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Development of Smart Technology Media for Promoting Ecotourism in Pang Sida National Park, Sa Kaeo Province, Thailand

泰国沙缴府邦西达国家公园生态旅游推广智能技术媒体的开发

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Abstract: This study aimed to develop smart technology media for promoting ecotourism in Pang Sida National Park, Sa Kaeo Province, Thailand, and to develop a quality assessment form for evaluating the media. The Delphi technique was employed in two rounds. In the first round, structured interview data from 22 purposively selected Delphi panel members were analyzed using content analysis to identify assessment criteria. The Delphi panel members comprised six academics, eight tourists who had previously visited the park, and eight tourism content creators on YouTube and TikTok. In the second round, the assessment criteria were evaluated using a rating-scale form, and the responses were analyzed using the mean, median (Md), and interquartile range (IQR). The developed media included an augmented reality (AR) website featuring three-dimensional (3D) butterfly models and a 360-degree virtual butterfly-viewing experience, promotional signs and posters incorporating QR codes and AR markers, and a tourism promotional video published on YouTube. The quality assessment form comprised 26 criteria across three dimensions: poster media, AR media, and video media. All criteria achieved a median of

Keywords: Smart Technology Media, Smart Tourism, Ecotourism, Pang Sida National Park, Augmented Reality (AR)

关键词：智慧科技媒介， 智慧旅游， 生态旅游， 庞斯达国家公园，增强现实.

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5.00, with IQR values ranging from 0.25 to 1.00, meeting the predetermined consensus criteria of Md ≥ 3.00 and IQR ≤ 1.50. These findings demonstrate consensus among the Delphi panel members regarding the assessment criteria. The developed form may serve as a guideline for evaluating and developing smart technology media for ecotourism promotion in other destinations.

摘要：
本研究旨在开发用于促进泰国沙缴府邦西达国家公园生态旅游的智能技术媒体, 并制定相应的媒体质量评价表. 本研究采用德尔菲法 (Delphi technique), 分两轮开展. 在第一轮中, 对采用目的抽样法选取的 22 名参与者进行结构式访谈, 并运用内容分析法确定评价指标. 参与者包括6名学者、8 名曾到访该国家公园的游客, 以及8名在 YouTube 和 TikTok 平台上创作旅游内容的创作者, 在第二轮中, 采用量表对各项评价指标进行评估, 并使用均值、中位数 (Md) 和四分位距 (IQR) 分析评价结果. 所开发的媒体包括一个增强现实 (AR) 网站, 该网站展示三维 (3D) 蝴蝶模型并提供 360 度蝴蝶虚拟观赏体验; 包含二维码和AR标记的宣传标牌与海报; 以及发布于 YouTube 平台的旅游宣传视频. 媒体质量评价表包含 26 项指标, 分为三个维度: 海报媒体、AR 媒体和视频媒体. 所有指标的中位数均为 5.00, 四分位距介于 0.25 至 1.00 之间, 符合预先设定的共识标准, 即 Md ≥ 3.00 且 IQR ≤ 1.50. 研究结果表明, 参与者对各项评价指标达成了共识. 该评价表可为其他生态旅游目的地的智能技术媒体评价与开发提供参考.

1. Introduction

Digital technologies have increasingly transformed tourism promotion by enabling destinations to provide tourists with more interactive, accessible, and immersive experiences. Nevertheless, many tourist attractions continue to rely on traditional promotional media, such as brochures, pamphlets, and printed signs, which may limit opportunities for tourists to access comprehensive information in an engaging manner. Virtual reality (VR) enables users to experience simulated environments through computers or mobile devices, creating a sense of physical presence and allowing them to explore destinations from different perspectives (Buabangplu, 2018). Augmented reality (AR), in contrast, integrates digital information with the real-world environment, enabling users to access digitally enhanced content through devices such as smartphones, tablets, and smart glasses. In addition to digital technologies, traditional promotional materials, including brochures, posters, infographic maps, and tourism maps, remain important tools for tourism communication. Their effectiveness depends on attractive design, portability, and clear, accessible visual content (Hazanee & Manlee, 2021). Integrating digital technologies with conventional promotional media may therefore provide opportunities to improve tourists' access to destination information and enhance their tourism experiences.

