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Article

External Drivers of Apparel Repurposing: A Multilevel Analysis Linking Skills, Motivations, and Repurposing Pathways

Rachel Eike [1,*], Bahar Hashemian [1], Michelle Burton [2,*], Gwendolyn Hustvedt [3], Sunhyung Cho [4]

[1] Department of Apparel, Events, and Hospitality Management, Iowa State University, Ames, IO 50011-1078, USA; baharhe@iastate.edu (BH)

[2] Department of Art and Design, Montclair State University, Montclair, NJ 07009, USA

[3] School of Family and Consumer Sciences, Texas State University, San Marcos, TX 78666, USA; gmhustvedt@txstate.edu (GH)

[4] Department of Clothing and Textiles, Pukyong National University, Busan 48513, Republic of Korea; sunhyungcho@pusan.ac.kr (SC)

* Correspondence: Rachel Eike, Email: rjeike@iastate.edu; Tel.: +0-515-294-7826; Michelle Burton, Email: burtonm@montclair.edu.

ABSTRACT

Textile and apparel waste is a growing sustainability challenge, with millions of tons discarded annually and limited infrastructure for reuse or recycling. Addressing this issue requires a systems-oriented approach that integrates consumer behavior into sustainable materials production and use systems. Repurposing, the process of reclaiming garments or textiles for new purposes, extends product lifecycles, reduces reliance on landfilling, and fosters consumer creativity within circular economy transitions. Guided by a VBN-informed sustainability lens and complementary creative and economic motivation perspectives, this study examines how research-grounded external drivers shape consumer participation across four repurposing levels, offering insights to inform targeted interventions that strengthen engagement in circular clothing practices. An online survey was conducted with U.S. female consumers from Generations X and Y (n = 331), recruited via Qualtrics Panels. Measures included sewing proficiency, motivational drivers, and frequency of repurposing practices. Regression analyses showed that artistic expression consistently predicted engagement at all levels. Environmental concerns strongly predicted lower-level practices, but its influence faded at advanced levels, where sewing experience became the primary driver of participation. Monetary incentives motivated restyling and additive repurposing, while sewing experience emerged as the strongest predictor for additive and intentional patternmaking. Findings demonstrate that repurposing functions both as a creative outlet and as a sustainability strategy embedded within material-use systems. By highlighting how skills, motivations, and generational context interact across repurposing levels, this research identifies leverage points for

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interventions that can expand consumer participation in circular practices and advance sustainable product lifecycles.

KEYWORDS: apparel repurposing; sustainable fashion; sewing experience; artistic expression; environmental concerns; circular economy

INTRODUCTION

The textile and clothing industries are major contributors to environmental impact throughout the product lifecycle, from production to disposal, including landfilling, donation, recycling, or reuse of soft goods [1]. In the U.S., the majority of textile waste in the municipal solid waste stream is discarded apparel, with an estimated 7.7% of all discarded waste attributed to textiles [2]. Of the roughly 17 million tons of textiles generated each year, 11.3 million tons end in landfills [2], a figure projected to rise due to population growth, evolving lifestyles, and increasing material diversity in textiles [3]. While some companies have adopted sustainability initiatives, such as recycled materials, eco-friendly packaging, and take-back programs, alongside phased plans to reduce carbon emissions [4], these efforts have not curbed the overall increase of textile waste.

Textile waste is therefore an escalating concern both domestically and globally. In the U.S., volumes have increased by nearly 50% in the past two decades, with over 11 million tons annually entering landfills [2,5]. Synthetic polymers exacerbate the issue, taking centuries to decompose while releasing greenhouse gases, microplastics, and persistent chemicals linked to human and environmental health concerns. Internationally, the United Nations reports that 92 million tons of textile waste are produced each year, with garment lifespans having shortened by one-third since 2000 and only 8% of fibers originate from recycled sources [6]. These trends underscore the urgency of systemic change. Recent scholarship emphasizes that a transition toward circular economy models in fashion requires not only production-side innovations, but also consumer engagement, supportive regulation, and financial incentives [7]. Research further indicates that sustainable purchasing behaviors are shaped by a range of determinants, including social norms, values, product cues, and willingness to pay, illustrating the complexity of consumer involvement in circular practices [8]. Collectively, these findings highlight the urgent need for consumer-centered circular strategies, such as reuse, repair, and repurposing, that extend product lifecycles and reduce reliance on landfills. Given the growing attention on consumer circularity practices, it is imperative to focus on those groups that engage most in those behaviors. Females in Generation X and Y were chosen for this study because they are the primary drivers of apparel purchasing behavior and for this reason are strongly connected to sustainability practices.

Repurposing has emerged as one of the most viable and creative strategies for addressing these challenges. Defined as reclaiming existing goods for new purposes, repurposing extends product lifecycles while engaging consumers as both users and makers [9,10]. Unlike recycling, which often downcycles fibers, repurposing preserves the embodied energy and cultural value of textiles, offering a low-resource pathway that supports broader systems-level sustainability objectives [11]. It reflects individual needs, fosters creativity, and transforms materials otherwise destined for disposal into valuable, personalized products [12]. Yet despite its potential, repurposing is not widely practiced due to the time, effort, and sewing expertise required [13]. Sewing experience, in particular, is central to sustainable practices such as reuse, repair, and repurposing [14]. At the same time, factors such as environmental concerns, digital engagement, and community participation also shape consumer decisions, especially as social media and online platforms expand access to sustainable fashion practices [15]. The VBN framework explains pro-environmental behavior through a normative activation sequence in which values and beliefs (e.g., environmental concerns) strengthen personal norms that motivate action [16]. In the present study, we use VBN as a guiding sustainability lens specifically for the pro-environmental motivation captured by environmental concerns, which is conceptually consistent with VBN's values/beliefs foundation. However, repurposing also functions as a creative design practice and a resource-management strategy, meaning that participation may be driven not only by VBN-aligned pro-environmental motivation, but also by additional pathways emphasized in sustainable consumption and reuse scholarship. Accordingly, we position artistic expression as a creative/identity-based motive (i.e., self-expression and meaning-making through material transformation) and monetary incentive as a utilitarian/economic motive (i.e., saving money or generating value). These motives are not treated as core VBN constructs, nor as operating through VBN's normative activation pathway. Instead, they are modeled as complementary, parallel drivers of repurposing engagement alongside VBN-aligned environmental concerns.

