



AN APPLIED STUDY OF THE HYBRID WORKFLOW IN THE DIGITAL REPRESENTATION OF FASHION ILLUSTRATION

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Abstract: *This paper examines the representation of contemporary fashion collections through a hybrid workflow, analyzed on the basis of examples developed by students in the Fashion Design program. The study takes as its starting point the practical value of these visual approaches in the development of the fashion project, in the articulation of design variations, and in sustaining the overall coherence of a collection. Its main focus lies on the relationship between the expressive dimension of fashion illustration and the digital tools integrated successively into the process of representation.*

The workflow under examination includes four stages: hand sketching, vectorization in Adobe Illustrator, image processing in Adobe Photoshop and/or Procreate, and 3D prototyping in Style3D. The research is practice-based and relies on a comparative framework structured around five criteria: the authenticity of fashion illustration, the clarity of design variations, the spatial verification of garment form, the visual coherence of the collection, and the relationship between artistic expression and digital precision. Within this sequence, hand sketching establishes the expressive intention, vectorization organizes the formal structure, digital processing enhances the visual density of the image, and 3D prototyping enables the evaluation of the relationships between silhouette, volume, and the collection as a whole.

The analysis highlights the expanded role of fashion illustration within a contemporary design methodology in which representation actively supports the exploration, refinement, and verification of visual solutions. The contribution of the paper lies in proposing an applied perspective on hybrid representation that is relevant both to fashion design practice and to academic training in the field.

Key words: *creative process, hand drawing, fashion design, visual coherence, collection development.*

1. INTRODUCTION

Recent research dedicated to digital fashion shows that the representation of clothing collections has shifted from the sphere of final presentation toward that of the actual development of the project. A substantial part of international research focuses on those practices in which digital technologies intervene directly in sketching, product development, simulation, and the articulation of the collection image. Case studies devoted to designers who work entirely or predominantly in 3D environments demonstrate that digital tools are no longer perceived as a technical adjunct, but as a professional medium in its own right, capable of reorganizing the design process and the status of the author within it.

The practice of illustrating contemporary collections is defined by the circulation of the image across several working media. The sketch remains essential at the moment when the idea is formed, since it is here that the initial direction of the silhouette, the composition, and the



relationship between intention and gesture are established. The collection image no longer has an exclusively representational role, but becomes the place where the collection is visually explored [1]. The present research emerges from several years of pedagogical and practice-based observation conducted within the Industrial Fashion Design program at the Technical University of Moldova, where the curriculum of courses related to the digital environment is oriented toward the application of hybrid graphic representation methods aimed at preserving the author's imprint and authenticity. Within this context, the present study aims to identify the digital tools that prove effective in the development of visual representation and to examine how they can be integrated into a hybrid workflow without affecting the authenticity of fashion illustration.

2. THEORETICAL ASPECTS

The theoretical foundations of this study draw on the contributions of Hans Belting and W.J.T. Mitchell to image theory. Belting argues that images are inseparable from the medium that produces and transmits them, and that any change of medium entails a redefinition of the image itself [2][3]. Applied to fashion design, this perspective suggests that the transition from manual sketch to digital vector and 3D simulation is not merely a technical process, but rather a series of transformations through which the fashion image acquires successive layers of precision and spatial coherence, without the author's plastic intention dissolving at any stage. Mitchell, in turn, maintains that the image functions as an active form of thought [4]; in fashion design, this means that representation participates actively in the constitution of the collection rather than being limited to its documentation.

The term "*hybrid*" does not describe the simple juxtaposition of different techniques. Rather, it designates a mode of working in which the transition from one medium to another constitutes the continuation of the same cognitive process through a different technical configuration, without conceptual rupture. The digital image, understood as a processual entity, remains permanently open to revision and reorganization, and within the hybrid workflow this property extends beyond the digital medium to encompass the entire trajectory of the project, including the manual stages, which may be reactivated whenever the process calls for formal freedom [6]. Consequently, the continuous interaction between manual drawing, digital intervention, and three-dimensional simulation leads to the emergence of a hybrid graphic language in which the expressiveness of the artistic gesture is combined with the precision and flexibility of digital media. This form of representation belongs neither exclusively to traditional drawing nor entirely to digitally generated imagery, but is constituted as an intermediate visual language capable of preserving the author's imprint while simultaneously extending the possibilities for analysis and formal construction within the collection [7].

