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Repairability Information and Sustainable Purchase Intentions

Dr. Elena Varga

Associate Professor, Danube School of Business, Hungary

Abstract

Growing concern about premature product replacement, resource consumption, and electronic waste has increased interest in repairability as an element of sustainable consumption. Yet consumers frequently make purchase decisions without clear information about whether products can be opened, diagnosed, repaired, upgraded, or supported with spare parts. This study examines how the amount and specificity of repairability information may influence sustainable purchase intentions. A simulation-based four-condition design is employed because no original consumer dataset was supplied for the study. A synthetic analytical sample of 480 observations was divided equally among four information conditions: no repairability information, a basic repair statement, a standardized repairability score, and detailed repair information covering spare-parts availability, disassembly, documentation, expected service support, and repair accessibility. Sustainable purchase intention serves as the principal outcome, while perceived transparency, expected product longevity, and consumer trust are incorporated as associated constructs.

The simulated analysis indicates that mean sustainable purchase intention rises progressively from 3.00 in the no-information condition to 4.16 in the detailed-information condition. A standardized repairability score also produces a comparatively strong simulated response, suggesting that concise evaluative information may reduce decision complexity. Repairability information appears particularly influential when it converts an abstract sustainability claim into concrete expectations about future product use and maintenance. The paper argues that repairability communication should be accurate, comparable, comprehensible, and supported by actual product and service capabilities. The numerical findings are illustrative rather than observations from real consumers, and future experimental research is required to validate the proposed relationships.

Keywords: repairability; sustainable purchase intention; product longevity; consumer information; circular economy; sustainable consumption; consumer trust

1. Introduction

Consumer purchasing decisions have important consequences for material consumption because the environmental burden associated with durable products is influenced not only by how products are manufactured but also by how long consumers retain, maintain, repair, and ultimately replace them. Product lifetime therefore occupies an important position within sustainable consumption and circular-economy thinking. Van Nes and Cramer demonstrated that lifetime optimization can contribute to more

sustainable consumption when longer use prevents unnecessary replacement, although the environmental value of lifetime extension varies across products and use conditions. Product design strategies that slow resource loops similarly emphasize durability, maintenance, repair, upgrading, and prolonged product use as mechanisms through which economic value can remain in circulation for longer periods.

Repairability is particularly relevant because product failure does not automatically require product replacement. A malfunctioning device can potentially be restored when its construction permits safe disassembly, replacement components are available, diagnostic information can be accessed, and the cost and effort of repair remain acceptable. Research on household products, however, has repeatedly shown that consumer decisions about replacement are influenced by perceived product age, expected remaining life, technological development, repair costs, functionality, and personal replacement motives. Cooper's research on product obsolescence demonstrated that consumer attitudes toward product lifetimes are complex rather than purely technical, while Cox and colleagues found that consumers' understanding and expectations of product lifetimes affect purchasing, use, and disposal decisions.

A central difficulty is that repairability is usually less visible at the point of sale than characteristics such as price, screen size, processing power, design, color, or energy efficiency. A consumer can often observe a product's appearance immediately but may have limited knowledge about battery replacement, spare-part availability, diagnostic procedures, fastener types, repair manuals, software restrictions, or expected support duration. Consequently, products that differ substantially in their potential lifetime may appear functionally similar during purchase evaluation. Previous consumer research on small household electrical and electronic equipment has shown that repair and second-hand behavior are shaped by practical, economic, and attitudinal considerations, illustrating the importance of making lifetime-related attributes more understandable to consumers.

Repairability information may address this informational asymmetry by transforming future maintainability into an observable purchase attribute. Information can range from a simple statement that a product is repairable to a standardized numerical or categorical score and, at a more detailed level, disclosure of component accessibility, spare-parts availability, expected support, repair documentation, warranty implications, and estimated repair difficulty. Earlier research on product-lifetime information has suggested that consumers often have imperfect knowledge about expected durability and replacement life. Sustainable-consumption research also demonstrates that behavior is influenced when environmental consequences become more tangible, understandable, and compatible with existing decision processes. White, Habib, and Hardisty's SHIFT framework emphasizes the role of social influence, habits, individual identity, feelings and cognition, and tangibility in encouraging more sustainable consumer behavior.

