JTH

https://jthkkss.com/
e-ISSN 2805-4431
DOI: https://doi.org/10.53797/jthkks.v6i1.7.2025

Development of Scratch Generative Design in Designing Cyber-Tech Themed Motifs as Innovation in Modest Sporty Casual Fashion Products

Fauchiyah, Nafiatus[1], Russanti, Irma[1*], Ismail, Mohamed Amiruddin[2]

[1]Department of Applied Science Fashion Student, Faculty of Vocational, University of Surabaya, INDONESIA
[2]Department Engineering Technology, Faculty of Technical and Vocational, Universiti Pendidikan Sultan Idris, MALAYSIA

*Corresponding author email: irmarussanti@unesa.ac.id

Received 29 Jul 2025; Accepted 20 Aug 2025; Available online 25 Sep 2025

Abstract: The contemporary fashion design paradigm is undergoing a fundamental shift toward integration with digital technology. Amidst this transition, the Indonesian modest sporty casual fashion market confronts the critical challenge of design uniformity and aesthetic repetition despite its exponential growth. This research addresses this innovation gap by exploring the implementation of generative design using Scratch, a platform commonly utilized within the game education domain. Adopting the ADDIE (Analysis, Design, Development, Implementation, Evaluation) methodological framework, this study aimed to formulate a design method for *Cyber-Tech* themed motifs. The findings demonstrate a successful recontextualization of Scratch's visual block programming from game development into an innovative textile design method. Utilizing this approach, the researcher produced 6 original motif prototypes, which were subsequently applied to fashion products via digital printing. To validate the results, the prototypes were assessed by 9 experts. The final analysis confirms the achievement of aesthetic coherence between the motif, material, and silhouette. This study proves that an educational tool can serve as a professional design solution to overcome market stagnation and diversify aesthetic offerings.

Keywords: Generative Design, Modest Fashion, Scratch Application, Textile Design, Digital Motifs**,** Cyber-Tech

1. Introduction

The contemporary fashion design paradigm is undergoing a fundamental shift toward integration with digital technology. Advancements in computation and artificial intelligence impel designers to explore new methods for textile surface ornamentation (Abdel et al., 2024). Generative design utilizing algorithms to produce visual works emerges as a transformative approach, offering motif innovation that transcends the limitations of human intuition (Channi et al., 2025). This research positions itself within this paradigm, exploring the intersection of simple coding, digital aesthetics, and specific market needs (Lee 2024).

In Indonesia, the modest sporty casual fashion phenomenon demonstrates exponential market growth and cultural significance, representing a generation seeking functional, modern apparel (Gauthier 2024). However, this rapid quantitative growth presents a crucial problem: a tendency toward design homogenization. Products heavily rely on conventional floral or geometric patterns, failing to explore technology-inspired visual languages as elements of novelty (Rashdan & Ashour, 2024; Ensslin 2022). An innovation gap exists for designs capable of reflecting the digital zeitgeist, creating an opportunity for disruptive intervention (Carmona 2021).

*Corresponding author:Irmarussanti@unesa.ac.id

The design intervention proposed in this study centers on the utilization of the Scratch application (Sáez-López et al., 2016). Developed by the MIT Media Lab, Scratch is primarily recognized for introducing computational thinking through visual block programming (Dúo Terrón 2023; Walker et al., 2023). Rather than focusing on its traditional use in game dynamics, this research argues for recontextualizing its fundamental logic the orchestration of visual elements via algorithmic commands (Leone 2024) into the static, pattern-rich domain of textile design. This approach proposes an innovative transition from educational coding to an accessible generative design method.

This recontextualization addresses a distinct gap in global scientific discourse regarding technology and fashion. While hubs like France and the United States emphasize smart textiles (Girard 2024), and Turkey innovates primarily in materials for the modest market (Özdil 2024), technical centers such as Germany and Russia often explore generative design through mathematical functionality detached from commercial apparel (Ayers et al., 2024). Consequently, significant potential remains unexplored in adapting educational gaming tools into professional design instruments for creating a Cyber-Tech aesthetic specifically within the modest sporty casual niche.

To bridge this gap, this article presents a structured implementation process validated through the systematic ADDIE framework (Abuhassna et al., 2024). The study aims to formulate a generative workflow using Scratch to produce original digital motifs (Gondoputranto & Dibia, 2022) and realize them into textile materials for modest fashion prototypes. Specifically, this research seeks to answer two pivotal questions: (1) How can the gamified programming logic of Scratch be technically transposed into a systematic generative framework for designing Cyber-Tech patterns? and (2) To what extent do the resulting prototypes demonstrate aesthetic coherence and alignment with the functional demands of the modest sporty casual market?

