

Modular Jewelry as a Medium for Fluid Identity: Co-Creation and Self-Expression in Iranian Gen Z

AmirAbbas DeldadehJavid^{1*}, Amir Mohsen Madani², Maryam Goodarzarvari³, Mahyar Samet Haghighi⁴

¹ Department of Industrial Design, Islamic Azad University, Central Tehran Branch. Tehran, Iran. Email: <mailto:s.deldadehjavid@gmail.com>

² Department of Industrial Design, Islamic Azad University, Yadegar Imam Khomeini (RAH) Branch, Tehran, Iran. Email: amir_m_madani@iaiu.ac.ir

³ Department of Industrial Design, Islamic Azad University, Central Tehran Branch. Tehran, Iran. Email: m.goodarzarvari@stu.semnaniau.ac.ir

⁴ Department of Industrial Design, Islamic Azad University, Central Tehran Branch. Tehran, Iran. Email: m.samethaghighi@iaiu.ir

*Corresponding author: AmirAbbas DeldadehJavid

DOI: [10.22059/jdt.2026.410398.1184](https://doi.org/10.22059/jdt.2026.410398.1184)

Received: 1 February 2026, Revised: 15 February 2026, Accepted: 16 February 2026, Available Online from 16 February 2026.

Abstract

Generation Z, characterized as digital natives, navigates a phygital existence where consumption serves as a primary mechanism for identity construction. In the contemporary Iranian jewelry market, despite a rich history of craftsmanship, there is a significant functional gap regarding adaptable systems that meet this generation's need for co-creation and differentiation. Drawing on the theories of "Extended Self" and "Value Co-creation", this study investigates the relationship between modular jewelry personalization capabilities and satisfaction with self-identity expression among Iranian youth (aged 18-29). The research employs an exploratory sequential mixed-methods design. Initially, qualitative content analysis was used to extract aesthetic codes. Subsequently, data from a validated online questionnaire ($N=68$, $\alpha=0.826$) were analyzed using Spearman's rank-order correlation. Findings reveal a robust demand for co-creation, with high personalization propensity ($M=4.43$, $SD=0.68$). A significant positive correlation ($r=0.657$, $p<0.01$) was established between interchangeability and user's perception of identity alignment. Response patterns suggest that participants orient toward both functional adaptability and symbolic meaning, though larger samples are needed to confirm these trends. The study concludes that modular design transcends static ornamentation, fostering psychological ownership and deeper emotional bonding. For the Iranian gold and jewelry industry, transitioning toward hybrid modular systems, combining precious bases with interchangeable add-ons, is recommended. This strategy not only satisfies the fluid identity needs of Gen Z but also promotes sustainable consumption by extending product lifecycles through functional adaptability.

Keywords

Modular Jewelry, Generation Z (Gen Z), Mass Customization, Self-Expression, Emotional Design, Iranian Market.

<https://jdt.ut.ac.ir/>

University of Tehran

Vol. 6, No. 2, P. 221-232, December 2025

Introduction

1. Context of Transformation: The Emergence of Gen Z and the Phygital Paradigm

Over the past two decades, rapid technological advancements and social shifts have fostered the emergence of a cohort sociologically defined as "Generation Z" or "Digital Natives." Born roughly between 1997 and 2012, members of this generation matured in an environment where daily life and the digital realm are inextricably intertwined, a phenomenon described as the Phygital state (Francis & Hoefel, 2018). For this demographic, consumption goes beyond mere practical necessity and serves as a primary mechanism for constructing and projecting individual identity and social image (Hosseini, 2019).

Within this context, fashion and jewelry constitute essential tools for visual self-expression among youth. Consumption patterns have shifted from the mere ownership of luxury goods toward a quest for interactive experiences and self-expression. International research indicates that Generation Z exhibits lower loyalty to traditional brands, favoring products that evoke a sense of authenticity and individuality (Niinimäki, 2023; Kusuma, 2021; Ahsan, 2021).

Priporas et al. (2017) observed that Gen Z expects smart retailing environments enabling personalization, while Williams and Page (2011) noted this generation's demand that brands facilitate self-expression, not just offer products. These patterns align with broader shifts toward co-creative consumption. These expectations align with broader characterizations of Generation Z as highly tech-savvy consumers who prioritize meaningful and personalized experiences (Bolton et al., 2013; Priporas et al., 2017).

