

Mass Customization as a Positioning Strategy in the Fashion Sector: Evidence from a Brazilian Startup

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ABSTRACT

The growing appreciation for products that express identity and individuality has driven the adoption of mass customization as a competitive strategy. This study analyzes its application in a handmade sneaker startup in Blumenau, Brazil, through action research adapted to the Kumar model and the Mass Customization and Personalization Effectiveness Index (MCPEI). The investigation mapped the process from initial contact to after-sales, incorporating artisanal techniques—such as hand painting, airbrushing, rhinestones, and recycled fabrics—and proposing organizational improvements. Results indicate productivity gains, reduced rework, and increased loyalty, linked to stronger brand identity and social media engagement. Theoretically, the study shows that classic mass customization frameworks can be adapted to small-scale, low-automation contexts, when supported by standardized processes, quality control, and active customer interaction. As a limitation, this is a single case study with predominantly qualitative data, and replication in other creative sectors is recommended. Findings reinforce that customization, beyond aesthetic differentiation, acts as a positioning and innovation strategy, fostering lasting emotional connections between consumers and brands. The study contributes to the Strategic Design field by framing mass customization as a strategic practice that links operational structuring with symbolic and experiential innovation.

Keywords: Action Research, Creative Industry, Mass Customization, Sneakers, Strategic Design.

INTRODUCTION

Industry 4.0 has been delivering positive results for companies since 2010, highlighting benefits such as industrial-scale customization, flexibility to respond to change, optimized decisions with real-time data, and productivity with automated and integrated processes (Kagermann et al., 2013).

This evolution toward Industry 4.0 has transformed the global production landscape, raising consumer expectations, especially regarding the demand for highly customized products. This emerging paradigm requires companies to transcend traditional mass production, which relies on standardization and economies of scale, in favor of models that integrate the flexibility of customization with the efficiency of large-scale production. The textile industry, which coexists with two realities—one of being a pioneer in utilizing the new steam engine technology during the First Industrial Revolution (Sakurai & Zuchi, 2018) and, on the other

hand, it still traditional profile, being classified in Brazil as an Industry 2.5 due to its low level of process innovation (Dal Forno et al., 2022).

In this context, the textile sector, despite its historical roots and often traditional processes, finds itself at an inflection point, actively seeking modernization and adaptation to fashion trends and market demands. The ability to offer customized products is not only a competitive advantage, but a strategic necessity for sustainability and growth in an increasingly saturated market. The research presented demonstrates how adopting mass customization principles can be a viable path for traditional industries to align with new technological and consumer realities, ensuring their relevance and competitiveness.

Sneakers, originally created for sports activities, have become central to urban fashion and subcultures such as sneakerheads, taking on symbolic meanings beyond their basic function (Kawamura, 2018). According to (Matthews et al., 2021), the sneakerhead subculture builds social identity through consumption and brand preference. Other authors indicate that, in the context of online customization of sports shoes, utilitarian value and the search for uniqueness are central motivators for the adoption of this process (Liang et al., 2017).

Despite their different emphases, Kumar's (2004) operational framework and the MCPEI index converge on the idea that customization effectiveness depends on aligning system capabilities with customer-perceived value. However, the literature diverges regarding how this alignment occurs in low-automation contexts. Studies such as Trentin et al. (2020) highlight technological modularity as the primary driver, whereas Medeiros and Cattani (2017) emphasize symbolic co-creation and narrative coherence. This study builds on this debate by combining both dimensions—operational and symbolic—within an artisanal production environment, using action research to explore how strategic design can mediate between efficiency and meaning.

The research problem addressed by this study is to investigate the feasibility and methodology for integrating the principles of mass customization into the inherently handmade production processes of a sneaker startup in southern Brazil. This approach seeks to analyze the challenges inherent to this implementation and the subsequent benefits. The uniqueness of reconciling "mass customization" with the "handmade" nature of the startup bridges the academic and practical gap by using action research as a method for improving the product development process. This balance represents a fundamental challenge and a strategic opportunity for small and medium-sized companies operating in markets with high demand for customized products, but needing to maintain quality, standardization, and consumer individuality.

This article aimed to analyze the practical implementation of mass customization in a handmade sneaker startup, identify and quantify the process improvements achieved, and assess the impact of these changes on customer perception and loyalty. This study's contribution to academic literature offers empirical evidence on the application of a structured mass customization process in a specialized market niche, as well as measurable results in terms of final product quality and customer value perception, including increased productivity, reduced rework, and greater customer loyalty. This study validates the adaptability and effectiveness of existing theoretical frameworks for mass customization, demonstrating their successful application even in small-scale, handmade contexts. Furthermore, its practical application proposes a model for other companies seeking

operational excellence, innovation, and sustainable growth in niche markets, regardless of whether they are in the textile sector.