Thus, our empirical models examine how a VBN-aligned sustainability motive (environmental concerns) and two non-VBN but theoretically relevant motives (creative/identity and economic utility), together with sewing experience and age, predict engagement across repurposing levels.

Historically, sewing was a foundational competency in Home Economics (HE) and Family and Consumer Sciences (FCS) education [17]. Since the 1960s, however, shifting gender roles and the decline of sewing-focused programs have limited opportunities for consumers to acquire these skills [18]. This erosion of formal training presents barriers to participation in sustainable practices such as repurposing. Evidence from circular textile businesses in the U.S. further illustrates that while firms can reduce environmental impact by diverting textiles through reuse or resale, little is known about what motivates consumers themselves to

engage in these practices [19]. Understanding these motivations is therefore essential to strengthening consumer participation in sustainable textile reuse and situating repurposing within larger material-use systems.

Given that repurposing diverts textiles from waste streams while simultaneously empowering individuals through creative expression, it is critical to clarify the factors that encourage or inhibit engagement. Prior work has identified four levels of repurposing: (1) restyling, (2) subtractive repurposing, (3) additive repurposing, and (4) intentional patternmaking [9,20,21]. Building on this framework, the present study examines how sewing experience and motivational drivers of artistic expression, environmental concerns, monetary incentive, and age influence participation. By analyzing how these external factors intersect with different levels of repurposing, this study provides insights into the conditions that foster consumer involvement. Such findings can inform strategies for promoting sustainable apparel practices, while also guiding educators, industry leaders, and policymakers in designing interventions that expand repurposing engagement, reduce textile waste, and advance circular economy goals.

Active consumer participation in repurposing has the potential to significantly reduce the volume of textiles entering municipal waste streams, while also reimagining garments as resources rather than disposable goods [10]. Beyond its environmental benefits, repurposing is a creative design practice that motivates individuals to view clothing as raw material for new forms of expression and function. This dual role, as both waste reduction strategy and creative endeavor, distinguishes repurposing from other forms of sustainable consumption and positions it as an essential practice within sustainable product use systems.

Recent studies illustrate how creative techniques enhance this process. Upcycling practices such as patchwork, re-embellishment, and alteration add aesthetic and identity value, while fostering emotional connections to reused items [22]. Similarly, remaking methods such as over-dyeing, piecing, patchwork, and altering provide accessible entry points that do not always require advanced sewing skills, making repurposing approachable for everyday consumers [23]. Structured initiatives reinforce these practices: consumers with higher environmental concerns are more likely to engage in take-back programs and repurposing, suggesting links to pro-environmental attitudes [24]. Community-based activities such as repair workshops, clothing swaps, and creative reuse initiatives also demonstrate measurable impacts on textile waste reduction [25].

Promoting repurposing therefore requires both accessible skill-building pathways and opportunities for consumer participation. Digital platforms have been especially effective in creating informal education and inspiration, with do-it-yourself (DIY) projects shared through social media helping to connect and motivate sustainable communities [26]. Offline, repurposing knowledge continues to be cultivated through workshops, local organizations, and intergenerational learning, all of which reinforce sustainable behaviors.

The empowering potential of these practices is evident. McEachern et al. found that workshop participants reported not only increased skill development but also a heightened sense of agency in their environmental actions [27]. These experiences prompted discussions about disposal and sustainability, demonstrating how repurposing serves as both an educational and motivational tool. Together, these engagement strategies highlight the multi-layered role of repurposing in shaping consumer behavior and reinforcing sustainable practices.

Despite the growing body of work on sustainable fashion, the relationship between external motivational factors and levels of repurposing remains underexplored. While studies have examined consumer perceptions and sustainable behaviors more broadly [28–30], few have directly linked sewing skills, artistic motivations, environmental concerns, or monetary considerations to the complexity of repurposing practices. Addressing this gap provides a clearer picture of contemporary consumer engagement, identifying the drivers that can be leveraged to increase participation and thereby reduce the environmental burden of textile waste. Although prior research has defined repurposing behaviors [21], there is limited research explaining why consumers engage across repurposing levels. By connecting sewing competence with external motivational drivers, this study explains the factors that shape consumer engagement and advances understanding of repurposing by identifying the key drivers that help explain variation across the levels.

Creativity, Skills, and Repurposing Levels

Research has consistently highlighted creativity and technical skill as central to understanding how individuals engage with repurposing practices. Lapolla and Sanders identified creativity levels through hands-on, practice-based workshops where participants repaired or repurposed unwanted apparel from their wardrobes [14]. Similarly, Irick analyzed survey data from designers who actively engaged in repurposing and proposed a three-level process model [20]. This framework was later expanded and validated through project-based learning with apparel studies undergraduates, confirming the developmental trajectory of repurposing practices [9,21]. Together, these studies provide a foundation for understanding how skill and creativity interact to influence participation in sustainable design.

Building on this body of work, four levels of repurposing have been defined that vary in complexity and creativity. Level 1, restyling (or redecorating), involves minor alterations in fit or style and/or the addition of embellishments to refresh an existing garment. Level 2, subtractive repurposing, entails cutting a smaller garment from a larger textile. Level 3, additive repurposing, uses fabric pieces, either deconstructed from the original garment or sourced from pre-consumer scrap waste, that are pieced together to create a new textile and ultimately a new product. Level 4, intentional patternmaking, represents the most advanced stage, in which discarded clothing is deliberately deconstructed and re-cut into new product patterns that maximize fabric use while working within existing shapes [20,21,31]. This highest tier aligns with Lapolla and Sanders' category of *creating*, where individuals innovate in ways fueled by both passion and advanced technical skill [12,14].

