

AI-assisted collaborative clothing design: a framework for creative authenticity

Abstract

Generative artificial intelligence (AI) is increasingly making its way into fashion practice through the possibilities it offers for rapid visual ideation, variation, and experimentation. These capabilities extend the scope and pace of creative exploration, but their use in the development of functional apparel poses significant questions about design direction, technical accuracy, authorship, and creative authenticity. The present study investigates an integrated digital workflow that combines human creative judgment, AI-assisted visual ideation, Adobe Illustrator-based 2D vector development, and CLO 3D virtual prototyping to maintain individual design direction in structured outerwear. The study applied a qualitative, practice-oriented design research approach using an avant-garde blazer as the focal design case. The workflow involved human-led concept development, AI-assisted controlled variation, technical reconstruction in Adobe Illustrator, and 3D virtual prototyping and refinement in CLO 3D. The Collaborative Authenticity Framework (CAF) was developed through this process in three interconnected phases: Conceptual Anchoring, Algorithmic Expansion, and Digital Prototyping and Curation. Three design variables were examined through modifications to five garment components: lapels, collars, sleeves, closures, and garment proportions. The findings indicate that AI can broaden the design exploration space, but AI-generated visual outputs require human interpretation, selection, technical reconstruction, and refinement before they can function coherently within a structured garment-development workflow. The study therefore conceptualizes creative authenticity not as the absence of computational assistance, but as an active process through which the designer maintains meaningful control over conceptual direction, evaluation, technical transformation, and final curation.

Keywords: generative AI, human-AI collaboration, fashion design, creative authenticity, adobe illustrator, digital prototyping

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Introduction

Artificial intelligence (AI) is increasingly shaping creative practices, providing computational power to generate alternatives, analyze information, and support decision-making.¹ Within fashion design, these developments have created new possibilities for visual exploration, rapid iteration, trend analysis, and digital garment development.² Generative AI is particularly significant because it can produce novel visual and textual outputs in response to human instructions, enabling designers to explore multiple possibilities within relatively short periods.^{3,4}

Generative AI is increasingly influencing creative practices by providing computational systems that can produce and transform visual content rapidly. In fashion design, this capability can support ideation, visual experimentation, and exploration of alternative forms. However, the speed and variety of AI-generated outputs also raise questions about designer agency, authorship, and the preservation of an identifiable design direction.⁵

These questions are particularly relevant to structured outerwear, including tailored coats and blazers. Such garments depend on relationships among silhouette, lapels, collars, sleeves, closures, proportions, pattern geometry, and construction logic. A visually convincing AI image may therefore require substantial human interpretation before it can function as a technically coherent garment concept.⁶

Digital fashion technologies provide a bridge between conceptual and technical development.⁷ Adobe Illustrator supports controlled

2D vector development, while CLO 3D supports virtual garment construction and evaluation. Generative AI outputs, however, are primarily visual and may not contain the pattern geometry, seam information, or construction logic required for direct implementation.⁸

AI in creative industries has addressed productivity, creativity enhancement, authorship, and human-AI collaboration, while digital fashion research has examined tools such as Adobe Illustrator and CLO 3D.⁹ A practical gap remains in explaining how designers can move from AI-generated visual alternatives to controlled, technically interpretable garment development without losing human creative direction. This study addresses that procedural gap through the Collaborative Authenticity Framework (CAF), a practice-oriented process linking human conceptual development, AI-assisted variation, digital reconstruction, virtual prototyping, and final curation.

The study uses structured blazer design to examine how AI-generated alternatives can be explored while keeping selection, interpretation, and transformation under meaningful human control.

In this study, “avant-garde” is used as a design descriptor rather than as a claim that the garment belongs to a formally verified artistic movement. It refers here to a deliberately non-conventional treatment of tailored outerwear through asymmetry, exaggerated or layered collar/lapel forms, altered proportions, and contrasting structural details, while retaining a recognizable blazer foundation. This bounded definition makes the term operational for the present design case.

Research objectives

The objectives of this study are to:

- 1) Examine how designers maintain creative control and identity when using AI-generated design ideas.
- 2) Investigate the integration of Adobe Illustrator and CLO 3D in AI-assisted structured outerwear design.
- 3) Develop a framework for preserving designers' creative direction throughout human-AI collaboration.