This generation seeks an active role in product formation, an approach known in design as Co-creation. This paradigm enables users to embed a portion of their personal narrative into the product.

Domestic studies in Iran confirm this trajectory. Partovi (2019) identifies jewelry as a critical element in shaping the visual identity of Iranian youth, while Alavi (2021) argues that social media has amplified this inclination, particularly among young women born in the 1380s (2000s CE, corresponding to Gen Z).

2. Local Context and the Functional Gap in the Iranian Market

Globally, jewelry design has shifted toward mass customization and flexible systems; however, the contemporary Iranian market continues to face significant limitations. Field studies and research by Jamshidi (2022) on youth online purchasing behavior indicate that, despite Iran's strong historical background in jewelry fabrication, the current market predominantly offers static collections with limited variety (Mazangi, 2021).

This rigidity creates a misalignment with the fluid and dynamic identity characteristics of the Iranian Generation Z. Demographic data from this study reveal that the majority of participants (aged 18-29) possess high levels of visual literacy and education. This sophistication drives complex expectations for jewelry design and functionality, which the traditional market model fails to address.

Evidence suggests that despite a strong desire among youth for co-creation in design details, the scarcity of adaptable products has created a distinct functional gap. Users are often compelled to select products that do not fully align with their aesthetic preferences or emotional needs (Karimi, 2020; Mohammadi, 2022).

3. Modular Design: A Strategy for Fluid Identity Expression

To bridge this gap, "Modular Design" serves as a viable strategic approach. In this system, the product is decomposed into independent yet compatible units, allowing users to configure the final assembly by altering component arrangement, material selection, and form (Smith et al., 2023).

Sadeghi (2022) and Choi (2021) demonstrate that technologies such as 3D printing have reduced the complexity and cost of manufacturing these systems, rendering practical implementation feasible. For instance, Farahani (2016) notes that modular wearable projects, such as magnetic-rail systems, enable user

assembly without altering core functionality. Modular design effectively addresses Gen Z's demand for variety and multifaceted identity construction. Drawing on the Psychological Ownership framework in design psychology, active user participation in fabrication or modification fosters a deeper emotional bond, one that transcends mere legal ownership (Rezaei, 2023). Consequently, modular jewelry evolves from static ornamentation into a medium for the non-verbal expression of emotional states, social status, and individual values. This capability is particularly significant for Iranian Gen Z, who navigate fluctuating socio-economic conditions and seek creative avenues for self-expression.

4. Research Objectives and Questions

This study addresses a specific theoretical and practical gap, elucidating how technical product features, such as modularity, translate into emotional values like self-expression. The primary objective is to examine the correlation between "jewelry personalization capabilities" and "satisfaction with self-identity expression" among Iranian Gen Z. Accordingly, the research questions are formulated as follows:

- **RQ1:** How do modular design and personalization capabilities in jewelry impact Iranian Gen Z's ability to express self-identity components and their level of emotional satisfaction?
- **RQ2:** Which aesthetic components (e.g., geometric or nature-inspired forms) are preferred by Iranian Gen Z, and how can they be effectively integrated into a modular jewelry system?

Theoretical Foundations and Literature Review

1. Introduction

The conceptual model of this study establishes a causal relationship between "Modular Personalization" as the independent variable and "Self-Identity Expression" as the dependent variable. To explicate the connection between these variables, the study integrates three theoretical frameworks: "Value Co-creation," which defines the nature of users participation in the design process; the "Extended Self" theory, which addresses the formation of emotional attachment to objects; and the concept of "Digital/Physical Identity," which clarifies the fluid identity status of Generation Z.

2. Co-creation: Transition from Consumer to Active Producer

In traditional Industrial Design approaches, users are typically positioned at the end of the value chain as a mere final consumer. Conversely, Co-creation theory posits that significant product value emerges during user interaction, rather than solely during factory manufacturing (Sanders & Stappers, 2008). For Generation Z, participation in the product formation process is an inherent expectation rather than an optional feature.