1. THEORETICAL BACKGROUND

Mass customization's ability to reconcile individual and unique solutions with aggregation, repeatability, efficiency, and low cost represents a breakthrough in a historical paradox. Traditionally, these two concepts were seen as inherently contradictory, situated at opposite ends of the production spectrum. However, mass customization demonstrates that it is possible to achieve significant strategic advantages in both dimensions, in addition to improving quality, delivery, and customer service. This ability to simultaneously manage individualization and efficiency allows companies to gain a unique competitive advantage, fundamentally altering their cost structure and value proposition in ways previously considered unfeasible. Consequently, successful implementation of mass customization requires a reassessment of conventional operational paradigms and a focus on innovative approaches that integrate seemingly conflicting objectives, rather than simply optimizing one at the expense of the other (Chen et al., 2009).

In the early 20th century, industry saw the introduction of mass production, driven by the assembly line model developed by Henry Ford. This approach prioritized standardization and production efficiency, resulting in homogeneous, low-cost products with little or no possibility for customization (Pine & Gilmore, 2013).

Beginning in the 1990s, the evolution of digital technologies and the adoption of more flexible production models allowed companies to begin incorporating customization elements, albeit limited, into their processes (Salvador et al., 2009). This period was marked by the transition from a purely mass-market paradigm to approaches more adaptable to consumer preferences.

In the 2000s, the rise of interactive digital platforms significantly transformed the relationship between companies and consumers. Online tools allowed customers to actively participate in defining product features, paving the way for personalized experiences on a larger scale (Blasco-Arcas et al., 2016).

Currently, customization is characterized by co-creation, in which individual preferences guide production and shape design, strengthening bonds between brand and consumer (Nurkka & Väänänen, 2018).

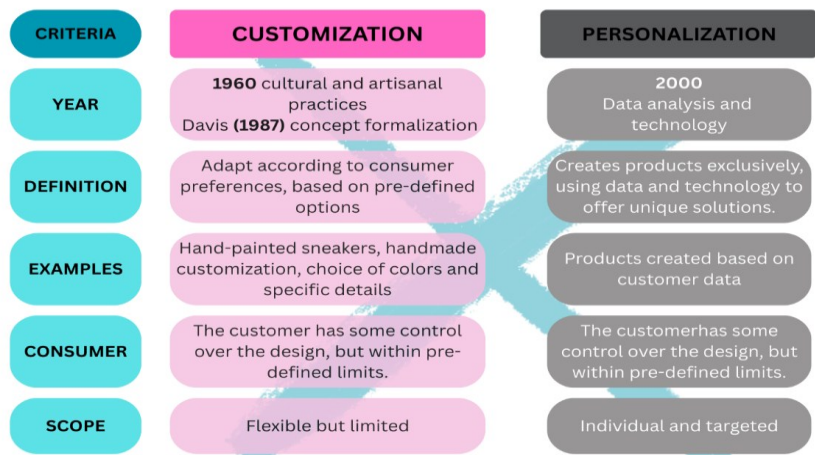


Figure 1. Difference and similarity between Customization and Personalization.

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Figure 1 differentiates customization from personalization. Given the focus of this work, the concept of on-demand mass customization will be adopted, which seeks to balance two important factors: the effectiveness of mass production and the ability to adapt the product to each customer's taste. In this model, the consumer actively participates in the creative process by choosing colors, themes, or details, but always within a set of options defined by the brand. Unlike full customization, where everything is made from scratch for each person, mass customization allows for more customers without sacrificing exclusivity. This approach precisely reflects the approach of the startup studied, which produces handmade products but is organized to achieve scale. Therefore, throughout this work, the term customization will always be used with this meaning in mind.

1.1. Examples of applications of mass customization in different sectors

Mass customization is not a phenomenon restricted to a single sector, but a versatile strategy that has found application and success in various industries globally (Machado & Moraes, 2008).

Starting with the automotive sector, a benchmark in technology adoption and historically characterized by mass production, examples include companies like BMW, which have implemented modular production systems and Industry 4.0 technologies, enabling the production of a wide range of vehicles with diverse features and specifications while maintaining efficiency and quality. Volkswagen uses artificial intelligence in production planning, while Tesla stands out for its flexible assembly lines and real-time monitoring systems.

