User Value Priorities in Product Personalization and their Implications for Designing Future Additive Manufacturing Enabled Personalization Tools

Syahibudil Ikhwan Abdul Kudus[1*], Nurin Aishah Mazalan[1], Mastura Muhammad Taha[1], Muhammed Nafis Osman Zahid[2], Yudhi Ariadi[3]

[1] Fakulti Teknologi dan Kejuruteraan Industri dan Pembuatan, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia.

[2] Fakulti Teknologi Kejuruteraan Pembuatan dan Mekatronik, Universiti Malaysia Pahang Al-Sultan Abdullah, 26600 Pekan, Pahang, Malaysia

[3] School of Engineering, University of Warwick, Coventry CV4 7AL, United Kingdom.

***Corresponding Author**

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ABSTRACT

Product personalisation has gained growing attention as consumers increasingly seek products that reflect personal preferences, identity, and functional needs. Additive manufacturing (AM) supports such customisation through flexible, low-volume production, yet limited empirical evidence exists on how end users evaluate the value of personalised products. This study investigates end users' perceived value of product personalisation by examining willingness to pay, purchase intention, and evaluations of six value components: functional, personal-expressive, aesthetic, unique, hedonic, and co-design value. An online questionnaire captured respondents' assessments of personalised features, and descriptive analysis summarised value perceptions and behavioural responses. Findings indicate that functional value is the strongest driver of perceived benefit, with respondents showing clear willingness to pay when personalisation improves utility or performance. Aesthetic and personal-expressive attributes generated interest but resulted in lower willingness to pay unless supported by functional advantages. Hedonic and co-design value were positively acknowledged, suggesting that enjoyment, creativity, and guided involvement enhance emotional engagement during the personalisation process. Unique value increased perceived distinctiveness but demonstrated limited economic influence. Perceived value in personalised products is multidimensional but anchored primarily in functional and experiential benefits. These insights offer guidance for designers and AM practitioners by identifying value components that should inform the development of future AM-enabled personalisation tools that support meaningful and user-centred design engagement.

Keywords-product personalisation, additive manufacturing, consumer value perception, co-design engagement, personalisation tool design

INTRODUCTION

Product personalisation has become increasingly prominent as consumer expectations shift towards products that reflect individual preferences, identities, and functional needs. Unlike conventional mass-produced goods, personalised products offer an opportunity for users to obtain designs that resonate more deeply with their personal tastes and lifestyles [1], [2]. When a product communicates aspects of a user's personality or self-image, it strengthens the emotional bond between the user and the artefact through feelings of pride, joy, attachment, and personal meaning [3], [4], [5], [6]. Such emotional responses indicate that personalisation is not merely a design trend but a meaningful mechanism for enhancing user-product relationships.

Recent consumer behaviour research shows that the desire for individuality and distinctiveness remains a strong motivation behind personalisation. Products that enable users to express who they are through form,

colour, symbols, or narrative elements help strengthen identity communication and self-expression [7], [8], [9]. Contemporary branding practices similarly reflect the rise of mass-personalisation such as the Heinz "Draw Ketchup" campaign [10], which allowed users to personalise product packaging while reinforcing brand relevance and emotional connection. These developments highlight a broader cultural movement in which personalisation acts as a facilitator of identity expression, emotional attachment, and perceived uniqueness.

Beyond passive customisation, studies emphasise the importance of user involvement and participation in the creation process [11], [12], [13]. Self-designed products offer value not only because of the outcome but also because of the design journey itself. As individuals engage in creative decisions and express their preferences more directly, they experience greater enjoyment, psychological ownership, and personal fulfilment [14], [15]. This experiential dimension becomes particularly significant when users feel that their cognitive effort translates into a more personally meaningful product [16]. Research also suggests that users tend to appreciate personalised outcomes more when they perceive their input as valuable and visible within the final artefact [17], [18].

The emergence of additive manufacturing (AM) has transformed the landscape of personalisation by removing barriers associated with conventional manufacturing. AM offers unparalleled design freedom, supports geometric complexity, and enables low-volume production without the need for expensive tooling [19], [20]. As AM technologies become more accessible, end-users can now participate in personalisation through digital platforms, parametric tools, and easy-to-use interfaces that modify three-dimensional product models [21], [22]. These capabilities make AM an attractive technology for delivering both aesthetic and functional personalisation, ranging from customised ergonomics and performance adjustments to unique surface textures and decorative elements [23]. Therefore, AM acts not only as a manufacturing method but also as a facilitator of user-driven design, enabling personalisation to take place at unprecedented levels of depth and precision.

To understand how users evaluate personalised products, consumer value theory provides a necessary conceptual lens. Value is multidimensional, shaped by functional, expressive, aesthetic, experiential, and symbolic factors [24], [25], [26], [27]. In the context of personalised products, Merle et al. [28], [29] propose a taxonomy that distinguishes between product-related value and experiential value. These categories encompass six key dimensions: functional value, personal-expressive value, sensory value, unique value, hedonic value, and co-design value. This taxonomy is particularly relevant to AM-enabled personalisation, where users can directly manipulate digital models and participate in meaningful stages of design, thereby influencing both the utility and experiential appeal of the final product.

However, despite extensive conceptual development, empirical evidence on how end-users assess personalised products, especially those produced through AM, remains limited. Existing studies often highlight inconsistencies, where aesthetic and expressive attributes may generate high interest but do not always increase willingness to pay [16], [29], [30]; functional enhancements are reliable purchase drivers, yet their relationship with hedonic or co-design value is not well understood [31], [32], [33]; and although active participation strengthens emotional connection, it may also introduce cognitive burden for some users, thereby reducing perceived value [14], [34], [35].

In addressing this gap, the present study investigates end-users' reflections across the six value components and examines their willingness to pay and purchase intention for personalised consumer products. This study provides empirical evidence on how users interpret value when presented with actual personalised examples. The study aims not only to measure value perception but also to identify which value components are most influential in shaping user decisions. This understanding is critical for informing the design of future AM-enabled personalisation tools and user-support systems. By identifying the value attributes that users prioritise, the study lays a foundation for developing design methods, toolkits, and digital interfaces that can help end-users make informed, meaningful, and satisfying personalisation choices.

LITERATURE REVIEW

Product personalisation has gained widespread attention as consumers increasingly seek products that reflect their unique identities, preferences, and lifestyles. The literature shows that personalised products allow

individuals to obtain designs that embody personal taste and communicate individuality [1]. When a product mirrors a user's personality or self-image, it symbolically reinforces identity and strengthens the emotional relationship between the user and the artefact [3], [8], [36]. This emotional connection, often referred to as product attachment, emerges from positive emotions such as pride, joy, nostalgia, and excitement [5], [37], [38], [39]. As users derive pleasure from creating or using a product, they form stronger psychological bonds and perceive the product as more meaningful.

A major driver of value in personalisation is the opportunity to create uniqueness, allowing users to differentiate themselves from others. Franke and Schreier [7] argue that self-designed products enhance the capacity to express distinctive characteristics, thereby increasing symbolic and identity-related value. Personalisation thus becomes a vehicle for self-expression, authenticity, and individuality. Contemporary branding strategies reflect this trend; for example, Heinz's "Draw Ketchup" campaign enabled users to create personalised bottle labels, reinforcing personal meaning through mass-personalised offerings [10]. Collectively, these studies highlight personalisation as a mechanism for strengthening identity expression, emotional attachment, and perceived uniqueness; factors that underpin value creation in personalised consumer products.