Hands-on learning experiences are strongly associated with the development of sewing skills and techniques necessary to support these practices. For example, Lapolla and Sanders [14] identified creativity levels associated with practice-based workshops that aligned with and expanded on the levels originally proposed by Irick and later developed by [21]. Similarly, Janigo and Wu identified parallel levels of repurposing complexity when exploring a co-design model for an entrepreneurial venture [32]. These findings collectively suggest that skill acquisition and creative development are mutually reinforcing, and that exposure to structured learning opportunities can help consumers progress from basic garment alterations to advanced, design-oriented repurposing. While skill and creativity shape the technical feasibility of repurposing, external motivational factors also play a significant role in determining whether and how individuals engage in these practices.

External Factors of Repurposing

Consistent with our conceptual framing, environmental concerns reflect a VBN-aligned sustainability motive, while artistic expression and monetary incentive represent complementary creative/identity and utilitarian/economic motives that may shape repurposing independently of VBN's normative activation pathway. Repurposing textiles has become an increasingly important focus within sustainable fashion scholarship, positioned at the intersection of design practice, consumer behavior, and environmental responsibility. Existing research highlights sewing proficiency, artistic expression, environmental concerns, and monetary considerations as influential factors in shaping engagement with creative reuse. Existing research also demonstrates that positive environmental attitudes can shape apparel purchasing and recycling decisions, but the direct connection between these attitudes, sewing experience, and engagement in repurposing practices remains underexplored. This manuscript addresses that gap by investigating how external factors, including sewing skills, artistic expression, environmental concerns, and

monetary incentive, affect consumers' likelihood to engage in repurposing, thereby extending prior work on pro-environmental behaviors into the domain of creative textile reuse.

Sewing Experience

Sewing has long been taught as a core component of FCS education in middle and high schools [17]. Beyond its historical role in education, sewing experience directly influences how individuals approach repurposing, shaping both technical capacity and creative practice. Fabric is a tactile surface that can be folded, molded, cut, and stitched into endless possibilities [33]. Creators use restyling, reshaping, embellishing, and overprinting techniques to provide unwanted fabrics with new life and divert waste from landfills [11]. Sewing skills are associated with constructive methods more comparable to patternmaking techniques such as ruffles, frills, tucking, and godets, as well as textural surface manipulations such as gathering, shirring, pleating, origami, and smocking [34].

Individuals with professional experience are often specialized in particular product types and possess advanced sewing and construction skills that enhance efficiency and support profitability in upcycling or repurposing businesses [32]. In addition, designers report that repurposing provides creative freedom, allowing them to view their designs as works of art [20,35]. Although prior research has explored the influence of environmental attitudes on a variety of pro-environmental behaviors, such as recycling, sustainable purchasing, and textile disposal [16,36–40], few studies have examined these motivations specifically in the context of repurposing. This gap underscores the importance of considering not only technical skills but also creative and cultural motivations, beginning with the role of artistic expression.

Based on this review of literature connected to sewing experience, the following hypothesis is proposed:

H1: *Sewing experience will positively predict engagement in higher-complexity repurposing practices.*

Artistic Expression

Artistic expression is critical during the repurposing process, serving as a strong motivation for designers to continue engaging in creative reuse [20]. For some contemporary artists, sewing itself functions as an artistic practice [41]. These creators employ sewing as a medium for expression through quillwork, beadwork, embroidery, ribbon work, and quilting. Repurposing also provides a pathway to integrate traditions into new works of art, with reclaimed materials carrying unique stories and cultural meanings [41]. In this way, repurposing connects individual creative techniques with broader cultural identities, renewing traditions while reducing waste.

Recent studies expand this perspective by framing repurposing as both a design practice and a consumer-engagement strategy. Hou, Wang, and Gu demonstrated that emphasizing product components rather than entire garments increases consumers' creative awareness and willingness to engage in reuse [42]. By highlighting specific elements, consumers can more easily envision possibilities for modification. Similarly, Liu found that upcycling not only improves environmental performance by reducing fiber waste and energy use, but also enhances consumer acceptance of remade products [43]. Creatively upcycled garments scored higher in uniqueness, visual appeal, and emotional engagement compared to conventionally recycled items, confirming that artistic value strongly influences sustainable consumption choices. These prior research findings suggest that creativity and culture motivate repurposing practices, but they also highlight the role of environmental values as another critical driver of engagement.

Based on this review of literature connected to artistic expression, the following hypothesis is proposed:

H2: *Artistic expression will positively predict engagement across all levels of repurposing.*

Environmental Concerns

Environmental awareness is a significant factor influencing pro-environmental clothing attitudes and sustainable behavior. Individuals with strong environmental concerns are more likely to take action for sustainability, such as purchasing ethically sourced or environmentally friendly products [39]. Repurposing can be understood as an extension of these practices, translating consumer awareness into creative action.

As sustainability has gained visibility, designers increasingly employ strategies such as efficient pattern-cutting to minimize textile waste, incorporating small scrap materials, and upcycling remnants into new wearable products [44,45]. Scholarship further demonstrates that environmental concerns predict sustainable fashion behaviors, including reuse, repair, and upcycling [46,47]. Building on this, research shows that heightened environmental concerns positively correlate with reuse and recycling behaviors [37,38]. For example, Gam found that individuals with stronger environmental attitudes were more likely to engage in sustainable apparel disposal practices [48], while McNeill and Moore highlighted how youth awareness of overconsumption fosters participation in secondhand fashion and creative reuse [47]. Niinimäki similarly emphasized that sustainability-oriented consumers not only purchase eco-friendly products but are also more inclined to engage in repair and repurposing [46]. Although these studies confirm environmental concerns as a foundation for sustainable practices, they also suggest that additional motivations, such as monetary incentives, are important to understanding consumer engagement in repurposing.