The application of AR in tourism has the potential to improve access to destination information by overlaying digital content onto real-world surroundings. Through mobile devices, AR can support interactive information presentation and help tourists better understand the characteristics of attractions. Such technologies can complement conventional promotional materials by providing additional information and more engaging ways to explore destinations. However, the effectiveness of technology-based tourism promotion depends not only on the availability of digital tools but also on the appropriateness, usability, and quality of the media developed for specific destinations. Establishing suitable criteria for assessing such media is therefore important to ensure that the developed materials meet tourists' informational needs and support meaningful tourism experiences.

Sa Kaeo Province, located in eastern Thailand, offers a variety of tourist attractions, including natural landscapes, historical sites, and caves. Natural attractions derive their tourism value from natural resources, distinctive geographical features, environmental characteristics, and educational significance (Ban Sing Subdistrict Administrative Organization, 2026). Among these attractions, Pang Sida National Park is notable for its waterfalls, diverse wildlife, and rich butterfly diversity. The park is home to more than 400 butterfly species, making butterfly watching one of its distinctive nature-based tourism activities (Tourism Authority of Thailand, 2026). Its butterfly diversity provides opportunities for nature appreciation, photography, and environmental learning, contributing to the park's potential for ecotourism development.

Field observations at Pang Sida National Park indicated that July and August are suitable periods for butterfly watching, attracting visitors to areas where butterflies can be observed in large numbers, particularly around waterfalls. During this period, butterfly photography competitions are organized as part of activities promoting tourism in the park. The butterfly salt lick area is one of the park's principal butterfly-viewing locations, offering visitors opportunities to observe and photograph a wide variety of butterfly species. These activities highlight the importance of providing accessible and engaging information about the park's butterfly diversity and ecotourism experiences. Currently, information about butterfly species and related attractions is communicated primarily through brochures and vinyl signs installed around the butterfly salt lick area. Although these materials provide basic information, their conventional presentation may limit opportunities for visitors to access more detailed content and interact with information about the park's natural attractions.

Field observations also suggested that many visitors were local residents or tourists from neighboring provinces who learned about the park primarily through word-of-mouth. This pattern indicates an opportunity to improve the accessibility and visibility of tourism information, particularly information about the park's distinctive butterfly diversity and nature-based tourism activities. Without engaging and easily accessible information, tourists may not fully recognize the unique characteristics of Pang Sida National Park or the range of experiences available beyond conventional sightseeing. Improving tourism communication is therefore important for helping visitors discover, understand, and appreciate the park's natural resources while supporting ecotourism promotion.

The increasing use of digital technologies in everyday life has influenced tourists' expectations regarding convenient and timely access to destination information. Integrating smart technology media into the promotion of Pang Sida National Park may therefore provide an approach to complement existing communication methods and improve the presentation of tourism information. For example, AR can enable tourists to access digitally enhanced information through mobile devices, while QR codes and online platforms can facilitate access to multimedia content before and during visits. Video media can further communicate the park's distinctive attractions and tourism activities to a broader audience. Combining these approaches with conventional promotional materials may enhance the visibility of the park's natural resources and provide tourists with more accessible and engaging information.

Previous research has demonstrated the potential of AR and VR to enhance tourism marketing and tourist experiences. Yung and Khoo-Lattimore (2019) reviewed the application of VR and AR in tourism research and identified tourism marketing and education as important research contexts, while also highlighting challenges related to technology awareness and usability. Fan et al. (2022), through a meta-analysis of 65 studies, examined the effects of immersive technologies on tourism experiences and identified presence as an important factor in shaping these experiences. These studies provide a foundation for understanding the potential contributions of immersive technologies to tourism. However, developing technology-based promotional media for a specific ecotourism destination also requires attention to the local context, the characteristics of natural attractions, tourists' information needs, and the quality of the media.

In particular, further research is needed to address the practical integration of digital and conventional promotional media and the systematic assessment of their quality within specific nature-based tourism contexts. For Pang Sida National Park, the existing reliance on brochures and vinyl signs indicates an opportunity to develop more engaging media that communicate the park's distinctive butterfly diversity and other natural attractions. Moreover, different media formats serve different communication purposes and may require assessment criteria appropriate to their characteristics. Developing destination-specific promotional media alongside a structured quality assessment instrument can therefore help address both the limitations of existing tourism communication and the need for systematic evaluation of the developed materials. This study addresses these practical needs by integrating media development with the development of a quality assessment instrument for ecotourism promotion.