Beyond passive forms of customisation, the literature emphasises the significance of active user involvement in the design process. Self-designed products create additional layers of value, including preference fit, process enjoyment, creative fulfilment, and psychological ownership [14]. Value arises not only from the final product but also from the design experience itself, where individuals invest cognitive effort and personal intention to create products that align closely with their needs [40]. Users tend to assign greater value to products when they enjoy the design process or see their personal effort reflected in the outcome [15].

Research also shows that self-design enhances pride of authorship, psychological ownership, and affective commitment [41], [42], [43]. However, studies caution that not all products are suitable for individualisation and that personalisation delivers varying levels of value depending on product category, user characteristics, and design complexity [15], [44]. Understanding the specific dimensions of value derived from personalisation is therefore essential for assessing its effectiveness.

AM is widely recognised as a transformative enabler of product personalisation due to its design freedom, geometric flexibility, and capacity for low-volume, customised production [45], [46]. Recent operational studies support this position by demonstrating that AM significantly lowers the cost and complexity of producing design variants, thereby enabling economically feasible mass personalisation and enhancing responsiveness to individual consumer requirements [45], [47].

AM allows users to modify digital CAD files by adjusting shapes, forms, textures, colours, and decorative features, thereby enabling personalisation at levels unattainable through traditional manufacturing methods [20], [48], [49]. AM technologies also enhance accessibility, allowing non-expert users to personalise products using parametric interfaces and design toolkits [21], [22], [49].

The flexibility of AM supports both aesthetic and functional personalisation: users can incorporate unique motifs and colours while also tailoring ergonomics, structural performance, or functional features. Because AM eliminates the need for tooling, design changes do not incur significant cost penalties, making one-off or small-batch personalisation economically feasible [50]. These characteristics position AM as a powerful tool for industries seeking to enhance user engagement, differentiate offerings, and provide customised value on demand [51].

Consumer value theory provides a foundational perspective for understanding how users assess personalised products, emphasising that value is multidimensional and shaped by functional, symbolic, emotional, experiential, and sensory factors [24], [52], [53]. In personalisation contexts, Merle et al. [28], [29] classify perceived value into two overarching categories: product value and experiential value, each comprising distinct components.

Functional value reflects improvements in utility and performance that personalised products offer over

standard alternatives [54], [55]. Personal-expressive value captures the extent to which a product conveys an individual's identity or self-image [9], [56], [57]. Sensory value relates to aesthetic appeal, visual pleasure, and sensory delight [25], [58], [59]. Unique value reflects the symbolic importance of owning a product that stands out from mass-produced items, reinforcing feelings of distinctiveness [54], [60], [61].

On the experiential side, hedonic value refers to enjoyment, entertainment, and emotional gratification in the personalisation experience [31], [62], [63], while co-design value arises from users' active participation and creative involvement in shaping a product [29], [64]. Together, these six components form the value taxonomy adopted for personalised AM products, integrating product-related and experience-related benefits into a comprehensive framework. This taxonomy is particularly salient in AM contexts, where users can directly manipulate digital models, shape design outcomes, and derive experiential value from meaningful co-design engagement.

Despite extensive conceptual advancements in product personalisation research, empirical evidence on how consumers evaluate personalised products, especially those produced using AM remains limited. Although prior studies identify multiple value sources, findings frequently present inconsistencies. Aesthetic and personal-expressive features often generate strong interest but do not consistently increase willingness to pay [29], [65]. Functional improvements are recognised as reliable purchase drivers, yet their interaction with hedonic enjoyment or co-design engagement remains unclear [31], [32], [66]. Furthermore, active participation in self-design strengthens emotional connection but may impose cognitive effort that reduces perceived value for some users [14], [34].

Scholars also note that not all products are equally suited for personalisation, as perceived benefits may vary according to product type, user characteristics, and design complexity [2], [15], [67]. These inconsistencies underscore the need for empirical investigation into how consumers perceive different dimensions of value such as functional, expressive, sensory, unique, hedonic, and co-design within AM-enabled personalisation contexts. Addressing this gap, the present study evaluates end-users' reflections on these value components and examines their willingness to pay and purchase intentions using a structured value taxonomy specifically developed for personalised AM products.

METHODOLOGY

This study employed a cross-sectional survey design to examine how end-users perceive the value of personalised consumer products. A structured online questionnaire was used to collect quantitative data on six value components derived from a validated value taxonomy for personalised products, they are: Functional, Personal-expressive, Sensory, Unique, Hedonic, and Co-design value.

In addition to value perception, the survey captured willingness to pay (WTP) using the Contingent Valuation Method (CVM) [68], [69], [70]. A closed-ended WTP format was adopted, enabling respondents to select from predetermined price ranges, an approach recommended in earlier valuation research for improving clarity and response reliability.

The online questionnaire was delivered using a secure, web-based survey system that enabled broad dissemination and efficient remote participation. The final instrument contained 23 questions addressing awareness of product personalisation, evaluations of the six value dimensions, willingness to pay, purchase intention, and demographic information. Likert-scale items were used to capture perceived importance across value components, while paired-comparison formats were included to examine respondents' preferences and attitudes toward personalised product attributes.

Participants were recruited through convenience sampling, reflecting the exploratory nature of the study and the need for broad access to a diverse respondent pool. Recruitment was conducted by distributing invitations through email, social networks, professional groups, and university contacts. This approach allowed wide reach across multiple countries, with most participants originating from Malaysia and the United Kingdom and additional responses obtained from Thailand, Indonesia, and Taiwan. The survey was self-administered, allowing respondents to participate at their convenience without interference from the researcher. Measures

were taken to ensure that the data collected reflected participants' genuine perceptions, including standardised question presentation and restrictions on incomplete submissions.

All responses were exported from the survey system for descriptive statistical analysis. The analysis focused on summarising frequency distributions and central tendencies associated with perceived value components, willingness to pay, and purchase intention. Given the exploratory nature of the study and the modest sample size, the analysis was not intended to support statistical generalisation; rather, it aimed to identify indicative trends, relative value perceptions, and emerging patterns within the respondent group. The study generated empirical data on how users evaluate personalised products and which value dimensions influence their decisions. This provides a basis for interpreting the significance of the six value components and their role in shaping interest, emotional engagement, and willingness to pay in personalisation contexts.

RESULTS AND DISCUSSION

The survey results provide insights into how end-users evaluate personalised consumer products and how different value components influence their WTP and purchase intention. The demographic distribution showed that 84% of respondents were between 21 and 50 years old (n=101), representing a broad and active consumer segment. Most participants were non-designers, with 78% reporting that their job roles did not involve product design, indicating that the responses reflect perspectives from typical end-users rather than design professionals. Additionally, 62% indicated prior experience with personalisation activities, suggesting that the majority were sufficiently familiar with the concept to provide informed and meaningful reflections.