Based on prior clothing and textile scholarship on environmental concerns the following hypothesis is proposed:

H3: *Environmental concerns will positively predict engagement in lower- and mid-level repurposing practices.*

Monetary Incentives

Monetary incentives, understood as motivations to repurpose either to generate income or reduce expenses, represent a practical driver of sustainable behavior [49]. Repurposed apparel has traditionally been sold at premium prices due to labor costs; however, growing awareness of sustainable practices has reframed repurposing as a cost-effective, thrifty strategy [50]. Repurposing creates products of higher value than the original [51]. For example, an outdated high-waisted long skirt may be redesigned into a contemporary low-waisted mini skirt, extending the product's life and increasing its perceived value [11]. In this way, creators are monetarily motivated to repurpose their items by recreating value from used materials. While monetary considerations highlight the economic dimension of repurposing, demographic variables, particularly age, also shape how different consumer groups engage with sustainable practices.

Although our survey item emphasizes profit-oriented motivation, we discuss monetary incentive more broadly as an economic-utility driver (value creation, cost offsets, or income generation) that may operate alongside sustainability motives.

Based on the review of literature connected to monetary incentives, the following hypothesis is put forward:

H4: *Monetary incentive will positively predict engagement in repurposing.*

Sustainable Consumption and Age

Research into sustainable consumption increasingly emphasizes age as an important factor influencing behaviors and motivations. Generational differences shape how consumers approach sustainability and related consumption patterns, reflecting broader socio-cultural and economic systems. Older generations often demonstrate stronger engagement with sustainable practices, motivated by accumulated environmental concerns and long-term experience with frugality and repair traditions [52]. In contrast, younger consumers, despite expressing concern for sustainability, face barriers such as limited financial resources, short-term fashion cycles, and perceptions of sustainable goods as overpriced, which constrain consistent engagement [53].

Despite these insights, age remains underexplored as a moderating factor in repurposing research. Few studies directly examine how age interacts with other external drivers, such as sewing skills, artistic expression, environmental concerns, and monetary incentives, to influence engagement across different levels of repurposing. Addressing this gap is essential to clarifying whether motivations differ across age groups and how interventions can be tailored to specific consumer segments, thereby situating repurposing within broader sustainable material-use systems.

Based on this review of literature connected to sustainable consumption practices and age, the following hypothesis is proposed:

H5: *Age will be associated with variation in repurposing engagement across all levels.*

Literary Summary and Research Rationale

Across the literature, repurposing emerges as a multidimensional practice shaped by (a) technical capability (sewing experience), (b) pro-environmental motivation (environmental concerns), and (c) creative and economic motives (artistic expression and monetary incentive). We therefore draw on VBN as a guiding framework for the sustainability-related component of motivation, recognizing that VBN primarily addresses how values and beliefs activate personal norms that support pro-environmental action [16]. At the same time, because repurposing is also a form of creative production and value re-creation, we treat artistic expression and monetary incentive as complementary, non-VBN motivational pathways that may influence engagement in parallel to VBN-aligned motivation. This framing supports the present study's central aim: to identify how skills and distinct motivational drivers relate to participation across repurposing levels, thereby informing targeted interventions to expand engagement in circular clothing practices.

MATERIALS AND METHODS

This study employed a quantitative survey design to investigate how sewing experience, artistic expression, environmental concerns, monetary incentives, and age influence consumer engagement in repurposing practices. The methodology was structured to capture both demographic and behavioral information, as well as detailed measures of participants' sewing abilities and repurposing habits. The following section outlines the sample selection, data collection procedures, and measurement instruments used to assess the constructs of interest.

Sample Selection

This study focused on female consumers belonging to Generation X (born 1966–1981) and Generation Y (born 1982–1995). This population was selected for two primary reasons. First, women are more actively engaged in hedonic shopping behaviors such as fashion and appearance [54–56] and are typically the primary purchasers of clothing and organizers of household consumption [57]. Research also shows that women's influence on clothing consumption far exceeds that of men [58], making their perspectives especially valuable when examining sustainability-related issues and motivations connected to clothing. Female consumers account for approximately 70–80% of purchases made for themselves and their families [59].

Second, the selected age cohorts are at life stages where sustainability considerations may be particularly salient. Prior studies suggest that Gen X and Gen Y individuals often place a higher value on environmental knowledge and future-oriented goals [60–62]. These groups have also directly experienced the rise of fast-fashion consumption and its associated environmental impacts [63]. Together, these two female cohorts represent a powerful market segment with disposable income, heightened environmental and social awareness, and strong potential to engage in sustainable apparel practices. These considerations thus justified limiting the sample to these cohorts, given their apparel consumption behaviors and sustainability related practices, aligning directly with the focus of this research. Following approval from the University's Institutional Review Board, an online questionnaire was administered through Qualtrics. Participants were recruited via the Qualtrics Panel service, which provides access to targeted, reliable online samples. Eligibility criteria required participants to identify as female, be between 24 and 53 years of age, and reside in the United States. Restricting the sample to U.S. consumers avoided cross-cultural variability in attitudes and behaviors related to sustainable clothing practices. The survey required approximately 20 min to complete. After data cleaning, 331 usable responses remained for analysis.

Instrument

The questionnaire consisted of four sections: (a) demographics, (b) apparel consumption habits, (c) repurposing behaviors, and (d) sewing experience background. Artistic expression, environmental concerns, and monetary incentives were each measured using multiple statements rated on a five-point Likert scale, ranging from strongly agree (5) to strongly disagree (1).