In the apparel and footwear industry, there are custom-made options, including Nike, which initially launched the "NIKEiD" platform in 1999, focused on the Air Force 1 sneaker model, allowing customers to design their own shoes, choosing colors, materials, logos, and messaging. Later, in 2009, the name changed to Nike By You, but the core concept of customers creating their own designs remained. Since the rebrand, the service has expanded its reach, encompassing not only footwear but also apparel, sports equipment, and collaborative designs with artists and designers. Technologically, the experience gained an advanced online 3D builder, more interactive displays, and a wider variety of styles to customize (Lenine, 2019; Vlahos, 2024). In Brazil, there are Riachuelo, which uses artificial intelligence to personalize the shopping experience and adapt collections to customer preferences, and Arezzo, which invests in digital platforms to enable personalized choices of styles and finishes. Other brands such as Brooks Brothers (shirts and suits), Pringle of Scotland (knitwear), Oakley (sunglasses), and Longchamp (tote bags) also offer customization options. Many use online platforms such as Maker's Row and Wrapsew, which connect manufacturers with brands and individuals, facilitating on-demand production. Pre-order models, such as those used by Moda Operandi, Coterie, and Nineteenth Amendment, allow brands to test new styles without large upfront investments in raw materials and production, with production only after the customer orders.

In the furniture industry, mass customization allows customers to express their personal style and meet specific functional needs. Customers can customize the design (composition and arrangement), appearance (material, color, and pattern), and add extras (such as cup holders or storage space). Furniture companies can mass-produce standardized frames and parts, allowing customers to choose fabrics, colors, and finishes for their furniture. Tools such as

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product configurators and Augmented Reality and 3D technologies are important for customers to visualize their choices and feel confident in their decision before purchasing (Homag, 2024; Mineiro et al., 2024).

Mass customization has also been successfully implemented in other industrial sectors. Dell, for example, uses an online configurator that allows customers to customize their laptops with various hardware and software options before purchase, which has increased customer satisfaction and loyalty (Sreeja S, 2021). Coca-Cola's "Share a Coke" campaign, which allowed customers to personalize bottles with their names, is another notable example of successful mass customization. The toy company Lego has also had numerous initiatives, starting in 2003 with customizable kits and even custom-made pieces via digital platforms. In the pharmacy sector, DrogaRaia adopts customized service strategies based on consumer behavior data.

Table 1: Comparison of Companies with Mass Customization

Company	Sector	Customization Type	Technologies Used	Additional Strategy
Nike	Fashion / Sports	Sneaker design, colors, messages	Digital platform, CAD, automation	D2C model, creative engagement
Dell	Technology	Hardware and software components	E-commerce, configuration systems	On-demand production
LEGO	Toys	Custom kits and parts	Digital platform, 3D printing	Co-creation with consumers
BMW / Mini	Automobiles	Exterior design, technology, and finish	Online configurator, modularity	Direct delivery, customized luxury
Riachuelo	Fashion	Personalized products and recommendations	AI, data analysis	Collection adaptation
Arezzo	Fashion	Selection of models and finishes	E-commerce, digital design	Personalization through digital channels
DrogaRaia	Health / Retail	Customized service and offers	Big data, recommendation algorithms	Behavioral-based loyalty
Happy Town	Furniture / Home Decor	Modular and customizable products	Parametric design, post-assembly	Flexibility in production and delivery
Randon	Transportation	Equipment customizable by load type	Modular engineering, JIT production	Technical and logistical customization

In summary, these companies demonstrate how mass customization can be applied across diverse sectors with a focus on customer engagement, operational flexibility, and the intelligent use of data and technology, as shown in Table 1.

1.2. Kumar's Model for Mass Customization

The model defined by (Kumar, 2004) has been widely applied to measure the effectiveness of mass customization and personalization strategies and the role of modularity. Basically, the model's stages are:

- a) **Customer Interaction** - the customer expresses their specific preferences and needs. The company, in turn, offers a set of predefined options, which can be presented through various channels, such as catalogs, interactive digital interfaces, or product configurators. It is worth noting that the customer's role has been redefined, making them more participatory in a collaborative process.
- b) **Specification Definition** - after the initial interaction, the customer's choices and preferences are translated into technical or functional data that can be processed by the production system. Specification capture acts as the digital backbone of customization, translating customer desires into actionable data (Salvador et al.,

2009). This stage is the critical digital bridge between the customer's abstract aspiration and concrete production action. Without efficient and accurate capture and translation of specifications into machine-readable data, the entire mass customization process would be unfeasible. The sophistication of product configurators and underlying product models is paramount here, as they manage the complexity of choices and ensure technical feasibility. The effectiveness of mass customization is therefore directly linked to the robustness and intelligence of the digital systems that manage customer input and translate it into production instructions, underscoring the need for an advanced IT infrastructure (Trentin et al., 2020).