Value Reflection on Personalised Function Features

To assess functional value, respondents were shown two comparative examples: a standard mass-produced fixie bike and a personalised fixie bike. The standard bike represented a generic, off-the-shelf model priced at £300, with no user-specific adjustments. In contrast, the personalised version was described as a bicycle tailored to the rider's body measurements, comfort, ergonomics, and safety, with additional options for bespoke paintwork and component upgrades. Respondents were then asked how much extra they would be willing to pay for enhanced functional features beyond the standard £300 baseline.

Findings from Table 1 reveal a varied distribution of willingness to pay. A notable proportion of respondents (26%) were unwilling to pay any additional cost for functional personalisation. However, 25% were willing to pay up to £50 above the standard price, and 20% indicated willingness to pay between £51 and £100. Only a very small fraction (0.09 on the weighted scale) expressed readiness to pay more than £200 for functional enhancements. These results suggest that although functional improvements were appreciated, respondents were financially cautious and only willing to pay a premium when personalisation offered clear and tangible performance benefits [71].

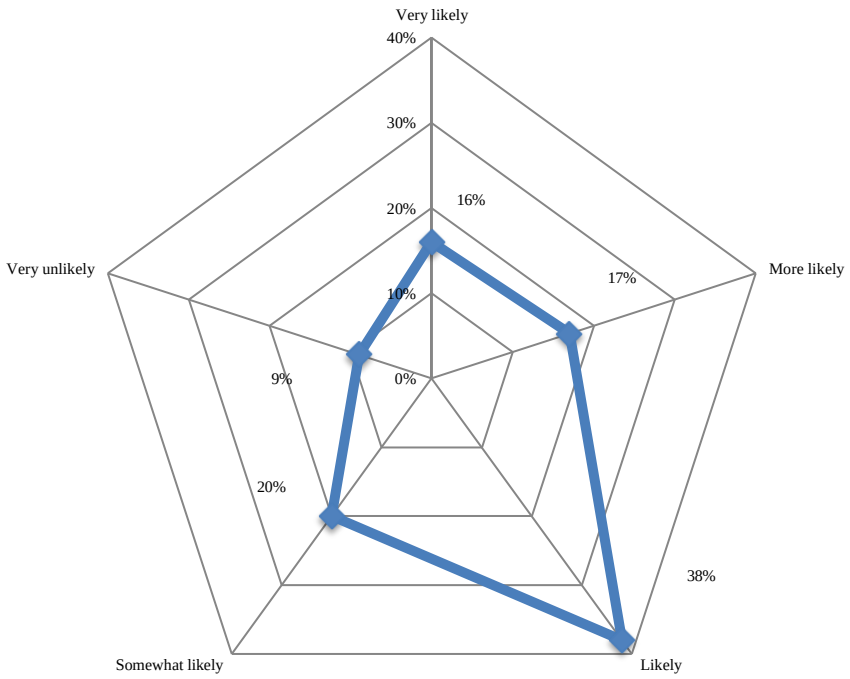
Table I WTP extra for personalised function features

Personalised features	WTP (£)					
	No Extra	<= £50	£51-£100	£101-£150	£151-£200	>= £201
Personalised saddle design for seating comfort.	12%	47%	23%	8%	6%	4%
Bespoke paintwork and finishes on the frame.	42%	29%	13%	11%	3%	2%
Personalised text printed on the frame and rims.	55%	32%	9%	2%	1%	1%
Tailoring bike size fit to end user's body measurement.	10%	22%	23%	24%	9%	12%

Carbon fibre frame for lightweight and competitive riding.	20%	11%	23%	22%	8%	16%
Electronic shifter on gears and brakes components.	22%	15%	22%	19%	10%	12%
Stronger and lighter wheel set.	19%	19%	26%	10%	13%	13%
Average score	0.26	0.25	0.20	0.14	0.07	0.09

Despite these moderate WTP levels, purchase intention remained high when functional personalisation was priced within a reasonable range. As shown in Fig. 1, 71% of respondents indicated that they were either "likely" or "very likely" to purchase the personalised fixie bike if the added cost remained acceptable. This reinforces functional value as the strongest driver of personalisation interest: users show clear enthusiasm for performance-enhancing features, but their willingness to pay is highly dependent on perceived necessity and affordability.

Fig. 1 Purchase intention for product with personalised functional features



Value Reflection on Personalised Personal-Expression Features

To examine personal-expressive value, respondents were shown visual examples of two products: a standard knee-high boot and a personalised knee-high boot (custom colours, material combinations, monograms, and

stylistic accents). The standard boot represented an off-the-shelf fashion item, whereas the personalised version highlighted how custom aesthetic and expressive elements could reflect the wearer's identity and individual taste. Respondents were asked to compare both designs and indicate their level of interest and perceived value.

Results in Table 2 below showed strong appreciation for expressive personalisation, with a noticeable proportion of respondents preferring the personalised boot for its aesthetic differentiation and identity-related appeal. However, WTP for expressive enhancements remained moderate, consistent with literature suggesting that symbolic or identity-related attributes enhance desirability but do not strongly influence price elasticity. Respondents valued the personalised boot's ability to communicate personality and style, yet many indicated they would only pay a small premium above the cost of standard footwear. This reflects the broader trend observed in personalisation research: expressive appeal increases emotional engagement but is not always sufficient to justify a high monetary premium.

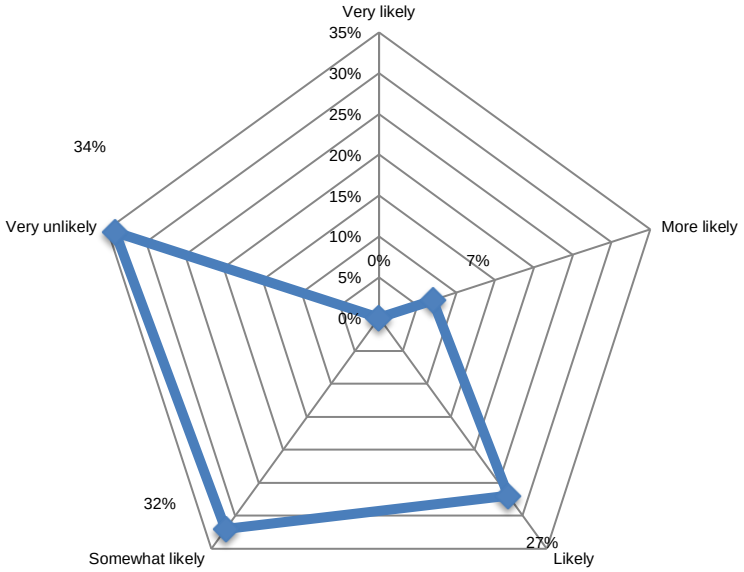
Respondents appreciated products that conveyed individuality, yet the WTP data, where 47% to 69% selected "no extra cost" for expressive features demonstrates that expressive enhancements alone do not justify substantial price increases. In line with broader personalisation research, identity expression increases desirability but rarely motivates users to pay significant premiums unless expressive features are combined with Functional features emerged or exclusivity. Overall, expressive personalisation operates as a meaningful driver of interest and emotional resonance but remains a secondary influence on spending behaviour when compared to functional value.

