests were set at $p < 0.050$.

4. Results

Medians were calculated across the eighteen product categories for each purchasing factor to evaluate their importance (Table 1). The medians were calculated in order to provide an appropriate measure of central tendency for ordinal data. Reliability was found to be an 'extremely important' purchasing factor for all the product categories in which it was surveyed. Longevity appeared 'extremely important' for seven product categories: Cars, electronic goods, floor coverings, furniture, large kitchen appliances, power tools for the home and garden, and space heating and cooling products. For the other eleven product categories, longevity was considered 'very important'. Except for cars, where price was considered 'extremely important', for all other product categories price was 'very important'. Guarantee length was rated 'very important' for eleven and 'moderately important' for the other seven product categories. Brand was 'very important' for cars and electronic goods, and 'moderately important' for the remainder of the product categories. Appearance illustrated the most difference

Table 1. Median importance of purchasing factors.

	Appearance	Brand	Guarantee	Longevity	Price	Reliability
Bicycles	Very	Moderately	Very	Very	Very	Extremely
Cars	Very	Very	Very	Extremely	Extremely	Extremely
Clothing	Extremely	Moderately	Moderately	Very	Very	n/a
Electronic goods	Moderately	Very	Very	Extremely	Very	Extremely
Floor coverings	Extremely	Moderately	Very	Extremely	Very	n/a
Footwear	Very	Moderately	Moderately	Very	Very	n/a
Furniture	Extremely	Moderately	Very	Extremely	Very	n/a
Household textiles	Extremely	Moderately	Moderately	Very	Very	n/a
Jewellery, clocks and watches	Extremely	Moderately	Very	Very	Very	Extremely
Kitchenware	Extremely	Moderately	Moderately	Very	Very	n/a
Large kitchen appliances	Very	Moderately	Very	Extremely	Very	Extremely
Musical instruments	Very	Moderately	Very	Very	Very	n/a
Power tools for the home and garden	Moderately	Moderately	Very	Extremely	Very	Extremely
Small household appliances	Moderately	Moderately	Very	Very	Very	Extremely
Small tools and fittings	Moderately	Moderately	Moderately	Very	Very	n/a
Space heating and cooling products	Moderately	Moderately	Very	Extremely	Very	Extremely
Sports equipment	Very	Moderately	Moderately	Very	Very	n/a
Toys and games	Moderately	Moderately	Moderately	Very	Very	n/a

Table 2. Concordance between participants on purchasing factors and effect sizes for Dunn-Bonferroni post hoc pairwise tests.

	Kendall's coefficient of concordance				Effect sizes for Dunn-Bonferroni post hoc pairwise tests				
	Total N	Kendall's *W*	Degrees of freedom	Asymp. Sig. [a]	Small effect [a b]	Moderate effect [a c]	Strong effect [a d]	Negligible effect [a e]	Non-significant [f]
Bicycles	778	0.226	5	0.000	6	6	0	1	2
Cars	791	0.239	5	0.000	7	4	0	3	1
Clothing	978	0.356	4	0.000	1	4	2	1	2
Electronic goods	992	0.305	5	0.000	5	5	2	2	1
Floor coverings	981	0.420	4	0.000	4	1	3	1	1
Footwear	996	0.306	4	0.000	0	5	0	0	5
Furniture	1116	0.393	4	0.000	3	1	3	1	2
Household textiles	1063	0.378	4	0.000	1	3	3	2	1
Jewellery, clocks and watches	1086	0.269	5	0.000	3	4	2	4	2
Kitchenware	1125	0.287	4	0.000	4	4	1	0	1
Large kitchen appliances	1082	0.317	5	0.000	8	4	1	1	1
Musical instruments	603	0.143	4	0.000	6	1	0	0	3
Power tools for the home and garden	765	0.426	5	0.000	5	4	4	2	0
Small household appliances	1176	0.317	5	0.000	7	5	1	2	0
Small tools and fittings	922	0.394	4	0.000	2	3	3	0	2
Space heating and cooling products	1164	0.408	5	0.000	4	4	3	3	1
Sports equipment	892	0.150	4	0.000	4	3	0	0	3
Toys and games	759	0.202	4	0.000	4	4	0	0	2

[a] $p < 0.050$; [b] $r \geq +/-0.100$; [c] $r \geq +/-0.300$; [d] $r \geq +/-0.500$; [e] $r < +/-0.100$; [f] $p \geq 0.050$.

between product categories and was considered 'extremely important' for six, 'very important' for another six and 'moderately important' for the remaining six.

Kendall's *W* and subsequent post hoc pairwise tests were undertaken for each product category (Table 2). Kendall's *W* was employed to assess the extent to which participants agreed on the importance of purchasing factors for each product category. The results for Kendall's *W* were significant at $p < 0.050$ across all product categories. The findings revealed a small-to-moderate level of agreement between participants across the purchasing factors for the eighteen product categories, with the smallest level of agreement reported for musical instruments ($W(4) = 0.143$, $p = 0.000$) and the largest level of agreement reported for power tools for the home and garden ($W(5) = 0.426$, $p = 0.000$).

