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Tumpal Futura: A Transmedia Adaptation of Futuristic Batik Design Concepts into a Scratch Education Game

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Abstract: The relevance of Batik for the new generation faces challenges due to the perception that tends to be static and bound to the past. This research addresses this challenge by conducting a transmedia adaptation of a futuristic Batik design concept, "Tumpal Futura", which is realized into an interactive educational game using the Scratch platform. Through the ADDIE framework and thematic analysis from in-depth interviews with nine experts, this research found that the fusion of cultural heritage with avant-garde aesthetics creates a powerful paradox and is effective in attracting young audiences. It was identified that the main challenge in the adaptation process was not visual replication, but rather the conceptual translation of the motif's philosophy into game mechanics. Furthermore, this study affirms that the success of a digital pedagogy tool lies not in its interactivity alone, but in its ability to provide a rich narrative context. This research successfully presents a model of a complete creative process for revitalizing cultural heritage through transmedia storytelling.

Keywords: Cultural heritage, futuristic design, transmedia adaptation, educational game, designer

1. Introduction

The contemporary fashion design paradigm operates at the dynamic intersection of technological innovation, cultural heritage and ecological awareness (Zhang & Shen, 2024). No longer limited to aesthetics and seasonal trends, the field is now championing a more holistic and interdisciplinary approach. According to Ma'ruf (2026) researchers and designers around the world are exploring digital fabrication, smart textiles and circular economy models not just as novelty, but as essential tools for creating narrative-driven experiences that resonate with a global, conscious audience. This shift positions sartorial artifacts as a potent medium for communication, capable of encapsulating complex ideas ranging from sustainable practices to the revitalization of cultural identity (Basaraba, 2022). In the context of Indonesia's fashion landscape, the research problem arises when observing the utilization of the archipelago's wastra in modern clothing (Asri, 2022). As a canvas to showcase the beauty of Batik, but its application is often limited to conventional decorative functions. There is a void for a more radical exploration, an attempt to synergize the deep philosophy of Batik motifs with futuristic aesthetics. Based Ardhianto et al. (2025), the main challenge is how to transform Batik from a static heritage image into a relevant visual language for the future.

This research answers that challenge by not only applying the motif, but reinterpreting the philosophy of the Tumpal motif-which symbolizes beginning and direction-into a futuristic design concept (Fitra et al., 2025). This research gap becomes more apparent when mapped against international scholarly debates. In France and the United States, the fashion-technology discourse is dominated by digital couture and augmented reality that focus on high-tech materiality, but are often divorced from the philosophical roots of traditional handicrafts (Wilkinson, 2022). In Germany, with its strong Bauhaus heritage, the focus is on technical textiles and sustainable engineering that prioritize function, but tend to explore less the integration of cultural symbolic narratives (De Medici et al., 2025). While countries with a rich textile

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heritage such as Turkey focus on digital archiving, and Russia with its avant-garde tradition excels in the exploration of form, no one has documented a full project lifecycle: from the philosophical reinterpretation of a traditional motif into a futuristic fashion artifact, to adapting it into an interactive digital educational medium. This article fills that processual and pedagogical gap (Protopappas, 2025).

To realize this digital adaptation, the Scratch application was chosen as the medium for developing the game "Getting to Know the Kinds of Batik in Indonesia" (Pratiwi et al., 2025). The choice of Scratch was based on some of its significant pedagogical advantages. As a block-based visual programming platform, Scratch removes complex technical barriers, allowing full focus on designing the narrative and interactivity of the game (De Oliveira, 2018). Its accessible and intuitive nature is ideal for creating a fun learning experience for the younger generation, who are the primary target audience in this cultural revitalization effort (Bowers, 2006). Through this game, the specific "Tumpal Futura" concept acts as a gateway to introduce players to the rich variety of other Batik motifs in Indonesia, transforming a couture design concept into an interactive and widespread cultural literacy tool.

To answer the challenge and fill the research gap, this research aims to build a futuristic fashion artifact as a conceptual foundation. Systematically, the objective of this stage is to develop the process of applying Batik within the framework of futuristic design, supported by the identification of relevant natural materials to realize the concept of futuristic Batik with Tumpal motif. Finally, this research analyzes the aesthetic result and uniqueness of the futuristic basic design with the Tumpal motif. The fashion artifact that resulted from this process then became the starting point for the main focus of the research: transmedia adaptation into an educational game.