Table 2 WTP extra for personalised personal-expression features

Personalised features	WTP (£)					
	No Extra	≤ £50	£51-£100	£101-£150	£151-£200	≥ £201
Thicker outsole to get more robust shape.	54%	29%	14%	1%	1%	1%
Changing the front toe shape to be more rectangular for more muscular appearance.	69%	17%	10%	3%	1%	0%
Extra padding and tighter opening to get more appealing leg shape.	47%	28%	20%	3%	0%	2%
Changing from typical laces to metal type buckle with spike design to give stronger character.	66%	24%	9%	0%	1%	0%
Chrome finishing at outsole for additional character.	68%	18%	11%	3%	0%	0%
Average score	0.61	0.23	0.13	0.02	0.01	0.01

Despite the modest WTP reported for personal-expressive features, respondents' purchase intention remained relatively positive when expressive personalisation was offered at a reasonable price. While most participants indicated that they would only pay a minimal premium for expressive enhancements to the knee-high boots such as unique colours, decorative buckles, or personalised finishes, the majority still showed interest in buying the product if the additional cost was low. This trend aligns clearly with the pattern observed in Fig. 2, where the largest proportions of respondents reported being either "somewhat likely" (32%) or "likely" (27%) to purchase a product that reflects their self-expression, even though 34% stated they were "very unlikely" and none selected "very likely". These results indicate that influence on economic decision-making is constrained by affordability.

Fig. 2 Purchase intention for product with personalised personal-expression features



Value Reflection On Personalised Aesthetic Features

Sensory value was examined using a comparison between a standard mass-produced table lamp and a personalised table lamp offering enhanced visual and aesthetic appeal. The standard lamp was described as having a simple shade design, traditional steel-and-fabric construction, and typical off-the-shelf features. Whereas the personalised lamp was presented with bespoke shapes, high-quality polymer materials, and thematic aesthetic elements tailored to individual taste. Respondents were told that the standard lamp cost £70 and were asked how much extra they would be willing to pay for specific aesthetic enhancements.

As shown in Table 3, the strongest WTP category was ≤ £20, which recorded the highest average score (0.33), followed by £21–£40 (0.23) and £41–£60 (0.17). Feature-specific responses show similar trends: 37% would pay up to £20 to choose attractive colours, 32% would pay up to £20 for creative shade shapes, and 31% would pay up to £20 for pleasant-looking materials. Although a small proportion of respondents indicated willingness to pay more than £60 for certain features, the data overall reflect a moderate but consistent readiness to pay extra for aesthetic personalisation.

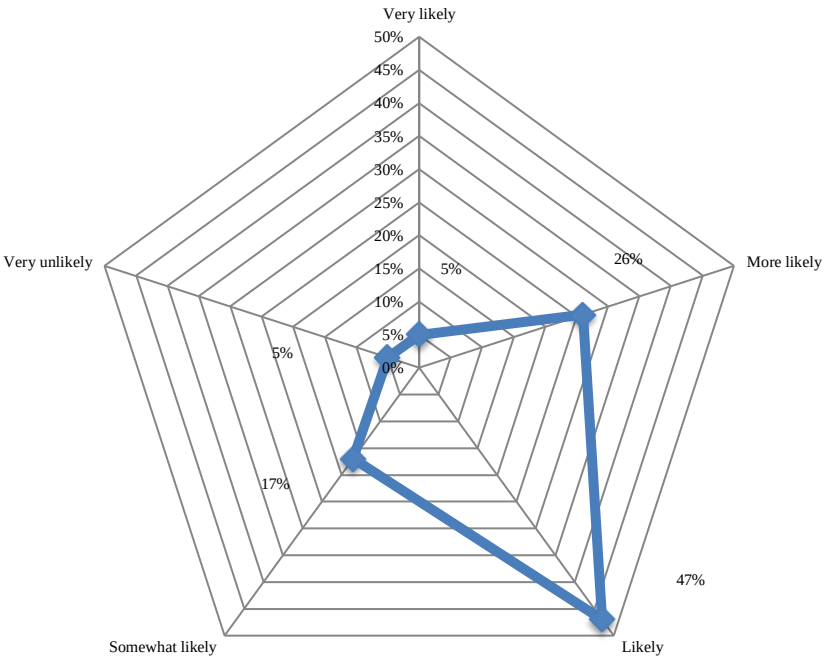
Table 3 WTP extra for personalised aesthetic features

Personalised features	WTP (£)					
	No Extra	<= £20	£21-£40	£41-£60	£61-£80	>=£81
Fabricated from fine and very pleasant looking material.	18%	31%	26%	15%	6%	4%
Able to choose attractive and beautiful colours.	14%	37%	25%	14%	8%	2%

Personalised shade design with creative and delightful shape.	13%	32%	24%	15%	12%	4%
End-users determine their own shade size.	19%	32%	16%	22%	6%	5%
Average score	0.16	0.33	0.23	0.17	0.08	0.04

Importantly, purchase intention results reinforce this positive attitude. Fig. 3 demonstrates that 78% of respondents were at least "likely" to purchase a product that enhanced beauty and sensory appeal through personalisation. These findings indicate that aesthetic value is a strong contributor to interest and purchase likelihood, even though respondents remain financially cautious and generally favour low-to-moderate price increments for aesthetic enhancements.

Fig. 3 Purchase intention for product with personalised aesthetic features



Value Reflection On Personalised Unique Features

The evaluation of Unique Value explored respondents' willingness to pay for personalised features that enhance symbolic individuality, using a family transporter vehicle as the case example. Participants were shown side-by-side examples of a standard mass-produced transporter characterised by standard colours, generic body kits, and typical accessories, and a personalised version featuring bespoke colours, creative decorations, distinctive graphics, and enhanced accessories designed to convey individuality. Respondents were informed that the standard model cost £15,000 and were asked how much additional cost they would be willing to pay for specific unique features.

As shown in Table 4, a substantial proportion of respondents were not willing to pay anything extra across all listed features, reflected in the highest average score for the "No Extra" category (0.42). However, meaningful segments were willing to pay modest premiums for certain features. For instance, 40% of respondents indicated willingness to pay up to £500 for bespoke paintwork and finishes, while features such as sportier

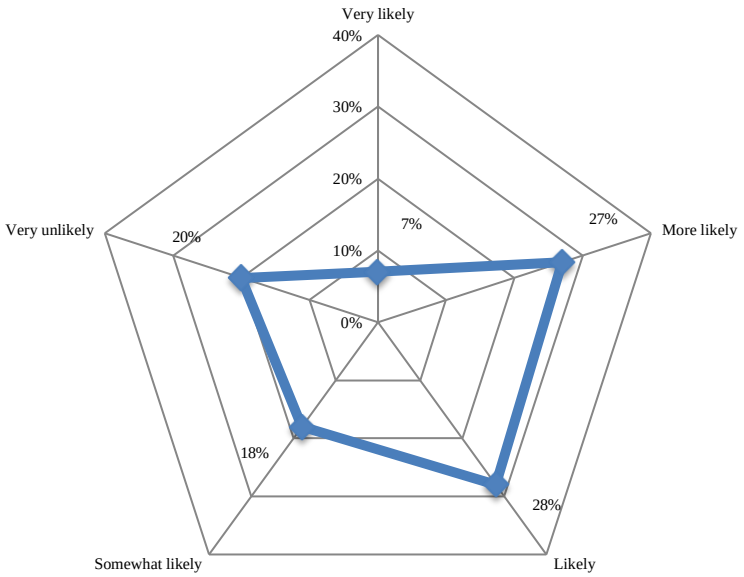
wheels, adjustable suspension, and customised accessories showed distributed interest across the £500-£1500 range. These patterns suggest that although uniqueness alone is not universally valued, respondents are open to paying extra when the personalised feature clearly enhances character or distinctiveness in a way they find personally relevant.

