

Digitisation of Intangible Cultural Heritage: Raising the Legend of a UNESCO Global Geopark Area

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Keywords

Digital comics;
Education; Intangible
cultural heritage;
Legends; Puncak Manik
Waterfall.

DOI

<https://doi.org/10.24843/UJLC.2026.v10.i01.p05>

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Abstract

The potential extinction of oral traditions, recognized as Intangible Cultural Heritage (ICH), necessitates systematic preservation in accordance with the UNESCO's Convention for the Safeguarding of the Intangible Cultural Heritage. Legends, as a vital component of ICH, embody local wisdom that should be adapted for younger generations through innovative media. It is a study in the field of educational sciences that documents oral traditions by developing a digital comic that narrates the Legend of the Puncak Manik Waterfall in the Ciletuh-Palabuhanratu UNESCO Global Geopark (UGGp). The research employs a Research and Development methodology grounded in the Borg and Gall model, with modifications to six of the ten stages, and combines a legal analysis of relevant laws and regulations as a normative foundation. Validation results indicate high efficacy, with media expert scores averaging 3.8 for graphics and 3.75 for displays, and a linguistic validation score of 3.7. Operational testing involving 30 catalyst teachers and 55 students produced a satisfaction rate exceeding 80%, demonstrating the product's effectiveness. The findings suggest that digital comics are a strategic medium for value transformation within a harmonized legal framework that aligns international and domestic regulations. It is recommended that this development model be implemented in other UGGp sites in Indonesia, including Batur, Gunung Sewu, Rinjani-Lombok, and Caldera Toba, to reinforce and sustain national cultural identity.

1. INTRODUCTION

The preservation of Intangible Cultural Heritage (ICH) is a global mandate established through the UNESCO's Convention for the Safeguarding of the Intangible Cultural Heritage (hereinafter, ICH Convention) to protect cultural expressions from the risk of extinction. As a crucial element of the ICH, legends are not merely local narratives but representations of the essence of culture, history, and societal value

systems, offering profound insights into humanity.¹ The values contained in the ICH's legend are recognised and established as protected under the convention.² The protection of ICH mandated by the ICH Convention is justified on the premise that there are 'humane' benefits to continuing to practice or to protect valuable cultural forms.³

The transmission of knowledge between generations is the foundation, ensuring that the values of local wisdom remain alive and relevant amid changing times.⁴ The preservation of ICH in the era of globalisation faces global challenges, especially the risk of cultural identity loss due to weakened intergenerational transmission. The ICH Convention recognises the vulnerability of local cultural traditions to global homogenization. In this context, the digitisation of legends is one of the efforts to support a global strategy for documenting and transmitting cultural values to younger generations. Thus, the development of digital media with legends is a response to the urgency of preserving ICH amid social and technological transformation.

However, the preservation of legends today faces significant challenges due to rapid social and technological change. The unsustainable process of inheritance, the loss of key sources, and the lack of documentation permanently deprive legends of their educational value. One of the legends represents cultural diversity and urgently needs to be protected is the Legend of *Curug Puncak Manik*⁵ (Puncak Manik Waterfall) in Ciletuh-Palabuhanratu area, Sukabumi Regency, West Java Province, which has been designated as a UNESCO Global Geopark UGGp.⁶ The preservation of the legend of Puncak Manik Waterfall is essential for supporting the integration of the three pillars of the Geopark: geological diversity, biological diversity, and cultural diversity, during the revalidation of UGGp Ciletuh-Palabuhanratu status.

Although digitalisation has been recognised as an effective strategy for protecting ICH, research on developing digital comics for toponymic legends that focus on transforming educational values remains very limited. In addition, there is a gap in empirical data on teachers' and students' perceptions of the use of digital comics with legends in educational contexts.

¹ Georgios Mathioudakis et al., "InCulture: A Collaborative Platform for Intangible Cultural Heritage Narratives," *Heritage* 5, no. 4 (2022): 2901.

² See Marcellus Mbah, Ane Turner Johnson, and Ferdinand M. Chipindi, "Institutionalizing the Intangible through Research and Engagement: Indigenous Knowledge and Higher Education for Sustainable Development in Zambia," *International Journal of Educational Development* 82 (2021): 1.

³ Lisa Gilman, "'Our Culture is Dying': Safeguarding versus Representation in the Implementation of the UNESCO ICH Convention," *International Journal of Intangible Heritage* 17 (2022): 52.

⁴ Minoos Hosseini Esfehiani and Julia Nicola Albrecht. "Roles of Intangible Cultural Heritage in Tourism in Natural Protected Areas," *Journal of Heritage Tourism* 13, no. 1 (2018): 25.

⁵ The term '*Curug*' refers to a waterfall in Sundanese, a language predominantly spoken by the Sunda people who primarily reside in West Java Province.

⁶ UNESCO, Full list of UNESCO Global Geoparks, <https://www.unesco.org/en/igpp/geoparks?hub=67817>

From a legal perspective, the Government of Indonesia has demonstrated its commitment to promoting and protecting ICH by ratifying the ICH Convention.⁷ The government subsequently developed a comprehensive legal framework, including Law No. 5 of 2017 on the Advancement of Culture and Minister of Education and Culture Regulation No. 106 of 2013 on Indonesian Intangible Cultural Heritage, to safeguard oral traditions as integral elements of national identity and culture.⁸

Since the ICH Convention was created in 2003, many have emphasized not only the need to preserve and respect ICH, but also to address its social, political, and economic implications. In particular, studies highlight that legends can serve as a medium of conservation, especially in natural environments that have strong cultural significance for local communities.⁹ Idris, Norsimaa and Yusoff (2016) corroborated that ICH needs to be preserved through technology to maintain the spiritual and intellectual wealth of a civilisation.¹⁰ Skublewska-Paszowska et.al (2022) argued that 3D visualization is one way to preserve ICH.¹¹ Siliutina et al (2024) held that digital initiatives play an important role in reducing risks and ensuring the sustainability, existence, and appreciation of diverse cultural heritages.¹² Other findings, such as Manouach and Foka (2025) suggested that digital comics that elevate cultural heritage can exemplify temporal authenticity through digitalisation.¹³ Building upon previous research, this study introduces an innovative approach by developing digital comics that integrate legends as elements of intangible cultural heritage.