The present study investigates whether progressively richer repairability information may strengthen sustainable purchase intentions by improving perceived transparency, expected product longevity, and trust. Because no primary survey or experimental dataset has been provided, the manuscript is explicitly structured as a simulation-based research article. Synthetic observations are used exclusively to demonstrate the expected relationships and appropriate statistical procedures. The results therefore represent testable analytical propositions rather than evidence about an actual population. The

study contributes by treating repairability information not merely as technical product documentation but as a consumer-facing sustainability signal capable of shaping pre-purchase perceptions of future use, product stewardship, and long-term value.

2. Objectives of the Study

2.1 Evaluation of Repairability Information Effects

The principal objective is to examine whether the availability and depth of repairability information can influence sustainable purchase intention. Rather than treating repairability disclosure as a binary variable, the study differentiates among four information environments. This structure allows analysis of whether a basic statement is sufficient or whether consumers may respond more positively when repairability is communicated through standardized or detailed evidence.

The objective recognizes that sustainable purchasing frequently involves information-processing constraints. Consumers may value longevity but still select products according to immediately visible attributes because future repair conditions are uncertain. The study therefore evaluates whether making repairability more salient can change the relative attractiveness of a product before purchase.

2.2 Examination of Transparency and Longevity Perceptions

A second objective is to investigate whether repairability information is associated with greater perceived product transparency and stronger expectations concerning useful product life. A repairability score or detailed disclosure may provide consumers with evidence that a manufacturer has considered maintenance beyond the initial transaction.

Expected longevity is especially important because repairability does not guarantee that a product will last longer, yet it can increase the perceived possibility of restoring functionality after failure. The study therefore distinguishes actual physical durability from the consumer's expectation that a product can remain usable through maintenance or repair.

2.3 Assessment of Consumer Trust and Sustainable Choice

The third objective is to assess whether repairability information may contribute to consumer trust and whether this trust is positively related to sustainable purchase intention. Detailed product information can potentially reduce uncertainty, but information may be ineffective when consumers consider it vague, unverifiable, or promotional.

The study consequently treats credible repairability disclosure as both a sustainability signal and a transparency mechanism. The managerial objective is to determine how manufacturers and retailers can communicate repair potential without reducing the concept to unsupported environmental marketing.

3. Review of Literature

3.1 Product Lifetime, Repair, and Sustainable Consumption

Product lifetime extension has long been discussed as an alternative to consumption systems characterized by rapid replacement. Cooper's work on consumer durables emphasized the relationship between product longevity, obsolescence, and consumption patterns. Van Nes and Cramer subsequently demonstrated that replacement behavior is influenced by several motives, including physical

deterioration, improved utility, changes in symbolic expression, and desire for new products. Longer technical life is therefore valuable only when consumers are also willing to retain products rather than replacing them for nonfunctional reasons.

Product attachment provides another explanation for prolonged ownership. Mugge, Schoormans, and Schifferstein argued that strong person-product relationships may encourage protective behavior and postpone replacement. When owners perceive products as personally meaningful, they may be more willing to maintain or repair them rather than discard them. Their work indicates that product longevity contains behavioral and emotional dimensions in addition to engineering durability.

Repairability complements durability by providing a pathway for restoring utility after component failure. Pérez-Belis and colleagues examined consumer attitudes toward repair and second-hand purchasing of small household electrical and electronic equipment and demonstrated that repair decisions depend on economic, practical, and behavioral factors. Hennies and Stamminger's survey of German households likewise documented maintenance and disposal histories across household appliances, highlighting the role of actual consumer practices in determining realized product lifetimes.

