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## Sustainability at Home: The Case of Vacuum Cleaners

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**Abstract.** Household practices are a microcosm that shows how we think about sustainability on an everyday basis. This study focuses on vacuuming, which is a household chore with similarities to routine work activities. The 24 participants in the study merely considered sustainability a minor aspect in their decisions about which vacuum cleaner to buy. Brand, price, and suction power were top considerations. With respect to repair/replace decisions, participants tended to favor repair, that is, the more sustainable option. However, decisions to repair a vacuum cleaner that broke down were often on the condition that it could be done cheaply. In contrast, decisions to replace were never conditional. Finally, participants exhibited cross-country differences in the importance they attached to sustainability. These differences suggest that national discourses have the power to influence individual householders' views on sustainability.

**Keywords:** sustainability, repair, replace, home automation, vacuum cleaner.

### 1 Introduction

Sustainability has become a global concern [5, 6]. It requires action at all levels, including the home. Household practices are a microcosm that shows how we consider – or disregard – sustainability on an everyday basis. Thereby, studies of sustainability at home have value in their own right and can also inform studies of sustainability at work. This study focuses on a single household practice, namely vacuuming.

Vacuuming is a recurring household chore, which is performed using vacuum cleaners at different levels of technical sophistication. Autonomous vacuum-cleaner robots have made it easier to schedule vacuuming for the off-peak periods in energy consumption. At the same time, studies warn that robotic vacuum cleaners may lead to more frequent vacuuming, thereby increasing energy consumption rather than making it greener [3]. Other inventions include bagless vacuum cleaners that reduce waste by collecting the dirt in an emptiable container rather than a disposable bag. However, factors other than environmental sustainability also influence householders' decisions about vacuuming and vacuum cleaners. The omnipresence of such factors is captured in the recognition that any approach to sustainability must integrate environmental, financial, and social concerns [2]. For vacuum cleaners, the non-environmental concerns for example include hygiene [4], price [1], and anthropomorphic relations to robotic vacuum cleaners [7]. This study investigates householders' thoughts about sustainability in relation to using, repairing, and replacing their vacuum cleaners.

## 2 Method

The study involved 24 participants, each having 1, 2, or 3 vacuum cleaners. In total, the participants had 36 vacuum cleaners distributed across France (8 participants, 11 vacuum cleaners), the Netherlands (8, 12), and Portugal (8, 13). The vacuum cleaners were near evenly distributed among canister-with-bag models (9), canister-without-bag models (10), upright-cordless models (9), and robotic models (8). Each participant took part in a three-week diary study that consisted of sensitizing activities and forms to be filled in. During the sensitizing activities, participants photographed and video-recorded their vacuuming practices. During form fill-in, participants answered questions about their user experience with their vacuum cleaners.

This paper involves six of the questions. Two free-text questions were about why the participants chose their vacuum cleaner and whether they would repair or replace it if it broke down. These questions were analyzed by grouping the content of the 36 answers to each question into reasons for buying and into conditions and causes for repairing or replacing. Three rating-scale questions were about the importance participants attached to sustainability. These questions were analyzed with analyses of variance (ANOVAs) to test for differences across countries. Finally, one rating-scale question about the importance of ease of use was included for comparative purposes.

## 3 Results

In response to the question “Why did you choose to buy this vacuum cleaner?”, the participants provided 65 reasons: brand (9), price (9), practical (8), suction power (8), cordless (5), bagless (4), easy to use (4), efficient (4), automatic (3), size (3), eco-friendly (2), good (2), long cord (2), noise level (1), and aesthetic (1). That is, the environmental dimension of sustainability was merely a minor factor in their decision about which vacuum cleaner to buy. Several participants remarked that good suction power equaled high energy consumption and that they were not prepared to sacrifice suction power for the sake of lower – more ecofriendly – energy consumption.