Research questions

- 1) How do designers maintain creative control and identity when using AI-generated design ideas?
- 2) How can Adobe Illustrator and CLO 3D be integrated into AI-assisted structured outerwear design?
- 3) How can a practical framework support designers' creative direction throughout human-AI collaboration?

Literature review

Generative AI and fashion design

Generative AI has expanded the role of computational technologies in creative practice by producing visual and textual alternatives in response to human instructions.¹⁰ This capability is relevant to fashion design, where ideation involves exploring silhouettes, details, materials, proportions, color combinations, and stylistic references.²

AI applications in fashion have been associated with image analysis, trend exploration, visual generation, and other forms of computational support. Generative AI introduces a further distinction because systems can propose visual alternatives rather than merely analyse existing designs. These alternatives may accelerate exploration, but their usefulness depends on how they are interpreted and incorporated by designers.¹¹

The value of generative AI in fashion design therefore lies not in replacing design judgment, but in supplying alternatives that can be evaluated against conceptual and technical criteria within a human-led process.

Human-AI collaboration in creative practice

The transition from AI as a conventional computational tool to AI as a collaborative system has increased interest in human-AI creative practice.¹² In such settings, the human remains responsible for framing the problem, assessing outputs, and making consequential design decisions. The Human-in-the-Loop principle is particularly relevant to fashion because it preserves human control over the interpretation and refinement of generated ideas.^{10,13}

Human-AI collaboration can consequently be understood as a division of creative labor. AI contributes computational exploration and variation, whereas the designer contributes intention, interpretation, contextualization, technical knowledge, and final judgment.¹⁴

Creativity support and designer agency

Creativity-support technologies are intended to increase the range or speed of creative exploration. In fashion, AI can support this function by generating alternatives that a designer may not have considered independently. However, increased option generation does not necessarily increase creative agency.¹⁵ Agency depends on the designer's ability to establish parameters, interpret outputs, reject

unsuitable proposals, and transform selected ideas. The present study therefore treats AI primarily as a creativity-support mechanism within a human-led process.¹⁶

Creative authenticity, authorship and designer identity

Authenticity in creative practice is closely associated with questions of identity, authorship, originality, and intentionality.¹⁷ In fashion, a designer's identity may be communicated through recurring approaches to silhouette, proportion, construction, detailing, material selection, and visual language. Such characteristics may collectively form a recognizable design signature.¹⁸

Generative AI complicates conventional understandings of authorship because an AI system can produce visual content that appears highly resolved without possessing the designer's intentions.^{19,20} The designer's contribution may instead lie in defining the brief, selecting outputs, transforming them, and determining the final design direction.²¹

From this perspective, authenticity should not necessarily be defined as complete human exclusion of computational assistance. Instead, authenticity can be understood as a process in which the designer maintains meaningful control over conceptual direction, interpretation, technical transformation, and the outcome.²²

This perspective is particularly relevant to custom clothing, where individualization and design identity are central. Authenticity can therefore be examined through the traceable role of human decisions throughout the design process rather than solely through the origin of an individual visual element.

Digital fashion design: adobe illustrator and CLO 3D

The integration of two-dimensional and three-dimensional digital tools provides an important technical bridge between visual concepts and garment development.²³ Adobe Illustrator can support controlled vector drawings and technical representations, while CLO 3D can translate pattern information into virtual garments for examining construction, fit, proportion, and drape.²⁴

CLO 3D extends this process by converting two-dimensional pattern information into a virtual three-dimensional garment. For AI-assisted design, this relationship is valuable because generative outputs are primarily visual and may not include the pattern geometry or construction information required for direct production.²⁵

Research gap

The literature demonstrates growing interest in AI-supported creativity, generative fashion design, human-AI collaboration, and digital garment development. However, these areas are often examined separately, with limited attention to an integrated workflow connecting AI-assisted ideation, designer-led conceptual control, two-dimensional (2D) technical development, three-dimensional (3D) garment simulation, and final aesthetic curation.

Accordingly, the research gap is primarily procedural rather than technological. This study addresses the gap by proposing a structured workflow in which human-defined creative direction guides AI-assisted ideation, selected concepts are translated into technical designs using Adobe Illustrator and virtually prototyped in CLO 3D, and the resulting designs undergo human-led evaluation and final curation. This integrated approach provides a practical basis for examining how generative AI can expand design possibilities while preserving designers' creative control and individual design identity.