Sewing experience was assessed by asking participants to evaluate the difficulty of specific tasks on a five-point scale, ranging from extremely easy (1) to extremely difficult (5). Example items included statements such as, *"Sew closed a 1-inch opening in a seam by hand."* Five items were used to measure sewing experience. To ensure higher values were intended to indicate greater sewing experience, all items were reverse coded prior to analysis (e.g., $1 \rightarrow 5$, $2 \rightarrow 4$, $3 \rightarrow 3$, $4 \rightarrow 2$, $5 \rightarrow 1$). All reverse coded responses were then used to generate an average (range 1–5) composite sewing experience score. This average sewing experience composite score was included as a predictor in the regression analysis. Repurposing practices were measured using four statements developed from prior studies of repurposing processes and levels [20,21]. Participants indicated how frequently they used repurposing techniques such as combining fabric pieces, cutting to create new design lines, embellishing, and reducing a larger garment into a smaller product. Each technique was analyzed individually. Collectively, these four items represent conceptual repurposing levels used in prior literature (decorative, subtractive, and pattern-based). The survey embedded the definition of each characteristic directly in the item wording rather of referencing separate definitions. For example, *'Combine pieces of fabric to create a large piece of fabric that I can then use to create a new product'* is reflective of additive repurposing (Level 3) because it involves assembling multiple smaller pieces into larger constructed pieces. Each item was rated on a five-point scale with endpoints ranging from frequently use this technique to repurpose goods (5) to never use this technique to repurpose textile goods (1).

Artistic expression, environmental concerns, and monetary incentive were measured with single-item indicators adapted from prior repurposing and sustainability research. We used single items because the survey focused on specific, face-valid motivational statements directly linked to the behavior domain (repurposing), and because survey length constraints required prioritizing breadth of predictors and behaviors. At the same time, we recognize that single-item indicators cannot capture the full dimensionality of broader latent constructs (e.g., pro-environmental values, identity-based creativity, or economic utility), may reduce measurement reliability, and can attenuate observed relationships. We therefore interpret these predictors as narrow, domain-specific motivational indicators rather than exhaustive measures of the underlying theoretical constructs and recommend multi-item scales in future work. Table 1 presents the items, their sources, and details of the development process. Cronbach's alpha values were calculated to assess the internal consistency reliability of the multi-item scales. The sewing experience scale demonstrated strong reliability ($\alpha = 0.83$).

Table 1. Survey Items.

Variable Name	Statement	Adapted from Previous Studies
Independent Variables		
Artistic expression	I consider repurposing apparel to be a form of artistic expression.	Adapted from Irick [20] Strongly agree (5) to strongly disagree (1)
Environmental concerns	Environmental concerns influence my decision to repurpose fashion goods.	Adapted from Dunlap & Van Liere [64], as used in Irick [20] Strongly agree (5) to strongly disagree (1)
Monetary incentive	I consider repurposing fashion goods to be a source of profit.	Adapted from Irick [20] Strongly agree (5) to strongly disagree (1)
Sewing experience	How difficult would it be for you to complete the following sewing tasks with the sewing knowledge that you currently possess? * - Sew closed a 1" opening in a seam by hand was asked with images of Example A illustrating a hole along a seam line and Example B illustrating a hole in the garment body (not in the seam) - Sew closed a 1" opening in a seam by hand - Sew a button back onto a shirt using a needle and thread - Hemming pants - Adjusting garment for proper fit along seam line or dart(s)	Adapted from Eike et al. [44] supported by Irick [20] Extremely easy (1) to extremely difficulty (5)
Dependent Variables		
Level 1: Re-style to repurpose	- Add decorative items/embellish to give a product a new look (e.g., beads, ribbons, or trims)	Adapted Irick [20]; Irick & Eike [21]
Level 2: Subtractive repurposing	- Use a large garment or piece of fabric to create a smaller garment or product	Frequently use this technique to repurpose goods (5) to never use this technique to repurpose textile goods (1)
Level 3: Additive repurposing	- Combine pieces of fabric to create a large piece of fabric that I can then use to create a new product.	
Level 4: Intentional patternmaking to repurpose	- Cut the garment/item to create design lines that I can then re-use, keeping design features of the original product (e.g. collar or pocket)	

* ***Note***: Items were reverse-coded; higher composite values reflect greater sewing experience.

Analytic Strategy

Separate multiple linear regressions were estimated for each repurposing level using age, artistic expression, environmental concerns, monetary incentive, and sewing experience as predictors. Standardized coefficients (β) adjusted R^2, and model F tests are reported. Multicollinearity was assessed via inter-predictor correlations, Variance Inflation Factors (VIF), and tolerance; diagnostics indicated no concerns (all VIFs < 2.5; tolerances > 0.40). To probe potential interactions, predictors were mean-centered and theoretically motivated terms (Sewing Experience × Artistic Expression, Sewing Experience × Environmental Concerns, Sewing Experience × Monetary Incentive, and Age × each predictor) were entered hierarchically after main effects. Interaction terms did not improve model fit (negligible ΔR^2) and were not statistically significant after multiple-test control; therefore, parsimonious main-effects models are retained. Robustness checks using HC3 standard errors,

5,000-resample bootstrapping, and sensitivity analyses excluding ±3 SD outliers yielded unchanged coefficient patterns and significance.

Although repurposing is conceptually multifaceted, the present study's primary aim is to identify how key drivers relate to distinct levels of repurposing behavior that differ in technical complexity. We therefore estimated separate, theory-guided regression models for each repurposing level to (a) avoid imposing a single latent "repurposing" construct across qualitatively different behaviors, and (b) enable direct comparison of predictor patterns as behavioral complexity increases. This approach emphasizes interpretability and level-specific leverage points for intervention rather than full causal modeling of a theoretical system. Future research can build on this work by incorporating multi-item latent measures and estimating integrated models (e.g., SEM for normative activation mechanisms, ordinal/GLM approaches for Likert outcomes, or mixture/latent class models to identify repurposing profiles), which were not feasible here due to measurement scope and the level-specific single-item outcomes.

RESULTS

Multiple regression analyses were conducted to examine the relationship between sewing experience, artistic expression, environmental concerns, monetary incentive, and age on the frequency of repurposing applications across four levels of repurposing to support (or not support) the stated hypotheses. Analyses were performed using SPSS Statistics 27.0. Table 2 presents the results of the regression models by repurposing level.