Findings by Rezaei (2023) indicate that personalization in wearable products enhances user's sense of empowerment and control. Similarly, Akbari (2015) identifies Experience and Interaction Design as an effective strategy for engaging the female demographic in the jewelry market. Within this framework, co-creation in modular jewelry enables users to transcend the role of a passive spectator and assume the role of a curator. This role involves curating and assembling diverse components to create a composition that reflects personal meaning and taste (Nimimäki, 2023; Gürşahbaz, 2023; Kusuma, 2021).

3. Modular Jewelry: Technical Infrastructure for Self-Expression

Modular design serves as a practical mechanism for implementing co-creation. It relies on constructing products from distinct yet compatible components that can be assembled in various combinations to generate multiple configurations.

Karimi (2020) and Smith et al. (2023) highlight that a critical advantage of this approach is balancing the requirements of manufacturing standardization with user demands for variety and personalization. From a psychological perspective, the ability to interchange and recombine components enables users to align their

jewelry with fluctuating emotional states or distinct social contexts. Wang (2023) defines this capability as aesthetic flexibility, positing it as an appropriate response to Gen Z's desire for a fluid and multifaceted identity.

4. The “Extended Self” Theory and Emotional Attachment

According to the "Extended Self" theory (Belk, 1988), specific objects can become integral to an individual's identity, particularly when the individual participates in their creation or perceives a sense of control over them. Belk revisited this framework in 2013, addressing how digital contexts reshape self-extension. Among the dimensions he proposes, dematerialization, re-embodiment, sharing, co-construction, and distributed memory, co-construction seems especially pertinent here. Users who configure modular jewelry do not merely buy an object; they help create it. This participatory process, Belk (2013) argues, strengthens the object's integration into personal identity. For Iranian Gen Z, whose experience spans physical and digital realms, modular jewelry provides a tangible medium for identities that are otherwise fluid and screen-mediated.

Research by Ahsan (2021) on Gen Z demonstrates that engaging in product personalization correlates with higher levels of emotional attachment. Similarly, Cho et al. (2021) confirm the relationship between self-expression satisfaction, consumer happiness, and the propensity for symbolic consumption.

This form of emotional attachment contributes to increased product longevity and enhances sustainability. In the Iranian market, where fast fashion and consumption patterns are increasingly prevalent (Mohammadi, 2022), forging an emotional bond between users and the jewelry can mitigate premature product discard. Personalization serves as a tool enabling users to embed personal narratives and experiences into the product, transforming it from a mere commercial commodity into a "personal possession" imbued with emotional value (Gomez et al., 2020).

Table 1: Comparative Summary of Supporting Theories.

Theoretical Application in the Current Study	Key Theorists/Sources	Theory / Key Concept
<i>Elucidates the psychological mechanisms of user co-creation, explaining Gen Z's high propensity for intervening in the final product configuration.</i>	Prahalad & Ramaswamy (2004); Sanders & Stappers (2008)	Value Co-creation
<i>Substantiates the causal link between "personalization" and "emotional attachment," interpreting jewelry as a physical extension of user's individual identity.</i>	Belk (1988); Ahsan (2021)	Extended Self Theory
<i>Establishes a technical and operational framework to address demands for "variety-seeking" and "adaptability" in wearable products.</i>	Smith et al. (2023); Karimi (2020)	Modular Design & Aesthetic Flexibility
<i>Analyzes the balance between "visual aesthetics" (Visceral Level) and "symbolic meaning" (Reflective Level) in shaping the aesthetic preferences of Iranian users.</i>	Norman (2004); Rezaei (2023)	Emotional Design & Psychological Ownership Design

Methodology

1. Paradigm and Research Design

This study adopts a "Pragmatist" paradigm, an approach that prioritizes selecting tools best suited to address the research problem rather than focusing on the dichotomy between quantitative and qualitative methods (Creswell & Clark, 2017). Given that Generation Z's consumer behavior encompasses both measurable aspects, such as the propensity for personalization, and perceptual dimensions, such as aesthetic preferences and symbolic meanings, the study employed an exploratory sequential mixed-methods design, integrated with Research through Design (RtD) principles for future prototyping phases.

Zarei (2023) describes this mixed design as efficient and suitable for Industrial Design research that manages qualitative and quantitative data simultaneously.

In this design, qualitative data were first collected to identify and formulate core concepts and variables. Subsequently, quantitative data were used to measure relationships between variables and assess the generalizability of the results (Fetters et al., 2013). This sequential approach ensures both depth and statistical rigor.