Two-hundred and twenty post hoc pairwise tests were calculated for each purchasing factor pairing across the eighteen product categories (Table 2). One-hundred and ninety of the tests were found to be significant at $p < 0.050$. Of these 190 tests, 28 exhibited a strong effect ($r \geq +/-0.500$), 65 exhibited a moderate effect ($r \geq +/-0.300$) and 74 exhibited a small effect ($r \geq +/-0.100$). Twenty-three post hoc tests, although significant at $p < 0.050$, exhibited negligible effect sizes ($r < +/-0.100$). For 30 of the post hoc tests it was not possible to reject the null hypothesis at $p < 0.050$, there were no significant differences between these purchasing factor pairs.

5. Discussion

The median purchasing factors across the eighteen product categories illustrate that participants consistently emphasised the importance of longevity and reliability. These two purchasing factors exhibited the highest number of 'very important' and 'extremely important' classifications in comparison to the four other factors. Furthermore, the majority (190/220) of the post hoc tests of purchasing factor pairs were significant at $p < 0.050$ which suggests that they were unique purchasing aspects that factored into consumers' decisions.

The findings from Kendall's *W* suggest that efforts to improve longevity and reliability should focus on product categories where there was at least a moderate level of agreement over the importance of the purchasing factors. Additionally, product categories such as power tools for the home and garden ($W(5) = 0.426$, $p = 0.000$) and space heating and cooling products ($W(5) = 0.408$, $p = 0.000$), along with other product categories encompassing EEE, not only exhibited moderate levels of agreement, but are also products which are energy and resource intensive in their manufacture and use [9].

It should be acknowledged that purchasing intentions do not always translate directly into behaviour. For example, in their study of EEE purchasing Knight et al. [10] noted that while participants considered longevity and reliability important, when their purchasing behaviour was observed through an accompanied shop method, these concerns were not always evident at the forefront of the decision-making process. Therefore, to facilitate the conversion of purchasing intentions into behaviour across the range of durable goods, manufacturers and retailers could provide lifespan labels and so bring concerns over longevity and reliability to the front of the consumers' mind when taking purchasing decisions. In scoping studies, lifespan labelling has been received favourably by consumers across a range

of durable goods [32]. In addition, consumer interest in guarantee periods could also be supported by statutory minimum guarantee lengths [10,31], which would further encourage the uptake of longer-lasting products. Taken together, the initiatives of lifespan labelling and minimum guarantee length could encourage designers and manufacturers to develop durable goods with longer lifetimes, which would reduce the throughput of materials and energy, advancing the circular economy and furthering sustainable consumption [6]. Furthermore, this could contribute to meeting the aspirations of LCE, where goods and services are designed and produced with respect for human wellbeing and prosperity within the biophysical boundaries of our one planet Earth [18].

6. Conclusion

This paper reported the findings of a national comparison of purchasing factors across an exhaustive range of durable goods. This research found that participants consistently emphasised the importance of longevity and reliability as purchasing factors. Nevertheless, the translation of these stated purchasing intentions into behaviour, and meeting the wider aspirations on UNSDG twelve for responsible production and consumption requires more than just producer-level interventions. Transformation in the consumption of durable goods requires the facilitation of product life extension strategies such as repair [54] and reuse [27], coupled with the encouragement of emotional durability [55,56]. Emotional durability, a design strategy which facilitates consumer attachment to products, could encourage consumers to prolong the life of their products through proper care, maintenance and repair. Additionally, product-service systems [57] through the intensification of use via sharing, renting and leasing also have a crucial role to play in engendering sustainable consumption.

Longer-lasting, physically- and emotionally-durable goods, through their reduced material and energy requirements over time, have a central role to play realising the aspirations of the circular economy, slowing and closing resource loops [6]. Furthermore, in many cases, the reduction in material and energy demand brought about by the increased uptake of longer-lasting products has the potential to reduce national resource footprints [13] and contribute to carbon reduction targets [14], meeting LCE's aspirations to nurture equitable human development within biophysical planetary boundaries [18].

This study has illustrated that there is a broad-base of consumer interest in purchasing reliable and longer-lasting products across a range of durable goods. Further research on particular product groups and specific products, adopting both choice modelling [58] and participant observation [10] approaches, could better establish the extent to which reliability and longevity factor into consumers' purchasing decisions. This proposed research would strengthen our understanding of how to transition these purchasing intentions into behaviour, and deliver comprehensive benefits for people and planet.

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Appendix A.

In general, how important are the following when you are buying [product category]?

a) How the product looks, b) brand, c) how long the product will last, d) how reliable the product will be, e) length of the guarantee provided, f) price.

1 Not at all important, 2 slightly important, 3 moderately important, 4 very important, 5 extremely important 96 do not know/ cannot say.

Appendix B.

Table B1. Difference between sample and target population characteristics

Age (years)	Females (%)	Males (%)
18-24	4.785	0.439
25-34	0.331	-2.664
35-44	-1.888	-0.446
45-54	-2.930	4.243
55-64	0.960	1.608
65-74	-0.984	1.072
75 or over	-3.931	-0.597

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