Table 4 WTP extra for personalised unique features

Personalised features	WTP (£)					
	No Extra	<= £500	£501-£1000	£1001-£1500	£1501-£2000	>= £2001
Personalised text on the body.	71%	18%	5%	6%	0%	0%
Bespoke paintwork and finishes on the body.	32%	40%	14%	7%	5%	2%
Personalised graphic design motifs.	55%	22%	15%	3%	4%	1%
Larger and sportier wheel set.	27%	25%	27%	10%	9%	2%
Adjustable wheel suspension system.	27%	22%	26%	11%	10%	4%
Customised roof rack and ladders.	37%	29%	17%	10%	6%	1%
Customised side door step.	43%	23%	18%	12%	3%	1%
Average score	0.42	0.26	0.17	0.08	0.05	0.02

Consistent with this, purchase intention for uniquely personalised products was encouraging with Fig. 4 shows that 62% of respondents were at least likely to purchase a product featuring unique personalised attributes. Together, these findings indicate that Unique Value contributes positively to desirability when distinctiveness is meaningful, yet it remains a secondary driver of spending compared with functional or performance-related enhancements.

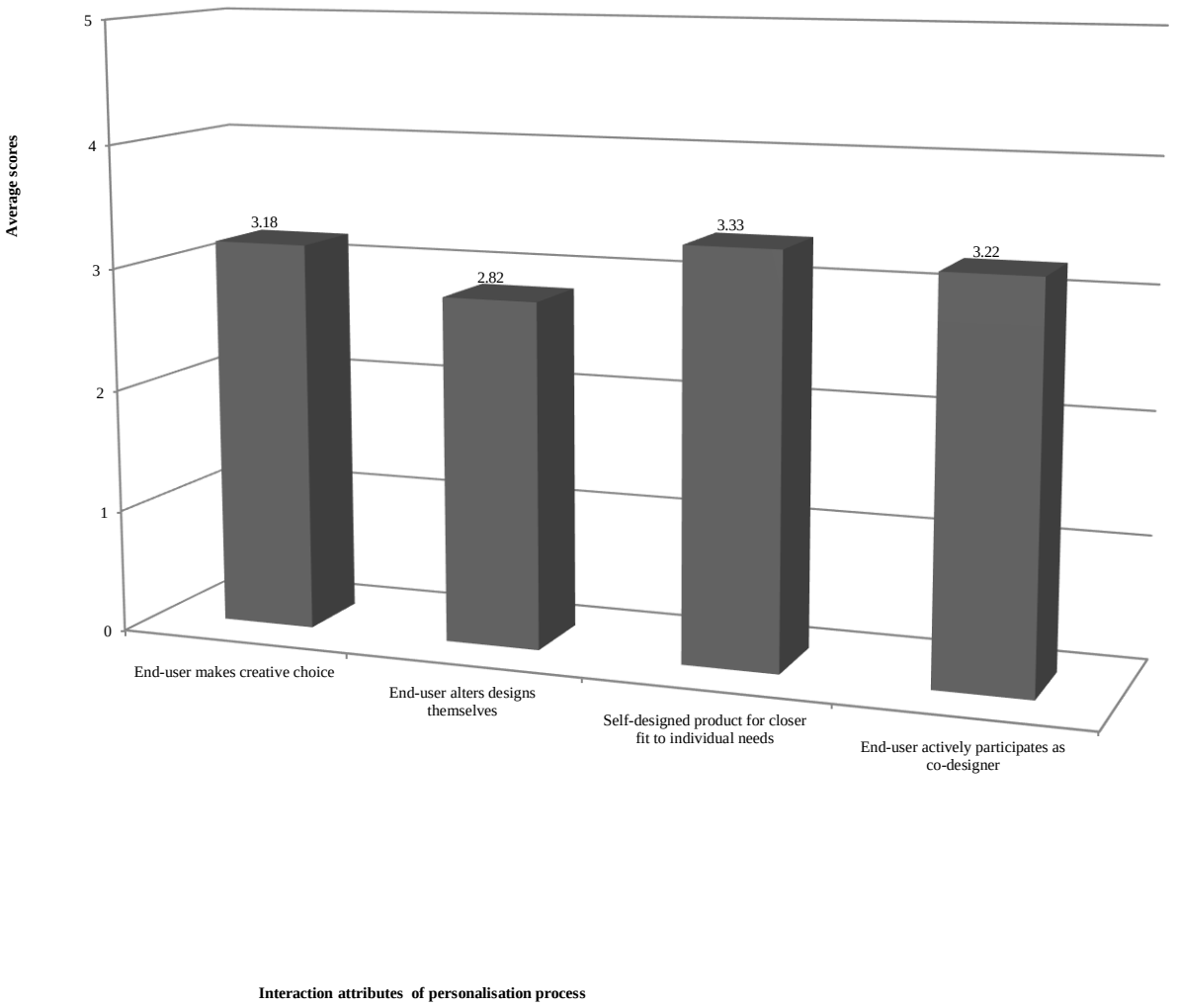
Fig. 4 Purchase intention for product with personalised unique features



Perception Of Interaction During Co-Design Process

Respondents' perceptions of interaction during the co-design process were assessed by asking them to rate the importance of several interaction attributes when personalising a product, compared with the minimal involvement typically associated with a standard design process. The results in Fig. 5 show that all interaction attributes were viewed as moderately important, with scores ranging from 2.82 to 3.33 on a five-point scale. The highest average score of 3.33 was the attribute describing a self-designed product that provides a closer fit to individual needs, indicating that respondents place strong value on personalisation when it enhances relevance and functional suitability [72]. This was followed by average score of 3.22 for the attribute reflecting active participation as a co-designer, showing that users appreciate having a meaningful role in shaping design outcomes. Creative involvement was also positively evaluated, with the attribute relating to making creative choices receiving a score of 3.18. The lowest score of 2.82 was recorded for the attribute describing users independently altering designs themselves, suggesting that while respondents value participation, they do not necessarily seek full autonomous control over all design aspects. Nevertheless, these results indicate that users value interaction during personalisation as a source of relevance, engagement, and personal influence, while still preferring a guided or collaborative approach rather than complete self-design autonomy.