- c) **Product Development** - at this stage, the product design is adapted based on detailed specifications received from the customer. Modularity emerges as the key enabler of scalable customization.
- d) **Production Planning** - this involves reorganizing manufacturing to accommodate distinct and individualized customer requests. The implementation of flexible systems and Just-in-Time (JIT) principles is crucial to reducing cycle time and the costs associated with variety production.
- e) **Customized Production** - at this central stage, the product is manufactured according to the customer's specific and unique choices. Customized production can involve the use of advanced automation, technologies such as 3D printing, and modular assembly. Flexible Manufacturing Systems (FMS) are used in industries, enabling the production of a wide variety of parts simultaneously with minimal changeover time.
- f) **Product Delivery** - the final step in Kumar's (2004) model focuses on product delivery. Distribution is organized to ensure agility and traceability, ensuring that the customized product reaches the customer efficiently. The post-production customer experience is a crucial factor in loyalty. Delivery organized for "agility and traceability" and D2C (direct-to-consumer) delivery to "reinforce the brand-customer bond" are key elements.

However, while the Kumar (2004) model was fundamental to understanding mass customization, it had some limitations, including focusing primarily on a company's operational function. Furthermore, it was applicable only to manufacturing companies and did not encompass the service sector. A third significant limitation was the assumption that all product features were equally important to customers, which does not reflect the reality of customer valuation. The model also used production lot size as a proxy for price performance, which limited the measurement of the "mass" aspect of mass customization.

Therefore, to overcome the limitations of the original model MCPEI was developed, expanding Kumar's (2004) research in three significant ways. First, the MCPEI encompasses both service and manufacturing firms, broadening the framework's applicability. Second, the assessment of product customization considers that customers assign different weights to different product features, representing a more accurate measure of customer-perceived customization. Finally, the index captures the impact of both market perception and system capabilities, offering a more holistic view of the effectiveness of a mass customization strategy. Unlike the original model, the MCPEI uses direct customer input to measure a product's price

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acceptability, providing a more direct measure of the price component of a mass customization strategy.

The most current approaches focus on collaborative engineering, which has a conceptual framework designed to integrate the customer into all stages of mass customization, considering three main phases (Barata et al., 2023):

- **Co-innovation (Problem-Solving Phase):** this phase addresses the need for continuous innovation in mass customization, where customer needs and manufacturer capabilities are constantly evolving. It involves effective problem-solving and the generation of new solutions when current offerings do not meet customer needs.
- **Co-configuration (Design Specification Phase):** in this phase, customers and manufacturers agree on the specifications for a specific product offering or type of customization. It is a process of searching within a defined solution space (product family architecture) to find a mutually satisfactory product variant. It often involves customers and sales engineers (sometimes design engineers).
- **Co-production (Transfer Phase):** this scenario encompasses material conversion, transportation, shop floor control, procurement, and inventory management. The focus is on collaboration with supply chain partners and end customers to increase production efficiency, improve responsiveness, and reduce costs. It typically involves customers, supply chain managers, and production engineers.

The collaborative engineering perspective transforms the entire value chain into an integrated and dynamic system. Constant interaction and conflict resolution at all stages are crucial to efficiently delivering customized products. This implies that the success of mass customization relies not solely on individual technological components, but on the collaborative and continuous orchestration of people, processes, and technology throughout the entire product lifecycle. Integrating these collaborative phases allows companies to overcome the challenges of asymmetric information and divergent preferences, resulting in solutions that best meet customer needs and manufacturer capabilities.

Beyond its operational dimension, mass customization can be interpreted through the lens of Strategic Design, as a process that connects tangible production to intangible value creation. As highlighted by (Calleo et al., 2025; Liem & Brangier, 2015) strategic design reframes design practice as an agent of organizational transformation, capable of generating meaning and differentiation. In this perspective, customization acts not only as a production model but as a strategic device for building identity and narrative coherence between company, product, and user. This view aligns with (Dorst and Watson's, 2023; Norman, 2023) argument that so-called strategic design is not a distinct discipline but rather a movement that connects design practice and strategic reasoning through iterative reframing and situated experimentation, revealing how design generates strategic value beyond formal planning processes.

Although Kumar's (2004) framework offers a systematic understanding of customization, it primarily reflects an engineering-oriented perspective focused on process optimization. From a strategic design standpoint, this reductionist view neglects the interpretive and cultural dimensions that underlie value creation. As highlighted by Dorst and Watson (2023), design's strategic potential emerges not from formalized procedures but from its capacity to reframe organizational challenges and generate meaning through practice. Therefore, this study

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extends Kumar's structure beyond its operational focus, interpreting it as a strategic platform for connecting material efficiency and symbolic differentiation. This approach contributes to the ongoing debate in Strategic Design by demonstrating how design can operate as a systemic and interpretive practice of innovation in low-automation contexts.