Methodology

Research design

This study adopts a qualitative, practice-oriented design research approach. The research investigates human-AI collaboration through the development and evaluation of a structured blazer design rather than through a quantitative assessment of consumer responses. The design process itself functions as the primary site of investigation.

The workflow involved a human designer establishing the initial concept, AI-assisted tools generating controlled alternatives, Adobe Illustrator supporting reconstruction and refinement, and CLO 3D enabling virtual prototyping. The analysis focused on design decisions, transformations, and the relationship between visual exploration and technical credibility.

Methodological scope and traceability. The unit of analysis was the design decision and its translation across stages, rather than the number of images produced or a measured user response. The available study record did not preserve the AI platform/model name, version, settings, exact prompt history, or a complete generation log. Therefore, the prompt examples in Section (Prompt documentation and reproducibility) are reconstructed, standardized templates derived from the documented design intentions and visible final design features; they should not be interpreted as verbatim historical prompts. We do not report the number of generated images because it cannot be verified from the available record.

Design case selection

An avant-garde blazer was selected as the focal garment. Structured outerwear was chosen because it combines substantial opportunities for aesthetic variation with significant technical constraints. Elements such as lapels, collars, closures, sleeves, darts, shoulders, proportions, and seam relationships must operate together to maintain visual coherence and garment structure.

The use of a single base garment also provided a consistent reference against which three subsequent design variables could be examined. This enabled the study to investigate controlled design variation rather than unrelated garment generation.

The blazer was selected because it makes the tension between visual experimentation and technical construction especially visible. Lapels and collars must relate to the neckline; sleeves must connect to the armhole and cuff; and front closures, pockets, darts, seams, and proportions must remain mutually coherent. The garment therefore provides a demanding but bounded case for all three objectives: observing designer control, tracing the Illustrator-to-CLO 3D workflow, and developing a repeatable collaboration framework. The single-case design supports analytical illustration of the process, not statistical generalization.

Human-led conceptual development

The process began with the development of the base blazer concept. The designer established its aesthetic direction, silhouette, proportions, and structural characteristics. This stage corresponds to the first CAF phase, Conceptual Anchoring, in which the design identity is defined before AI-assisted exploration begins.

Defining the conceptual parameters before AI-assisted generation provided an explicit human-authored baseline against which subsequent alternatives could be considered. The baseline therefore functioned as a reference point for evaluating conceptual alignment and stylistic coherence.

AI-assisted design expansion

Following conceptual development, AI-assisted tools were used to explore selected garment components. Rather than regenerating the entire garment without constraints, the process retained the core silhouette while varying lapels, collars, sleeves, buttons, closures, and proportions. The AI-assisted process was organized around three design variables involving five principal garment components: lapels, collars, sleeves, closures, and proportions. AI-generated alternatives were reviewed against the initial design direction, and unsuitable outputs were rejected or modified rather than treated as finished designs.

Outputs that conflicted with the intended design language or weakened the underlying tailored structure were not carried forward. AI-generated images were treated as exploratory propositions rather than final garment designs.

Prompt documentation and reproducibility

The prompt templates below document the design logic used to explore the base blazer and three design variables. Each template identifies the retained silhouette, the component to vary, the intended visual direction, and constraints aimed at maintaining tailoring coherence. Because the original prompt archive was not preserved, these templates are reconstructed from the available design description and final visual outputs; they support methodological transparency and partial replication but do not establish the exact prompts originally entered. The AI platform and model version were not recorded in the available study materials.

For future replication, researchers should preserve a prompt log that records the platform/model and version, date, settings or seed where available, number of outputs generated, selected output identifier, and rationale for accepting, modifying, or rejecting each output. These metadata are unavailable in the present study record and are not inferred retrospectively (Table 1).

Table 1 Reconstructed prompt templates and design constraints for the base blazer and three design variables

Design task	Reconstructed prompt template	Constraint / purpose
Base blazer / concept anchor	Create a front-and-back concept for an avant-garde tailored blazer. Keep a recognizable structured, semi-fitted blazer silhouette, defined shoulder line, fitted waist, long sleeves, welt pockets, and a coherent front closure. Use a restrained light body with charcoal contrast details. Show a clear front and back view.	Establish a stable base garment and visual language; avoid replacing the garment category.
Variable 1: lapel / crossover	Using the same base blazer, explore an asymmetrical crossover front with an exaggerated peak lapel. Vary lapel width and extension while retaining the shoulder line, sleeve shape, pocket placement, and overall tailored structure. Present a clean front and back technical-style view.	Vary lapel and closure expression while preserving core silhouette.