2. Research Scope

- **Thematic Scope:** The primary focus of this study is Industrial Design, specifically the design of modular jewelry. Within this framework, "Personalization Capability" functions as the independent variable, while "Self-Identity Expression" and "Emotional Attachment to Product" serve as dependent variables. Theoretically, this research sits at the intersection of "Consumer Psychology" and "Design for Experience."
- **Spatial Scope:** Given that a significant portion of Gen Z's life and interactions occur within the digital realm, data collection was conducted via online platforms. The questionnaire distribution and primary outreach utilized social media networks, including Instagram and specialized Telegram groups, to access youth interested in fashion, design, and art across various Iranian cities. This method mitigated the geographical limitations of traditional field research, contributing to a more diverse sample regarding residential location.
- **Temporal Scope:** Quantitative data collection occurred over two weeks in Ordibehesht 1404 in the Iranian calendar (April-May 2025 CE). Preliminary qualitative data were gathered and coded through open interviews and content analysis of descriptive responses in the three months preceding this period.

3. Population and Sampling

The target population comprises Iranian youth aged 18-29 (born approximately 1997-2008), sociologically characterized as "Generation Z." Inclusion criteria were defined as: falling within this age bracket, possessing interest or purchasing experience in jewelry, and demonstrating proficiency in using online platforms.

Due to the study's exploratory nature and limitations in accessing a randomized sample, convenience sampling was employed. The online questionnaire link was disseminated via social media pages and groups dedicated to design, fashion, contemporary jewelry, and visual arts. Participants were encouraged to forward the survey to other eligible individuals.

After filtering incomplete responses or those exhibiting invalid response patterns, 68 valid questionnaires were retained for analysis ($N=68$). This sample size is adequate for exploratory correlational analyses but limits generalizability.

4. Data Collection Instruments

Phase 1 (Qualitative):

Open-ended questions were utilized to gain deep insight into the vocabulary, preferences, and concepts that users employ to describe their ideal jewelry. The qualitative inquiries included:

- Which visual features in a piece of jewelry appeal to you?
- What concepts can be expressed through jewelry?

If you could modify your jewelry, what would you change? Qualitative data were processed using qualitative content analysis and open coding. Key concepts, such as "Geometric," "Natural," "Delicate," "Concept," and "Variety", were extracted to inform the design of the quantitative items.

Phase 2 (Quantitative):

Based on the qualitative findings, a structured researcher-made questionnaire was developed, comprising three main sections:

- **Section 1 - Demographics:** Age, gender, education level, and role (consumer or designer).
- **Section 2 - Personalization Willingness:** 12 items on a 5-point Likert scale (1=Strongly Disagree, 5=Strongly Agree) to measure user attitudes toward personalization, interchangeability, and design co-creation.
- **Section 3 - Identity Expression and Emotional Attachment:** 13 items to evaluate satisfaction with self-identity expression, emotional attachment, and the perceived value of the jewelry.

Sample items: I prefer to assemble my jewelry modules myself (Personalization, Likert 1-5); 'This jewelry reflects my current mood/identity' (Self-Expression, Likert 1-5). Full questionnaire in supplementary materials.

5. Instrument Validation

To assess content validity, the initial draft was reviewed by three Industrial Design experts and one consumer psychologist, leading to the modification of specific items and the removal of two ambiguous ones. All items achieved acceptable content validity ratios ($CVR > 0.62$). Face validity was confirmed through a pilot test with 10 members of the target population.

Internal consistency was evaluated using Cronbach's alpha. The total alpha coefficient was 0.826, indicating high internal consistency. Subscale coefficients were reported as 0.81 for Personalization Willingness, 0.79 for Self-Identity Expression, and 0.83 for Emotional Attachment.

Data Analysis

Quantitative data were analyzed using IBM SPSS Statistics (Version 26). Descriptive statistics (means, standard deviations, and ranges) were computed for the primary variables. Given the ordinal nature of the Likert-scale data and evidence of non-normality (Kolmogorov-Smirnov test, $p < 0.05$), nonparametric Spearman rank-order correlation coefficients were calculated to examine relationships among variables, with statistical significance set at $p < 0.01$. Qualitative data from open-ended responses were coded thematically in MAXQDA software.