2. METHODOLOGY

This study adopts an action research approach, as outlined by (Erro-Garcés & Alfaro-Tanco, 2020), characterized by the researcher's active participation in the diagnosis, planning, execution, and evaluation of interventions in the investigated environment. This approach was chosen due to the need to simultaneously understand and improve the production processes of a handmade sneaker startup, integrating principles of mass customization with a context of low automation and on-demand production. Thus, the steps were: defining the context and unit of analysis; time frame; data collection; and analysis procedures.

The research was conducted at a startup located in Blumenau, Santa Catarina, founded in 2019 and specializing in the handmade production of customized sneakers. The unit of analysis encompasses the complete service and production process, from initial contact with the customer to delivery and after-sales, considering the specificities of on-demand customization. The collection and intervention stages took place between January and May 2024, a period in which the adaptation of Kumar's Mass Customization Model (2004) associated with MCPEI was applied.

Multiple sources of evidence were used in data collection:

- **Primary data:** participant observation during the production flow; semi-structured interviews with the managing partner and production team; photographic and video recordings of the customization stages; and monitoring of customer interactions.
- **Secondary data:** documentary analysis of internal records (production records, customer messages, sales data) and a theoretical review of mass customization and methodologies applied to micro and small businesses

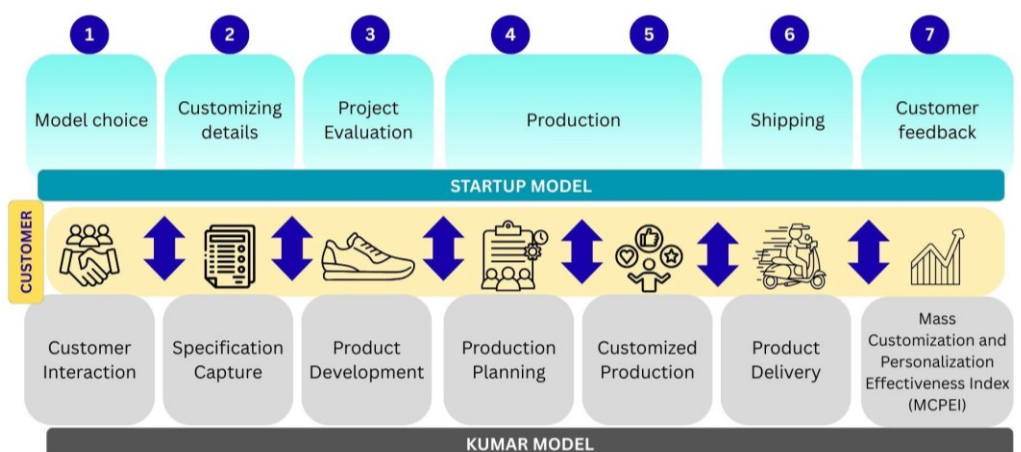


Figure 2 – Kumar's model, adapted for Startup and customer interaction

The triangulation of these sources aimed to increase the reliability of the results, allowing comparison between participant perceptions, direct observations, and documentary records. The analysis was conducted in two phases: initial diagnosis and implementation and evaluation. The initial diagnosis involved mapping the existing process, identifying bottlenecks, and evaluating customization practices based on Kumar's (2004) model.

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Subsequently, the adapted model was applied, with adjustments to the stages of customer interaction, product development, planning, production, and delivery. Qualitative indicators were compared before and after the intervention, including perception of quality, engagement on social networks, incidence of rework and customer satisfaction (Figure 2).

Kumar's model was adjusted to reflect the artisanal nature of production, preserving essential steps while making others more flexible, such as specification capture, which now integrates informal interactions via social media and messaging apps. Storytelling and symbolic value elements, absent from the original model, were also incorporated. After understanding Kumar's model, it was tested and adapted for the startup under study.

To operationalize the application of Kumar's (2004) model, each of its six stages was adapted to the context of artisanal production. Table 2 summarizes these correspondences. Customer Interaction involved direct communication with clients through social media and messaging apps to capture preferences and design intent. Specification Definition was translated into digital sketches and mockups for approval. Product Development focused on the modular definition of visual elements. Production Planning introduced a task division checklist to balance artisanal flexibility and process control. Customized Production emphasized quality checkpoints and photographic documentation. Product Delivery and Feedback stages incorporated storytelling, certificates of authenticity, and client posts on social media as qualitative indicators of perceived value. To complement Kumar's stages, MCPEI was used qualitatively to guide the analysis of four dimensions: system capability, customer perception, modularity, and value communication. While numerical scoring was not feasible given the qualitative nature of this single case, the index's dimensions structured the interpretation of process improvements, providing analytical consistency between intervention and results.