Variable 2: curved structure / collar	Using the same structured blazer, introduce a softer curved design language, a layered stand/mandarin collar, curved upper cuff edges, and coordinated sleeve details. Keep the neckline and collar join visually plausible and show front and back views.	Explore curved forms while prompting attention to collar–neckline continuity.
Variable 3: asymmetric closure / high collar	Using the base blazer as reference, explore an asymmetric front closure and a high stand collar with charcoal contrast panels, decorative buttons, welt pockets, fitted sleeves, and a back waistband. Preserve a coherent tailored silhouette and show front and back views.	Explore stronger proportion and closure changes without losing garment identity.

Adobe illustrator development

Adobe Illustrator was used to develop controlled two-dimensional vector representations. The base blazer was mapped using vector geometry, including proportions, dart placements, seam relationships, and construction information. Selected AI-assisted variations were interpreted and reconstructed within the vector environment. This step converted visual proposals into more controlled design representations and allowed the designer to adjust proportions, lines, component relationships, and construction details.

CLO 3D virtual prototyping

The developed two-dimensional patterns were transferred into CLO 3D for virtual garment construction. The patterns were arranged and stitched on a virtual avatar and subjected to digital material simulation. A heavyweight wool-blend material representation was used in the design process to examine the behavior of the structured blazer.

The heavyweight wool-blend representation was selected as a design-simulation choice because the study focused on structured outerwear. Compared with a light, fluid fabric representation, a heavier wool-like material provides a plausible visual basis for examining the blazer's body, lapel roll/stance, shoulder definition, and overall silhouette. In CLO 3D, the material properties can influence the appearance of drape, folds, and resistance to collapse; the selected material therefore helped assess whether the intended structured form remained visually legible. This rationale concerns virtual appearance only: no measured fabric parameters, physical swatch tests, or real-garment performance tests were reported, so the simulation should not be treated as validation of a particular wool blend.

The virtual environment enabled examination of garment drape, fit, shoulder structure, tension, and overall proportion. These observations were used to identify issues requiring further adjustment. CLO 3D was treated as a feasibility and refinement environment rather than evidence of physical garment performance.

Design evaluation

The AI-assisted variations were evaluated according to four interconnected criteria:

- 1) Conceptual Alignment: whether the variation remained consistent with the initial design direction.
- 2) Aesthetic Consistency: whether the variation strengthened or weakened the designer's identifiable visual language.
- 3) Technical Acceptability: whether the design could be represented and examined within the two-dimensional and three-dimensional digital workflow.
- 4) Human Creative Control: whether the designer retained meaningful responsibility for accepting, modifying, or rejecting the AI-generated proposal.

The analysis therefore focused on design decisions, transformations, and digital prototyping observations rather than statistical measurement or physical testing.

Decision rule. An output was accepted for further development when it aligned with the concept, strengthened the intended visual language, and could be translated into coherent 2D/3D garment representations. It was modified when its visual direction was useful but a component relationship, proportion, or construction detail needed correction. It was rejected when it disrupted the core silhouette, conflicted with the intended aesthetic, or could not be made sufficiently coherent through the documented digital workflow. These criteria were applied qualitatively by the designer; no independent panel scoring or quantitative reliability measure was conducted.

Control checkpoints across the workflow were:

- 1) Before generation, the designer defined the brief and base silhouette
- 2) During generation, the designer bounded variation to selected components
- 3) During review, the designer compared outputs with the conceptual and aesthetic criteria
- 4) During reconstruction, the designer corrected lines, proportions, and component relationships in Illustrator
- 5) During simulation, the designer inspected fit, drape, and structural appearance in CLO 3D
- 6) During curation, the designer retained responsibility for the final design. Thus, control was exercised through repeated decisions rather than through a single final approval.

Collaborative authenticity framework

Framework development

The Collaborative Authenticity Framework (CAF) was developed to provide a structured process for human-AI collaboration in fashion design. It links conceptual anchoring, algorithmic exploration, digital prototyping, and human curation so that AI expands possibilities without becoming the sole determinant of the final design.