2. Methodology

This research adopts the ADDIE instructional design framework (Analysis, Design, Development, Implementation, and Evaluation). The researcher selected this model for its systematic, structured, and iterative nature, which is highly relevant for a design based research project aiming to produce and validate an innovative product. The comprehensive research workflow is illustrated in Fig. 1. The primary approach to data collection and analysis is qualitative. The study employs a purposive sampling strategy, involving nine experts comprised of fashion industry professionals, design practitioners, and academics to ensure valid and reliable data. Data is gathered using semi-structured interviews as the main instrument and analyzed using thematic analysis.

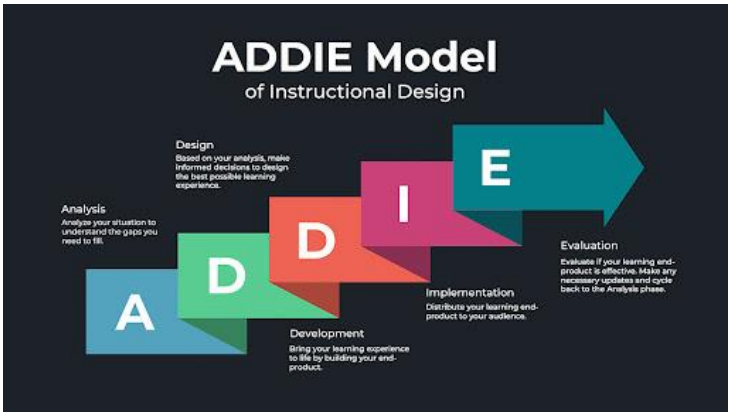


Fig 1: The ADDIE Instructional Design Workflow

2.1 Analysis Stage

In this initial stage, the researcher conducts a needs analysis to thoroughly identify the problem and research gap. Key activities include an extensive literature review on generative design, the *Cyber-Tech* aesthetic, and the *modest sporty casual* market. Concurrently, the researcher conducts semi-structured interview sessions with all participant groups. The interview instrument comprises 7 core open ended questions designed to probe the participants' perceptions of current market motifs and their acceptance of digital novelty. The objective at this stage is to validate the problem, identify innovation opportunities, and understand the initial perceptions of the proposed idea.

2.2 Design Stage

Based on the findings from the analysis stage, the researcher formulates a creative blueprint for the project as illustrated in Fig.2 as the protype design. This stage involves detailed concept design: defining the mood board, color palette, and key silhouettes for the *modest sporty casual* collection. Crucially, the researcher designs the technical workflow for using the Scratch application. Instead of its traditional use for gaming, the platform's logic is repurposed to define parameters and programming blocks that generate abstract *Cyber-Tech* motifs. Additionally, the researcher selects fabric materials with characteristics suitable for *sporty casual* wear that can optimally receive digital printing.