Accordingly, this study aimed (1) to develop smart technology media to promote ecotourism in Pang Sida National Park, Sa Kaeo Province, Thailand, and (2) to develop a quality assessment instrument for evaluating smart technology media used to promote ecotourism in the park. The study covered three media categories: poster media, augmented reality (AR) media, and video media. By developing promotional media suited to the park's ecotourism context and establishing an instrument for systematically assessing media quality, this study seeks to contribute to the improvement of tourism information communication and provide practical guidance for the development of promotional media in nature-based tourism destinations.

2. Objectives

2.1 To create and develop smart technology media to promote ecotourism in Pang Sida National Park, Sa Kaeo Province.

2.2 To develop a quality assessment form for evaluating smart technology media used to promote ecotourism in Pang Sida National Park, Sa Kaeo Province.

3. Methodology

3.1. Scopes of the study

3.1.1. Study Area

This study was conducted in Pang Sida National Park, Sa Kaeo Province, Thailand.

3.1.2. Scope of Content

This study focused on concepts and theories related to augmented reality (AR) technology, smart tourism information, and ecotourism.

3.1.3. Study Period

This study was conducted from October 2024 to August 2026.

3.2. Research Instruments

The research instruments included a fishbone diagram, a structured interview form, a website incorporating augmented reality (AR) technology, and a smart technology media quality assessment form. The structured interview form, which was used in the Delphi process to develop the smart technology media quality assessment form, was evaluated for content validity using the Index of Item-Objective Congruence (IOC). The overall IOC value was 0.93, indicating that the instrument demonstrated acceptable content validity. The validated structured interview form was subsequently used to collect data from the Delphi panel members.

3.3. Data Collection

The data collection procedures for the study entitled “Development of Smart Technology Media for Promoting Ecotourism in Pang Sida National Park, Sa Kaeo Province, Thailand” were conducted as follows:

3.3.1. Field data collection using the 3G Principles: Field data were collected through participant observation in the study area and inquiries with park officials and tourists visiting Pang Sida National Park, Sa Kaeo Province.

3.3.2. Fishbone diagram analysis: A fishbone diagram was used to identify the root causes of tourists' limited access to information about tourism activities within Pang Sida National Park.

3.3.3. Design and development of smart technology media: smart technology media were designed and developed to promote ecotourism in Pang Sida National Park, Sa Kaeo Province, through the following procedures:

1) Document and Literature Review: Relevant documents and previous studies on media production for tourism promotion and public relations were reviewed. These included print media, video clips, social media, and augmented reality (AR) technology. The findings from the review were used to determine appropriate content and formats for the development of smart technology media.

2) Collaborative media design and development: Various forms of smart technology media were collaboratively designed and developed. These included travel videos featuring Pang Sida National Park for distribution via YouTube and an augmented reality (AR) application that enabled users to view three-dimensional (3D) butterfly models.

3) Development of the smart technology media quality assessment form: The Delphi technique was employed to develop the smart technology media quality assessment form. In the first round, a structured interview form was administered to 22 Delphi panel members, comprising academics, tourists who had previously visited Pang Sida National Park, and travel content creators. Data obtained from the first-round interviews were analyzed using content analysis and synthesized to establish the criteria for assessing the quality of smart technology media. In the second round, the developed assessment form was administered to the same 22 Delphi panel members, who rated the assessment criteria. The responses were subsequently analyzed to determine the level of consensus among the Delphi panel members.

3.4. Delphi Panel Selection and Data Analysis

The Delphi panel consisted of 22 purposively selected participants representing three stakeholder groups: six academics, eight tourists who had previously visited Pang Sida National Park, and eight tourism content creators on YouTube and TikTok. Selection was based on participants' relevant academic knowledge, firsthand experience of the study area, or experience in producing and communicating tourism-related content. All participants had previously visited the park's waterfall attractions. This composition was intended to incorporate academic, visitor, and tourism communication perspectives into the development of the media quality assessment criteria. The same 22 panel members participated in both Delphi rounds. The development of the smart technology media quality assessment form using the Delphi technique involved two rounds of data collection and analysis. In the first round, data obtained from structured interviews using open-ended questions with the 22 Delphi panel members were analyzed using content analysis. The findings were synthesized to identify the criteria for assessing the quality of the smart technology media.