Phase 1: Conceptual anchoring: Human-led

The designer establishes the initial concept, mood, silhouette, aesthetic identity, proportions, and key design principles. These characteristics provide the conceptual boundaries within which AI-assisted exploration subsequently occurs. The purpose of Conceptual Anchoring is to establish a recognizable creative starting point before algorithmic variation is introduced.

Phase 2: Algorithmic expansion: AI-assisted

AI is introduced to generate variations of selected design components. The core silhouette and principal conceptual

characteristics remain controlled by the designer while selected features are modified. In the present blazer application, these included lapels, collars, sleeves, closures, buttons, and proportions.

The resulting AI-generated alternatives are treated as exploratory propositions rather than final designs. The designer evaluates, filters, modifies, or rejects these alternatives according to conceptual and stylistic criteria.

Phase 3: Digital prototyping and curation: Human-AI synergy

Selected alternatives are translated into the digital garment-development workflow. Adobe Illustrator supports controlled vector development, while CLO 3D enables three-dimensional construction and simulation. At this stage, the designer evaluates the relationship

between visual intention and digital garment behavior. Unsuitable alternatives can be rejected or modified, while promising variations can be refined.

The final outcome therefore emerges through an iterative relationship between computational suggestions and human judgment, with authenticity located in the continuity of human-led decisions across the process.

Operational structure of the CAF

The framework consequently defines authenticity as an active process of human control rather than as a claim that every individual design element must originate solely from the designer (Table 2).

Table 2 Operational structure of the Collaborative Authenticity Framework (CAF)

CAF phase	Primary human role	AI role	Principal output	Authenticity checkpoint
Conceptual Anchoring	Establish concept, identity, silhouette, proportions, and design intent	No autonomous conceptual control	Base design direction	Designer defines the creative starting point
Algorithmic Expansion	Set parameters, interpret, select, modify, or reject alternatives	Generate controlled variations	Alternative design propositions	Designer determines which outputs enter the design trajectory
Digital Prototyping	Translate, construct, evaluate, and refine	Support visual exploration	2D and 3D design iterations	Technical and stylistic decisions remain human-led
Final Curation	Select and refine the final outcome	Provide alternative possibilities	Final design	Designer determines final aesthetic and construction decisions

Application and design findings

Decision trace: generated directions, revisions, and exclusions

The available documentation captures the selected design outcomes and two explicit technical problems but does not preserve

a complete archive of all generated images. The decision trace below therefore summarizes the alternatives and decisions supported by the documented process; it is not an exhaustive inventory of every output (Table 3).

Table 3 Decision trace of selected, modified, and rejected design directions

Design variable / proposal	Decision	Reason documented in the process
Variable 1: wider/exaggerated lapel and asymmetrical crossover	Selected and reconstructed	The selected form strengthened the visual presence while retaining the principal tailored structure; alternatives that weakened fit or conflicted with the intended aesthetic were not carried forward.
Variable 2: curved structure, layered stand collar; curved cuff	Modified before prototyping	The visual direction was retained, but the collar-neckline geometry was insufficiently resolved and required human adjustment in Illustrator before CLO 3D review.
Variable 3: asymmetrical closure, high stand collar, charcoal contrast	Selected and translated into digital garment	The designer retained changes that aligned with the intended formalwear/avant-garde direction and evaluated the relationship between closure, proportion, and 3D appearance.
Any alternative weakening fit, tailored coherence, or established design direction	Rejected / not carried forward	It did not satisfy the conceptual-alignment, aesthetic-consistency, or technical-acceptability criteria.

Base avant-garde blazer

The application began with an avant-garde blazer as the base garment. The designer developed its initial technical drawing in Adobe Illustrator, establishing the front and back views, principal

proportions, dart placements, seam relationships, and construction details (Figure 1). This two-dimensional design provided a consistent foundation for subsequent experimentation.