The objectives of this study are to document the legend of the Puncak Manik Waterfall and to strengthen the framework for protecting ICH at both national and international levels. The research addresses three primary questions: (1) What is the relationship between Indonesian legal regulations and the ICH Convention in safeguarding legends as ICH? (2) How can legends be documented through digital comics to serve as a medium for transforming educational values and local wisdom to younger generations? (3) What are the perspectives of teachers and students regarding digital comics featuring legends as a medium for cultural and educational transformation? Utilizing webtoon platforms, this research aims not only to document legends but also to facilitate the transmission of educational values to a broader youth audience.

⁷ Presidential Regulation No. 78 of 2007 concerning the Ratification of the Convention for the Protection of Intangible Cultural Heritage

⁸ Minister of Education and Culture Regulation No. 106 of 2013 concerning Indonesian Intangible Cultural Heritage, Art 2.

⁹ *Ibid.*

¹⁰ Muhammad Zaffwan Idris, Norsimaa Binti Mustaffa, and Syed Osman Syed Yusoff, "Preservation of Intangible Cultural Heritage Using Advanced Digital Technology: Issues and Challenges," *Harmonia: Journal of Arts Research and Education* 16, no. 1 (2016): 1.

¹¹ Maria Skublewska-Paszowska et al., "3D Technologies for Intangible Cultural Heritage Preservation—Literature Review for Selected Databases," *Heritage Science* 10, no. 1 (2022): 20.

¹² Iryna Siliutina et al., "Cultural Preservation and Digital Heritage: Challenges and Opportunities," *Revista Amazonia Investiga* 14, no. 75 (2024): 269.

¹³ Ilan Manouach and Anna Foka, "Comics as Heritage: Theorizing Digital Futures of Vernacular Expression," *Heritage* 8, no. 8 (2025):1.

In terms of research method, it adopts the Research and Development (R&D) model of Borg and Gall, modifying the ten steps to six to align with the research objectives. The six steps are information collection and planning, product development, product testing, product revision, operational testing, dissemination, and implementation.¹⁴ This approach is combined with a legal analysis that examines relevant laws and regulations as the normative basis for the study. The anticipated outcomes are intended to provide an academic foundation for similar initiatives in other UNESCO Global Geoparks (UGGPs) in Indonesia, including Batur UGGp, Gunung Sewu UGGp, Rinjani-Lombok UGGp, and Caldera Toba UGGp.

2. RESULT AND ANALYSIS

2.1. Legal Framework

2.1.1. UNESCO's Legal Framework

The United Nations Educational, Scientific, and Cultural Organisation (UNESCO) is a specialised agency of the United Nations established on the principle that peace should be based on the moral and intellectual solidarity of humanity. This is detailed in the relevant provisions of the UNESCO Constitution.¹⁵ In 2001, the Executive Board of UNESCO assessed the recommendation of the Man and the Biosphere (MAB) International Coordinating Council and its Bureau regarding the inclusion of a geosites or geoparks programme within the World Network of Biosphere Reserves. The Executive Board then invited the Director-General not to pursue the development of a UNESCO geosites/geoparks programme, but instead to support ad hoc efforts with Member States as appropriate.¹⁶ In 2004, UNESCO adopted an Operational Guideline for National Geoparks Seeking UNESCO's Assistance, which, among other provisions, includes criteria and a nomination procedure.¹⁷ Currently, it has an organ, the UNESCO Global Geoparks Council, which, among other responsibilities, accredits extensions of revalidated UNESCO Global Geoparks.¹⁸

The General Conference of UNESCO formally adopted the ICH Convention at a session in Paris from 29 September to 17 October 2003. This international legal framework mandates the establishment of an Intergovernmental Committee to oversee the implementation of measures to protect intangible cultures globally. The committee comprises representatives of 18 States Parties responsible for ensuring the effective implementation of the convention at the international level.¹⁹ The construction of this law is strengthened by academic discourse that defines

¹⁴ Walter Richard Borg and Meredith Damien Gall, *Educational Research: An Introduction*. 4th Ed. (Longman, 1983):775.

¹⁵ UNESCO, "Constitution of the United Nations Educational, Scientific and Cultural Organization," 2024, <https://www.unesco.org/en/legal-affairs/constitution>.

¹⁶ Decisions adopted by the Executive Board of the UNESCO at its 161st session (161 EX/Decisions 2001), 3.3.1

¹⁷ Operational Guideline for National Geoparks Seeking UNESCO's Assistance, 2004, Art.1 and Art. 2.

¹⁸ Operational Guidelines for UNESCO Global Geoparks, 2015, para 4.1 and Statutes of the International Geoscience and Geoparks Programme, Part B, Art. 2.8.

¹⁹ Convention for the Safeguarding of the Intangible Cultural Heritage, Art. 5(1).

ICH as a dynamic, interpretive, and related element to physical elements or tangible manifestations.²⁰

The adoption of this legal instrument is a strategic response to the intensification of globalization and social transformation, which threaten the sustainability of cultural identity. The intensification of globalisation creates an urgency to establish an integrated international framework to mitigate the risk of cultural homogenization.²¹ Within this framework, the convention sets four fundamental objectives. First, it requires systematic protection efforts that include identification, documentation, research, preservation, and revitalization of cultural heritage. Second, it ensures the respect for ICH as a representation of the identity of communities, groups, and individuals. Third, this convention increases public awareness at the local, national, and international levels of the significance of cultural heritage. Fourth, through the ratification mechanism, each State Party is obligated to integrate these international principles into its domestic policies. Synchronization between international commitments and proactive national regulations is a key prerequisite for the effectiveness of cultural heritage preservation in the modern era.²²

In line with the ICH Convention, UNESCO's conceptualisation of digital heritage underscores its significant value for humanity.²³ In 2003, UNESCO adopted the Charter on the Preservation of Digital Heritage. Within the broader context of cultural heritage preservation, the charter emphasises that digital heritage is not constrained by time, geography, culture, or format. Although it is culture-specific, digital heritage remains potentially accessible to individuals worldwide.²⁴ The charter was adopted during the General Conference of October 2003, alongside the ICH Convention. Unlike the convention, which is legally binding due to its ratification by member states and thus carries broader implications,²⁵ the charter is a non-binding declaration generally regarded as soft law.²⁶ On 8 July 2025, UNESCO introduced the Dive into Heritage platform at the 47th session of the World Heritage Committee, representing a significant advancement in digital heritage preservation.²⁷

²⁰ Amalia Nurma Dewi et al., "UNESCO and the Definition of Intangible Cultural Heritage - Proposing some Conceptual Underpinnings," *Language and Semiotic Studies* 11, no. 1 (2025): 71.