The central finding that underpins the present study emerges from research conducted over several years of academic practice in the training of young designers. Systematic observation and comparative analysis of the visual results produced through three working modes - exclusively manual, exclusively digital, and hybrid - have led to a general methodological argument: the hybrid workflow is the most effective in simultaneously meeting two essential requirements of fashion illustration, namely the preservation of the author's imprint and the achievement of superior visual expressiveness. Works produced exclusively through digital means showed a recurrent tendency toward stylistic uniformity, while those created exclusively by hand preserved individual imprint but limited the possibilities for analysis and did not allow for the spatial verification of form. Didactic observation also confirmed that the moment at which the digital medium is introduced is decisive: when introduced before sketching, it directs formal decisions before the idea has fully matured;



when introduced afterward, it becomes a tool for developing an already personalized intention, in keeping with Kevin Tallon's observation that digital tools should serve the gesture rather than replace it [5] [8].

3. APPLIED STUDY: THE HYBRID WORKFLOW MODEL

The applied study confirms that the effectiveness of digital tools depends less on their complexity and more on the position they occupy within the sequence of stages. When the digital medium is introduced too early, there is a risk that the image becomes structured before the idea has fully matured. When it is introduced after the manual execution of the sketch, the relationship changes: the drawing preserves its distinctiveness, while digital intervention assumes the role of clarification, development, and control. For this reason, the applied research has focused on testing a hybrid model in which manual sketching, scanning, 2D digital processing, and 3D simulation form successive stages of the same visual construction [6].

3.1. Hand sketching as the foundational stage

The first stage in developing the model remains manual work. This choice does not stem from a sentimental attachment to traditional drawing, but from the observation that the authenticity of the gesture what, in studio language, may be called the designer's imprint is preserved most faithfully in the sketch. In the initial drawing, the rhythm of the line, the degree of body stylization, the way compositional accents are distributed, and the energy of the first formal attempt become more clearly visible (fig.1). Research on the ideation process confirms that, at this stage, sketching functions simultaneously as a cognitive and visual instrument, offering a space for the exploration and testing of ideas before they undergo more rigorous processing [6]. This stage is decisive in shaping an individual visual position, since it compels the student to formulate an initial formal solution before entering the phase of correction, refinement, and digital finishing.

3.2. Digital processing in Adobe Photoshop and Procreate

Photoshop and Procreate operate through raster and layer-based systems, oriented toward the manipulation of visual values color, texture, and light within a flexible framework that allows gradual and non-destructive intervention. The focus shifts toward the visual depth of the image: color, texture, light, emphasis, and atmosphere. Customizable brushes and the layer mask system support flexible editing, in which areas can be hidden, revealed, and progressively adjusted without destroying the original layer. It is precisely this flexibility that makes it possible to preserve continuity with the hand sketch: the scanned line is not erased, but reworked and further developed (fig.1). Photoshop and Procreate prove effective where the image requires expressive density, confirming that the visual surface alone does not resolve the problem of the concept, but must remain consistent with the structure already formulated.

3.3. Vectorization in Adobe Illustrator

Adobe Illustrator operates through a vector-based system grounded in mathematical curves and control points, enabling the precise construction and adjustment of forms independent of resolution. The program becomes useful when the drawing needs to be structurally stabilized and translated into a form that allows precise intervention. The *Image Trace* function facilitates the conversion of raster sketches into editable vector graphics, transforming hand-drawn lines into scalable curves characterized by contour clarity and by the possibility of accurately adjusting forms, proportions, and relationships between elements (fig.1). This stage serves a role of ordering and

formal clarification: it does not erase the individuality of the original sketch, but rather gives it geometric coherence and greater usability in the process of analysis, systematic comparison, and the development of design variants [9].