Table 2. Operationalization of Kumar's (2004) stages in an artisanal sneaker startup and evidence collected

Kumar's stage	Operationalization in the startup (this study)	Evidence / data collected	MCPEI dimensions
Customer Interaction	Briefing via social media/WhatsApp; capture of preferences (colors, motifs, references); definition of constraints (budget/lead time).	Screenshots of conversations; order sheet; time-to-approval notes.	Customer Perception Value Communication
Specification Definition	Creation of digital sketches/mockups; iteration until approval; feasibility check of materials and techniques.	Versioned mockups; approval record; feasibility checklist.	System Capability Modularity Customer Perception
Product Development	Modular definition of visual elements (base, overlays, appliqués); selection of techniques (hand painting, airbrushing, fabric).	BOM-lite (materials list); technique-module matrix; photo register of trials.	Modularity System Capability
Production Planning	Task division checklist; sequencing to reduce rework and drying bottlenecks.	Planning checklist; rework log (before/after); lead-time notes.	System Capability
Customized Production	Execution with in-process quality gates (surface prep, color fastness touch test, edge control); photographic documentation.	In-process QC ticks; photo register; defect/rework tally.	System Capability Customer Perception
Delivery	Packaging with certificate of authenticity and message; scheduled "surprise" handover when applicable.	Certificate template; delivery confirmation; unboxing photos.	Value Communication Customer Perception
Feedback / After-sales	Collection of public reaction via posts/stories; DM feedback; qualitative sentiment; loyalty/repeat-order signal.	Post links, impressions, comments; 5-star notes; return-purchase flag.	Customer Perception; Value Communication

Note: In this single-case, the MCPEI was used qualitatively to structure analysis rather than produce a numerical score. The four dimensions (System Capability, Customer Perception, Modularity, and Value Communication) guided evidence collection and interpretation.

3. METHODOLOGY

To test Kumar's model and its adaptations, action research was conducted at the sneaker customization startup, which has been located in Blumenau, Santa Catarina, since 2019. The process mapped involved an order for a customized sneaker to be delivered to a Brazilian comedian in 2024. This action was part of a partnership with another technology startup, which requested a special collection of shoes for its employees and a strategic partner of the company.

- a) **Model selection** - The startup team received direct guidance: develop a striking, original design that aligned with the partner company's visual identity. The customization created for the comedian followed an aesthetic that spoke directly to the world of comedy, integrating visual elements linked to his personality and the identity of the partner startup. The project received widespread attention on social media, reflecting increased audience engagement and the strengthening of the brand as an artistic and cultural expression.
- b) **Detail customization** - among the techniques available by the startup are hand painting combined with leather pen details, airbrushing, and the application of rhinestones and/or recycled fabric (Figure 3).



Figure 3. Hand painting techniques combined with leather pen details, airbrushing and application of recycled fabric.

Table 3 shows a comparison of the techniques, mentioning the advantages and disadvantages of each.

Table 3: Customization's techniques

Technique	Description	Advantages	Disadvantages
Hand painting	Hand-applying special paints to sneakers	Highly customizable and exclusive	Long production time
Airbrushing	Using spray paint to create effects	Professional and uniform finish	Requires high precision
Applying rhinestones	Attaching rhinestones and other elements	Sophisticated and eye-catching aesthetics	Can be fragile if not properly secured
Applying recycled fabric	Using scraps or recycled fabric pieces	Sustainability and reusability of materials; unique appearance	Time-consuming handmade process

- c) **Project Evaluation** - This stage involves interactions with the client until approval of the final artwork for the items to be customized.
- d) **Production** - According to the client's definition, production begins with material selection, which impacts the quality and durability of the products. The main inputs used include leather dyes, which ensure water resistance; specialized pens, which allow for the application of details and contours; embroidery, which adds texture and

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sophistication; and protective varnishes, which improve wear resistance. Sustainability also influences the choice of materials: eco-friendly dyes and recycled fabrics add value to the product and attract conscious consumers. Figure 4 shows some stages of the production process for this case study. Table 4 presents a comparison between the different materials used in sneaker customization, highlighting their purpose, cost, durability, and sustainability aspects. These factors are fundamental for assessing the viability of each material in the production process, seeking a balance between quality, resistance, and environmental impact. Additionally, the video shows each stage of production, from design conception to final details. To gain an inside look at operational processes and management challenges, an interview was conducted with a manager responsible for the production and customer service departments of the startup under review. The goal of the interview was to understand how the company tackles these challenges.