²¹ Saúl Lázaro Ortiz and Celeste Jiménez de Madariaga, "The UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage: A Critical Analysis," *International Journal of Cultural Policy* 28, no. 3 (2021): 338.

²² *Ibid.*

²³ Sabine von Schorlemer, "UNESCO and the Challenge of Preserving the Digital Cultural Heritage," *Santander Art and Culture Law Review* 6, no. 2 (2020): 40.

²⁴ UNESCO Charter on the Preservation of Digital Heritage, Art. 9

²⁵ See Yola de Lusenet, "Tending the Garden or Harvesting the Fields: Digital Preservation and the UNESCO Charter on the Preservation of the Digital Heritage," *Library Trends* 56, no.1 (2007): 173.

²⁶ Leyla Hashimova, "Norms of soft law in international legal regulation of cultural heritage protection," *International Law and Integration Problems* 62, no.1 (2021): 27.

²⁷ UNESCO, "Dive into Heritage is now live! UNESCO launches online platform to explore World Heritage in 3D," <https://whc.unesco.org/en/news/2803#:~:text=The%20event%20featured%20a%20live,in%20developing%20this%20innovative%20platform.>

2.1.2. Indonesia's Legal Framework

Indonesia's commitment to the protection of heritage and cultural progress is firmly rooted in the national legal framework, which was spearheaded by Law No. 5 of 2017 concerning the Advancement of Culture.²⁸ This framework is further strengthened through the Presidential Regulation No. 78 of 2007 which ratified the ICH Convention, which affirms the role of the state in preserving the cultural practices of the community.²⁹ Furthermore, Government Regulation No. 87 of 2021 functions as the main implementing regulation of the Law on the Advancement of Culture,³⁰ which determines the mechanisms and technical aspects of the protection of cultural heritage, is supported by the Regulation of the Minister of Education and Culture³¹ which regulates the inventory of ICH.

Moving away from the general cultural framework, the government then focused attention on strategic areas through Presidential Regulation No. 9 of 2019 concerning Geopark Development, which specifically regulates the management of geo-sites and cultural heritage.³² This regulation formally recognizes that UGGp has a higher status than national geopark. It also emphasises that the protection of heritage, both tangible and intangible, is the responsibility of the government across sectors and levels, so it requires targeted implementation at the regional level.

The Executive Board of UNESCO, on the recommendation of the UNESCO Global Geoparks Council, on 17 April 2018 issued a certificate recognising Ciletuh-Palabuhanratu as a UNESCO Global Geopark (UGGp). Such a designation has significant consequences for the national and regional governments. These consequences include the mandatory formulation and implementation of geopark management plans that integrate conservation, education, and sustainable economic development, thereby requiring the government to allocate resources and establish a coordinating body to preserve and promote geoparks.

The application of the national legal framework is evident in the enactment of regional regulations. At the provincial level, the Governor of West Java issued regulations governing the establishment and management of geoparks, including the Ciletuh Geopark Area. In 2016, Governor Regulation No. 20 of 2016 established the Management Agency for the Ciletuh National Geopark Area in Sukabumi Regency.³³ In 2018, an additional governor regulation was enacted, establishing that a geopark area functions as a regional management framework integrating geodiversity,

²⁸ Law No. 5 of 2017 the Advancement of Culture, Art 3.

²⁹ Presidential Regulation No. 78 of 2007 Ratification of the Convention for the Safeguarding of the Intangible Cultural Heritage, Art 1.

³⁰ Government Regulation No.87 of 2021 the Implementing Regulations of Law No. 5 of 2017 Concerning the Advancement of Culture, Art 2.

³¹ Regulation of the Minister of Education and Culture No. 106 of 2013 concerning Indonesian Intangible Cultural Heritage, Art 2.

³² Presidential Regulation No. 9 of 2019 concerning the Development of Geoparks, Art 8 (1).

³³ Governor Regulation No. 20 of 2016 concerning the Management Agency of the Ciletuh National Geopark Area in Sukabumi Regency, Art 2(1).

biodiversity, and cultural diversity through conservation, education, and sustainable development principles.³⁴

At the regency level, Sukabumi Regent Regulation No. 25 of 2021 addresses the Ciletuh-Palabuhanratu UGGp Master Plan for 2020-2029, with the objective of advancing geopark development through the integration of protection, education, and local economic empowerment.³⁵ It constitutes a concrete step toward implementing national policies that support UGGp development. Furthermore, it aligns with another regional regulation that promotes regional culture through protection, development, and utilization.³⁶ The commitment to advancing regional culture further strengthens the development of the geopark.³⁷

Analysis of the legal framework demonstrates that the alignment between the ICH Convention and Indonesia's national legal framework provides robust juridical legitimacy for the digital transformation of ICH. The creation of a digital comic depicting the legend of Puncak Manik Waterfall in the Ciletuh-Palabuhanratu UGGp exemplifies the implementation of the documentation and revitalization mandate outlined in Minister of Education and Culture Regulation No. 106 of 2013, as well as the "Cultural Utilisation" strategy specified in Law No. 5 of 2017. Therefore, transforming oral traditions into dynamic educational media fulfills the educational pillars established by law and regulations. This approach preserves the relevance of local cultural values, reinforces collective community identity during periods of information disruption, and supports the systematic sustainability of cultural heritage.