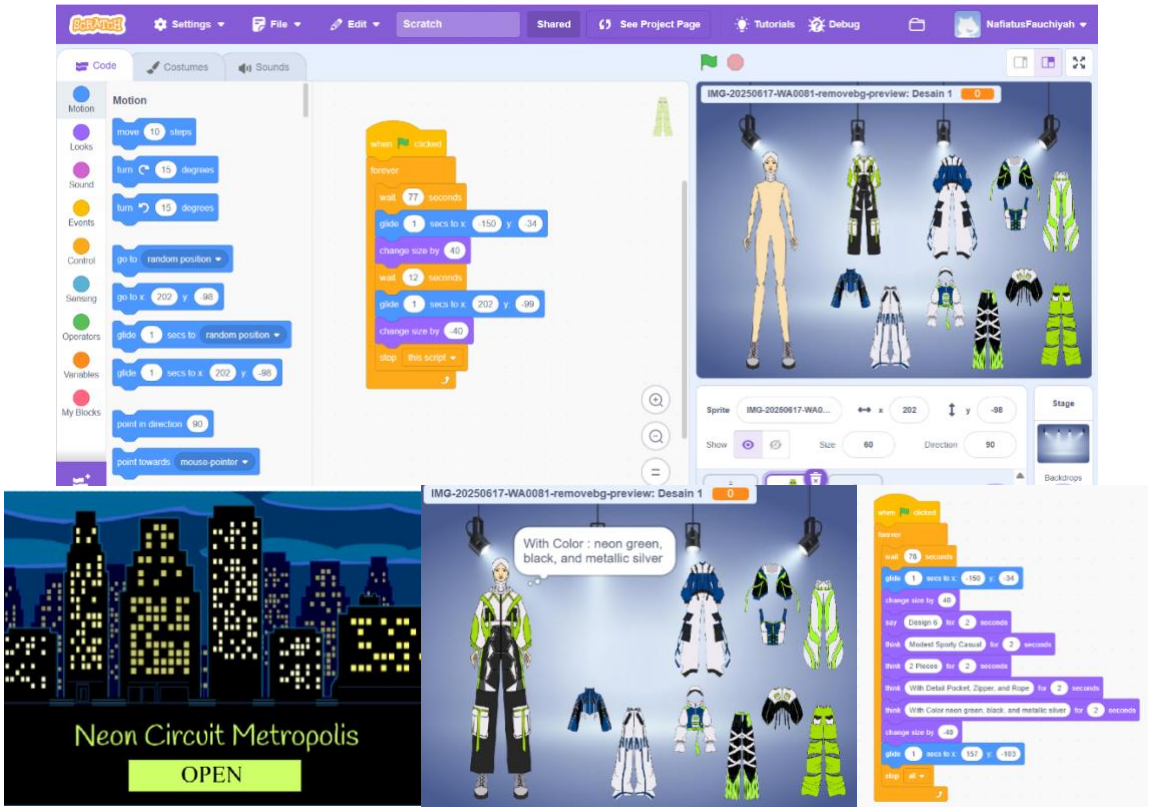
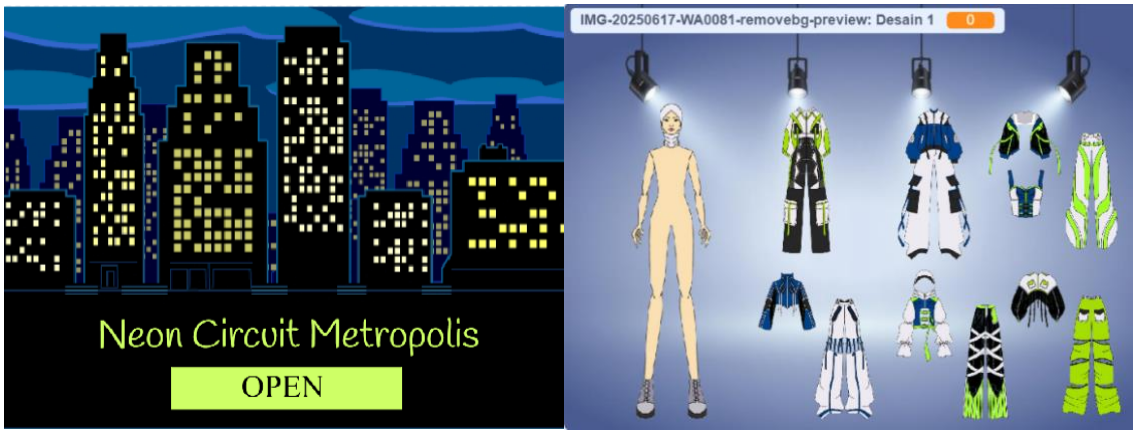


Fig 2: Prototype Design

2.3 Development Stage

At this stage, the researcher executes the designed blueprint as presented in Fig. 3. This creative-technical process begins by developing the code and algorithms within the Scratch application to generate a series of alternative digital motifs with a *Cyber-Tech* theme. The drag-and-drop mechanism of the block-based coding is utilized to control visual elements rather than game mechanics, creating complex generative patterns. From the various alternatives produced, the researcher conducts a curation process to finalize a selection of motifs that best align with the concept. The development stage concludes with preparing the design files of the final motifs for application onto the chosen fabric via digital textile printing.



(a) (b)

Fig 3 (a) Main menu page; (b) apparel selection

In this study, the outcomes of the discussions held during the design phase guided the creation of the software and instructional materials for the digital game. A scratch was used to code the digital game and create an application, in accordance with the present study's development strategy. Every development was put through constant testing to ensure that the electrical digital game ran smoothly and effectively. The drag-and-drop mechanism, design counters in each interactive component are controlled through block based coding on Scratch, as shown in Fig. 4.