3.4. 3D Prototyping

The three-dimensional stage, carried out in Style3D, was introduced as a means of spatial verification. The program's ability to work with patterns, avatars, materials, and physical simulations makes it useful for testing how well the two-dimensional image holds up when transferred into volume [10]. This stage fulfills a clear function: to demonstrate that the illustration developed in 2D remains coherent in relation to the body, proportion, fabric drape, and the actual tension of the construction. Where the sketch and digital image suggested a promising solution, the 3D simulation either confirmed it or required a critical return to the previous stages (fig.1). This feedback function is one of the most valuable contributions of the hybrid model: it prevents premature fixation on a two-dimensional solution that later proves formally or materially unsustainable when translated into three dimensions.

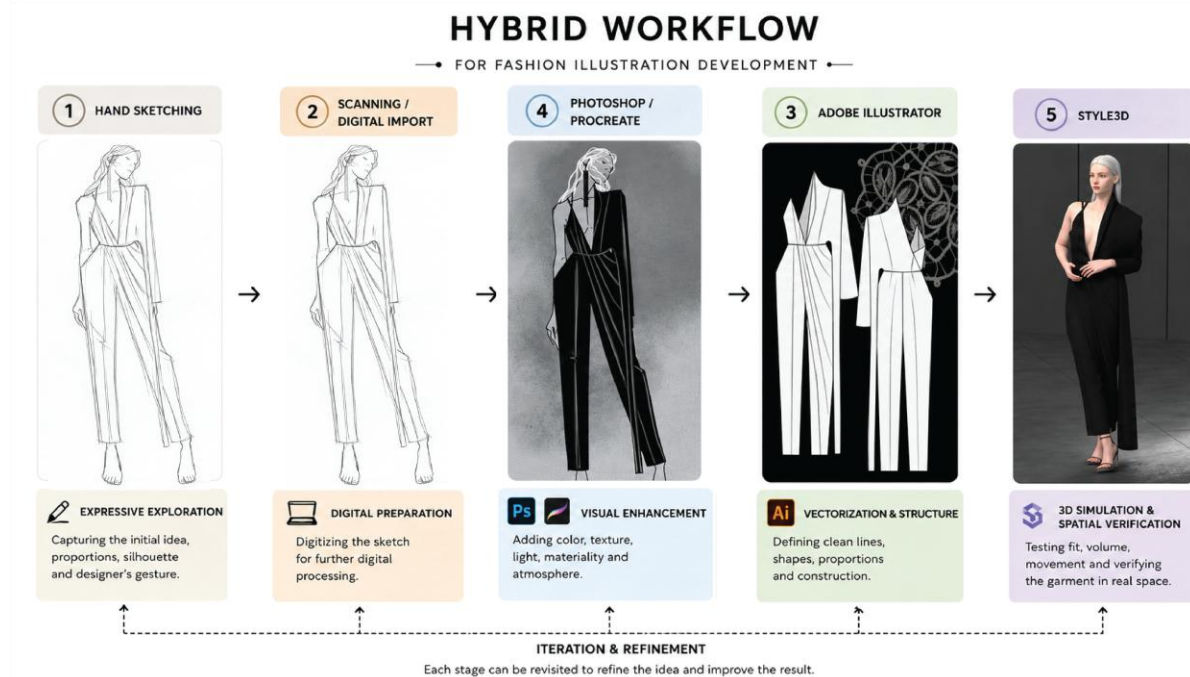


Fig.1 Hybrid workflow in the digital representation of fashion illustration

4. RESULTS AND DISCUSSION

The results of the applied observations showed that the effectiveness of digital technologies in fashion illustration depends less on their technical complexity than on the way they are integrated into a coherent workflow. When used separately, each tool provides only a partial response to the demands of representation. By contrast, the articulation of hand sketching, vectorization, digital image processing, and 3D simulation into a logical sequence generates a more complete working process, capable of supporting the exploration, comparison, refinement, and verification of visual solutions at the same time.

A first important result concerns the authenticity of fashion illustration. Comparative observations showed that the author's imprint is best preserved when the process begins with manual sketching and digital tools are introduced only afterward. At this initial stage, the energy of the line, the rhythm of the composition, and the individual character of the image are established. When the digital medium intervenes too early, there is a risk that the representation becomes prematurely formalized and less personal.