2.1.3. Theoretical Contribution in the Legal Framework of Intangible Cultural Heritage Protection

The research and development of the digital comic entitled the Legend of Puncak Manik Waterfall makes a theoretical contribution to strengthening the legal framework for the protection of ICH. Digital comics have also been recognized as cultural artifacts and vernacular expressions in a dynamic platform.³⁸ Education plays a vital role in the transmission of ICH, ensuring the sustainability of people's cultural identities. The formal and non-formal education system is a strategic means to integrate cultural values into the curriculum.³⁹ The use of innovative technology through digital comics featuring virtualization has proven to be effective in increasing student engagement in understanding the characteristics of ICH in depth.⁴⁰

³⁴ West Java Province. Governor Regulation No. 72 of 2018 concerning the Development of Geopark Areas in West Java Province, Consideration letter a.

³⁵ Sukabumi Regent Regulation No. 25 of 2021 concerning Master Plan of UNESCO Global Geopark, Art 4.

³⁶ Regional Regulation of Sukabumi Regency No. 1 of 2022 concerning the Advancement of Regional Culture Art 4 (b and c).

³⁷ *Ibid.*

³⁸ Manouach and Foka, *op.cit.*, 17.

³⁹ Angela Michelle Labrador, "Integrating ICH and Education: A Review of Converging Theories and Methods." *International Journal of Intangible Heritage* 17 (2022): 24.

⁴⁰ Nana Li and Yanxia Li, "Design and Research on the Digital Display and Preservation of Intangible Cultural Heritage Using Extended Reality Technology," in *3rd IEEE*

Digitization serves as the main instrument for archiving while popularizing cultural heritage to the public at large.⁴¹

In the context of geoparks, digital comics filled with legends provide a narrative framework that makes it easier for the public to appreciate the scientific features of geology.⁴² The preservation of legends is crucial to maintaining historical integrity and supporting conservation efforts in protected areas.⁴³ Thus, Indonesia, along with other countries such as China, Spain, and Latvia, has adopted special laws to protect legends in response to the ICH Convention.⁴⁴ The implementation of this digital comic strengthens its effectiveness in adapting to national legal devices and international protection standards. The strategy ensures that cultural heritage documentation is not only static but also serves as a medium for the sustainable transformation of value.

2.2. Documenting Legends through Digital Comic Development

The findings of this research are digital comic documents of the legend of Puncak Manik Waterfall in Indonesian. Modern technologies, such as digital platforms, are used to preserve and disseminate legends, making them accessible to a broader audience and ensuring their transmission to future generations. Digital comic products are developed through a six-step research and development (R&D) process, which is modified from the Borg and Gall Model.⁴⁵ The results of product validation by digital media experts for the graphic aspect (3.8), the overall appearance (3.75), and the application aspect (3.0). The acquisition of this score, when compared to the score criteria, indicates that it meets the good criteria.⁴⁶ Validation of language use by linguists reaches 3.0, including good categories.⁴⁷ The perspective of teachers and students towards digital comics was very positive, with the results of data analysis reaching the criteria of more than 80% ($80\% < X$), which means a very high category.⁴⁸ The FGD with 30 catalyst teachers indicated their readiness to implement digital comics in their schools and to disseminate them to teachers in other schools in Sukabumi Regency.

International Conference on Networks, Multimedia and Information Technology, NMITCON 2025 (Shandong University of Engineering and Vocational Technology, Jinan, China: Institute of Electrical and Electronics Engineers Inc., 2025).

⁴¹ Siliutina et al., *op.cit.*, 262, 268, 269,

⁴² Daniel Sánchez-Aguirre, Hector González García, and Carles Canet, "Reflections on Geological Heritage as a Cultural and Natural Asset at Geothermal Sites," *Revista Mexicana De Ciencias Geologicas* 42, No. 2 (2025): 113.

⁴³ Anas Hili et al., "Inventory, Evaluation, and Mapping of the Geological and Geomorphological Sites of the Tazekka National Park (Middle Eastern Atlas, Morocco)," *Geoheritage* 16, no. 2 (2024):1.

⁴⁴ Steve Collins and Ian Craig, "Ar Dàimhean Is Dualchas: Safeguarding Scotland's Intangible Cultural Heritage," *Scottish Affairs* 34, no. 4 (2025): 470.

⁴⁵ *Ibid.*

⁴⁶ Saifuddin Azwar, *Penyusunan Skala Psikologi*, 2nd ed. (Pustaka Pelajar, 2022), 147-149.

⁴⁷ *Ibid.*

⁴⁸ *Ibid.*

The six-step modification used in this study provides a more comprehensive framework for developing digital comics than the three-step approach. The six-step process enables systematic information gathering and planning, product development, product testing, revision, operational testing, dissemination, and implementation through focus group discussions (FGDs). This expanded methodology substantially enhances both the effectiveness and reach of the final product relative to the more limited three-step model. The six-step modification model demonstrated greater efficacy in product development, whereas previous research employing only three steps reached only the product evaluation stage and did not proceed to implementation or dissemination.⁴⁹

The development of digital comics raises the legend of Puncak Manik Waterfall used Indonesian to help target users improve literacy and language skills.⁵⁰ By conveying language that is familiar to the target audience, namely, students and teachers, it makes it easier for them to understand the stories and messages conveyed in the comics. In addition, successfully developed digital comics are not only reading materials for students but also learning media when used by teachers to convey local wisdom. Thus, the digital comics developed through this research and development can enhance students' literacy and appreciation of the cultural values embedded in legends. The introduction of legends through digital comic media allows students to appreciate their cultural heritage better and strengthen their sense of identity. Thus, this product serves as an effective educational medium in preserving culture.

This research contributes to UNESCO's Recommendation on the protection of ICH in recognition of the fundamental role of ICH for sustainable development.⁵¹ The main objective of this research is to conserve ICH as a necessary medium for supporting education for sustainable development. In addition, the development of digital comics contributes to efforts to revitalize legends as an endangered component of ICH.