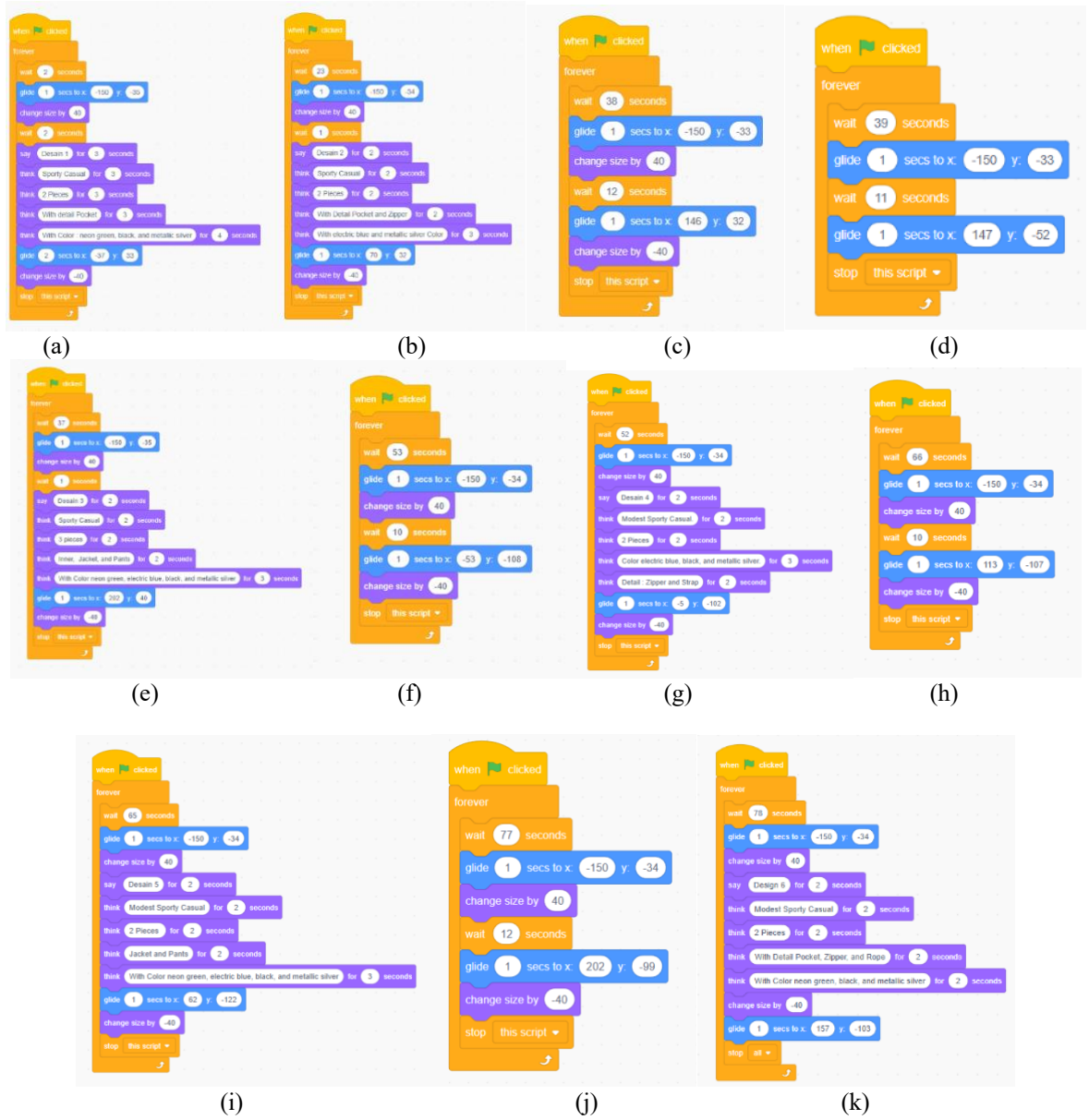


Fig 4 (a) Coding block for design 1; (b) coding block for design 2; (c) coding block for pants design 3; (d) Coding block for jacket design 3; (e) coding block for inner design 3; (f) coding block for pants design 4; (g) Coding block for jacket design 4; (h) coding block for pants design 5; (i) coding block for jacket design 5; (j) coding block for pants design 6; (k) coding block for jacket design 6.