3.2 Consumer Information and Sustainability Signaling

Consumers cannot directly observe every environmental or lifetime-related property of a product during purchase. Sustainable choices therefore frequently depend on labels, certifications, product claims, retailer communication, or other informational cues. Such information can reduce search costs and convert technically complex product attributes into decision-relevant signals. However, its effectiveness depends on comprehension, credibility, comparability, and perceived relevance.

Repairability presents a particularly strong case for information intervention because many of its determinants become visible only after product failure. Spare parts may be unavailable, components may be permanently bonded, batteries may be difficult to replace, or documentation may be inaccessible. Consumers discovering these limitations after purchase have little opportunity to use that information when selecting among competing products. Repairability disclosure moves at least part of this information toward the pre-purchase stage.

The principle is consistent with research on consumer understanding of product lifetimes. Cox and colleagues reported that consumers hold expectations about product life and that these expectations are relevant to purchasing and disposal. Their work indicates that lifetime-related information could potentially improve the relationship between consumer expectations and product characteristics.

3.3 Purchase Intention, Trust, and the Information–Behavior Gap

The theory of planned behavior developed by Ajzen provides a useful basis for understanding sustainable purchase intention. According to this perspective, behavioral intention is shaped by attitudes, subjective norms, and perceived behavioral control. Repairability information can potentially influence attitudes by increasing perceptions of environmental responsibility and economic value, while also improving perceived control by clarifying what can be done when a product fails.

Nevertheless, sustainable intentions do not automatically produce sustainable behavior. Consumers often express positive attitudes toward environmentally preferable choices yet prioritize price, convenience, appearance, availability, or performance during actual purchase decisions. Peattie's

analysis of green consumption emphasized the limitations of assuming a straightforward relationship between environmental attitudes and marketplace behavior.

White, Habib, and Hardisty similarly argue that sustainable consumer behavior is more likely when interventions make sustainability personally meaningful and tangible rather than merely providing abstract environmental appeals. Repairability information may contribute to this process because it connects sustainability with a concrete future scenario: whether a consumer will be able to keep using a purchased product after a failure occurs.

4. Research Methodology

4.1 Research Design and Synthetic Sample

The study employs a simulation-based between-condition research design. No human participants were recruited and no marketplace transactions were observed. A synthetic dataset was generated exclusively to demonstrate how repairability information could be experimentally evaluated in future empirical research.

The analytical structure contains 480 simulated observations, with 120 observations allocated to each of four repairability-information conditions. The first condition provides no repairability information. The second provides a brief repair statement. The third uses a standardized repairability score. The fourth supplies detailed repair information concerning component accessibility, spare parts, repair instructions, service support, and repair feasibility.

Table 1: Simulation Design and Measurement Framework

Research Component	Specification
Research approach	Simulation-based comparative experiment
Synthetic sample size	480 observations
Observations per condition	120
Condition 1	No repairability information
Condition 2	Basic repair statement
Condition 3	Standardized repairability score
Condition 4	Detailed repair information
Primary outcome	Sustainable purchase intention
Associated constructs	Perceived transparency, expected product longevity, consumer trust
Measurement scale	Illustrative five-point scale
Statistical procedures	Descriptive statistics, one-way ANOVA, Pearson correlations
Data status	Entirely synthetic

Note: The numerical dataset is simulated for methodological demonstration and does not represent responses from actual consumers.

4.2 Construct Operationalization

Sustainable purchase intention is defined as the consumer's stated likelihood of selecting a product partly because its design and support conditions facilitate longer use, maintenance, and repair. In a future experiment, respondents could evaluate statements concerning purchase likelihood, preference over a comparable alternative, willingness to consider the product, and intention to choose the product when repairability information is available.