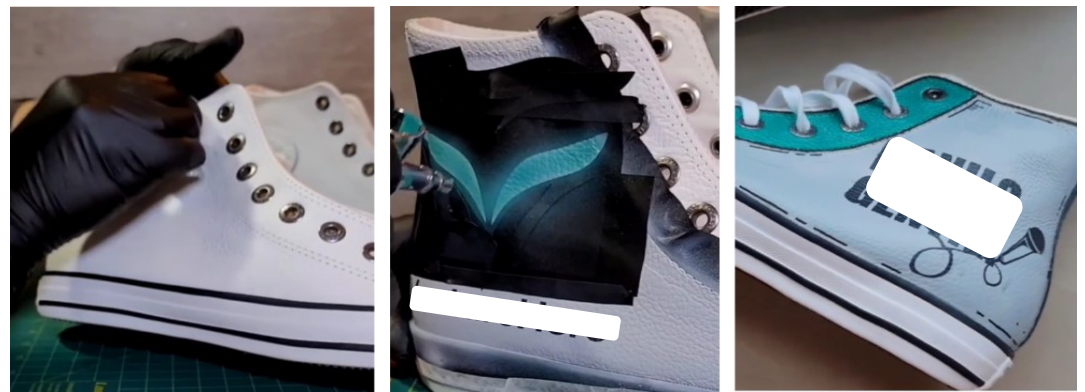


Figure 4. Customization process of the analyzed startup.

Table 4: Materials used and criteria evaluated

Material	Purpose	Cost	Durability	Sustainability
Leather paints	Surface Customization	High	High	Average
Leather pens	Fine Lines and Details	Low	Medium	High
Adhesive tapes	Painting Mask	Low	Low	Average
Recycled fabric	Sneaker Applications	High	High	High
Protective varnish	Customization Fixation	Medium	High	Low

Table 5 summarizes the responses obtained during the interview, highlighting operational challenges, perceptions of customer feedback, and improvements planned by management. The interview revealed that, early on, the startup's biggest challenge was ensuring consistent quality and product reliability. Over time, priorities shifted to optimizing production, balancing costs and delivery times, and strengthening the brand in the market. The company adopted a phased production model to improve efficiency and structured customer service via social media and WhatsApp, allowing direct and constant contact with customers. When asked what he would have done differently, the partner emphasized that he would have invested earlier in strategic management, team training, and marketing initiatives. This response reinforces the importance of a well-planned foundation from the outset. When asked about the future, the startup sees growth in the B2B market and increased brand recognition, which could drive new expansion opportunities. Now, the focus is on scalability and process optimization to consolidate its position in the sector.

Table 5: Interview with the startup partner

Question	Member's Response
1) What have been the biggest challenges since the startup's inception to date?	Achieving a reliable level of quality was our biggest concern in the beginning. Study and practice helped us achieve this standard.
2) How does the team handle mass customization and production?	We use a phased production line, distributing tasks according to each person's strengths, optimizing time and quality.
3) What challenges does the company face in balancing quality, cost, and delivery time?	Initially, we spent a lot of time on details, increasing deadlines. With experience, we were able to predict the final result and optimize production.
4) How do the customization and delivery logistics work?	The process involves receiving the order, design approval, production in 3-4 days, drying, and shipping, taking 7 to 10 days in total.
5) How does the startup manage customer service and order customization?	We use social media and WhatsApp, with 24-hour support. After the order is placed, we send the model to the design team and proceed with the customization.
6) Is there a defined workflow to ensure customization quality?	Yes, each person has their own role, and we review each step to avoid errors and ensure the design isn't influenced by the artist's personal taste.
7) What has been done to solve the most critical challenges so far?	We delegate tasks and seek out a qualified team, in addition to optimizing processes to avoid production bottlenecks.
8) If you could start over from scratch, what would you do differently?	I would invest more in management, team training, and marketing to strengthen the brand from the start. The demand for exclusive products continues to grow, and we see opportunities in the B2B market. Brand recognition has increased, opening up new growth opportunities.
9) How do you see the future of the startup and the custom sneaker market?	Achieving a reliable level of quality was our biggest concern in the beginning. Study and practice helped us achieve this standard.

- e) **Shipping** – in this case, the delivery was scheduled as an event to create the "surprise" factor.
- f) **Customer feedback** – it was observed that feedback doesn't always follow the same pattern, meaning a written questionnaire isn't necessary. Social media posts and videos capturing the excitement of the delivery generate high engagement, amplified by followers and stakeholders.

After applying the steps and diagnosing the issue, improvements were suggested. One of these was the proposal of an adapted model. This model includes the following structured steps:

- a) Initial contact with the customer: gathering preferences;
- b) Selection of the sneaker base: models compatible with customization;
- c) Art development: creation of digital mockups and approval;
- d) Sneaker preparation: cleaning, insulation, and primer application;
- e) Customization execution: hand painting, airbrushing, application of elements;
- f) Finishing and drying: sealing with varnish and aesthetic review;
- g) Quality control: compliance checklist and visual tests;
- h) Packaging and shipping: addition of gifts and certificate of authenticity;
- i) After-sales and feedback collection.