2.4 Implementation and Evaluation Stage

Following the production of prototypes, the study proceeds to the evaluation phase. This stage serves as the validation step within the ADDIE framework. The researcher presents the finished prototypes to the nine expert participants to obtain critical feedback. The validation focuses on assessing the innovation aspects, the aesthetic coherence among the motif, material, and silhouette, and the commercial viability of the final product.

3. Results And Findings

This section presents the qualitative findings obtained from in-depth interviews with nine expert participants. To ensure a rigorous interpretation of the data, the researcher adopted the interactive qualitative analysis model proposed by Miles, Huberman, and Saldaña (2014). This systematic approach involves three concurrent flows of activity: data condensation, data display, and conclusion drawing/verification. This method allowed the researcher to effectively synthesize the experts' perceptions into four distinct categories, ranging from market analysis to product evaluation.

To provide context for the findings, the professional backgrounds of the nine expert participants involved in this study are detailed in Table 1.

Table 1: Respondent profiles

Respondent	Participant Category	Job Position	Work Experience (Years)
R1	Fashion Industry Expert	Creative Director (Leading Fashion Brand)	25
R2	Fashion Industry Expert	Senior Fashion Consultant	18
R3	Fashion Industry Expert	National Fashion Museum Curator	22
R4	Fashion Practitioner	Independent Fashion Designer	10
R5	Fashion Practitioner	Professional Stylist	8
R6	Fashion Practitioner	Digital Fashion Merchandiser	12
R7	Fashion/IT Academic	Lecturer in Fashion Design & Textile Technology	15
R8	Fashion/IT Academic	Human-Computer Interaction (HCI) Researcher	13
R9	Fashion/IT Academic	Head of Visual Communication Design Study Program	20

3.1 Industry Experts' Perception of Market Opportunity and Innovation

This theme encapsulates the consensus among industry experts regarding the current state of the modest fashion market, identifying a critical saturation point that demands novel visual interventions. Industry experts consistently validated the research's initial analysis.

All three experts agreed that the modest sporty casual fashion trend will continue to strengthen over the next 3-5 years, driven by the lifestyle shifts of the younger generation. However, they emphasized that growth depends on differentiation. As R2 stated: "The market will not disappear; rather, it will become more fragmented. The winners will be those who can offer 'something new' beyond basic color plays and silhouettes." Specifically, the experts emphasized that the most crucial innovation needed today lies at the level of motifs and visual narratives, as the majority of products on the market still rely on conventional patterns. Highlighting this aesthetic stagnation, R1 remarked: "We see a fatigue with current motifs. Consumers are searching for a more personal and modern identity. An aesthetic inspired by the digital world, like Cyber-Tech, is a highly potential niche that remains untapped."

3.2 Design Practitioners' Perception of the Creative Process and New Aesthetics

This theme explores the practical challenges designers face in bridging artistic expression with cultural norms, highlighting the process of negotiating the 'Cyber-Tech' aesthetic within modest parameters.

Design practitioners provided insights into the creative challenges they face. They revealed their greatest challenge is balancing free artistic expression with the normative constraints of modest apparel. Describing this negotiation, R4 explained: "Often, we have to 'translate' global trends to ensure they are acceptable. The challenge is to prevent the final result from feeling awkward or forced." Regarding the Cyber-Tech aesthetic, practitioners initially expressed skepticism due to its common association with avant-garde or dystopian imagery. However, their perceptions changed positively after viewing the proposed concept. R6 commented on the successful adaptation: "Execution is key. If the Cyber-Tech motif is designed with the right color palette and scale, it will not clash with the values of modesty. On the contrary, it can create a new visual language that reflects the identity of the modern, tech-savvy Muslim woman."

3.3 Academics' Perception of Methodological Contribution

This theme focuses on the validation of the research methodology, specifically the novel use of educational tools to democratize generative design in a professional context.

Academics evaluated this project from the perspective of its methodological contribution to design and fashion studies. They considered the intersection of computational art and textile design a relevant frontier for fostering innovation. R7 highlighted the shift in the designer's role: "Generative art frees designers from the blank canvas. By defining rules and parameters, the designer becomes an 'orchestrator' of the creative process, not merely an executor. Therein lies the novelty." This view also confirms a research gap in the utilization of educational tools like Scratch for professional design purposes. R9 affirmed the significance of this "middle ground" approach: "The discourse on fashion and technology often leaps to smart textiles or complex algorithms. Yet, there is an unexplored 'middle ground': how accessible tools like Scratch can democratize generative design. This research directly fills that void."