2. Methods

This study used the ADDIE (Analysis, Design, Development, Implementation, Evaluation) instructional design model as the methodological framework (Spatioti et al., 2022). The ADDIE model was chosen for its systematic and structured nature, which is highly relevant to guide the product creation process from the conceptualization stage to the final evaluation (Abuhassna et al., 2024). This approach allows researchers to carefully navigate the transmedia adaptation process, from the analysis of the futuristic Batik design concept to the development and evaluation of Scratch-based educational games. Each stage in this model has a specific focus and purpose, which collectively ensure that the final product produced is valid, effective, and in line with the research objectives.

The ADDIE model also provides flexibility for continuous refinement throughout the development process, allowing feedback obtained at each stage to inform subsequent revisions and improvements (Reinbold, 2013). In the context of this study, the model facilitated the integration of educational objectives, cultural content, and digital game design principles into a coherent development framework. Through a sequential yet iterative process, researchers were able to identify learners' needs, design appropriate instructional strategies, develop engaging game features, implement the product in a learning environment, and evaluate its effectiveness in achieving the intended learning outcomes. This systematic approach ensured that the educational game was not only technically functional but also pedagogically sound and culturally relevant for elementary school students.

Furthermore, the use of the ADDIE model supported the alignment between the game content and the targeted competencies related to cultural literacy and digital learning. Each phase generated outputs that served as the foundation for the next phase, creating a logical progression from needs analysis to product validation. By incorporating expert feedback and user evaluation throughout the development cycle, the model contributed to enhancing the quality, usability, and instructional effectiveness of the final product. Therefore, the ADDIE framework was considered particularly suitable for developing a Scratch-based educational game that introduces students to the diversity of Indonesian batik through an interactive and engaging learning experience.

2.1 Analysis

In this initial stage, researchers conducted a comprehensive needs analysis to identify core issues and formulate the foundation of the project. The analysis focused on three main areas:

a. the urgency of presenting the Batik narrative in a format relevant to the digital generation;
b. the potential of the futuristic design concept, which touches on the avant-garde, as the main attraction to reintroduce cultural heritage; and
c. the technical and pedagogical feasibility of the Scratch platform as an adaptation medium.

To collect data at this stage, the researcher used an instrument in the form of semi-structured interviews.
Research participants were purposively selected to gain a holistic perspective, consisting of three groups.

1) Fashion Industry Expert: Provided insights into trends, market relevance and audience perceptions of tradition-based fashion innovations.
2) Design Practitioner: Provides a technical insight into the creative process, the challenges in realizing the futuristic concept, and the visual potential of the Tumpal motif.
3) Academics (Design and Education): Provides a theoretical foundation on design semiotics, avant-garde principles, and effective pedagogical approaches for cultural education through digital media.

The qualitative data collected from the interviews was then analyzed using the thematic analysis method. This process involved codifying the data, identifying recurring patterns, and formulating key themes that formed the basis for decisions in the later stages of design.

2.2 Design

Based on the findings from the thematic analysis, the design stage focused on designing a blueprint for the educational game product. Activities at this stage include:

a. the formulation of specific learning objectives for the "Getting to Know the Different Types of Batik in Indonesia" game;
b. the creation of a storyboard detailing the narrative flow and user experience, with the concept of "Tumpal Futura" as the opening gate;
c. the design of the user interface and user experience; and
d. the development of visual style guides for all digital assets (characters, backgrounds, and icons) that reflect the conceptualized futuristic aesthetic.

The prototype design process emphasized the alignment between educational objectives, cultural content, and interactive game mechanics to ensure meaningful learning experiences. During this stage, particular attention was given to integrating authentic representations of Indonesian batik motifs into the game environment while maintaining an engaging futuristic theme. The resulting prototype served as a comprehensive reference for the subsequent development phase, providing detailed specifications regarding gameplay structure, navigation flow, visual elements, learning activities, and assessment features. By establishing a clear design framework, the prototype ensured consistency in the development of the educational game and facilitated the effective translation of instructional goals into an interactive digital learning medium. That exist on this figure 1.