Due to the modest sample size ($N=68$), more advanced multivariate techniques such as confirmatory factor analysis or principal component analysis were not employed, as they require larger participant-to-variable ratios (Hair et al., 2010).

Ethical Considerations

Ethical considerations for human research were strictly observed throughout the study. Participation was voluntary, with the right to withdraw at any stage. No personally identifiable information was recorded. Clear explanations regarding research objectives and data usage were provided, and informed consent was obtained before data collection.

Table 2: Demographic Characteristics of Respondents ($N=68$).

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	34	50.00
	Female	34	50.00
Age	18-23 Years	9	13.24
	24-29 Years	59	86.76
Education	Diploma & Associate Degree	13	19.11
	Bachelor's Degree	35	51.47

Role	Master's & PhD	20	29.41
	Jewelry Consumer	64	94.12

Findings

1. Descriptive Findings: The Gap Between Demand and Supply

Data analysis reveals high participant awareness within the jewelry market, yet a significant portion of demand remains unmet. The mean score for "Willingness to Personalize" is 4.43 (out of 5), indicating a strong desire among users to participate in the product's final configuration. Conversely, satisfaction with current market offerings averages only 2.15. This disparity highlights a distinct "functional gap" between user expectations and available supply.

Demographically, 86.76% of respondents fall within the 24-29 age range, a period typically associated with the onset or consolidation of financial independence. At this stage, jewelry serves primarily as a tool for social image management and the expression of individual style and identity. Gender distribution was nearly equal (50% male, 50% female), providing a balanced perspective on preferences.

Table 3: Descriptive Statistics of Main Research Variable

Variable	Mean (M) ¹	Standard Deviation (SD)
Willingness to Personalize	4.43	0.68
Satisfaction with Current Market	2.15	0.92
Importance of Identity Expression	4.61	0.55
Willingness to Buy Modular	4.28	0.74

The high mean scores for Willingness to Personalize ($M=4.43$) and Importance of Identity Expression ($M=4.61$) indicate strong demand for co-creation and self-expressive features, while the low satisfaction with the current market ($M=2.15$) highlights a clear gap in available offerings.

2. Hypothesis Testing: The Relationship Between Personalization and Identity Expression

Spearman correlation results (Table 4) indicate a statistically significant, relatively strong positive relationship between "Personalization Capability" and "Self-Identity Expression" ($r = .657$, $p < .01$, 95% CI [0.48, 0.78]).

This suggests that higher levels of modularity are associated with a stronger user perception that the product reflects their personal identity. Additionally, a positive correlation ($r = 0.612$) exists between "Design Co-creation" and "User Perceived Value." This suggests that active user involvement in product formation leads to higher valuation. Consequently, the co-creation approach is economically justifiable for both the designer and the manufacturer.

Table 4: Spearman Correlation Matrix of Research Variables ($N=68$).

Variable	1	2	3	4
Personalization Capability	1.00	-	-	-
Self-Identity Expression	.657 ²	1.00	-	-
Emotional Attachment	.589	.721	1.00	-
Perceived Value	.612	.543	.498	1.00

The squared correlation ($r^2 = .43$) indicates that personalization capability accounts for roughly 43% of the variance in identity expression. This represents a moderate-to-large effect by conventional standards

¹ Scores are based on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). Higher means indicate stronger agreement.

² $p > 0.01$ (two-tailed).

(Cohen, 1988). Still, most variance remains unexplained, suggesting that other factors like economic constraints, peer influence, and cultural norms also matter.

3. Integration of Response Patterns with Qualitative Themes

Examination of item-level response patterns, in conjunction with the qualitative thematic analysis, reveals two consistent orientations among participants. A considerable proportion of responses emphasized functional adaptability, such as interchangeability of components and the ability to modify jewelry for daily or contextual variation. Concurrently, many participants highlighted symbolic and emotional dimensions, including the alignment of jewelry with personal mood, narrative, and identity projection. These dual orientations, functional adaptability, and symbolic meaning align closely with the predominant qualitative themes of "Variety-Seeking" and "Emotional Expression" (see Table 5) and provide complementary insight into the preferences of Iranian Generation Z consumers.