3.4 Participants' Critical Evaluation of the Product Prototypes

The final theme presents the holistic evaluation of the finished prototypes, confirming that the method yields products that are aesthetically coherent, commercially viable, and methodologically significant.

After directly interacting with the prototypes, participants provided critical evaluations. Overall, a consensus emerged that the project successfully achieved coherence between the Cyber-Tech motifs and the modest sporty casual silhouettes. R5 commented on the surprise of this combination: "Initially, I thought it would look strange, but the motif integrates well... It looks edgy yet remains modest." From an industry perspective, participants judged the product to have strong commercial viability. R4 highlighted the product's primary strength in its uniqueness: "This is a signature that cannot be easily imitated... It provides a very high selling point." Finally, from an academic perspective, the participants validated the research's methodological significance. R8 concluded: "The implementation of Scratch in this project successfully demonstrates significant methodological novelty... This is a tangible example of design-based research that yields an innovative artifact as well as a new knowledge contribution."

Table 2: Thematic analysis matrix based on respondent profiles

Respondent	Participant Profile	Interview Question	Key Answer/Transcript (Synthesized)	Research Theme
R1, R2, R3	Fashion Industry Expert 1. Creative Director (25 yrs) 2. Senior Fashion Consultant (18 yrs) 3. Fashion Museum Curator (22 yrs)	"How do you see the trends and market potential for modest sporty casual wear in Indonesia? What kind of innovation does the market need most right now?"	a) The trend will continue to strengthen, but the market is becoming saturated with uniform designs. b) The most crucial innovation lies in motifs and visual narratives. c) Digital aesthetics like Cyber d) Tech represent an untapped potential market niche.	1. Convergence of Market Opportunity and Innovation Gap
R4, R5, R6	Fashion Practitioner 1. Independent Fashion Designer (10 yrs) 2. Professional Stylist (8 yrs) 3. Digital Fashion Merchandiser (12 yrs)	"What is the biggest challenge you face when designing motifs for modest apparel? What is your perception of combining the Cyber-Tech aesthetic with modest fashion?"	a) The main challenge is balancing artistic expression with normative constraints. b) Initial skepticism existed, but proper execution can integrate technological aesthetics well. c) It can create a new visual language for modern consumers.	2. Designer's Perspective: Bridging Technological Aesthetics with Modest Norms
R7, R8, R9	Fashion/IT Academic 1. Lecturer, Fashion Design & Textile Tech. (15 yrs)	"How can the intersection of computational art and textile design drive novelty? Where do you see	a) Generative art changes the designer's role to that of a creative 'orchestrator'. b) A research gap exists in using accessible design	3. Academic Perspective: Validation of Methodological Novelty

Continued

	2. HCI Researcher (13 yrs) 3. Head of Visual Comm. Design Program (20 yrs)	the most significant research gaps?"	tools for professional purposes c) This project fills the void between high-tech research and conventional design practice.	
R1 - R9	All Participants	"After seeing this product, what is your perception of the coherence between the Cyber-Tech motif and the modest sporty casual silhouette?"	a) Participants deemed the coherence between motif and silhouette successful. b) They found the offered innovation relevant and a break from market aesthetic repetition. c) They considered the final look "edgy yet modest".	4. Critical Evaluation of the Product Prototype
R1, R2, R3	Fashion Industry Expert	"Does a product like this have commercial viability? Which consumer segment would be its primary target?"	a) It possesses strong commercial viability. b) The primary target: Urban millennials and Gen Z (early adopters).	4a. Sub-theme: Commercial Viability
R4, R5, R6	Fashion Practitioner	"From an aesthetic and uniqueness standpoint, what are the primary strengths and weaknesses of this prototype collection?"	a) Strength: The originality of motifs that are difficult to imitate. b) Weakness: Requires refinement in motif placement and material selection.	4b. Sub-theme: Aesthetic and Technical Critique
R7, R8, R9	Fashion/IT Academic	"Does the implementation of Scratch as a generative design tool in this product successfully demonstrate significant methodological novelty?"	a) Yes, it successfully demonstrates significant methodological novelty. b) It serves as tangible proof of recontextualizing gaming platform logic for textile design.	4c. Sub-theme: Methodological Validation

4. Discussion and Implications

This section discusses the findings presented above, interpreting their meaning and contextualizing them with academic literature to highlight broader implications for the field.