Perceived transparency represents the extent to which consumers believe the seller or manufacturer provides understandable and relevant information about future product maintenance. Expected product longevity captures the consumer's expectation that the product can remain operational for a longer period because repair remains feasible after failure. Consumer trust represents confidence in the manufacturer's product-related claims and longer-term support commitments.

Repairability information should be operationalized carefully in real research. A standardized score should be accompanied by an explanation of its scale, while detailed information should reflect objectively verifiable product characteristics. This requirement is important because inaccurate or exaggerated repairability communication could create a discrepancy between consumer expectations and actual product experience.

4.3 Statistical Analysis and Research Ethics

Mean comparisons are used to assess differences in sustainable purchase intention across the four simulated groups. A one-way analysis of variance demonstrates how researchers could test whether the information condition produces statistically distinguishable group differences. Pearson correlation coefficients are additionally used to illustrate associations between sustainable purchase intention and transparency, longevity expectations, and trust.

The simulation generated individual-level variation around theoretically specified group means instead of assigning identical values to every observation. This procedure permits demonstration of realistic statistical dispersion without suggesting that the values were obtained through a field survey.

Because the study uses synthetic data and does not involve identifiable persons, interviews, interventions, or human behavioral records, no human-participant ethics approval is claimed. A future empirical study should obtain institutional review where applicable, collect informed consent, disclose the experimental purpose appropriately, and implement suitable privacy and data-management procedures.

5. Analysis

5.1 Sustainable Purchase Intention Across Information Conditions

The simulated results demonstrate a progressive increase in sustainable purchase intention as repairability information becomes more specific and interpretable. The no-information condition recorded the lowest mean purchase intention at 3.00, while providing a basic repair statement increased the simulated mean to 3.39, suggesting that even limited information may positively influence consumer

evaluation. The detailed-information condition generated the strongest response, with a mean sustainable purchase intention of 4.16. Overall, this progression illustrates the theoretical possibility that consumers may place greater value on product repairability when information is presented in concrete and understandable terms rather than through broad or generalized sustainability claims. The findings further suggest that specific details about repair options, replacement components, maintenance procedures, or expected product longevity may help consumers connect sustainability information with practical product benefits, thereby strengthening their willingness to consider more sustainable purchasing choices.

Table 2: Simulated Outcomes by Repairability Information Condition

Repairability Information Condition	Sustainable Purchase Intention	Perceived Transparency	Expected Product Longevity	Consumer Trust
No repairability information	3.00	2.91	3.07	3.12
Basic repair statement	3.39	3.36	3.46	3.47
Repairability score	3.87	3.80	3.84	3.78
Detailed repair information	4.16s	4.20	4.17	4.00

Scale: 1 = low; 5 = high. Source: Author-generated synthetic dataset for methodological demonstration.

5.2 Statistical Relationships

The illustrative one-way ANOVA produced a substantial difference in sustainable purchase intention across the four information conditions, $F(3, 476) = 121.89$, $p < .001$. Because the observations were deliberately simulated to demonstrate a theoretically expected pattern, this statistical significance must not be interpreted as empirical confirmation. It indicates only that the synthetic groups differ under the assumptions built into the simulation.

Sustainable purchase intention showed a strong positive simulated association with perceived transparency ($r = .788$). Positive relationships were also observed with expected product longevity ($r = .748$) and consumer trust ($r = .707$). The pattern illustrates a conceptual mechanism in which repairability information may influence sustainable choice partly because it improves the perceived informational quality and future usability of the product.

The strength of the simulated transparency relationship is particularly notable. Repairability communication may therefore operate through more than environmental concern. A consumer can interpret detailed maintenance information as evidence that a manufacturer is prepared to communicate the limitations and service conditions of a product rather than concentrating exclusively on immediate selling attributes.