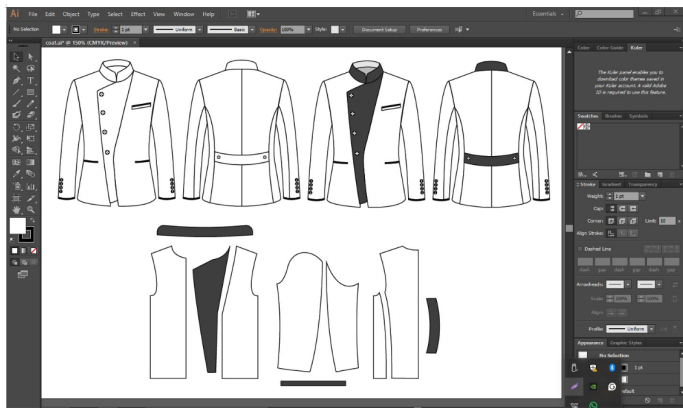


Figure 1 Adobe Illustrator technical flat of the base blazer, showing front and back views and the principal pattern components.

The two-dimensional patterns were transferred to CLO 3D, assembled and stitched on a virtual avatar, and examined for fit, drape, proportion, and structural appearance. The front and back views show the resulting virtual prototype and pattern layout (Figure 2) and (Figure 3), which served as a consistent reference for evaluating the subsequent design variables.

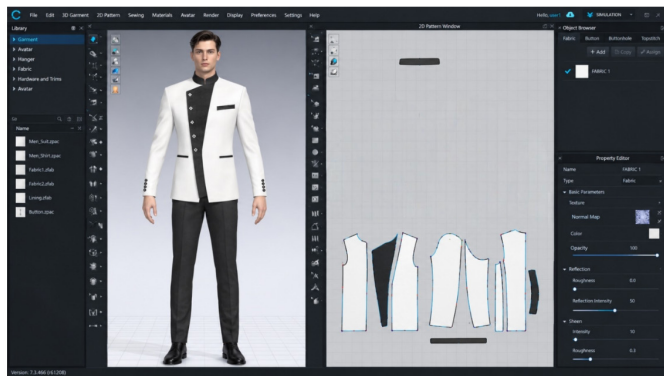


Figure 2 CLO 3D virtual prototype of the base blazer, front view, alongside the corresponding 2D pattern layout.

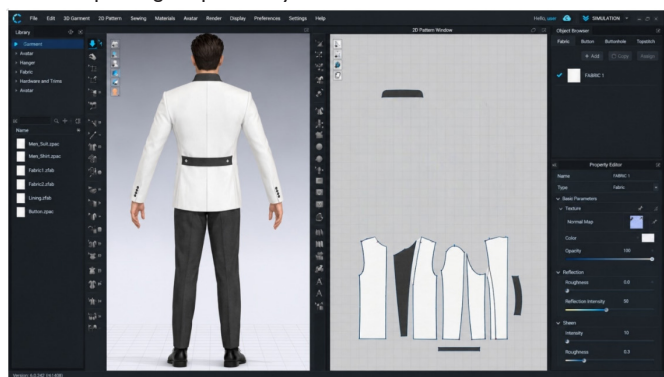


Figure 3 CLO 3D virtual prototype of the base blazer, back view, alongside the corresponding 2D pattern layout.

Variable 1: Asymmetrical crossover front and exaggerated peak lapel

The first variable retained a structured, semi-fitted silhouette while introducing an asymmetrical crossover front and an exaggerated peak lapel. AI-assisted manipulation was used to explore variations in lapel width. Several alternatives were generated from the original

design direction, after which the designer evaluated the alternatives in relation to the intended tailored and avant-garde aesthetic.

The selected variation extended the lapel beyond the shoulder line, creating a stronger visual presence while retaining the principal tailored structure (Figure 4). Alternatives that weakened the intended fit or conflicted with the established aesthetic direction were rejected.



Figure 4 First design variable: asymmetrical crossover front and exaggerated lapel, represented in front and back technical views.

The selected AI output did not provide the pattern geometry and seam information required for direct garment construction. The designer therefore reconstructed the proposal in Illustrator, translating its visual characteristics into controlled lines, proportions, and component relationships before examining the result in CLO 3D.

Variable 2: Curved structural language

The second variable retained a structured and slightly elongated tailored silhouette with a fitted waist and architectural foundation but introduced a softer visual language. The AI-assisted process explored curved rather than predominantly sharp structural lines. A layered mandarin collar with overlapping construction was introduced, accompanied by modified sleeve detailing.

The second variation introduced a curved upper cuff edge and multiple decorative buttons, adding visual emphasis while retaining the original design philosophy (Figure 5).