4.1 Motif Innovation as a Response to Market Stagnation

The findings from industry experts confirm the initial research hypothesis: the maturing *modest sporty casual* market faces a risk of aesthetic stagnation. The need for "something new" is no longer sufficiently answered by changes in silhouette or color but demands innovation at the level of motif and visual narrative. This finding aligns with the market analysis by (Rachmad, 2024) which states that product differentiation through digital motif innovation can significantly increase brand loyalty. Thus, the design intervention through *Cyber-Tech* motifs proposed in this study serves as a strong and relevant justification for meeting an identified market need.

4.2 Aesthetic Negotiation: Uniting Cyber-Tech with Modest Norms

The shift in designers' perceptions from skepticism to acceptance indicates a process of "aesthetic negotiation." This reflects how modest fashion designers actively adapt and recontextualize global trends for their specific audience. The challenge of translating the *Cyber-Tech* aesthetic to avoid being "awkward" was answered through controlled design execution. The implementation of Scratch as a design tool offers a practical solution for this negotiation process, as it allows for the design of complex patterns whose parameters can still be adjusted according to existing normative constraints (Fagerlund et al., 2021).

4.3 Design Democratization: Scratch as a Methodological Bridge

The validation from academics underscores this research's primary methodological contribution. By transferring Scratch from an educational context to professional design practice, this research fills the "middle ground" often overlooked in fashion technology discourse. This approach supports the democratization of computational design, enabling designers without deep coding backgrounds to experiment with algorithm-based creation. This lowers the technical barrier to entry, a crucial factor given that visual programming languages have been proven to effectively develop computational thinking across various disciplines (Denning & Tedre, 2021). Furthermore, this method demonstrates that generative design does not rely solely on complex engineering but can be achieved through accessible interfaces to produce sophisticated visual works (Regenwetter et al., 2022).

4.4 Synthesis and Research Implications

Beyond the immediate product, this study yields significant implications for three distinct sectors:

a) **For the Fashion Industry:** The findings offer a cost-effective, accessible workflow for brands to overcome aesthetic fatigue. By adopting accessible tools like Scratch, modest fashion brands can rapidly prototype *Cyber-Tech* or other algorithmic patterns, creating a unique "digital signature" that appeals to the tech-savvy Gen Z market.

b) **For Academia:** This research contributes to the discourse on "low-tech" innovation. It validates the concept that educational tools can be recontextualized for professional output, challenging the assumption that high-quality generative design requires expensive, proprietary software.

c) **For Design Education:** The study suggests a new pedagogical approach. Scratch is analyzed in scientific production primarily for STEAM education (Dúo-Terrón, 2023). Integrating this tool into fashion curricula can serve as a "soft entry" for students to learn algorithmic logic and computational thinking before advancing to complex CAD systems, bridging the gap between traditional craft and digital fabrication.

4.5 Limitations and Future Directions

While the results are promising, this study has limitations that must be acknowledged. First, the qualitative nature of the research relies on a relatively small sample size of nine experts. While the purposive sampling ensured high-quality insights, the findings may not be generalizable to the entire global modest fashion market. Second, the technical reliance on Scratch presents constraints regarding resolution and file export formats compared to professional vector-based generative software. Future research should explore the integration of this method with AI-driven curation tools or test the workflow on a broader range of textile surfaces to further validate its commercial scalability.

5. Conclusion

This research successfully validates the implementation of Scratch as an effective generative design method to address aesthetic stagnation in the *modest sporty casual* fashion market[1]. By recontextualizing visual block programming from education to professional practice, the study proves that innovation does not always require complex technology[2]. The findings confirm that the method generates original *Cyber-Tech* motifs with high visual complexity, achieving aesthetic coherence in the final product prototypes[3]. Academically, this work fills a gap regarding the commercial use of educational tools, while offering the industry an accessible workflow to democratize design innovation[4]. However, the study acknowledges limitations, particularly the raster-based output of Scratch which restricts scalability and the specific scope of the qualitative validation. To address these constraints, future research should first explore code-based platforms like Processing or p5.js for higher technical precision. Furthermore, a comparative analysis between Scratch-generated motifs versus AI-generated patterns is recommended to evaluate human-guided versus automated design[5]. Finally, the application of this method should be tested across broader market segments, specifically within modest high-fashion or performance sportswear[6].