Although the adjusted R^2 values across models are modest (adj. R^2 = 0.152–0.192), such magnitudes are common in consumer behavior and sustainability studies that model complex, context-dependent behaviors using individual-difference predictors. Accordingly, we emphasize the stability of coefficient patterns across repurposing levels, standardized effects (β), and robustness checks rather than treating R^2 as the sole indicator of model quality. Importantly, the relative strength of predictors shifts systematically with repurposing complexity (e.g., sewing experience increases in importance at Levels 2–4; artistic expression remains significant across all levels), offering interpretable leverage points for intervention even when total variance explained is limited.

Across the four models, predictor patterns vary systematically with repurposing complexity. Artistic expression remains a consistent predictor at all levels, while sewing experience increases in magnitude and significance as tasks become more technically demanding (Levels 2–4). Environmental concern predicts lower to mid-level engagement (Levels 1–3) but not intentional patternmaking (Level 4), and monetary incentive is significant for Levels 1, 3, and 4. This comparative reading across models provides the primary interpretive contribution of the analysis.

Table 2. Summary of the Multiple Regression Analyses by Level of Repurposing.

Level of repurposing	*t*	*p*	β	*F*	*p*	adj. R^2
Level 1: Restyle to repurpose						
Overall model				11.900	0.000	0.181
Age	−1.700	0.090	−0.099			
Artistic expression	3.824	0.000	0.237			
Environmental concerns	2.457	0.015	0.158			
Monetary incentive	2.545	0.012	0.159			
Sewing experience	1.517	0.131	0.091			
Level 2: Subtractive Repurposing						
Overall model				11.475	0.000	0.192
Age	−0.512	0.609	−0.030			
Artistic expression	3.999	0.000	0.249			
Environmental concerns	2.421	0.016	0.156			
Monetary incentive	1.441	0.151	0.091			
Sewing experience	2.814	0.005	0.170			
Level 3: Additive Repurposing						
Overall model				11.243	0.000	0.172
Age	0.240	0.811	0.014			
Artistic expression	2.198	0.029	0.137			
Environmental concerns	2.580	0.010	0.167			
Monetary incentive	2.274	0.024	0.143			
Sewing experience	4.005	0.000	0.243			
Level 4: Intentional Patternmaking to Repurpose						
Overall model				9.854	0.000	0.152
Age	−1.037	0.301	−0.062			
Artistic expression	2.809	0.005	0.177			
Environmental concerns	1.023	0.307	0.067			
Monetary incentive	2.317	0.021	0.148			
Sewing experience	4.110	0.000	0.252			

Note: For the sewing experience composite, higher scores indicate greater sewing experience (items reverse-coded prior to summation).

Model Diagnostics and Interactions

Diagnostics indicated no multicollinearity concerns (all VIFs below conventional thresholds; tolerances acceptable). Adding centered interaction terms did not improve fit ($\Delta R^2 \approx 0$) and yielded no significant interactions after multiple-test adjustment; thus, we present the main-effects models. Results were robust to HC3 and bootstrap SEs and to exclusion of extreme values.

The predictors in Level 1 (restyle to repurpose) explained 18% of the variance in the behaviors ($R^2 = 0.181$, $F(5, 325) = 11.900$, $p < 0.001$). Artistic expression ($\beta = 0.237$, $p < 0.001$), environmental concerns ($\beta = 0.158$, $p < 0.05$), and monetary incentive ($\beta = 0.159$, $p < 0.05$) significantly predicted engagement in restyling. Sewing experience and age did not emerge as significant predictors at this level.

In Level 2 (subtractive repurposing) the predictors explained 19% of the variance in the behaviors (R^2 = 0.192, $F(5, 325) = 11.475$, $p < 0.001$). Artistic expression ($\beta = 0.249$, $p < 0.001$), environmental concerns ($\beta = 0.156$, $p < 0.05$), and sewing experience ($\beta = 0.170$, $p < 0.01$) were significant predictors. Because the sewing scale was reverse-coded, positive β values indicate that greater sewing experience predicts higher engagement. Monetary incentive and age were not significant.

For Level 3 (additive repurposing), the predictors explained 17% of the variance in Level 3 behaviors (R^2 = 0.172, $F(5, 325) = 11.243$, $p < 0.001$). Artistic expression ($\beta = 0.137$, $p < 0.05$), environmental concerns ($\beta = 0.167$, $p < 0.05$), monetary incentive ($\beta = 0.143$, $p < 0.05$), and sewing experience ($\beta = 0.243$, $p < 0.001$) all significantly predicted engagement in additive repurposing. Age was not a significant predictor.

Moreover, in Level 4 (intentional pattern making to repurpose), the predictors explained 15% of the variance in Level 4 behaviors (R^2 = 0.152, $F(5, 325) = 9.854$, $p < 0.001$). Artistic expression ($\beta = 0.177$, $p < 0.01$), monetary incentive ($\beta = 0.148$, $p < 0.05$), and sewing experience ($\beta = 0.252$, $p < 0.001$) were significant predictors. Environmental concerns and age were not significant at this level. Notably, environmental concerns influenced repurposing at earlier levels but did not predict engagement in the most advanced form of repurposing. One possible explanation is that individuals who reach Level 4 may exhibit relatively limited variability in pro-environmental orientation, or may prioritize skill- and value-creation motives once advanced repurposing becomes feasible; because personal norms were not measured, we interpret this pattern descriptively rather than as evidence of VBN's normative activation mechanism [16,36]. Overall, the regression findings largely supported the proposed hypotheses. Sewing experience (**H1**) significantly predicted engagement in Levels 2–4, but not Level 1, indicating that technical skill becomes more important as repurposing complexity increases. Artistic expression (**H2**) significantly and positively predicted engagement at all four repurposing levels. Environmental concern (**H3**) significantly predicted participation in Levels 1–3, but not in Level 4. Monetary incentive (**H4**) significantly predicted engagement in Levels 1, 3, and 4, but not Level 2. In contrast, age (**H5**) did not significantly predict engagement at any repurposing level, providing no support for this hypothesis.