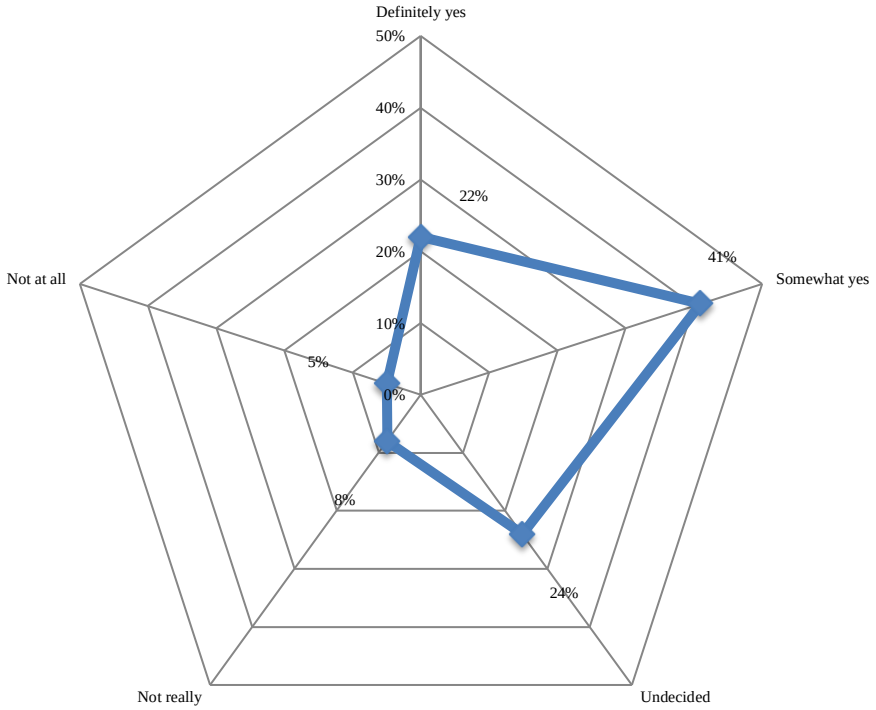
Fig. 5 Interaction attributes during personalisation process



Respondents were also asked about their willingness to participate in a creative cooperation process with designers when personalising their own products. This involves a deeper level of engagement than simple interaction, requiring collaborative effort, design feedback, and shared decision-making. As shown in Fig. 6, the majority expressed positive intentions toward such cooperation. A total of 22% indicated that they were

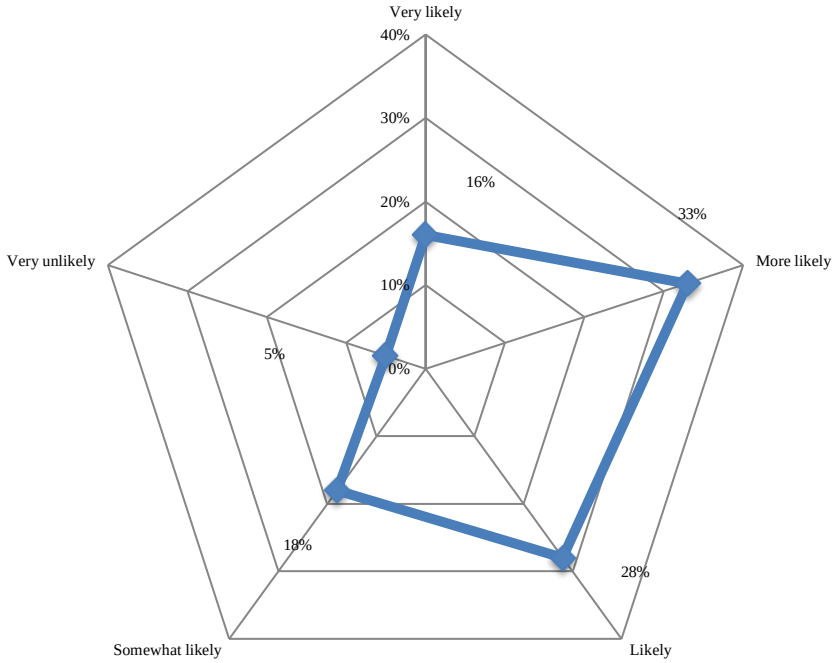
definitely willing to engage in creative collaboration, while a further 41% stated that they were somewhat willing to be involved in this process. Only a minority expressed uncertainty or reluctance. These results suggest that respondents view collaborative co-design as a meaningful part of the personalisation experience, where cooperation with designers enhances confidence, provides necessary technical support, and increases the perceived value of the final design. The findings further indicate that interaction during personalisation stimulates user interest, motivating them to take part in shaping the product rather than relying solely on designers to complete the design. Hence, creative cooperation is perceived as enriching and beneficial, reinforcing co-design value as an important experiential dimension of personalised consumer products.

Fig. 6 Willingness to participate in creative cooperation process



Building on the results of interaction and cooperation, respondents were also asked about their future intention to purchase personalised products that require user interaction during the design process. This question was posed based on their earlier reflections on interaction and creative engagement. The results shown in Fig. 7 indicate that respondents generally held positive attitudes toward purchasing such products, suggesting that interaction-based personalisation is not only acceptable but potentially desirable to many users. Although the figure itself presents the distribution visually, the accompanying explanation emphasises that purchase intention aligns with respondents' earlier willingness to participate in design activities. This indicates that users appreciate personalised products that involve their input, provided that the interaction is purposeful, engaging, and supported by designers when necessary. The findings imply strong market relevance for interactive personalised products, as consumers appear open to purchasing items that require their involvement, particularly when such involvement strengthens personal meaning, uniqueness, and experiential satisfaction.

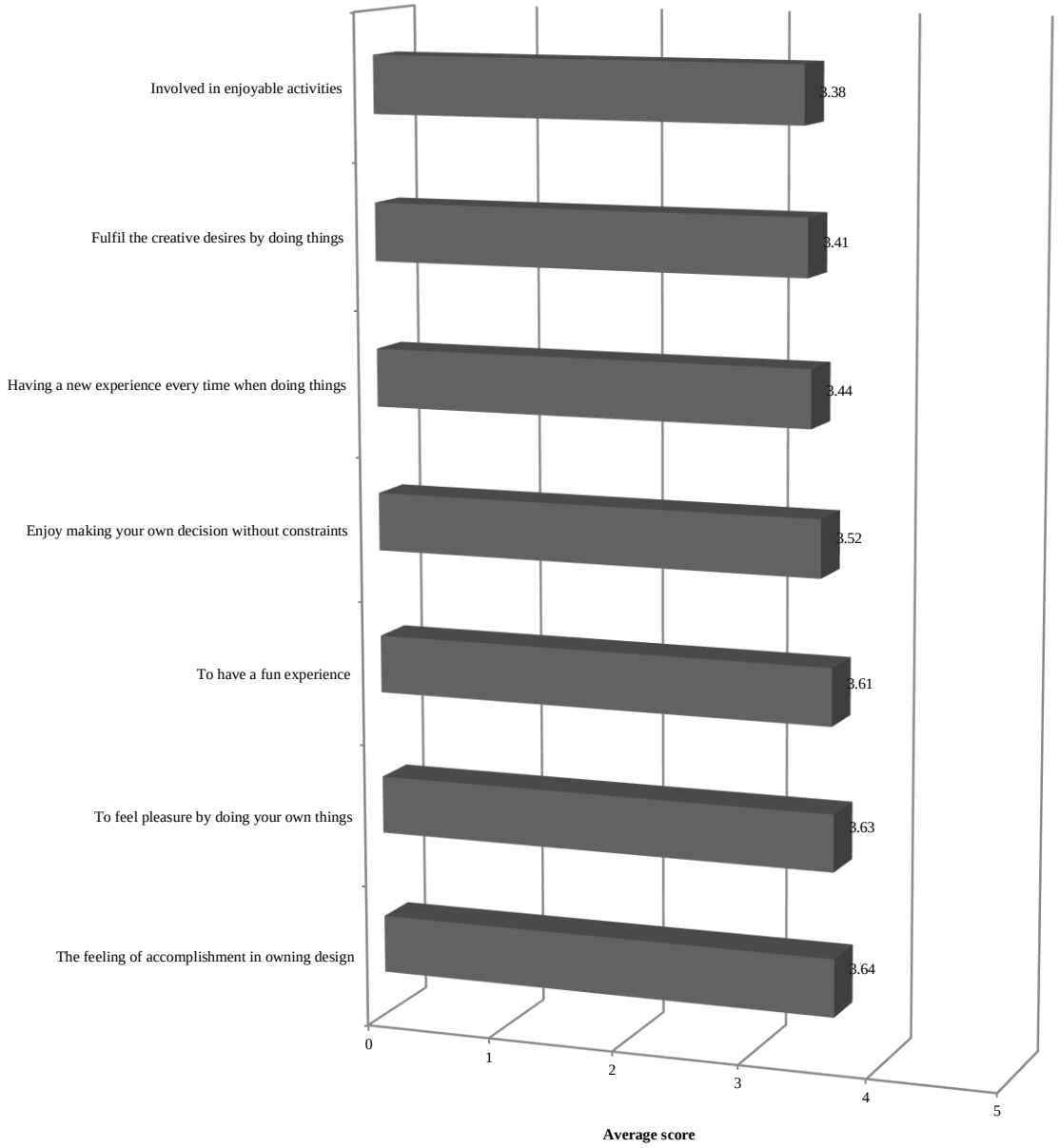
Fig. 7 Purchase intention for personalised product that requires interaction