With regard to the clarity of design variations, Adobe Illustrator and Photoshop/Procreate proved essential for the development and comparison of visual alternatives. Vectorization contributed to the organization and clarification of the sketch structure, while raster-based processing allowed the rapid testing of chromatic, textural, and atmospheric variations. This flexibility made it possible to evaluate several options within the same workspace, reducing the risk of premature fixation on a single solution (fig.2).



Fig.2. Fashion illustrations created through a hybrid workflow, from hand sketches to processing in Adobe Photoshop/Procreate, produced by Turcu Victoria, student in Industrial Fashion Design.

Another relevant result concerns the spatial verification of garment form through Style3D. Three-dimensional simulation enabled the testing of the relationship between silhouette, body, proportion, and material behavior, revealing situations in which a visually convincing 2D solution required adjustment once translated into volume. Therefore, the 3D stage does not replace the physical prototype, but it introduces a useful intermediate form of verification that reduces the analytical risk of premature materialization. At the same time, the simulation environment allows the designer to evaluate the coherence between image, volume, and material behavior before the realization of the physical garment, contributing to a more controlled and analytically grounded design process. (fig. 3).



Fig 3. Fashion illustrations created through a hybrid workflow, from hand sketches to processing in Adobe Illustrator/Photoshop and three-dimensional simulation in Style3D, produced by Industrial Fashion Design students Efros Marialina and Leviçhi Cristina.

The hybrid workflow also proved effective in maintaining the visual coherence of the collection. The continuous transition between media facilitated the evaluation of relationships among garments, compositional rhythm, graphic accents, and the overall atmosphere. In this way, the process supported not only the development of individual images, but also the construction of a unified collection identity.

At the same time, the results showed that the hybrid model enables a balanced relationship between artistic expression and digital precision. The sketch preserves spontaneity and authorial character, while digital tools introduce clarity, control, and the possibility of revision. The effectiveness of this model does not lie in replacing drawing with technology, but in the fact that each medium complements the function of the other.

Another significant finding concerns the methodological importance of the sequence itself. The observations showed that the hybrid workflow becomes most effective when the stages follow a progression from intuition to control: hand sketching as a space of exploration, vectorization as structural clarification, digital processing as expressive enhancement, and 3D simulation as spatial verification. When this sequence is altered, the process tends to lose coherence, as the image may become technically resolved before the concept has been sufficiently developed. This confirms that the value of the hybrid model lies not only in the combination of tools, but also in the logic of their successive use.

From a pedagogical perspective, these results are equally relevant. In academic training, students often associate digital tools with professional finish and visual accuracy; however, the study showed that technical refinement alone does not guarantee a strong fashion image. The most successful outcomes were those in which students were able to preserve their conceptual intention while moving across different media. In this sense, the hybrid workflow supports not only the production of more coherent representations, but also the development of critical judgment, helping



students understand when to sketch freely, when to refine, and when to verify their ideas through digital means.

Compared with exclusively manual or exclusively digital methods, the hybrid workflow proved superior because it combines the expressiveness of gesture with the analytical advantages of digital media. Consequently, the results confirm that hybrid representation should be understood not as a simple sequence of tools, but as an integrated method in which each stage plays a distinct and necessary role in the development of the fashion project.

5. CONCLUSIONS

The applied study conducted within the framework of university teaching practice in the Industrial Fashion Design program at the Technical University of Moldova confirms, through systematic observation and multi-year comparative analysis, that the hybrid workflow model - hand sketching, vectorization in Adobe Illustrator, processing in Photoshop/Procreate, and prototyping in Style3D produces fashion representations that are more complete, more analytical, and more spatially verifiable than the isolated use of any of these tools. This conclusion is not theoretical but empirical: it results from the direct comparison of the visual outcomes obtained by students through the three working methods investigated.

From the perspective of preserving the author's imprint, the study confirms that hand sketching is the irreducible stage of any authentic representational workflow. The energy of the gesture, the productive imprecision of the line, and the compositional tension of the first attempt cannot be reproduced by any digital interface without losing precisely what makes them valuable. Subsequent digital intervention vectorization, raster processing, and 3D simulation does not replace this value, but rather continues and amplifies it, adding levels of clarity, expressive density, and spatial verification that manual gesture alone cannot sustain without compressing its own freedom.