Digital comic development research is a humanistic approach⁵², because the developed digital comics explore cultural themes, social values, and the human experience. It features the Puncak Manik Waterfall as an important part of revitalizing ICH by highlighting historical and traditional aspects of toponymic legends. The development of digital comics containing the Puncak Manik Waterfall can be said to be an effort to protect ICH because it has gone through the process of identification, research and

⁴⁹ Afakhrul Masub, Bakhtiar Arya, and Setya Nugroho, "Curriculum Development of Environmental Education Based on Local Wisdom at Elementary School," *International Journal of Learning, Teaching and Educational Research* 15, no. 3 (2016): 24.

⁵⁰ Nadi Suprpto et al., "Scientific Mapping and Production Analysis of Digital Comic, Animation, and Digital Cartoon in Education," *Humanities and Social Sciences Communications* 11, no. 1 (2024): 9.

⁵¹ Maria Gabriella Trovato and Nadine Panayot Haroun, "Anfeh Costal Landscape: Preservation, Management and Landscape Planning Strategies," *Journal of Marine and Island Cultures* 7, no. 2 (2018): 48.

⁵² Mi Hee Kong, "Marine Cultural Tourism Gwangalli Eobang Festival: Cultural Inheritance and Efficiency Enhancement from a Humanistic Perspective," *Journal of Marine and Island Cultures* 13, no. 1 (2024): 111.

development, documentation, promotion, and transmission through testing and operational dissemination.⁵³ All of these efforts are aimed at maintaining the sustainability and protection of ICH in the area of Ciletuh-Palabuhanratu UGGp.

2.2.1. Information Collecting and Planning

At this stage, purposive sampling was employed by conducting interviews with six members of the *Pakidulan* Sukabumi Nature Association (PAPSI). The interview results indicated that participants were familiar with the origin of the name "Puncak Manik Waterfall" through oral traditions passed down from their ancestors. However, this narrative is not consistently transmitted to younger generations, resulting in the gradual loss of local cultural heritage. Participants emphasized the importance of documenting these legends to prevent their extinction and to facilitate cultural transmission to the younger generation. Based on these findings, the researchers intend to document the legend of Puncak Manik Waterfall as a digital comic.

Documenting legends as ICH is essential, as these narratives convey valuable messages and represent the materialisation of human thought and behaviour. Such documentation holds significant meaning for the understanding and advancement of history, science, and culture within societies, nations, and states.⁵⁴ The preservation of legends may be achieved through various methods, including documentation, revitalisation, reconstruction, and dissemination.⁵⁵ This study specifically seeks to digitally document legends as an innovative approach aligned with the current digital era⁵⁶ and to disseminate these materials to teachers throughout Sukabumi Regency.

2.2.2. Develop Product

The product development steps include eight activities: creating a synopsis, designing story characters, sketching, creating line art, coloring images, detailing colors, creating text bubbles, and designing story panels. Panels in digital comic development aim to create a clear and engaging narrative structure, thereby making the storyline easier for readers to understand. By dividing the story into organized panels, developers can visually emphasize important moments and character expressions, thereby enhancing the reading experience. The panels harmoniously integrate graphic and textual elements, creating a dynamic rhythm in the narrative delivery. In addition, the panel assists researchers in classifying comic

⁵³ Edgardo Besmonte, "Identification and Safeguarding of Intangible Cultural Heritage (ICH) of Tabaco City, Philippines, through Cultural Mapping," *Journal of Education, Management and Development Studies* 2, no. 2 (2022): 8.

⁵⁴ Mailinda Eka Yuniza et al., "Quo Vadis Regulation on Underwater Cultural Heritage in Indonesia: Balancing Conservation and Economic Interest," *Udayana Journal of Law and Culture* 6, no. 2 (2022): 140.

⁵⁵ *Ibid.*

⁵⁶ See Jessika Eichler, "Intangible Cultural Heritage, Inequalities and Participation: Who Decides on Heritage?," *International Journal of Human Rights* 25, no. 5 (2021): 800 and Chiara Palladino and Gabriel Bodard, *Can't Touch This: Digital Approaches to Materiality in Cultural Heritage* (Ubiquity Press, 2023), 9.

genres and guiding the development of stories and thematic elements in a structured manner (Figure 1).



Data source: Shaleha., et al

Figure 1. Samples of Story Panel, 2024

Product development, the second stage of the R&D method, has advantages over other methods. At this stage, the multidisciplinary process is integrated, combining different areas of knowledge⁵⁷, including creativity in making synopses, character design, sketching, drawing, coloring, and making balloon text for the preparation of story panels. This integration requires effective teamwork; therefore, communication and collaboration among team members should improve. Therefore, this stage is crucial to translating each team member's ideas into high-quality digital comic products.

2.3. Validation of Comic Product Quality

The third step of the R&D method is product testing. The testing aims to validate the quality of comic products and to obtain expert feedback to inform product revisions. Expert validation consists of digital media experts and linguists. Digital media experts assess aspects of graphic applications, presentations, and comics. Linguists evaluate the use of language in comics

⁵⁷ Cristovao Relvas and Antonio Ramos, "New Methodology for Product Development Process Using Structured Tools," *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture* 235, no. 3 (2021): 381.

to ensure that the text is appropriate for the target reader's level of understanding and maintains the narrative's clarity and fluency. Validation criteria using score conversion from non-parametric statistical analysis results into five categories using conversion scores.⁵⁸

Table 1. Result of the Product Quality by Digital Media Expert and Linguist Expert

No	Validation Aspect	Validation Score	Criteria
1.	Graphic Aspect	3,8	≥ 3.0 – 3.9 Good
2.	Overall Appearance	3,75	≥ 3.0 – 3.9 Good
3.	Application Aspect	3,0	≥ 3.0 – 3.9 Good
4.	Linguistics	3,7	≥ 3.0 – 3.9 Good

Table 1 shows that the validation results of digital media experts and digital comic product linguists meet good criteria according to conversion. The results of expert validation show that the research and development of digital comic products is of good quality. Thus, digital comics in this era of globalization have the potential to serve as a tool for cultural preservation. Previous research has highlighted the threat of globalization to cultural diversity.⁵⁹ However, the findings of this study prove that globalization in the digital era is not a threat. The development of digital comics offers people an opportunity for people to preserve their cultural heritage and enrich cross-cultural dialogue.