2.2.1 Prototype Design

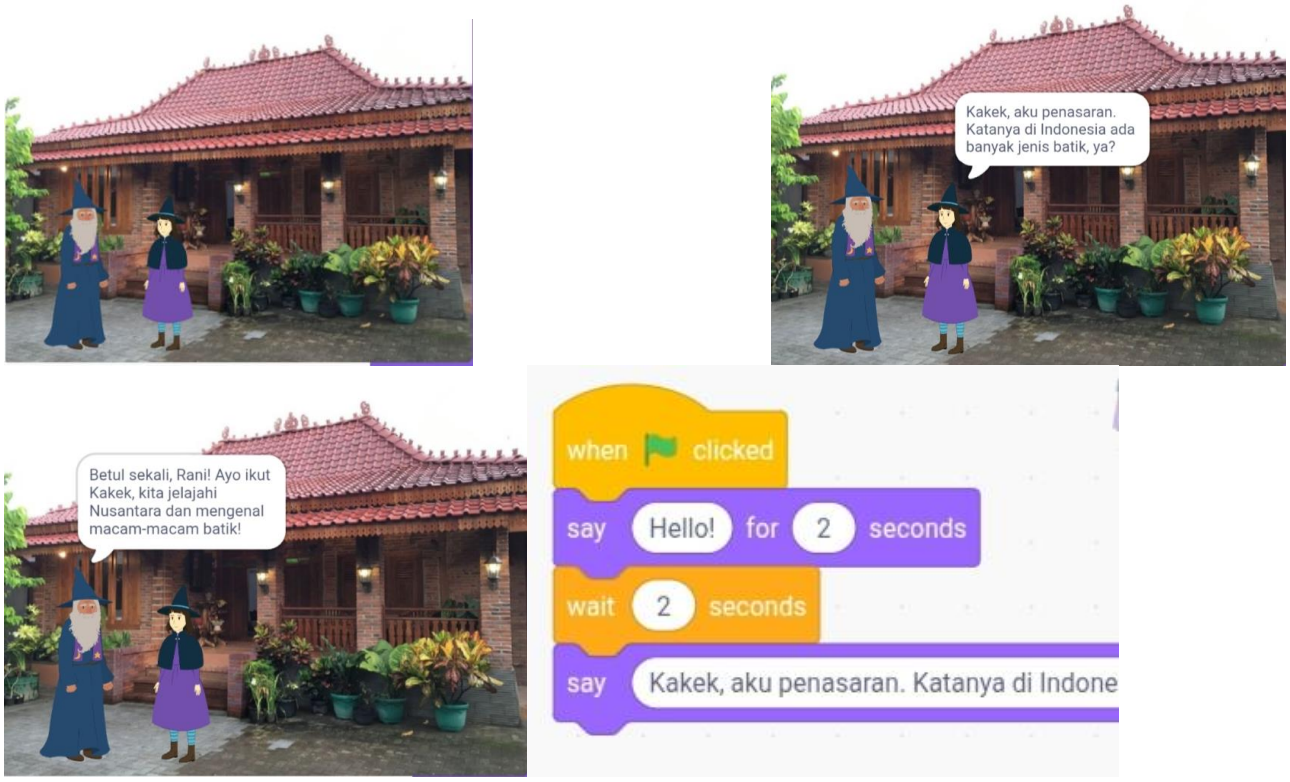

Figure 1. Prototype Design

2.3 Development

At this stage, the design blueprint is realized into a functional product. The research team developed visual assets in accordance with the style guide shown on Figure 2. Design Development. Next, all the assets were integrated into the Scratch platform. The programming process was carried out by compiling visual code blocks to build game mechanics, interactivity systems, narrative flow, and assessment systems in accordance with the storyboard and functional design. The result of this stage is a prototype of the educational game "Getting to Know Various Batik Nusantara" that is ready