Figure 5 Second design variable: curved structural language with a layered stand collar, contrasting cuffs, and coordinated back detailing.

During technical translation, the AI-generated visual proposal did not adequately resolve the geometric relationship between the collar and neck opening. The designer adjusted the construction in Illustrator and then examined the revised form in CLO 3D, where the

curved sleeve and cuff relationships could be assessed as part of the virtual garment.

The available record does not establish whether this difficulty resulted solely from insufficient prompt detail, from the image-generation system's limitations, or from both. The reconstructed Variable 2 prompt above explicitly asks for a plausible collar–neckline join, but even a more explicit visual prompt cannot guarantee pattern-level geometry or construction accuracy. The observed issue is therefore reported as a limitation of the AI-assisted visual-to-technical translation, not as proof of a specific prompt failure. The designer's correction in Illustrator was the control point that resolved the issue for the subsequent virtual prototype.

Variable 3: Asymmetrical closure and high stand collar

The third variable introduced more substantial proportional changes while maintaining a relationship with the original structured blazer. The design incorporated an asymmetric front closure, high stand collar, structured silhouette, contrasting detailing, decorative buttons, welt pockets, fitted sleeves, and a back waistband.

AI-assisted exploration was used to investigate more radical proportional possibilities. The resulting alternatives were examined through the designer's technical tailoring knowledge and the CLO 3D environment. The design incorporated contrasting charcoal detailing and asymmetric panel relationships, while the digital prototype provided a means of examining the relationship between the closure, proportions, and three-dimensional garment appearance (Figure 6).



Figure 6 Structured mandarin collar with an asymmetric front closure and contrasting charcoal detailing; decorative buttons, welt pockets, fitted sleeves, and a back waistband contribute to a contemporary formalwear aesthetic.

This iteration demonstrates the complementary roles of AI and human expertise. AI enabled broader exploration of proportional possibilities, while the designer determined which changes remained consistent with the intended design language and translated them into a coherent digital garment.

Discussion

Human creative control in AI-assisted ideation

The first research question examined how designers can critically evaluate and control AI-generated ideas while safeguarding individual creative identity. The design iterations demonstrate that human control can be maintained through explicit decision points. The designer established the original concept before introducing AI, constrained the areas of variation, and subsequently evaluated the resulting alternatives.

Variable 1 provides a clear example. The AI generated multiple label variations, but the designer did not accept them automatically. Selected forms were reconstructed in Illustrator and then examined in CLO 3D, making the human contribution visible through selection, modification, and technical translation.

The designer's role consequently extends beyond generating visual possibilities to include defining criteria, interpreting outputs, resolving inconsistencies, and determining the final form.

Integration of adobe illustrator and CLO 3D

The second research question concerned the integration of two-dimensional vector development with three-dimensional digital garment modeling. The study demonstrates that these technologies provide complementary stages within an AI-assisted workflow. Illustrator supports controlled two-dimensional reconstruction, while CLO 3D enables virtual examination of the resulting garment. Together, they help identify differences between visual attractiveness and technical credibility.

This transition is important because visual acceptability alone does not establish garment feasibility. Tailored garments require relationships between pattern pieces, proportions, seams, closures, sleeves, collars, and three-dimensional volume. The Illustrator-to-CLO workflow therefore functions as a translation and evaluation mechanism between AI-assisted ideation and digital garment development.

The collar and neck-opening issue observed in Variable 2 further illustrates this relationship. The AI-generated visual proposal provided an aesthetic direction, but the geometric relationship required human reconstruction before it could be examined within the digital garment workflow. The example therefore highlights the continued importance of apparel-specific technical knowledge in AI-assisted design.

The evidence supports a process-level conclusion: the workflow made a mismatch visible and created an opportunity for correction. It does not establish that the resulting virtual garment would pass physical fitting, wear, durability, or production tests. Nor does the single-case analysis demonstrate that the CAF will produce the same benefits for all designers or AI systems.

The CAF as a human-AI collaboration model

The third research question asked how a practical model could support human creative control throughout AI-assisted custom clothing design. The CAF addresses this question by dividing the workflow into Conceptual Anchoring, Algorithmic Expansion, and Digital Prototyping and Curation. The first phase establishes the human-defined design direction. The second permits AI-assisted exploration within selected variables. The third translates and evaluates chosen alternatives before final curation. This sequence divides roles explicitly and helps prevent uncontrolled adoption of generated outputs.