In the second round, the criteria identified through the first-round analysis were incorporated into a rating-scale assessment form, which was administered to the same 22 Delphi panel members. The responses were analyzed using the mean, median (Md), and interquartile range (IQR). The median was used to indicate the central tendency of the Delphi panel members’ ratings, while the IQR was used to assess the dispersion of their responses and determine the degree of consensus regarding the assessment criteria. Consensus was operationally defined as a median rating of at least 3.00 ($Md \geq 3.00$) and an interquartile range of no more than 1.50 ($IQR \leq 1.50$) on the five-point rating scale. The median threshold was used to identify

criteria rated at or above the midpoint of the scale, while the IQR threshold was used to assess the degree of agreement among panel members. These thresholds were established as operational criteria for the present study, consistent with the principle that Delphi consensus should be explicitly defined and reported (Diamond et al., 2014; von der Gracht, 2012).

4. Results

4.1. The researcher constructed a fishbone diagram to identify the root causes of tourists' limited access to information about tourism activities in Pang Sida National Park, as shown in Figure 1:



Figure 1. Fishbone diagram illustrating the root causes of tourists' limited access to information about tourism activities in Pang Sida National Park (The authors)

4.2. Based on the findings from the fishbone diagram analysis, which identified the root causes of tourists' limited access to information about tourism activities in Pang Sida National Park, a tourism promotional video was produced and distributed via YouTube. The video highlights a distinctive visitor activity that has received limited attention in previous travel content: collecting unique illustrated signatures from designated park staff members. Each staff member has a distinctive signature incorporating an illustration of a butterfly, tiger, or elephant and is therefore popularly known among visitors by the corresponding nickname: “Phi Butterfly,” “Phi Tiger,” and “Phi Elephant.” The term “Phi” is a Thai form of address commonly used to refer respectfully and familiarly to an older person. Visitors are encouraged to collect all three signatures as part of their experience while exploring Pang Sida National Park. In addition, a website was developed to provide a virtual butterfly-viewing experience. The website features a 360-degree butterfly-viewing system with an augmented reality (AR) mode accessible via smartphones.



Figure 2. Pang Sida National Park tourism promotional video on YouTube (The authors)

4.3. How to use the AR Website:

4.3.1. Access the AR Website via a Web Browser

1) Access the AR website developed in this study using a smartphone or other camera enabled device: buupangsida.com

2) It is recommended to use a Web AR compatible browser, such as Google Chrome or Safari.



Figure 3. AR Website developed (The authors)

4.3.2. Alternatively, scan the QR Code to access the AR Website

Figure 4. QR Code for Accessing the AR Website (The authors)

Subsequently, the findings were used to design tourism promotional signs for Pang Sida National Park, which were installed at designated locations within the park. In addition, promotional posters were developed to provide step-by-step instructions for viewing butterflies using AR and were disseminated through the website of the relevant local government agency in Sa Kaeo Province, as shown in Figure 5.



Figure 5. Public relations poster demonstrating step-by-step instructions for viewing butterflies using AR (The authors)

4.4 Development of the smart technology media quality assessment form

Based on the content analysis of the first-round interviews, the findings were synthesized into 26 assessment criteria across three dimensions: seven items for poster media, eight items for augmented reality (AR) media, and eleven items for video media. These criteria were incorporated into a five-point rating-scale assessment form.

After establishing the smart technology media quality assessment criteria, the researcher administered the assessment form to the same 22 Delphi panel members for evaluation in the second round. The results are presented in Table 1.

Table 1. Median, Interquartile Range, and Mean of the Smart technology media quality assessment criteria

Smart technology media quality assessment criteria	***Md***	***IQR***	***Mean***	***Appropriateness level***
Poster media				
1. The layout and arrangement of the content elements are appropriate.	5.00	1.00	4.77	very high
2. The division of topics and the sequence of the content are clear.	5.00	0.25	4.64	very high
3. The font style, color, and size are clear and legible.	5.00	1.00	4.73	very high
4. The illustrations are aesthetically appropriate and consistent with the content.	5.00	1.00	4.64	very high
5. The media reflect the distinctive identity of the tourism destination.	5.00	1.00	4.68	very high
6. The content is communicated clearly.	5.00	1.00	4.64	very high
7. The overall design is aesthetically appealing.	5.00	1.00	4.68	very high
AR media				
1. The AR media make information easier to understand and provide clearer visual representations than text-only information.	5.00	1.00	4.59	very high
2. The displayed 3D models are sharp, clear, and realistic.	5.00	0.25	4.77	very high
3. AR marker detection is fast and accurate.	5.00	1.00	4.64	very high
4. The AR system is convenient and easy to use.	5.00	1.00	4.64	very high
5. The AR system responds quickly.	5.00	0.25	4.77	very high
6. The AR media provide multidimensional visualization.	5.00	1.00	4.68	very high
7. Users can interact effectively with virtual objects.	5.00	1.00	4.59	very high
8. The AR system is compatible with various types of mobile devices.	5.00	0.25	4.77	very high
Video media				
1. The video has high-quality audio and visuals, and the content is easy to understand.	5.00	1.00	4.55	very high
2. The video is appropriately edited.	5.00	1.00	4.50	very high
3. The video presents the content in a continuous and logical sequence.	5.00	0.25	4.68	very high
4. The presented content is distinctive from other tourism videos.	5.00	0.25	4.68	very high
5. The duration of the video is appropriate.	5.00	1.00	4.68	very high
6. The video uses a variety of camera angles to present the tourism content.	5.00	1.00	4.55	very high
7. The video should include both Thai and English subtitles.	5.00	1.00	4.73	very high