Participants were also asked whether they would have their vacuum cleaner repaired or replaced if it broke down (“Imagine your vacuum cleaner breaks down, do you repair it or buy a new one?”). They would repair 20 of their vacuum cleaners and replace 15 of them. One vacuum cleaner (a robot) would neither be repaired nor replaced because the participant had two vacuum cleaners and did not experience a real need for the robotic vacuum cleaner. Table 1 shows the conditions that qualified the participants’ repair/replace decisions and the causes that explained them. Notably, only repair decisions were conditional, mostly on the price of the repair. Apparently, replace decisions did not involve the uncertainty indicated by qualifying conditions. With respect to causes, repairing and replacing were considered the cheaper option about equally often. Low price, ecofriendliness, and satisfaction with the vacuum cleaner were the main causes for repair decisions. In addition, one owner of a robotic vacuum cleaner explained that it would be repaired because it was part of the family and, therefore, not replaceable. The main causes for replace decision were dissatisfac-

tion with the current vacuum cleaner, low price, and the opportunity to upgrade to a better model. Overall, repair/replace decisions would be based on competing criteria, of which sustainability was just one.

**Table 1.** Conditions (*If* column) and causes (*Because* column) for repair/replace decisions.

Decision	If	Because
Repair	Cheap (7), Possible (2), Quick (1)	Cheaper (6), Ecofriendly (3), Happy with it (3), It is not old (2), It is part of the family (1)
Replace	-	Not happy with it (7), Cheaper (5), Upgrade to better model (3), Quicker (1)
Neither	-	No need for it (1)

Note: numbers in parentheses give the number of times a condition/cause was mentioned

The participants considered sustainability issues important but not very important, see Table 2. In comparison, the question “Overall, how important is ease of use” received a mean rating of 9.06 ( $SD = 1.12$ ), that is, about one and a half scale point above the sustainability questions. Notably, the importance of repairability varied across countries,  $F(2, 32) = 4.70$ ,  $p = .016$ . Bonferroni-adjusted pairwise comparisons showed that Portuguese participants attached significantly more importance to repairability than Dutch participants did. Similarly, the importance of recyclability varied across countries,  $F(2, 31) = 8.96$ ,  $p < .001$ . Bonferroni-adjusted pairwise comparisons showed that French and Portuguese participants attached significantly more importance to recyclability than Dutch participants did. There was no difference across countries in the importance of environmental friendliness,  $F(2, 32) = 3.11$ ,  $p = .059$ .

**Table 2.** Importance of sustainability across countries (mean and, in parentheses, standard deviation), all questions answered on a scale from 0 (not important) to 10 (very important).

Question	France	Netherlands	Portugal	Total
Overall, how important is repairability for you, $N = 35$ *	7.60 (2.46)	5.83 (3.07)	8.7 (1.48)	7.43 (2.65)
How important is it that your vacuum cleaner can be recycled, $N = 34$ ***	8.60 (1.78)	4.91 (3.11)	8.38 (1.81)	7.32 (2.80)
How important is environmental friendliness for you in a vacuum cleaner, $N = 35$	8.20 (1.62)	6.42 (3.03)	8.54 (1.76)	7.71 (2.38)

Note: \*  $p < .05$ , \*\*\*  $p < .001$  (analysis of variance)

## 4 Conclusion

While vacuuming is a household chore, it has similarities to routine work activities. In addition, the household context means that the user cannot offload sustainability to other actors. Either the householder prioritizes sustainability or it is trumped by other considerations. The participants in the study considered sustainability in their vacu-

uming decisions but it was merely a minor consideration compared to factors such as brand, price, and suction power. In terms of frequency of mention, sustainability was a factor in buying decisions on a par with whether the vacuum cleaner had a long cord. On the positive side, participants tended to favor repair over replacement, but decisions to repair were often on the condition that it could be done cheaply. Finally, the cross-country differences in the importance of sustainability suggest that national discourses produce social norms with the power to influence individual householders' views on sustainability.

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