Overall, the practical results highlight that the effectiveness of customization in this context relies less on technological tools than on the team's ability to structure creative processes, manage symbolic value, and ensure consistency across handcrafted products.

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Table 6: Comparison before and after implementation of the proposed model

Evaluated Aspect	Initial Situation	Situation After the Proposed Model	Evidence
Customer Communication	Return failures and delays in approval	Exclusive channel	Interview with partner
Quality Control	Subjectivity and rework	Checklist and division of roles	Checklist implemented and positive feedback
Customer Perceived Value	Product without distinctive packaging	Inclusion of gifts, certificates, and post-sale interaction	5.0 rating for service and loyalty
Value Added	Customized product without storytelling	Creation of experience with collaborative design	Feedback

Thus, the benefits of practical application resulted in increased added value for the customer and higher quality of the customized product (see Table 6). Customization came to be understood not only as an aesthetic differentiation, but as a form of individual expression. The ability to actively participate in the creative process, selecting visual elements, colors, and personal symbols, fostered a deeper emotional connection with the product and the brand. Furthermore, small gestures such as including certificates of authenticity, gifts, and messages written specifically for each customer added symbolic value and strengthened the relationship with the client. By structuring a production flow in stages, reviewing each phase, and clearly assigning responsibilities, the startup was able to consolidate a consistent quality standard. Eliminating rework, using checklists, and defining visual standards ensured that the final result was consistent with the creative proposal.

4. CONCLUSION

This study addressed the research question of how mass customization principles can be integrated into a handmade, low-automation production context. The analysis demonstrated that adapting Kumar’s (2004) framework to small-scale creative enterprises enables measurable operational improvements, enhanced customer engagement, and clearer strategic positioning.

The literature reinforces that the successful implementation of mass customization depends on a set of technologies and methodologies that enable the flexibility and efficiency necessary to meet individualized customer demands, including modularity and product family architecture, product configuration systems, and FMS.

The practical application demonstrated the strategic potential of customization as a marketing and differentiation tool. The delivery of an exclusive sneaker to an influencer generated high engagement on social media and strengthened brand recognition. According to Trentin et al. (2020), this model reinforces the symbolic value of customization and its role as a vehicle for customer expression – a fundamental attribute among younger generations.

Customization techniques offer multiple possibilities, ranging from artistic exclusivity, sustainability, and innovative materials. However, they all share challenges related to the demand for specialized skills, production time, and durability of the final product. Choosing the ideal technique depends on the customization objective, the target audience profile, and the startup's production capacity, highlighting the importance of a balance between creativity, quality, and operational efficiency.

The results showed increased productivity, less rework, brand strengthening, and greater engagement, validating customization as a differentiation and positioning strategy.

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In the field of entrepreneurship, this work reinforces that creative startups can build sustainable differentiators by fostering emotional connections with their audiences and integrating cultural, artistic, and identity values into the product. Customization, in this sense, goes beyond the product itself and consolidates itself as a positioning and innovation strategy.

Limitations include the single-case study nature, the predominance of qualitative data, and the lack of standardized performance indicators. Future research can apply the model to other creative sectors and compare results between companies of different sizes and levels of automation, deepening the understanding of the critical factors for the adoption of mass customization.

From a strategic design standpoint, the findings demonstrate that differentiation in low-automation contexts can emerge not from technological sophistication, but from symbolic and relational innovation. By translating handmade capabilities into structured processes, the startup generated a unique value proposition grounded in authenticity, co-creation, and identity, key assets for small firms competing in saturated markets (Calabretta et al., 2016). Therefore, the proposed model contributes to the discussion on design-led differentiation, showing how strategic design can enable competitiveness through meaning, collaboration, and cultural embeddedness rather than scale or automation. This reinforces the view that innovation in creative economies often resides in the capacity to orchestrate symbolic capital as a strategic resource (Dorst & Watson, 2023).

The originality of this study lies in reframing mass customization not merely as an operational innovation, but as a strategic design practice that mediates between efficiency, identity, and meaning. By articulating action research and symbolic value creation, it advances the understanding of design as a systemic capability for organizational learning and differentiation. This perspective aligns with recent Strategic Design debates on how design practices enable the integration of cultural, experiential, and technological dimensions into innovation processes (Calleo et al., 2025; Dorst & Watson, 2023).

By explicitly connecting the findings to the research question, the study confirms that structured customization processes can bridge handmade production and strategic differentiation, offering a replicable pathway for other creative startups seeking to translate design practices into competitive advantage.

ACKNOWLEDGMENTS

The authors would like to thank Fundação de Amparo à Pesquisa e Inovação do Estado de Santa Catarina (FAPESC) for the financial support received.

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