Reflections On Enjoyment, Pleasure, and Emotional Fulfilment

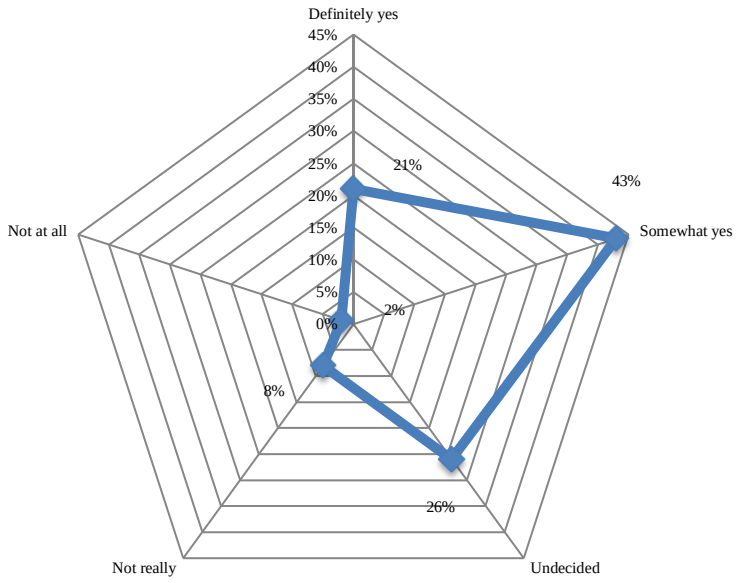
Hedonic value was assessed by examining respondents' reflections on enjoyment, pleasure, and emotional fulfilment during the personalisation process. As shown in Fig. 8, respondents rated all entertainment-related attributes as important when personalising a product, with average scores ranging from 3.38 to 3.64 on a five-point scale. The highest rating, at 3.64, was given to the sense of accomplishment derived from owning a design they had created, followed closely by the pleasure of "doing your own things" at 3.63 and the desire to have a fun experience at 3.61. Other attributes such as enjoying autonomous decision-making (3.52), having new and varied experiences (3.44), fulfilling creative desires (3.41), and taking part in enjoyable activities (3.38) were also scored positively. These results indicate that respondents associated product personalisation with meaningful emotional experiences, including creativity, satisfaction, novelty, and enjoyment. In comparison with the standard design process, they perceived personalisation as more stimulating and emotionally rewarding.

Fig. 8 The importance of entertainment attributes during personalisation process



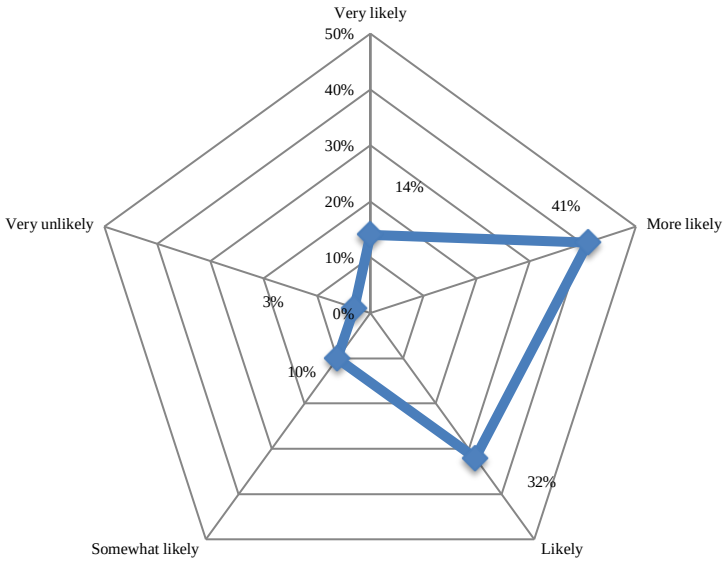
Respondents were then asked whether they would be willing to participate in personalisation specifically to experience the enjoyment of creating something. The findings in Fig. 9 show strong support for this dimension of value with 21% were definitely willing to take part in personalisation for enjoyment, while a further 43% were somewhat willing. Only a small proportion reported limited willingness. These results confirm that hedonic motivations such as fun, excitement, autonomy, and creative satisfaction are major contributors to user engagement, encouraging users to persevere in refining their designs until they achieve a satisfying outcome. Without hedonic enjoyment, the personalisation process risks being perceived as dull or overly effortful, which would limit active user involvement.

Fig. 9 Willingness to participate in personalisation to experience the enjoyment of creating things



Finally, respondents were asked about their intention to purchase personalised products that enable them to enjoy the act of creating. As shown in Fig. 10, the majority expressed positive purchase intentions 14% reported being very likely to buy such products, 41% reported being more likely, and 32% reported being likely to do so. These results demonstrate that hedonic value has a strong influence on potential market behaviour. When personalisation offers enjoyable activities and satisfying creative experiences, users are more motivated not only to participate in the design process but also to purchase the final product. Overall, hedonic value emerges as a critical experiential component that enhances appeal, encourages participation, and strengthens purchase intention in personalised consumer products.