Smart technology media quality assessment criteria	*Md*	*IQR*	*Mean*	*Appropriateness level*
8. The presenter or content creator explains the information concisely.	5.00	1.00	4.64	very high
9. The presenter's personality and presentation style enhance the attractiveness and engagement of the video.	5.00	1.00	4.68	very high
10. The reputation of the presenter or content creator enhances viewers' interest in the video.	5.00	1.00	4.64	very high
11. The background music enhances the overall presentation and helps maintain viewers' engagement.	5.00	1.00	4.59	very high

Consensus criteria: Md ≥ 3.00 and IQR ≤ 1.50.

As shown in Table 1, all 26 assessment criteria had a median (Md) of 5.00, while the interquartile range (IQR) values ranged from 0.25 to 1.00. All criteria met the predetermined consensus criteria of Md ≥ 3.00 and IQR ≤ 1.50 (Diamond et al., 2014; von der Gracht, 2012), indicating a strong consensus among the Delphi panel members. The mean scores ranged from 4.50 to 4.77, with all criteria rated at a very high level of appropriateness. These findings indicate that the Delphi panel members reached consensus on the appropriateness of the smart technology media quality assessment criteria across the three dimensions of poster media, AR media, and video media.

5. Conclusion and Discussion

The study also developed a media quality assessment form through a two-round Delphi technique involving 22 panel members. The findings demonstrated strong agreement on the appropriateness of the assessment criteria across poster, AR, and video media. The resulting assessment form provides a structured framework for evaluating smart technology media and may serve as a practical reference for future ecotourism media development in similar destinations.

1) Development of Smart technology media to promote ecotourism in Pang Sida National Park, Sa Kaeo Province

The development of smart technology media in this study aimed to enhance the promotion of ecotourism in Pang Sida National Park, Sa Kaeo Province, by integrating digital technology with tourism information and interpretation. The developed media consisted of an AR website featuring three-dimensional (3D) butterfly models and a 360-degree virtual butterfly-viewing experience, public relations signs and posters incorporating QR codes and AR markers, and a tourism promotional video published on YouTube. The integration of these media provided tourists with convenient access to information while offering an interactive and immersive way to experience one of the distinctive attractions of Pang Sida National Park before an actual visit.

The findings are consistent with Kritawanich (2023), who developed augmented reality smart media to promote cultural tourism in Mae Sai District, Chiang Rai Province. The study demonstrated that the integration of AR technology with tourism promotional media could provide an effective means of presenting tourism information, with the developed promotional poster media achieving an excellent level of overall content quality. The similarity between the two studies suggests that combining visual communication with AR technology can enhance the presentation of destination-related information and provide tourists with a more engaging experience than conventional information media alone.

The findings are also related to the concept of cognitive technology discussed by Chaiyarak & Wannapiroon (2020), who emphasized the potential of advanced digital technologies to enhance interaction between users and digital information. Although the present study specifically employed AR technology rather than cognitive technology, both approaches demonstrate the role of digital technologies in creating more interactive forms of information presentation and improving users' engagement with digital content. In the context of tourism, such technologies can facilitate access to information while providing tourists with opportunities to experience destination-related content in more interactive and visually engaging ways.