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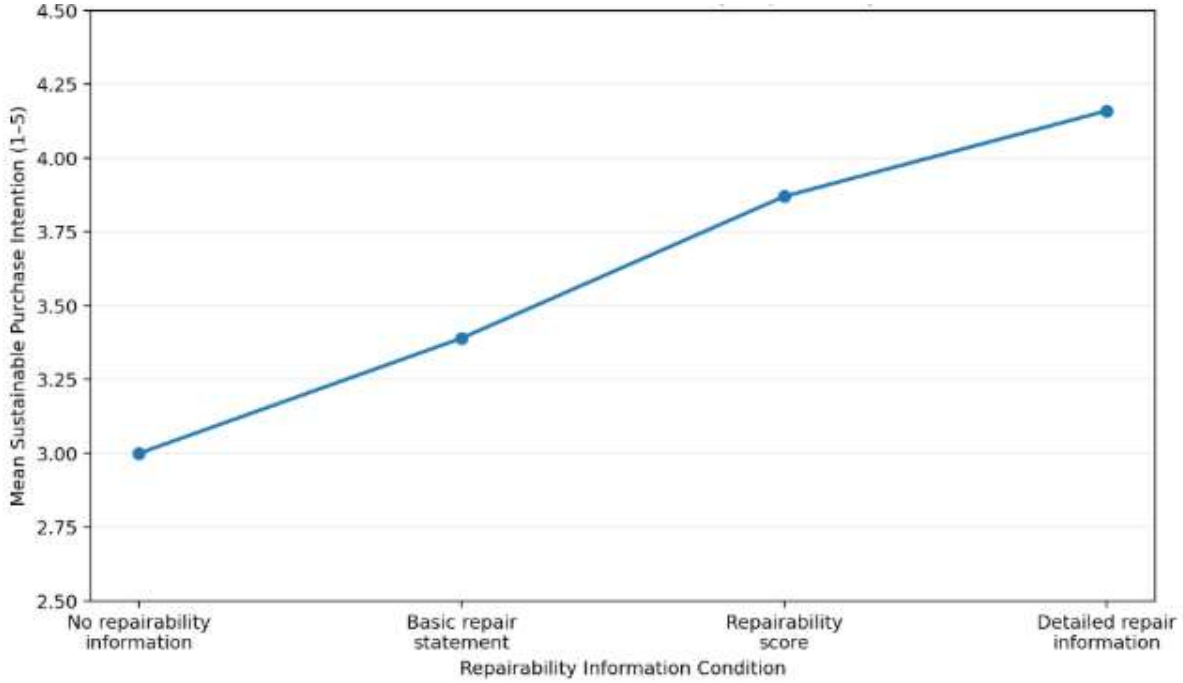
5.3 Graphical Comparison

Graph 1: Simulated Sustainable Purchase Intention by Repairability Information



Key Finding: Mean sustainable purchase intention increases from 3.00 when repairability information is absent to 4.16 when detailed repairability information is provided.

The graph displays a consistent upward progression rather than an abrupt response to a single disclosure format. The difference between the basic-statement and repairability-score conditions suggests that standardized information may offer additional decision value by making repair potential easier to compare.

The increase between the repairability-score and detailed-information conditions is smaller than the increase between several earlier stages. This simulated pattern raises an important empirical question: whether standardized repair scores provide most of the decision benefit while detailed technical information primarily assists consumers who are highly involved in product maintenance. Future experiments could compare these disclosure formats according to consumer knowledge and product category.

6. Discussion

6.1 Repairability Information as a Sustainable Choice Architecture

The simulation suggests that repairability information can be conceptualized as a form of sustainable choice architecture. Consumers purchasing durable goods routinely evaluate immediate product attributes, whereas repair conditions concern uncertain future events. Without structured information, repairability may receive little weight because evaluating it requires technical knowledge, additional search, and prediction about future failure.

A repairability score or structured disclosure reduces this cognitive burden by converting several technical characteristics into a more accessible evaluation. This interpretation is consistent with research emphasizing the importance of making sustainable consequences tangible and understandable. White, Habib, and Hardisty argue that behavioral interventions become more effective when sustainability is incorporated into psychologically meaningful decision processes.