to be implemented and tested as shown in Figure 2. Throughout the development process, iterative testing was conducted to ensure that each game component functioned properly and provided a seamless user experience. This process involved checking the accuracy of navigation features, validating the responsiveness of interactive elements, and ensuring that the educational content was presented correctly within the gameplay environment. Several revisions were made to improve visual consistency, optimize game performance, and enhance user engagement based on the results of internal evaluations. Furthermore, special attention was given to balancing entertainment and educational aspects so that learners could acquire knowledge about Indonesian batik traditions while actively participating in enjoyable game activities. The completed prototype integrated instructional content, visual storytelling, and interactive challenges into a cohesive learning environment, making it suitable for classroom implementation and further evaluation in the subsequent research stages. To further enhance the educational value of the game, several instructional features were incorporated into the prototype. These features included informational panels introducing the history and characteristics of various Indonesian batik motifs, guided learning sequences, and interactive quizzes designed to assess students' understanding after completing each learning section. The content organization followed a gradual progression from basic to more complex concepts, enabling learners to build their knowledge systematically while maintaining engagement throughout the gameplay experience.

Moreover, the development process emphasized usability and accessibility considerations to ensure that the game could be easily operated by elementary school students. User interface elements, such as buttons, icons, text displays, and navigation menus, were designed to be visually clear and intuitive. The use of colorful graphics, animations, and immediate feedback mechanisms was intended to sustain learners' attention and encourage active participation. These design considerations were aligned with principles of game-based learning, which emphasize learner interaction, motivation, and meaningful engagement with educational content.

The final prototype represented the integration of cultural education and digital technology in an interactive learning medium. By combining authentic batik content with engaging game mechanics, the product was expected to foster students' appreciation of Indonesia's cultural heritage while simultaneously supporting the achievement of learning objectives. Consequently, the developed game served as both an instructional tool and a cultural learning resource, providing a foundation for subsequent implementation, validation, and effectiveness evaluation with the target users.