References

Abdel Halim, M. S., Ibrahim, G. E., & Abdel Tawab, F. M. (2024). Utilizing Artificial Intelligence Technical to develop some Textile Craft Industries. *International Design Journal*, *14*(5), 43-63. https://doi.org/10.21608/idj.2024.372636

Abuhassna, H., Alnawajha, S., Awae, F., Adnan, M. A. B. M., & Edwards, B. I. (2024). Synthesizing technology integration within the Addie model for instructional design: A comprehensive systematic literature review. *Journal of Autonomous Intelligence*, *7*(5), 1-28. https://doi.org/10.32629/jai.v7i5.1546

Ayers, D., Leal, J. C., Hjartarson, B., & Alves, M. B. (Eds.). (2024). *Globalizing the Avant-garde* (Vol. 8). Walter de Gruyter GmbH & Co KG.

Carmona, M. (2021). *Public places urban spaces: The dimensions of urban design*. Routledge. Matthew Carmona, New York. https://doi.org/10.4324/9781315158457

Channi, H. K., Kaur, A., & Kaur, S. (2025). AI-driven generative design redefines the engineering process. *Generative Artificial Intelligence in Finance: Large Language Models, Interfaces, and Industry Use Cases to Transform Accounting and Finance Processes*, 327-359. https://doi.org/10.1002/9781394271078.ch17

Denning, P. J., & Tedre, M. (2021). Computational thinking: A disciplinary perspective. *Informatics in Education*, *20*(3), 361.

Dúo-Terrón, P. (2023). Analysis of scratch software in scientific production for 20 years: programming in education to develop computational thinking and steam disciplines. *Education Sciences*, *13*(4), 404. https://doi.org/10.3390/educsci13040404

Ensslin, A. (2022). *Pre-web digital publishing and the lore of electronic literature*. Cambridge University Press. https://doi.org/10.1017/9781108903165

Fagerlund, J., Häkkinen, P., Vesisenaho, M., & Viiri, J. (2021). Computational thinking in programming with Scratch in primary schools: A systematic review. *Computer Applications in Engineering Education*, *29*(1), 12-28.

Gauthier, F. (2024). Thinking Outside the West: Religious Change from the Nation-State to the Global-Market Regime. *Sociology of religion*, *85*(2), 123-145. https://doi.org/10.1093/socrel/srad004

Girard, A. (2024). History and Evolution of Fashion and Design in Different Regions and Periods in France. *International Journal of Fashion and Design*, *3*(1), 49-59. https://doi.org/10.47604/ijfd.2390

Gondoputranto, O., & Dibia, I. W. (2022). The use of technology in capturing various traditional motifs and ornaments: A case study of batik fractal, Indonesia and TUDITA-Turkish digital textile archive. *Humaniora*, *13*(1), 39-48. https://doi.org/10.21512/humaniora.v13i1.7408

Lee, N., & Suh, S. (2024). How does digital technology inspire global fashion design trends? Big data analysis on design elements. *Applied Sciences*, *14*(13), 5693. https://doi.org/10.3390/app14135693

Leone, M. (2024). Semiotics of the black box: on the rhetorics of algorithmic images. *Visual Communication*, *23*(3), 426-451. https://doi.org/10.1177/14703572241247120

Özdil, M. A. (2024). Dressing the Empire: Clothing, Identity, and Social Control in the Ottoman Millet System. *Lectio Socialis*, *8*(2), 99-134. https://doi.org/10.47478/lectio.1489487

Regenwetter, L., Nobari, A. H., & Ahmed, F. (2022). Deep generative models in engineering design: A review. *Journal of Mechanical Design*, *144*(7), 071704. https://doi.org/10.1115/1.4053859

Rashdan, W., & Ashour, A. F. (2024). Heritage-Inspired Strategies in Interior Design: Balancing Critical Regionalism and Reflexive Modernism for Identity Preservation. *Heritage (2571-9408)*, *7*(12). https://doi.org/10.3390/heritage7120316

Sáez-López, J. M., Román-González, M., & Vázquez-Cano, E. (2016). Visual programming languages integrated across the curriculum in elementary school: A two year case study using "Scratch" in five schools. *Computers & Education*, *97*, 129-141. https://doi.org/10.1016/j.compedu.2016.03.003

Walker, M., Phung, T., Chakraborti, T., Williams, T., & Szafir, D. (2023). Virtual, augmented, and mixed reality for human-robot interaction: A survey and virtual design element taxonomy. *ACM Transactions on Human-Robot Interaction*, *12*(4), 1-39. https://dl.acm.org/doi/pdf/10.1145/3597623