This digital comic filled with the legend of Puncak Manik Waterfall, combines visual and textual elements to create a compelling narrative that captures and conveys complex cultural stories. This multimodal approach enables a richer representation of cultural elements, thereby making them more accessible to a wider audience.⁶⁰ Feedback from digital media experts on improving the appearance of the comics necessitated the addition of a university logo to the comic cover. Feedback will be considered for product revision in the next step.

Product quality validation aims to ensure the quality of comic products. This stage is an advantage of the R&D method compared to other methods, because it is an integrated stage with the previous stage, namely product development, and the next stage of product revision.⁶¹ Other research has shown that the validation stage of product development can support the

⁵⁸ See Azwar, *op.cit.*, 148 and Ida Ermiana et al., “Ethnocultural Wisdom and Development of E-Comic,” *International Journal of Evaluation and Research in Education* 13, no. 6 (2024): 3618.

⁵⁹ Jason Lam, “Cultural Preservation in the Face of Globalization,” *International Journal of Business, Management and Visuals* 4, no. 1 (2021): 27.

⁶⁰ Veronica Moretti and Francesco Della Puppa, *The Social Genres of Comics: Impact and Innovation of Comics in Social Sciences* (Palgrave Macmillan, 2025): 12.

⁶¹ Khadija Tahera et al., “Testing in the Incremental Design and Development of Complex Products,” *Research in Engineering Design* 30, no. 2 (2019): 292.

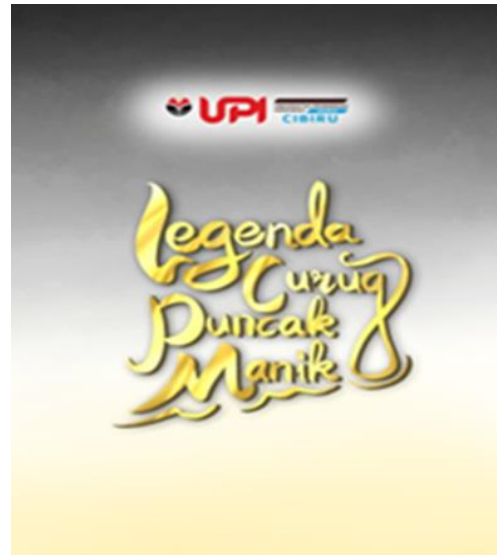
development of innovative products, helping maintain a competitive advantage.⁶²

2.4. Revision of Product

Product revisions are made based on feedback provided by Digital Media Experts. The feedback suggested by digital media experts is to provide a logo on the cover of the comic. Figure 2 shows the revised product.



Comic Cover before revision



Comic Cover after revision

Figure 2. Revision of the Product

The final revision is the final stage of product development. This product is a subtle comic. These comics are uploaded to the Webtoon platform for readers to access⁶³ (Figure 3).

⁶² Li-Ping Wang and Qi Gao, "Research on the Influence of Technology Diversification Strategy on New Product Development Advantages," *Studies in Science of Science* 41, no. 7 (2023): 1273.

⁶³ Nadil, "Legenda Curug Puncak Manik," webtoon, 2024.

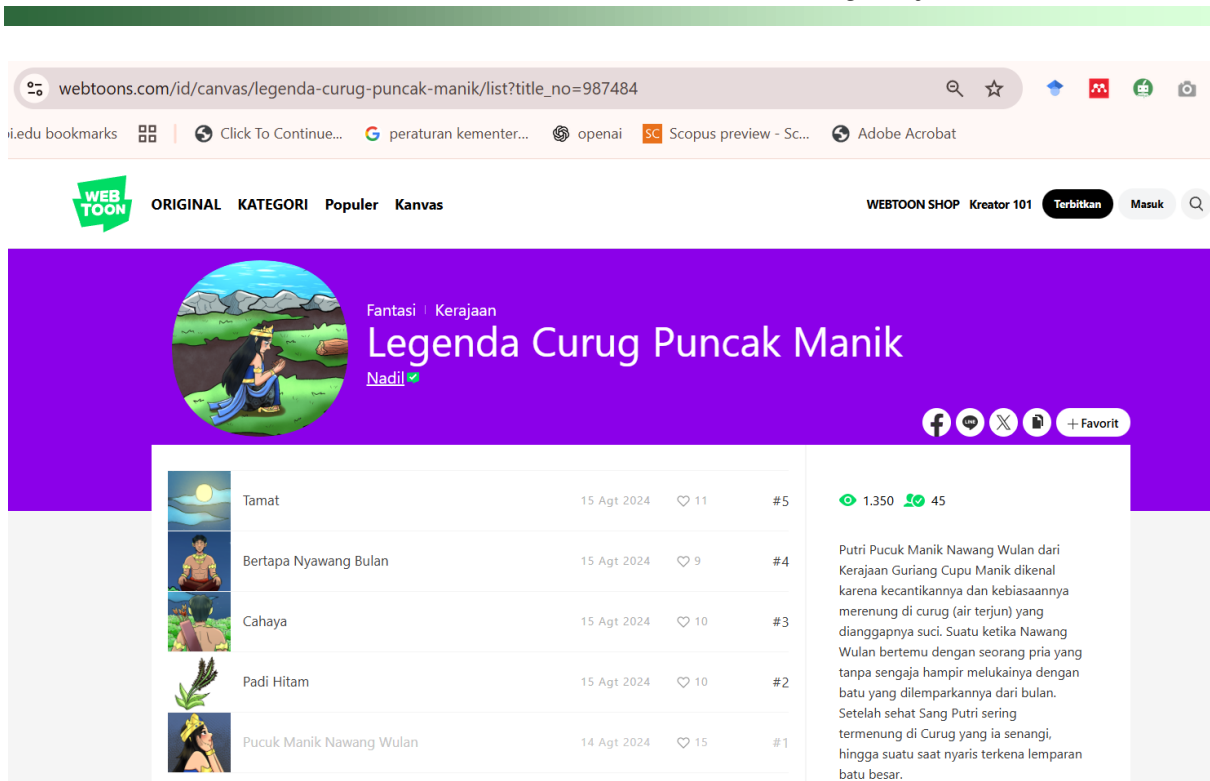


Figure 3. The final product of comic development is uploaded to Webtoon

The Legend of Puncak Manik Waterfall, as a toponymic legend, cannot be ignored because it contains stories that can teach values such as courage, wisdom, and respect for nature and history. This legend is the first legend to be developed through digital comics published through webtoons. This digital comic is expected to provide in-depth insights into cultural and historical values that can inform the education of the younger generation. By understanding the origins of place names, students can develop an appreciation for the environment and increase awareness of their cultural identity. This is in line with UGGp objectives, which focus not only on the preservation of natural diversity but also on strengthening local culture.⁶⁴