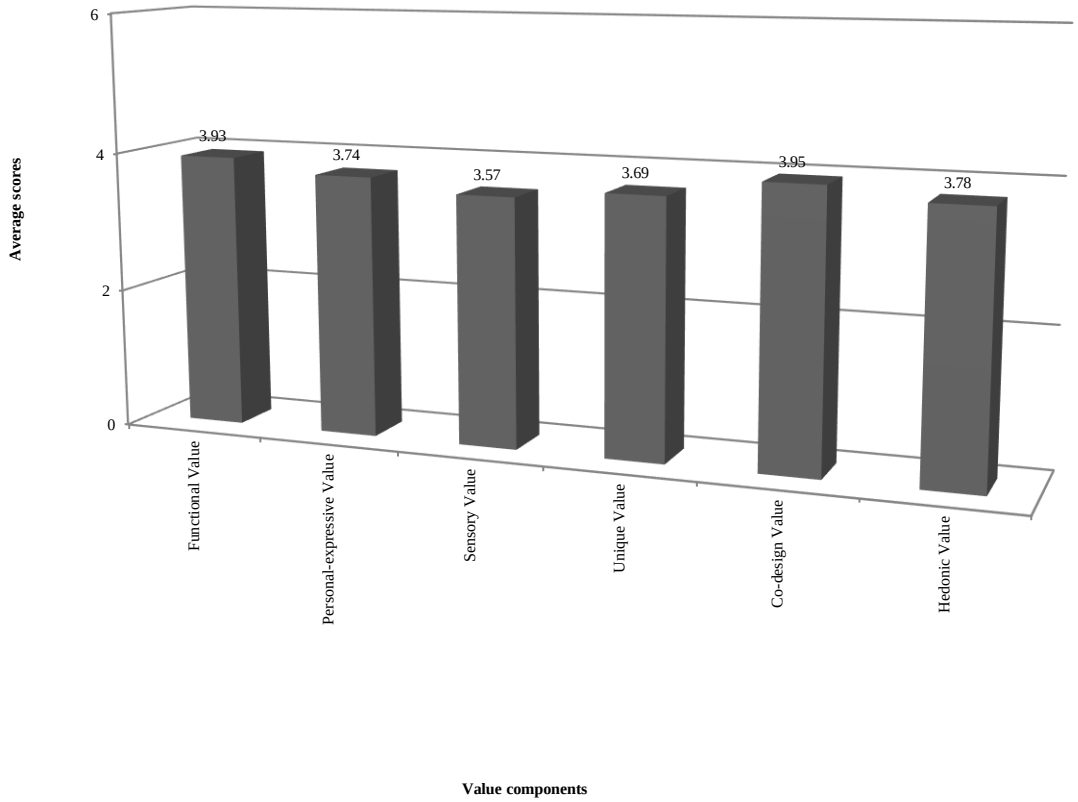
Fig. 10 Purchase intention of personalised product that enables them to enjoy creating things



Reflections On The Value of Product Personalisation

The study revealed that respondents attributed positive value across all six components of the value taxonomy, indicating broad acceptance of the benefits associated with personalisation. As illustrated in Figure 11, hedonic value emerged as the strongest contributor, reflecting respondents' appreciation for the enjoyment, novelty, and emotional stimulation associated with engaging in the personalisation experience. This was closely followed by functional value, suggesting that improvements in utility and performance remain highly relevant and continue to serve as an important justification for choosing a personalised product over a standard alternative. Co-design value also received a favourable evaluation, indicating that respondents value the opportunity to play an active role in shaping the product, even if they prefer guided rather than fully autonomous involvement.

Fig. 11 Respondents evaluation on the overall value of product personalisation



On the product-value side, sensory value and personal-expressive value were both rated positively, demonstrating the contribution of aesthetics, visual appeal, and identity expression to overall value perceptions. Although not the highest-scoring components, they nonetheless reinforced the idea that personalised products offer emotional and self-relevant benefits beyond functional enhancement. Unique value, while slightly lower than the other components, still received a positive evaluation. It suggests that while distinctiveness is desirable, users do not prioritise uniqueness as strongly as enjoyment or functionality unless it is paired with meaningful aesthetic or expressive features. Henceforth, the value profile indicates that enjoyment (hedonic), usefulness (functional), and creative involvement (co-design) form the core of perceived value in personalised products, while aesthetic, expressive, and uniqueness attributes act as complementary enhancers that strengthen desirability and personal relevance.

These results not only highlight the relative importance of each value dimension but also offer actionable guidance for the development of AM-enabled personalisation tools. By understanding which components users value most developers can prioritise features that support enjoyable interaction, functional relevance, and guided participation within future personalisation interfaces.

CONCLUSIONS

This study examined how end users evaluate personalised consumer products across six value dimensions, namely functional, personal-expressive, aesthetic, unique, hedonic, and co-design value. The findings demonstrate that consumer value is multidimensional, with functional and hedonic value emerging as the most influential determinants of willingness to pay and purchase intention. Respondents were more willing to invest in personalisation when it delivered meaningful improvements in fit, utility, or performance, and they placed high importance on the enjoyment, creativity, and sense of accomplishment derived from the personalisation process. Co-design value was also positively perceived, especially when users were able to engage in meaningful collaboration without the burden of full design autonomy.

Personal-expressive, aesthetic, and unique values enhanced interest and emotional attachment but had weaker influence on actual spending behaviour. These dimensions became economically relevant only when supported by functional improvements or engaging and enjoyable design activities. Therefore, these insights refine current understanding of value formation in personalised AM products and indicate which value dimensions should be prioritised when designing personalised offerings. Crucially, the identification of these value priorities provides a practical foundation for developing AM-enabled personalisation tools that support meaningful, guided, and value-driven user participation.

The findings also present several opportunities for future research. Product-specific investigations can clarify how value perceptions differ across categories such as wearables, home décor, accessories, or ergonomic devices. Experimental methods such as conjoint analysis or choice modelling can further examine the trade-offs users make between functional, aesthetic, and experiential attributes. Future studies should also explore how value evolves during live personalisation sessions, particularly when users engage with parametric configurators, visualisation platforms, augmented reality (AR) interfaces, or guided digital toolkits. Broader demographic sampling, including cultural and age diversity, would strengthen generalisability and reveal how different user groups interpret and prioritise value.

In addition to future research directions, this study offers several practical recommendations. First, AM-enabled personalisation tools should prioritise functionality by enabling clear, intuitive adjustments to fit, ergonomics, and performance-driven features. Second, hedonic value should be embedded through interactive, visually engaging, and enjoyable design workflows that support creativity without overwhelming the user. Third, co-design features should emphasise guided personalisation through preset templates, constraint-based modelling, real-time feedback, and designer-supported pathways rather than unrestricted autonomy. Fourth, aesthetic, expressive, and uniqueness features should be treated as secondary enhancements that complement, rather than replace, functionally grounded modifications.

Finally, the integration of artificial intelligence (AI) into AM-enabled personalisation tools represents a promising direction. AI-driven generative design, automated design suggestions, preference-learning algorithms, and adaptive recommendation systems can support users by reducing cognitive load while increasing the quality and relevance of personalised outcomes. These capabilities can help align user intentions with feasible AM outputs, enhance design confidence, and improve the overall personalisation experience. Ultimately, this study provides a foundational empirical understanding of how consumers evaluate personalised products and identifies functional benefit, enjoyment, and guided design involvement as the core determinants of perceived value. These insights can guide the development of more effective personalisation strategies, user-support systems, AM-based product offerings, and emerging AI-assisted personalisation tools in future applications.

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