2.3.1 Design Development

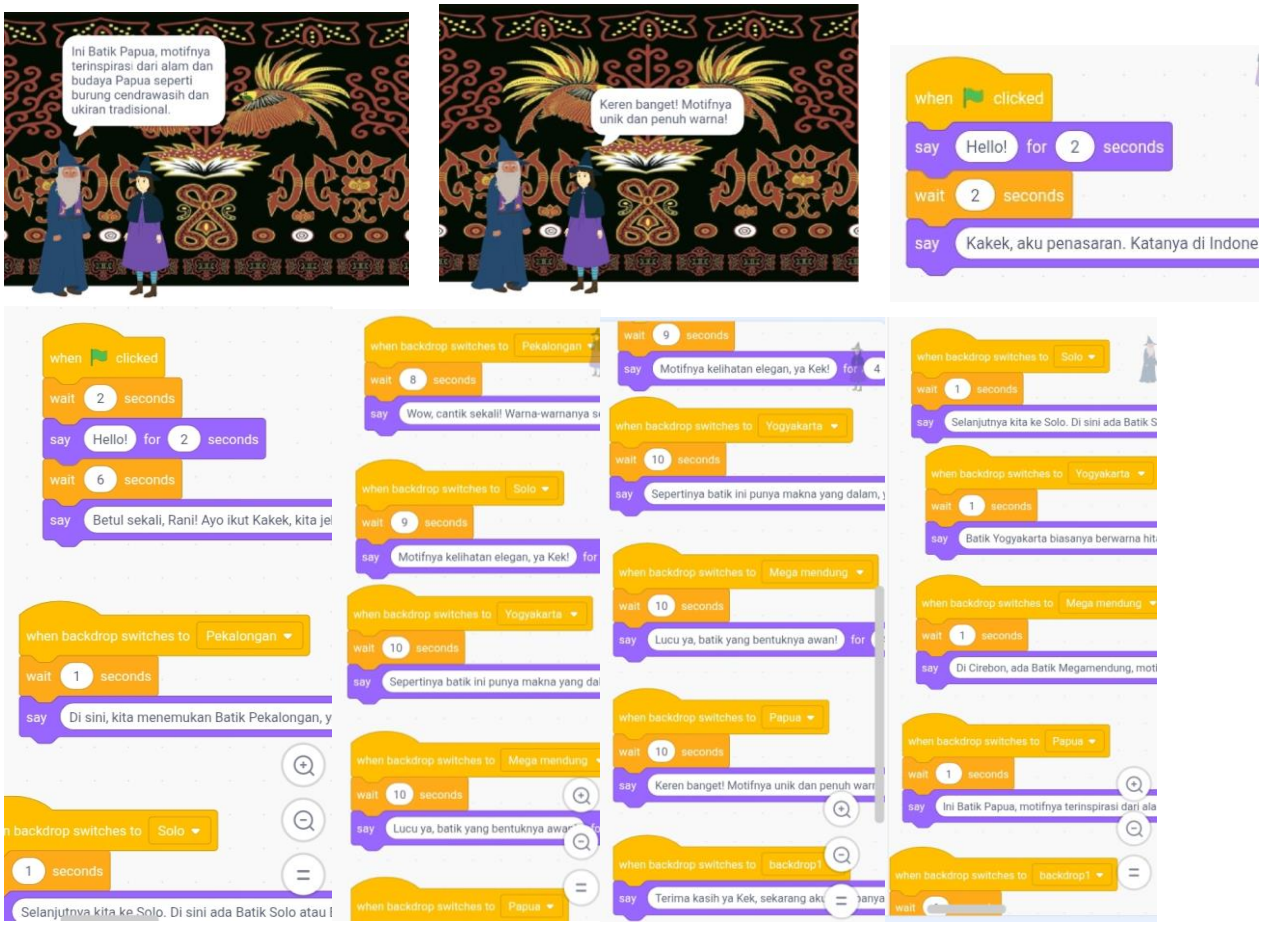

Figure 2. Design Development

2.4 Implementation

The implementation phase involved testing the game prototype with a representative group of users from the target audience (e.g., high school students or undergraduates). During the pilot session, the researcher observes the user's interaction with the game, records responses, and identifies potential technical and comprehension issues. This session aims to collect empirical data on the usability, engagement and instructional clarity of the developed game.

2.5 Evaluation

Evaluation is done formatively and summatively. Formative evaluation occurs on an ongoing basis at the end of each stage to ensure each step is on track. Summative evaluation took place after the implementation phase was completed. Data collected from observations and user feedback sessions were re-analyzed using thematic analysis to identify key strengths, weaknesses and areas that required improvement. The results of this evaluation were used to measure the effectiveness of the game in achieving the learning objectives and to provide recommendations for future development.

3. Finding

3.1 Theme 1: Relevance Through Paradox: Futuristic Innovation as a Gateway to Cultural Heritage

Based on the questions regarding Batik's relevance among young audiences and the market acceptance of its futuristic aesthetic blend, a strong consensus emerged among the nine respondents. Industry experts and academics agreed that the relevance of Batik for Generation Z is conditional and requires a strong "trigger factor" or "hook". The majority of respondents (7 out of 9) stated that a futuristic or avant-garde design approach combined with traditional motifs such as Tumpal serves as an effective hook. Industry experts highlighted its "high commercial value" due to its novelty, while academics emphasized its role in preventing cultural stagnation and the perception that Batik is a product of the past. The

findings indicate that the paradox between "heritage" and "future" creates a compelling narrative and makes Batik culturally and commercially relevant again.

3.2 Theme 2: Conceptual Translations: From Tactile Philosophy to Digital Mechanics

Answering the question of the biggest challenge in the creative process and how to translate design elements into game assets, the design practitioners unanimously identified the main challenge as not technical, but conceptual. That challenge is translating the "philosophy" and "feel" (sensory experience) of a Batik piece into a digital medium. The respondents rejected the idea of simply replicating the visual texture of the fabric literally. Instead, the most approved solution, supported by the academics, was to do a "functional translation". For example, the philosophy of the Tumpal motif as a direction or beginning can be translated not as a static image, but as a game mechanic, such as a tutorial level, a new area opening item, or an initial narrative that guides the player, as seen in the opening dialog of the game.

3.3 Theme 3: The Digital Pedagogical Gap: The Need for Narrative Context in the Age of Interactivity

Questions posed to academics about the pedagogical challenges of teaching intangible cultural heritage and the dialog between avant-garde design and tradition revealed one crucial finding. The main challenge in digital education is not the lack of interactivity, but the loss of "narrative context". All three scholars emphasized that digital interaction alone is not enough for in-depth cultural knowledge transfer. An educational game about Batik, such as the developed prototype, should explicitly provide the story behind each motif, such as its origin and color meaning. Avant-garde design serves as a disruptive and attention-grabbing "entry point", but the real pedagogical value lies in the game's ability to present a rich narrative, which is often inaccessible to the digital generation.