The implication is that repairability information should be presented at the moment when consumers compare products rather than being hidden within post-purchase support documentation. Product pages, shelf labels, specification sheets, and digital comparison interfaces represent potential locations where repairability can become part of routine choice.

6.2 Product Longevity, Value, and Consumer Trust

The relationship between repairability information and expected product longevity is theoretically significant because consumers may interpret repair support as a signal of longer-term product value. Cox and colleagues established that consumers form expectations regarding product lifetimes, while van Nes and Cramer showed that replacement decisions are shaped by several functional and nonfunctional motives.

Repairability should nevertheless not be presented as equivalent to durability. A highly repairable product may still experience frequent failures, whereas a durable product may require little repair over its useful life. Responsible consumer information should therefore distinguish among reliability, durability, repairability, upgradeability, and expected support duration. Combining these concepts under an undefined label could weaken consumer understanding.

Trust becomes particularly important when repairability claims involve future manufacturer commitments. A company may advertise spare-parts availability at the time of sale, but the consumer benefits only if those parts remain reasonably obtainable later. Credible repairability communication therefore requires alignment among product architecture, service operations, documentation, pricing, and long-term support.

6.3 Implications for Manufacturers, Retailers, and Sustainability Policy

For manufacturers, the findings suggest that repairability can become a visible component of product value rather than a hidden engineering attribute. Design teams can improve modularity and component accessibility, while marketing teams can communicate these features without reducing sustainability communication to broad environmental claims. Repairability may therefore connect engineering decisions directly with marketplace differentiation.

Retailers can contribute through product-comparison systems that include repairability alongside price, warranty, energy use, performance, and other familiar attributes. Standardized information can be especially useful in digital retail because consumers frequently compare multiple alternatives simultaneously. However, scoring systems must remain transparent regarding how individual repair criteria are weighted.

From a policy perspective, comparable repairability information may help address information asymmetry, but labeling alone cannot create a functioning repair economy. The effectiveness of disclosure ultimately depends on the underlying availability of parts, documentation, tools, qualified

services, reasonable repair prices, and products designed for access. Repairability information should consequently complement rather than substitute substantive product-design and after-sales improvements.

7. Conclusion

This study examined the conceptual relationship between repairability information and sustainable purchase intentions through a transparent simulation-based design. The analysis was motivated by a fundamental feature of durable-product markets: consumers can readily observe many immediate product characteristics but frequently have limited information about the conditions that will determine whether the product can be maintained after a future failure. Repairability information can reduce this uncertainty by bringing long-term service characteristics into the pre-purchase decision.

The simulated results illustrate a progressive increase in sustainable purchase intention as repairability disclosure becomes more informative. Purchase intention rises from 3.00 in the no-information condition to 3.39 following a basic repair statement, 3.87 with a standardized repairability score, and 4.16 when detailed repair information is supplied. Perceived transparency, expected longevity, and consumer trust display corresponding positive patterns. Because these results derive from synthetic observations, they should be interpreted as analytical expectations rather than empirical estimates.

The study has practical implications for manufacturers and retailers seeking to connect circular-product design with consumer decision making. Providing repairability information may strengthen sustainable purchasing when the information is specific, comparable, understandable, and supported by genuine repair infrastructure. Manufacturers should therefore avoid treating repairability as a purely promotional claim. Communication should correspond with actual component accessibility, spare-parts policies, technical documentation, service options, and expected support periods.

Future research should validate the proposed model using controlled consumer experiments and actual purchasing environments. Particular attention should be given to product type, price, consumer technical knowledge, repair experience, environmental values, standardized scoring systems, and willingness to pay. Researchers should also investigate whether the effect of repairability information persists when repairable alternatives carry a price premium. Such evidence would clarify when repairability information can move beyond sustainability awareness and become a meaningful determinant of marketplace behavior.

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