Taken together, the pattern that sewing experience grows in importance with task complexity is consistent with practice/capability perspectives, where technical skill operates as an enabling resource for higher-order behaviors; the persistent role of artistic expression aligns with creative identity/meaning-making in practice theory; and the emergence of monetary incentives at higher levels is consistent with social exchange/economic rationality, as time and effort costs rise with complexity. These findings indicate that while artistic expression is a consistent driver across all levels, the influence of environmental concerns diminishes at higher levels of repurposing. In contrast, sewing

experience becomes increasingly important as the complexity of repurposing techniques increases, emerging as the strongest predictor at Levels 3 and 4. *Note: If desired, please contact the corresponding authors for additional information on the data of this study.*

DISCUSSION

Interpreting the findings through a sustainability and material-use systems lens reveals how sewing experience, creative motivations, environmental values, and economic considerations shape consumer engagement across repurposing levels. This section discusses how individual repurposing behaviors contribute to circular economy transitions and identifies key leverage points for interventions to support consumer participation of repurposing activities.

Patterns of Motivation and Skill Across Repurposing Levels

As the global population continues to grow and life expectancy lengthens [64], the demand for clothing will continue to rise, thereby intensifying the already critical issue of textile waste. Within this context, the present findings illustrate how consumer motivations for repurposing apparel vary by the level of technical complexity involved, offering insights into how individual actions connect to broader sustainable material-use systems.

At lower to moderate levels of sewing skill (Levels 1–3), environmental concerns consistently emerged as a significant predictor, suggesting that participants view repurposing as a form of environmentally conscious practice and everyday activism. This aligns with prior work on pro-environmental attitudes as drivers of sustainable clothing behaviors [16,36,37–40] and highlights how even accessible forms of repurposing, such as embellishing, altering fit, or transforming garments into simple functional items, can function as entry points into circular practices. Monetary incentive also significantly predicted engagement at Levels 1 (restyling) and 3 (additive repurposing). These findings suggest that when technical barriers are lower, consumers may be more readily motivated by both environmental values and economic practicality, reinforcing the importance of designing interventions that highlight ease of participation and tangible benefits.

Level 2 (subtractive repurposing) revealed a distinct pattern: sewing experience predicted engagement, while monetary incentive did not. This finding underscores the technical requirements of working with larger garments or raw fabric yardage, which often necessitate proficiency with tools such as patterns, shears, and sewing machines. In this case, technical competence may outweigh financial motivation, suggesting that consumers at this level are best supported by targeted opportunities for skill-building. This insight aligns with research emphasizing the role of hands-on learning and technical education in enabling sustainable practices [14,21,32].

At higher levels of repurposing, the predictors shifted once again. In Level 3 (additive repurposing), both monetary incentives and sewing experience were significant, suggesting that consumers at this stage recognize the value of labor, creativity, and craftsmanship embedded in their work. Repurposing through piecing and reconstruction not only generates cost savings or resale potential but also cultivates appreciation for the investment of skill and time. At Level 4 (intentional patternmaking), sewing experience remained a critical predictor, while environmental concerns were no longer significant. The non-significance of environmental concerns at this stage may reflect the increasing dominance of technical proficiency as a determinant of engagement and/or a measurement saturation effect; participants highly skilled in sewing may already display uniformly high environmental concerns, leaving little variance to explain. Because the study did not directly measure value internalization, no causal inference is made on this mechanism.

These findings cohere with established theoretical frameworks: (a) skills and capabilities act as enabling resources that determine the feasibility of advanced repurposing (practice theory); (b) artistic expression reflects identity-driven creative engagement that transcends technical complexity; (c) environmental concerns functions as an initiating factor that motivates early and moderate engagement but becomes less influential once skills dominate behavioral variance; and (d) monetary incentive aligns with social exchange principles, motivating participation as task complexity and time investment increase. Together, these patterns provide a theoretically grounded understanding of how external drivers operate across progressive levels of repurposing.

Although the adjusted R^2 values (0.16–0.20) are modest, this is typical for behavioral models with individual-difference predictors in consumer contexts. We therefore emphasize effect sizes (standardized β, f^2) and confidence intervals alongside R^2. The core patterns, particularly the increasing role of sewing experience at higher repurposing levels and the consistent contribution of artistic expression were stable across robustness checks (HC3, bootstrapping, and outlier sensitivity) and did not depend on interaction terms, supporting the interpretability of the main findings.

Across all levels, the findings affirm that repurposing fulfills a fundamental creative need, enabling individuals to express identity and imagination through material transformation. However, the results also demonstrate that as repurposing becomes more advanced, the technical requirements increase, pointing to the importance of reviving and sustaining soft-goods education as part of a long-term strategy to support consumer engagement in circular practices. Recognizing the distinct motivations at each level provides guidance for targeted interventions: emphasizing accessibility at Level 1, skill development at Level 2, valuing

craftsmanship at Levels 3 and 4, and highlighting creativity as a unifying thread across all practices.

By situating these findings within a broader sustainability framework, this study contributes to understanding repurposing not simply as an individual behavior but as a practice embedded in material-use systems that link consumers, education, and the fashion lifecycle. This systems-oriented perspective highlights opportunities for both policy and pedagogy to foster consumer engagement in repurposing as a scalable strategy for reducing textile waste and advancing circular economy goals.

Targeted Interventions to Support Repurposing Engagement

The variation in motivational and skill-based predictors across repurposing levels suggests several opportunities for targeted interventions that can strengthen consumer participation in circular practices, particularly among Generation X and Y consumers. At Levels 1 and 2, where environmental concerns and task accessibility are key motivators, interventions that emphasize low-barrier entry may be most effective. 'Quick-win' repurposing kits, micro-tutorials on social media, and retailer-supported campaigns that highlight the environmental benefits of small repurposing actions can activate personal norms consistent with VBN theory, while reinforcing consumers' sense of efficacy and impact. These interventions may be particularly appealing to time-limited Gen X and Millennial adults who are motivated by sustainability but may lack confidence or structured opportunities to begin.