4. Discussion

4.1 Design Paradox as an Engagement Strategy

The finding of an aesthetic paradox that enhances Batik's relevance is in line with research in consumer psychology and branding published by Sage and Taylor & Francis. The concept of "strategic incongruity" suggests that unexpected combinations of elements can increase audience attention and cognitive processing, ultimately driving deeper engagement. Furthermore, these findings support the theory of cultural "resignification", where the meaning of a symbol is renegotiated in a new context. Research in the Journal of Cultural Heritage (Elsevier) suggests that the recontextualization of cultural heritage in digital media can strengthen, rather than diminish, its symbolic value for new audiences (Schmidt & Meyer, 2022). Thus, "Tumpal Futura" not only modernizes the visuals, but also revitalizes the meaning of Tumpal in the digital era.

4.2 Procedural Rhetoric in Transmedia Adaptation

The challenge of "functional translation" from motive philosophy to game mechanics resonates strongly with the theory of procedural rhetoric in game studies, which is often discussed in Wiley and Springer Nature journals. This theory, popularized by Ian Bogost, states that video games convey arguments and meanings through processes, rules, and systems, rather than simply through images and text. Our finding to translate the function of the Tumpal (as a guide) into a starter game mechanism is a practical application of this theory. Research in the Journal of Gaming & Virtual Worlds (Intellect, often referenced by Emerald) confirms that meaning in games is often "experienced" through action (enacted), rather than simply "read". Therefore, effective transmedia adaptation of a design concept to games lies not in visual replication, but in its functional incarnation in an interactive system.

4.3 Narrative-based Learning in a Digital Environment

The need for narrative context expressed by scholars underscores the weakness of the "tool-centrism" approach in educational technology. Literature from the Computers & Education (Elsevier) and Education Sciences (MDPI) journals consistently warn that the effectiveness of digital tools lies not in their technological sophistication, but in their ability to provide a meaningful framework for learning. This is in line with interdisciplinary research in PLOS ONE showing that the most effective learning occurs when new information is connected to existing narratives or is emotionally engaging. The success of the game prototype in presenting a short dialog that explains the context of Batik Pekalongan is a crucial first step to address this pedagogical gap and proves that even in a simple platform, narrative content is key to successful cultural education.

4.4 Profile of Research Respondents

To provide a deeper understanding of the quality of the data obtained, the following table details the professional backgrounds of the nine respondents who participated in this study like Table.1 Profile of Research Respondents. The selection of respondents was purposive to ensure each group was represented by individuals with experience and expertise relevant to the research topic.

Table.1 Profile of Research Respondents

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 Academic/IT	Lecturer in Fashion Design & Textile Technology	15
R8	Fashion Academic/IT	Human-Computer Interaction (HCI) Researcher	13
R9	Fashion Academic/IT	Head of Visual Communication Design Study Program	20

4.5 Appendix Evidence of Thematic Analysis

The following Table 2 presents a thematic analysis matrix as evidence of the interview data codification process. The matrix shows the flow from the key questions asked, the representative raw quotes from respondents, the initial codification by the researcher, to the formulation of the three main research themes.