Creative authenticity as a process

The findings suggest that creative authenticity in AI-assisted fashion design should not be understood as a binary condition in which a garment is either human-designed or AI-designed. Instead, authenticity can be considered through the relationship between intention, intervention, interpretation, and final authorship.

The AI-generated alternatives in this study did not independently determine the final designs. Their role was to expand the range of possibilities, while the designer retained responsibility for

interpretation, selection, reconstruction, and refinement. Authenticity is therefore associated with the process through which design decisions remain meaningfully human-directed.

This perspective positions creative authenticity as an active process rather than as a fixed property of a garment. Human authorship is expressed through conceptual definition, critical selection, technical transformation, and final curation.

Implications for fashion design practice

The proposed framework offers several practical implications for designers adopting generative AI. First, designers may benefit from establishing a clear conceptual foundation before introducing AI. This provides criteria against which generated alternatives can be assessed. Second, AI can be used selectively rather than indiscriminately. Instead of asking a generative system to determine an entire garment, designers can restrict exploration to specific components or variables. Third, integrating two-dimensional and three-dimensional digital tools provides a mechanism for translating visual ideas into more technically interpretable forms. Finally, documenting design decisions can make the human contribution more transparent by recording why outputs were accepted, modified, or rejected.

Limitations and future research

This study has several limitations. First, it is practice-oriented and centers on a single blazer, which limits the transferability of the findings. Second, the analysis is qualitative and does not provide statistical evidence or a large-scale assessment of designer or consumer responses. Third, CLO 3D provides virtual simulation rather than physical garment testing; digital observations should not be interpreted as evidence of manufacturing performance. Fourth, generative AI technologies continue to develop rapidly. The specific capabilities and limitations observed in this study may therefore change as AI systems evolve.

Future research should examine the CAF across multiple designers, garment categories, AI platforms, and physical prototypes, with expert evaluation and production testing where appropriate.

A further limitation concerns documentation: the original study record did not include a prompt archive, AI-system/version metadata, or a complete inventory of generated and rejected images. The prompt templates and decision trace reported here are reconstructed from the documented design intentions and outcomes, not treated as observed historical records. Future studies should retain timestamped prompts, generated outputs, selection rationales, and revision histories to support transparent replication.

Conclusion

This study investigated how generative AI can be incorporated into fashion design while maintaining the designer's individual creative direction. Using a qualitative, practice-oriented design process centred on a structured blazer, the study connected human-led conceptual development, AI-assisted variation, Adobe Illustrator vector development, and CLO 3D digital prototyping. The findings indicate that AI can broaden the design exploration space by rapidly generating alternatives, but those alternatives require human evaluation and technical translation before they can become coherent garment proposals.

In relation to RQ1, creative control can be maintained through deliberate evaluation and modification of AI-generated alternatives. In relation to RQ2, Adobe Illustrator and CLO 3D provide

complementary stages for translating visual proposals into technically interpretable digital garments. In relation to RQ3, the CAF provides a practical model for structuring human creative control. The principal contribution of the study is therefore conceptual and procedural. Rather than proposing AI as an autonomous designer, the CAF positions it within a bounded workflow in which human intention guides exploration and human judgment determines transformation and curation.

The study does not suggest that AI automatically preserves authenticity or that every AI-assisted design is original. Instead, it shows how authenticity can be supported when human intention, selection, transformation, and curation remain explicit throughout the workflow.

As generative AI becomes increasingly integrated into fashion design practice, future research should examine how such workflows operate across designers, garment categories, and production contexts. The central issue is not simply how many alternatives AI can generate, but how designers can use those alternatives while retaining a clear and accountable creative direction.

Given the single-case design and the reconstructed nature of the prompt templates, the CAF should be treated as a preliminary, testable workflow proposition rather than a validated general model. Replication across multiple cases, prospective recording of AI systems and prompts, and physical garment evaluation are needed to assess its broader applicability.

Ultimately, the integration of AI into fashion design need not be understood simply as a choice between technological automation and human creativity. The findings instead support the examination of how computational generation and human design expertise can be deliberately organized so that AI expands the possibilities of design while human intention remains central to the creative process.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

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