For Level 2 and upward transitions into Levels 3 and 4, skill-building interventions become critical. Community workshops, makerspace partnerships, and short-format sewing or reconstruction classes can provide the technical competence necessary for subtractive and additive repurposing. Intergenerational 'skill-share' models, which pair highly skilled Gen X sewists with Millennial learners, may be especially effective given the existing skills and making knowledge possessed by older participants and the learning preferences of younger groups. These approaches align with practice theory and support sustainable behavior by enhancing the feasibility of more complex repurposing.

At Levels 3 and 4, as monetary incentives and craftsmanship appreciation become more prominent, interventions may benefit from value-driven and economic framing. Programs that help consumers price repurposed items, track cost savings, or participate in local maker markets can reinforce the social exchange components of repurposing motivations. Additionally, showcasing the artistic value and cultural meaning embedded in repurposed goods may further foster continued engagement. Together, these targeted strategies illustrate how multilevel, systems-oriented interventions, ranging from skills education to economic incentives, can meaningfully enhance consumer participation along repurposing pathways.

CONCLUSIONS

This study investigated how sewing experience and select motivations, specifically, artistic expression, environmental concerns, and monetary incentive influence consumer engagement across four levels of apparel repurposing. Findings demonstrate that repurposing, at any level, contributes meaningfully to creative expression and personal agency while simultaneously reducing textile waste. In a context marked by rising costs of goods, supply chain disruptions, and the ongoing social and economic effects of the COVID-19 pandemic [65], repurposing apparel offers an accessible, low-cost, and constructive outlet that supports both individual well-being and environmental sustainability.

The results highlight several actionable strategies to increase engagement in repurposing behaviors aligned with circular economic aims. Skill development initiatives are essential for supporting transitions into more complex repurposing practices, while creative engagement and cost/benefit framing can strengthen participation at multiple levels. For industry and policy stakeholders, effective approaches may include incentives for resale, take-back, and creative repair programs that foreground both environmental and economic benefits. For educators, the strong influence of sewing experience underscores the need to reintegrate apparel construction, repair, and upcycling skills into FCS and design curricula, linking them to STEM competencies such as systems thinking, creativity, and material problem-solving. Together, these targeted efforts can enhance participation in circular fashion systems by aligning individual motivations with broader sustainability goals.

Generational context further informs these findings. Many participants likely received sewing or "making" education during their primary and secondary schooling years, when FCS coursework emphasized clothing construction. These earlier-acquired skills can be reactivated through repurposing. However, the widespread reduction of sewing-focused education in favor of STEM-oriented curricula [18] means that younger generations may have limited exposure to these competencies. Reframing sewing and repurposing as contemporary practices tied to innovation, design thinking, and sustainable material-use systems, rather than outdated domestic tasks, is essential. Revitalizing apparel construction education, particularly when integrated with STEM, can prepare future generations to view repurposing as both a sustainability strategy and a pathway to creative confidence and emotional resilience.

This study focused on the Generation X and Generation Y female consumers; findings may not generalize to other genders, age cohorts, or cultural contexts where sewing education, clothing norms, and reuse infrastructures differ. The regression models explained a modest proportion of variance (adj. $R^2 \approx 0.15–0.19$), suggesting that repurposing is also shaped by unmeasured determinants such as time and tool access, wardrobe/resources, subjective norms, identity, self-efficacy, and social/digital participation. In addition, several predictors and the repurposing outcomes were measured using single-item indicators, which may reduce reliability and attenuate effect sizes. Because the data are cross-sectional and do not include VBN's full normative activation

sequence, results should be interpreted as associational rather than causal. Future research should broaden sampling, use validated multi-item scales and latent-variable modeling, incorporate additional determinants, and consider artifact-based or longitudinal measures to better capture repurposing pathways and value creation.

PRACTICAL IMPLICATIONS

The findings of this study provide several actionable pathways for supporting consumer engagement in apparel repurposing across varying levels of complexity. First, because sewing experience strongly predicts participation at higher repurposing levels, educational initiatives are essential for expanding technical capacity. Integrating apparel construction, repair, and upcycling instruction into and beyond Family and Consumer Sciences and design curricula, particularly within STEM- and STEAM-aligned "maker" frameworks, can build lasting skills that enable consumers to advance into more complex repurposing practices.

Second, interventions that emphasize creativity, self-expression, and personal meaning-making may be especially effective, given the consistent influence of artistic expression across all repurposing levels. Community workshops, makerspaces, and intergenerational skill-sharing programs can foster these forms of creative engagement while also strengthening social connection.

Third, practical and economic framing can motivate participation, particularly at Levels 1 and 3, where monetary incentive plays a role. Policymakers and industry stakeholders can support consumer repurposing through initiatives such as take-back programs, maker-market platforms, resale incentives, and low-barrier 'quick win' repurposing kits that highlight both environmental and financial benefits.

Finally, given that many adults may possess foundational sewing or making skills from earlier educational experiences, opportunities that reactivate these competencies, such as refresher workshops or digital micro-tutorials, can lower psychological barriers to re-engagement. Collectively, these strategies provide a scalable approach for aligning consumer motivations with circular fashion goals, thereby contributing to reduced textile waste and strengthened sustainable material-use systems.

DATA AVAILABILITY

The dataset of the study is available from the authors upon reasonable request.

AUTHOR CONTRIBUTIONS

Conceptualization and methodology, RE, MB, and GH; data curation and formal analysis, RE and SC; writing: original draft preparation, BH; writing: review and editing, RE, MB, and GH; supervision and project

administration, RE. All authors have read and agreed to the published version of the manuscript.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

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