Documenting ICH legends through digital comics constitutes a creative approach to preserving it. This creativity serves as a tool in preserving ICH in World Heritage Sites. The creativity of this documentation can also serve as a guideline for various stakeholders in maintaining ICH status.⁶⁵

Webtoon platforms are an ideal choice for publishing digital comics featuring the legend of Puncak Manik Waterfall. Webtoon platforms have an advantage in publishing digital comics compared to Tapas, MangaPlus, Instagram, and Comixology. Tapas has access restrictions: some comics are available only to subscription readers, thereby reducing audience reach. A sustainable economic structure is absent at Tapas, leaving content creators short on time and resources. Other impacts also affect the quality and consistency of work.⁶⁶ MangaPlus has a drawback: its limited reading system

⁶⁴ *Ibid.*

⁶⁵ *Ibid.*

⁶⁶ Gabrielle Kovaliv, "Internet, the Paradise Lost of Comics? Observations on the Constraints behind Publishing Webcomics, Based on Interviews with Francophone Authors," *Studies in Comics* 14, no. 1 (2023): 125.

can limit access to features and make them less appealing to readers who prefer a wide variety of genres. MangaPlus is also limited in language options, making it less appealing to readers.⁶⁷

Publication through Instagram also has limitations, as it relies heavily on follower interaction and engagement. This problem causes comic creators to have to invest significant effort in managing and distributing their work, thus reducing the creative process.⁶⁸ Comixology, despite having an extensive collection of comics, often restricts access due to its purchasing system, which requires readers to purchase comics separately.⁶⁹ Thus, webtoon platforms, compared to other platforms, have an efficient distribution system and free access for content creators. Webtoons are able to reach a wider audience globally, while increasing reader engagement, making them the go-to choice for publishing digital comics.⁷⁰

2.5 Exploring Teacher and Student Perspectives on Digital Comics

The exploration of teacher and student perspectives on digital comics is used as an operational testing stage. The pilot test in this study aims to explore teachers' and students' perspectives on comic products as an educational medium. Teacher and student respondents were selected proportionally with backgrounds from primary and junior high schools. The study involved students under 18 years of age, with institutional approval from the Head of the Local Content Section of the Sukabumi Regency Education Office. The research was conducted from June 2024 to January 2025 in Sukabumi Regency as a minimal-risk educational activity, and all data were anonymised. The results of data processing from a questionnaire of 30 teachers and 55 students (Table 2).

Table 2. Perspectives of the Teachers and Students regarding the Digital Comic

Perspective Aspects (N%)	Teachers Respondents	Students Respondents	Criteria
Clarity of the story	81,0	82,90	Very High
Visual Quality	81,65	82,55	Very High
Emotional connection	81,65	81,85	Very High
Educational Value	81,65	81,10	Very High
Appeal & Engagement	83,00	81,10	Very High
Accessibility	83,65	82,55	Very High

Teacher and student perspectives (Table 2) regarding digital comic products are assessed across six dimensions: story clarity, visual quality,

⁶⁷ Choong-Soo Ryu, "Customized 3D Webtoon Viewer Enabling Smart Device-Based Visual Effects," *Information (Japan)* 19, no. 3 (2016): 891.

⁶⁸ María Abellán Hernández, "New Spaces for the Diffusion of Webcomics. Instagram as a Platform for Editing and Promotion," *Sobre Practicas Artisticas y Politicas de la Edicion* 10 (2024): 47.

⁶⁹ Brian Yecies et al., "Global Transcreators and the Extension of the Korean Webtoon IP-Engine," *Media, Culture and Society* 42, no. 1 (2020): 45.

⁷⁰ *Ibid.*

emotional connection, educational value, appeal and engagement, and accessibility. The perspective of teachers and students can be said to be very positive because Table 2, when compared to the criteria that meet the criteria, is very high, and it is proven to be in the category of $80\% < X$. These results are better than previous studies⁷¹ which indicates that teachers' and students' assessments of digital comic products reach only 76%. The results of operational testing with very high results prove that the development of digital comics is valid and feasible to be used as a learning medium in the educational process.⁷² By utilizing digital comics full of legends, it can be said that the digital media containing the Puncak Manik Waterfall, which is used in the educational process, contributes to ratifying the UNESCO convention.⁷³

Digital comics have the potential to enhance the legend of the Puncak Manik Waterfall by increasing accessibility, attracting a broader audience, and promoting geological and cultural diversity. Integrating toponymic legends into a digital format contributes to the preservation and dissemination of local cultural heritage. Furthermore, digital comics serve as educational tools that raise awareness of the importance of preserving geological and cultural elements within geopark areas.⁷⁴

2.6 Dissemination and Implementation

The dissemination and implementation stage of the digital comic development results was conducted on 23-24 January 2025 through an FGD involving 30 catalyst teachers from the elementary and junior high school levels (Figure 4). The collected data are qualitative and aimed at obtaining the driving teacher's approval to implement and disseminate digital comics featuring the legend of Puncak Manik Waterfall. The qualitative data obtained during the FGD included the riding teachers' opinions on the benefits of digital comics as a learning medium, their readiness to adopt them, and the dissemination strategies they planned to use.

Catalyst teachers contend that digital comics are an effective medium for introducing students to legends in schools. Digital comics featuring the legend of Puncak Manik Waterfall constitute a novel medium, and teachers express support for their adoption. The narratives in these comics are considered highly inspiring and reported to motivate students' reading.