Table 5: Thematic Analysis Codes (MAXQDA Output).

Main Theme	Sub-Themes	Frequency (n)	Example Quote
Variety-Seeking	Interchangeability, multi-use	52	"I want to swap modules for different outfits."
Aesthetic Preferences	Geometric (modern), Natural (organic)	45 (Geom=25, Nat=20)	"Geometric shapes feel contemporary."
Emotional Expression	Mood-Adaptive, Identity Projection	38	"Changes with my emotions daily."
Sustainability	Longevity, Anti-Waste	22	"Better for environment than buying new."
Practicality	Ease of Assembly, Cost	15	"Magnetic connections without tools."

Inter-coder reliability: Cohen's kappa = 0.85 (substantial agreement between two independent coders).

Discussion

1. Interpretation of Findings

Main Finding in Context

The correlation between personalization and identity satisfaction ($r = .657, p < .01$) confirms our primary hypothesis and aligns with prior work on co-creation and psychological ownership (Sanders & Stappers, 2008; Rezaei, 2023). Yet around 57% of variance remains unexplained ($r^2 = .43$), suggesting other influences, economic realities, peer expectations, and cultural norms also shape how Iranian Gen Z uses jewelry for self-expression.

Comparison with Prior Research

Ahsan (2021) found similar positive links between customization and attachment among Swedish Gen Z fashion consumers. Our results extend that finding to a non-Western, middle-income context. Iran's economic volatility and market limitations may moderate the personalization-satisfaction relationship. The underlying psychological mechanism appears cross-cultural, but access and affordability vary considerably.

Theoretical Contribution

This study contributes to Belk's (2013) framework by showing how physical modular objects can embody fluidity usually associated with digital identities. Iranian Gen Z curates' multiple personas online; modular jewelry offers a rare material outlet for that multiplicity. This integration of physical modularity with digital flexibility represents a novel application of "Extended Self" theory.

Practical Implications

High personalization interest ($M=4.43$) contrasts sharply with low market satisfaction ($M=2.15$), revealing a functional gap. Iranian manufacturers operate supply-driven models, whereas Gen Z demands co-creative systems. Hybrid platforms, precious bases with affordable interchangeable add-ons, could capture unmet demand while addressing price sensitivity.

Alternative Explanations

Participants' enthusiasm for personalization may partly reflect aspirations rather than actual behavior, given the absence of physical prototypes. The correlation may also vary by socioeconomic status: affluent users might prioritize symbolic expression, while budget-conscious users value functional variety for wardrobe extension. Future work should test these moderators explicitly.

2. Limitations and Research Suggestions

This study has several methodological constraints.

Sample Size and Statistical Power

The modest sample size ($N=68$), while adequate for exploratory correlations, precluded advanced multivariate analyses such as confirmatory factor analysis (Hair et al., 2010; Tabachnick & Fidell, 2019). Future research should employ larger samples (preferably $N>150$) to enable robust validation of potential latent structures.

Sampling Bias and Generalizability

Recruiting via Instagram and Telegram naturally skewed the sample toward urban, educated, digitally active participants. Rural youth, those with less education, or individuals less engaged online, are underrepresented. Participants who voluntarily engage with design and fashion content may show stronger personalization preferences than the general population. Results cannot be generalized to all Iranian Gen Z, especially those in rural areas or with limited digital access.

Lack of Control Variables

Although the gender distribution was balanced, potential moderating effects of gender on preferences for functional versus symbolic aspects were not examined. Future research should investigate whether male and female respondents differ in these orientations.

Self-Report Bias

Survey data may introduce social desirability bias. Respondents might overemphasize sustainable or personalized preferences to present themselves favorably. Actual purchasing may diverge from stated intentions.

Absence of Physical Prototypes

Participants evaluated hypothetical scenarios without handling modular jewelry. Physical interaction, assessing assembly ease, connection durability, and tactile satisfaction, is essential for validating these findings. Future research should test prototypes observationally.

Recommendations for Future Research

- *Replication with larger, stratified samples:* Conduct confirmatory factor analysis with $N>150$, ensuring representation across income, geography (urban/rural), and education.
- *Gender as moderator:* Examine potential differences between men and women in preferences for functional adaptability versus symbolic expression.
- *Experimental design:* Compare emotional attachment between users given modular versus fixed jewelry in controlled settings.
- *Longitudinal tracking:* Monitor whether modular jewelry truly extends product lifespan and reduces consumption.
- *Cross-cultural comparison:* Replicate in other Middle Eastern or Global South contexts to assess cultural specificity.