Table.2 Appendix Evidence of Thematic Analysis

No.	Respondent	Key Question	Interview Quote (Representative Raw Data)	Initial Code	Derived Theme
1	R1	How do you see the relevance of Batik in the discourse of contemporary fashion design, especially among younger audiences (Gen Z)?	"Relevant, but with conditions. Gen Z needs something fresh, not something that feels 'old'. If Batik is presented the usual way, they'll skip it. But if there's a futuristic twist, it becomes a statement. Suddenly it's edgy yet still rooted."	Innovation as a condition for relevance; The 'edgy & rooted' paradox	Relevance Through Paradox: Futuristic Innovation as a Gateway to Cultural Heritage
2	R2	To what extent can the fusion of futuristic or avant-garde aesthetics with traditional motifs be accepted and hold commercial value?	"The commercial value is actually high because of that fusion. These consumers aren't looking for ordinary clothes. This 'Tumpal Futura' concept has a powerful narrative to sell."	Commercial value through novelty; Narrative as selling point	Relevance Through Paradox: Futuristic Innovation as a Gateway to Cultural Heritage
3	R3	How can avant-garde design theory, often disruptive in nature, constructively dialogue with the philosophy of traditional motifs?	"Avant-garde acts as a 'disruption' that opens the eyes. It breaks old perceptions. Once the audience is intrigued by its strange or new forms, a harmonious dialogue with traditional philosophy can begin. It's a bridge, not a wall."	Avant-garde as a dialogue initiator; Constructive disruption	Relevance Through Paradox: Futuristic Innovation as a Gateway to Cultural Heritage

4	R4	In your creative process, what is the biggest challenge when trying to translate the philosophy of a traditional motif into a modern design form?	"The biggest challenge isn't technical, but in translating the 'feeling' and philosophy. The fabric's physical texture is hard to digitize. So we shouldn't just copy the shape, but translate its function and meaning."	Translating 'feeling' and philosophy; Function > Form	Conceptual Translation: From Tactile Philosophy to Digital Mechanics
5	R5	How do you imagine key elements of a fashion design concept being effectively translated into visual assets in a 2D game?	"Absolutely possible. Take Tumpal, which means pointer or beginning. In a game, it could be a mechanic for the tutorial level or a 'hint' button. So we adapt its function into game mechanics, not just slap on the image."	Functional adaptation to game mechanics; Concept to action	Conceptual Translation: From Tactile Philosophy to Digital Mechanics
6	R6	How do you imagine key elements of a fashion design concept being effectively translated into visual assets in a 2D game?	"Abstraction is key. Take the essence of the silhouette or color palette from the futuristic design, and make that the visual style of the game. For example, the sharp lines from the fashion design could inspire the game's user interface."	Abstraction of design elements; Transmedia visual coherence	Conceptual Translation: From Tactile Philosophy to Digital Mechanics
7	R7	From a pedagogical perspective, what is the main challenge in teaching intangible cultural heritage like Batik to a generation used to digital interaction?	"The main challenge is context. Kids today can just click and play games, but they don't know the stories behind the motifs. Interactivity without narrative is hollow. A game must fill that narrative gap."	Narrative context gap; Interactivity needs story	Digital Pedagogical Gap: The Need for Narrative Context in the Interactive Era
8	R8	From a pedagogical perspective, what is the main challenge in teaching intangible cultural heritage like Batik to a generation used to digital interaction?	"A good educational game must be more than just a 'guess the picture' quiz. It has to tell a story. For example, in your PDF file, there's a dialogue between Grandpa and Rani about Batik from Pekalongan. That's the pedagogical core, delivering the 'why'."	Dialogue as pedagogical bridge; Content > Mechanics	Digital Pedagogical Gap: The Need for Narrative Context in the Interactive Era
9	R9	How do you see the relevance of Batik in the discourse of contemporary fashion design, especially among younger audiences (Gen Z)?	"They (Gen Z) are very visual. If the game is interesting, they'll play. From there, they learn about Batik—like Batik from Papua. The game becomes the entry point. Without an appealing entry, they won't 'visit' at all."	Game as "entry point"; Visual appeal draws interest	Digital Pedagogical Gap: The Need for Narrative Context in the Interactive Era

5. Conclusion

This research confirms that transmedia adaptation is a potential strategy for cultural revitalization in the digital era. By transforming the concept of futuristic Batik fashion into an educational game, this study shows that the synergy between

the novelty of innovation and the depth of heritage successfully creates a bridge to a new generation. A key lesson learned is the importance of "functional translation", where the philosophy and function of a motif are translated into game mechanics beyond mere visual copying. This study also reaffirms that meaningful narrative is the foundation of effective digital pedagogy. Although this study has limitations in terms of sample size and prototype scope, the work provides a practical model for designers, educators and cultural activists. Future research directions are suggested to expand the implementation of the game to a larger audience and develop more complex game designs to continue bridging cultural heritage with its digital future.

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Conflict of Interest

The authors declare no conflicts of interest.

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