⁷¹ Mutiara Rahmah, Mailizar, and Yusrizal, "Assessing Validity of Problem-Based Comics for Learning of Social Arithmetic," *Journal of Physics: Conference Series* 1460, no. 1 (2020): 1.

⁷² Nofha Rina et al., "Character Education Based on Digital Comic Media," *Method* 14, no. 3 (2020): 110, Lena Gleisner Villasmil, "The Effects of Influencing Factors on Upper Secondary School Teachers' Use of Digital Learning Resources for Teaching," *Computers and Education Open* 7 (2024): 1.

⁷³ Peter Dippon and Johannes Moskaliuk, "Sharing Intangible Cultural Heritage: Disparities of Distribution," *Journal of Heritage Tourism* 15, no. 4 (2020): 456.

⁷⁴ See John Edward Gordon, "Geoheritage, Geotourism and the Cultural Landscape: Enhancing the Visitor Experience and Promoting Geoconservation," *Geosciences (Switzerland)* 8, no. 4 (2018):1 and Maria Manuela Catana and José Bernardo Brilha, "The Role of UNESCO Global Geoparks in Promoting Geosciences Education for Sustainability," *Geoheritage* 12, no. 1 (2020): 1.

Catalyst teachers have indicated their readiness to implement digital comics in classroom instruction, citing the suitability of legend-based stories for social studies, Indonesian, and environmental education. They also note the ease of implementation due to the webtoon platform's accessibility. The catalyst teachers have agreed to pursue a dissemination strategy through meetings of the Teacher Working Group (KKG) forum and the Subject Teacher Deliberation (MGMP) at the Sukabumi Regency level. Dissemination efforts are further supported through collaboration with the Education Office. This dissemination agreement marks an initial milestone in the revitalization of ICH preservation, as illustrated in Figure 4 of the FGD activity with the catalyst teachers.



Sources: Author (Researcher) Document⁷⁵

Figure 4. Photo Focus Group Discussion with the Catalyst Teacher

Catalyst teachers play an important role in promoting digital comic media among fellow teachers, serving as agents of change that encourage the adoption of innovative learning practices. Analysis of the results of the FGD based on the following themes (Table 3).

⁷⁵ The presentation of photos of FGD activities has been approved by officials of the Sukabumi Regency Education Office, who serve as partners in the implementation of the FGD. The approval of no objection is stated in a letter No. 400.3.7/038/2025.

Table 3. Themes Emerging from the FGD Analysis

No	Theme	Analytical Description	Illustrative Statement
1.	Teachers' Readiness for Digital Comic Implementation	This theme reflects teachers' confidence and preparedness to integrate digital comics into classroom instruction. Participants highlighted their prior experience with digital learning tools and perceived the digital comic as compatible with existing curricular objectives and school infrastructure.	"We are already familiar with digital media, so using digital comics in class will not be difficult for us."
2.	Perceived Pedagogical and Cultural Benefits	Teachers perceived digital comics as an effective medium to enhance student engagement, facilitate contextual understanding, and support culturally responsive teaching. The integration of visual narratives and local contexts was viewed as beneficial for meaningful learning.	"The stories and visuals make the lessons more engaging and closer to students' daily experiences."
3.	Willingness to Disseminate Educational Innovation	This theme captures teachers' intentions to share and promote the use of digital comics with colleagues within teacher communities and across schools. Such willingness indicates a collaborative professional culture and collective commitment to educational improvement.	"We plan to introduce this digital comic to other teachers in our professional community."

Catalyst teachers demonstrate a positive response to digital comics, a willingness to integrate them into the teaching and learning process, and active promotion of their use to other teachers. Their readiness to implement and disseminate digital comics enables effective communication and demonstration. Furthermore, catalyst teachers foster a collaborative environment that encourages other educators to explore and apply digital comics in their instruction, thereby enriching students' learning experiences and supporting cultural preservation through creative and engaging materials.

3. CONCLUSION

The development of digital comics featuring the legend of Puncak Manik Waterfall represents a strategic initiative to protect Intangible Cultural Heritage (ICH) in accordance with the ICH Convention and Law No. 5 of 2017. This digital comic functions as an innovative educational medium, transmitting local wisdom to younger generations in the digital era. Alignment between international legal frameworks and national and local regulations, particularly the Sukabumi Regent Regulation No. 25 of 2021, establishes a robust foundation for managing the Ciletuh-Palabuhanratu UNESCO Global Geopark (UGGp). Employing legends as a medium for

geological interpretation, this study demonstrates that digital transformation not only reinforces cultural identity but also enhances public access to the scientific significance of geoparks. Consequently, the comic serves as an adaptive model that integrates education, conservation, and legal compliance to preserve ICH.

Research Limitations

Despite its contribution to protecting local legends through digital comics, this research has limitations. The study was conducted with a limited sample of participants, comprising selected teachers and primary school students, which may limit the broader cultural representation of the findings. In addition, the development and evaluation of digital comics occur in the early stages of the R&D cycle, with a focus on formative validation rather than large-scale implementation. These limitations provide guidance for future research to engage the wider community and implement a broader dissemination phase.

Ethic Statement

All research procedures have been carried out with official permission from the Education Office of Sukabumi Regency, West Java, Indonesia, the authorised authority for granting permits and coordinating research implementation in the Ciletuh–Palabuhanratu UNESCO Global Geopark area (No: 400.3.7/038/2024), equipped with Ethical Approval of Research Ethics Commission Universitas Pendidikan Indonesia No. 3/UN40.K/PT.01.01/2026. Prior to data collection, the coordinator and parent representatives of all participants provided written consent after receiving an adequate explanation of the study's objectives, benefits, and procedures. This research protects children's personal identities by adhering to applicable data protection and scientific research ethics principles.

ACKNOWLEDGMENT

The authors wish to express their profound gratitude to Dinie Anggraeni Dewi for her exceptional legal expertise and invaluable assistance in analysing the legal framework of this study. Her profound insights and guidance were instrumental in refining the juridical analysis and ensuring the academic rigor of this paper.

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