Final Conclusion

Findings indicate that modular personalization plays a pivotal role in addressing the needs and aesthetic preferences of Generation Z in the Iranian jewelry market. By shifting from traditional production-for-consumption to production through user co-creation, modular jewelry can become a meaningful medium for the dynamic and evolving identity of young Iranian users.

Supplementary Materials

Full Questionnaire (Researcher-Designed)

Section A: Demographic Information

Item	Response Options
Age	18-23 / 24-29
Gender	Male / Female / Other
Education	Diploma / Associate / Bachelor's / Master's/PhD
Role	Consumer / Designer/Maker

Section B: Personalization Willingness (12 items, $\alpha=0.81$)

No.	Item
1	Modular jewelry allows me to change styles daily without buying new pieces.
2	I enjoy assembling interchangeable components myself.
3	Personalization makes jewelry more aligned with my mood.
4	I prefer co-creation over fixed designs.
5	Variety in modules (geometric/natural) increases my interest.
6	3D printing for custom modules appeals to me.
7	Emotional attachment grows with user modification.
8	Sustainable due to longevity from adaptability.
9	Willing to pay premium for modular systems.
10	Current market lacks flexibility (reverse scored).
11	App-based configurators would enhance purchase.
12	Interchangeability reflects my dynamic identity.

Section C: Self-Identity Expression & Emotional Attachment (13 items, $\alpha=0.83$)

No.	Item
1	This jewelry expresses my personal identity accurately.
2	Geometric forms represent my modern self.
3	Natural motifs evoke my authentic heritage.
4	Customization fosters psychological ownership.
5	It projects my social image effectively.
6	Emotional bond stronger than static jewelry.
7	Satisfaction with self-expression is high.
8	Symbolic engraving adds personal narrative.
9	Aligns with fluctuating life stages.
10	Increases perceived value.
11	Promotes long-term use over fast fashion.
12	Reflects cultural values subtly.
13	Overall happiness from wearing it.

Open-Ended (Qualitative):

1. Preferred visual features in jewelry?
2. Concepts expressed through modular changes?
3. What would you modify in your ideal jewelry?

References

- Ahsan, M. (2021). Generation Z's perceived value of customised fashion. *Master's thesis, The Swedish School of Textiles, University of Borås*.
- Akar, E., & Yüksel, H. F. (2023). Consumer co-creation: An opportunity to humanise the new product development process. *International Journal of Market Research, 65*(3).
- Akbari, A. (2015). Designing jewelry for women with an experience and interaction design approach. *Master's thesis, University of Art, Tehran*.
- Alavi, S. N. (2021). The impact of social media on the tendency towards fashion and jewelry among Gen Z girls (Decade 80s). *New Media Studies, 7*(26), 189-212.
- Antle, A. N. (2020). Research through Design in HCI. *Interactions, 27*(4), 38-42. <https://doi.org/10.1145/3406895>
- Belk, R. W. (1988). Possessions and the extended self. *Journal of Consumer Research, 15*(2), 139-168. <https://doi.org/10.1086/209154>
- Belk, R. W. (2013). Extended self in a digital world. *Journal of Consumer Research, 40*(3), 477-500. <https://doi.org/10.1086/671052>
- Bolton, R. N., Parasuraman, A., Hoefnagels, A., Migchels, N., Kabadayi, S., Gruber, T., & Solnet, D. (2013). Understanding Generation Y and their use of social media: A review and research agenda. *Journal of Service Management, 24*(3), 245-267. <https://doi.org/10.1108/09564231311326987>
- Cho, E., & Lee, S. (2021). Relations of conspicuous consumption tendency, self-expression satisfaction, and consumer happiness. *Sustainability, 13*(21), 11664. <https://doi.org/10.3390/su132111664>
- Choi, J. (2021). 3D printing and the future of modular jewelry. *International Journal of Fashion Design, Technology and Education, 14*(2), 145-155.
- Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). *Lawrence Erlbaum Associates*.
- Creswell, J. W., & Clark, V. L. P. (2017). Designing and conducting mixed methods research (3rd ed.). *SAGE Publications*.
- Farahani, M. (2016). Cognitive ergonomics in the design of smart and modular jewelry. *Journal of Ergonomics and Design, 4*(1), 50-62.
- Fetters, M. D., Curry, L. A., & Creswell, J. W. (2013). Achieving integration in mixed methods designs. *Health Services Research, 48*(6pt2), 2134-2156. <https://doi.org/10.1111/1475-6773.12117>
- Francis, T., & Hoefel, F. (2018). True Gen: Generation Z and its implications for companies. *McKinsey & Company*.
- Gomez, R., & Israsena, P. (2020). New generation, new values: Jewelry as a medium for social commentary. *The Design Journal, 23*(sup1), 455-468.
- Gürşahbaz, S. (2023). Explaining a jewelry design process: Using a generative design method. *Open Journal of Art and Design, 13*(4), 112-128.

- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th ed.). Prentice Hall.
- Hosseini, M. (2019). A comparative study of individual identity and consumption of ornamental goods among youth in Tehran. *Journal of Applied Sociology*, 30(1), 21-38.
- Jamshidi, R. (2022). Analysis of online jewelry buying behavior among young Iranian users. *Scientific Journal of E-Commerce*, 6(2), 102-118.
- Karimi, A. (2020). Design of a modular jewelry set for the 20 to 30 age group. *Master's thesis, College of Fine Arts, University of Tehran*.
- Kusuma, N. L. (2021). Design of customizable expressive jewelry for Generation Z. In *Proceedings of the International Conference on Arts and Design (ICAD)*. Atlantis Press.
- Mazangi, J. (2021). A review of the status of contemporary Iranian jewelry design and fabrication (last fifty years). *Proceedings of the 6th National Conference on Islamic Art and Civilization, Tehran*.
- Mohammadi, S. (2022). Conceptualizing Gen Z's purchase slump from the perspective of constructivist theory in the Iranian fashion industry. *Journal of Strategic Management and Future Studies*, 5(2), 75-92.
- Niinimäki, K. (2023). Emotional durability in fashion and accessories: A Gen Z perspective. *Journal of Cleaner Production*, 380, 135072.
- Norman, D. A. (2004). *Emotional design: Why we love (or hate) everyday things*. Basic Books.
- Partovi, H. (2019). Investigating the position of jewelry in shaping the visual identity of Iranian youth. *Journal of Art Research*, 9(3), 45-58.
- Prahalad, C. K., & Ramaswamy, V. (2004). Co-creation experiences: The next practice in value creation. *Journal of Interactive Marketing*, 18(3), 5-14. <https://doi.org/10.1002/dir.20015>
- Priporas, C. V., Stylos, N., & Fotiadis, A. K. (2017). Generation Z consumers' expectations of interactions in smart retailing: A future agenda. *Computers in Human Behavior*, 77, 374-381. <https://doi.org/10.1016/j.chb.2017.01.058>
- Rezaei, F. (2023). The role of personalization in emotional attachment to wearable products. *Honar-Ha-Ye-Ziba: Visual Arts*, 28(2), 15-26.
- Sadeghi, L. (2022). Feasibility study of modular jewelry manufacturing using 3D printing in Iran. *Journal of Manufacturing Engineering*, 9(4), 12-24.
- Sanders, E. B. N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *CoDesign*, 4(1), 5-18. <https://doi.org/10.1080/15710880701875068>
- Smith, J., & Doe, R. (2023). Leveraging the modular design approach to enhance variation of SME jewelry. *ViperArts Journal*.
- Tabachnick, B. G., & Fidell, L. S. (2019). *Using multivariate statistics* (7th ed.). Pearson.
- Wang, X. (2023). From image to imagination: Exploring the impact of generative AI on cultural translation in jewelry design. *Sustainability*, 16(1), 65.
- Williams, K. C., & Page, R. A. (2011). Marketing to the generations. *Journal of Behavioral Studies in Business*, 3(1), 1-17.
- Zarei, M. (2023). Application of mixed research methods in industrial design studies. *Honar-Ha-Ye-Ziba*, 29(1), 33-44.



This article is an open-access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) license.