The integration of digital methods into the development of fashion collections does not imply the abandonment of graphic tradition, but its extension through technological means that enhance the capacity for analysis, refinement, and visual communication. The real effectiveness of these tools does not depend on their degree of sophistication, but on the designer's critical position toward the medium: the risks of digitalization stylistic standardization, dependence on presets, and detachment from materiality systematically emerge when the tool is treated as a substitute for aesthetic judgment. When subordinated to artistic intention and critical discernment, the same digital medium can intensify precisely those qualities that fashion design consistently requires: clarity, coherence, flexibility, and expressiveness.

The pedagogical implications of this research are direct and immediately applicable. The development of digital competencies, in the absence of a solid foundation in artistic education, risks producing efficient software users whose visual voice remains fragile. The relevant competence in contemporary fashion design does not lie in the advanced technical mastery of a single tool, but in the ability to know what one is seeking and to construct meaningful transitions between different media while preserving the conceptual coherence and visual authenticity of the project throughout the entire workflow. In this sense, the proposed hybrid model is not merely a position shared by international practice, but a conclusion validated locally through years of didactic observation within a specific context of academic training.

Future research directions include the comparative testing of the hybrid model across different educational programs and professional contexts, the development of assessment tools calibrated to the three parameters identified in the present study, and the investigation of how generative tools based on artificial intelligence may be responsibly integrated into hybrid workflows



without compromising the designer's critical and curatorial agency. In all of these directions, the fundamental conclusion of this research remains valid: high-quality fashion representation does not result from tools themselves, but from the designer's ability to orchestrate them coherently in the service of an original visual intention.

REFERENCES

- [1] Särmäkari, N., & Vänskä, A. (2022). 'Just hit a button!' – fashion 4.0 designers as cyborgs, experimenting and designing with generative algorithms. *International Journal of Fashion Design, Technology and Education*, 15(2), 211–220. <https://doi.org/10.1080/17543266.2021.1991005>
- [2] Belting H., *An Anthropology of Images*. Princeton: Princeton University Press, 2011, pp. 9-14.
- [3] McKelvey, K.,; Munslow J, *Fashion Design: Process, Innovation and Practice*, 2nd ed., Wiley-Blackwell, Oxford, 2012.
- [4].Mitchell, W.J.T., *Picture Theory: Essays on Verbal and Visual Representation*, University of Chicago Press, Chicago, 1994.
- [5]Cross, N. *Design Thinking: Understanding How Designers Think and Work*. 1st ed., Oxford, Berg, 2011.
- [6] Habib A, Akter S, Akter F, et al. *Hybrid digital fashion illustration: techniques and innovations in the contemporary fashion design process*. *J Textile Eng Fashion Technol*. 2025; 11(6):329–335. DOI: 10.15406/jteft.2025.11.00441.
- [7] Spagnoli, Alessandra & Fabro Cardoso, Gabriela. (2023). *Dematerializing fashion. Improving design-led sustainable and hybrid retail experiences via digital twins*. Researchgate DOI:[10.26530/9789401496476-073](https://doi.org/10.26530/9789401496476-073)
- [8] Amalia Drakou, Evridiki Papachristou, Theodore Tarnanidis, Nikolaos Bilalis. (2024). *Transforming Fashion Education: The Impact of AI-Driven 3D Design on Learning, Creativity, and Sustainability*. In Proceedings of the 13th Hellenic Conference on Artificial Intelligence (SETN '24). Association for Computing Machinery, New York, NY, USA, Article 59, 1–6. <https://doi.org/10.1145/3688671.3688794>
- [9] Zheng, J., Potamias, R. A., & Zafeiriou, S. (2024). *Design2cloth: 3d cloth generation from 2d masks*. In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (pp. 1748-1758).
- [10] Florea-Burduja, E., Cangaș, S., & Burduja, V. *Digital fashion—a sustainable alternative for the future*. *Journal" Annals of University of Oradea. Fascicle of Textiles, Leatherwork*, 26(2), 39-42. https://textile.webhost.uoradea.ro/Annals/AUO_FTL_Vol%2024_no%201_2023.pdf