Furthermore, the findings are consistent with Tongchum & Sompuet (2026), who developed public relations media using augmented reality technology to enhance cultural tourism destinations along Khlong Bang Yai, Bang Yai District, Nonthaburi Province. Their study integrated AR technology with posters, postcards, and video clips for seven tourist attractions and reported a high level of media quality, particularly in terms of design. Tourist satisfaction was also reported at the highest level, particularly for video media. These findings support the integration of AR technology with different forms of tourism promotional media as an approach to enhancing the attractiveness and accessibility of tourism information for tourists in the digital era.

The findings of the present study further suggest that smart technology media can respond to the changing information-seeking behaviors and expectations of modern tourists. Tourists in the digital era seek not only accurate tourism information but also convenient access, attractive visual presentation, and interactive experiences through digital devices. The integration of an AR website, public relations signs and posters, and video media therefore provides multiple

channels through which tourists can obtain and interact with tourism information. In particular, the use of 3D butterfly models and the virtual butterfly-viewing experience allows users to explore one of the distinctive natural attractions of Pang Sida National Park in a digital environment before visiting the actual destination. Such an experience may enhance tourists' interest in the park and contribute to the promotion of ecotourism by communicating the distinctive natural characteristics of Pang Sida National Park in an engaging and accessible manner.

2) Development of the Smart Technology Media Quality Assessment Form

The second objective of the study was to develop a quality assessment form for evaluating smart technology media used to promote ecotourism in Pang Sida National Park. The assessment form was developed using the Delphi technique. In the first round, open-ended interviews were conducted with 22 participants, and the interview data were analyzed using content analysis. The findings were subsequently synthesized into 26 assessment criteria across three dimensions: seven items for poster media, eight items for augmented reality (AR) media, and eleven items for video media. In the second round, the 26 criteria were incorporated into a five-point rating-scale assessment form and evaluated by the same 22 participants to determine the appropriateness of the proposed criteria and the level of consensus among the participants.

The results demonstrated a strong consensus regarding the proposed assessment criteria. These findings support the appropriateness of the developed criteria for assessing smart technology media across the three dimensions of poster media, AR media, and video media.

The findings are consistent with the concept of the Delphi technique proposed by Dalkey & Helmer (1963), which emphasizes the systematic collection and refinement of expert judgments to establish consensus. In the present study, the Delphi process enabled qualitative opinions and recommendations obtained from the participants in the first round to be systematically analyzed and transformed into specific assessment criteria. The second-round evaluation then provided an opportunity for the same participants to assess the appropriateness of those criteria quantitatively. The resulting median and IQR values demonstrated that consensus was achieved for all 26 criteria, supporting their inclusion in the developed smart technology media quality assessment form.

The findings are also consistent with Ab Latif et al. (2017), who demonstrated the application of the Delphi technique in the development of assessment instruments through expert consensus. The strong consensus obtained in the present study supports the appropriateness of using expert judgment as a basis for developing criteria that address different characteristics of smart technology media. Rather than focusing on a single type of media, the developed assessment form incorporates three complementary dimensions: poster media, AR media, and video media, thereby reflecting the integrated nature of the smart technology media developed in this study.

The three dimensions also represent different but complementary aspects of tourism communication. Poster media emphasize the clarity, organization, visual design, and distinctive identity of tourism information. AR media emphasize ease of understanding, quality of 3D visualization, marker detection, system responsiveness, user interaction, and compatibility with mobile devices. Video media emphasize audiovisual quality, content sequencing, editing, duration, camera angles, subtitles, presentation style, and background music. The inclusion of these dimensions indicates that the quality of smart technology media for tourism should not be considered solely in terms of technological functionality; rather, it should also encompass the quality of visual communication, content presentation, usability, and user engagement.

Overall, the findings suggest that the Delphi technique provided a systematic approach for transforming expert opinions into a structured set of assessment criteria for smart technology media. The consensus achieved across all 26 criteria supports the appropriateness of the developed assessment form as a framework for evaluating the quality of integrated tourism media. The assessment form may also provide a useful guideline for the future development and evaluation of smart technology media in other ecotourism destinations, although its application in other contexts should take into account the specific characteristics of each destination and target group.

6. Limitations and Further Study

This study was conducted specifically in Pang Sida National Park, Sa Kaeo Province, Thailand, and the development of the smart technology media quality assessment form involved 22 Delphi panel members. Therefore, the findings should be interpreted within the context of the study area and the selected panel. Future research could apply and further validate the developed assessment criteria in other ecotourism destinations and examine tourists' experiences with AR media, including their potential effects on environmental learning and sustainable tourism behavior.

Author Contributions

Conceptualization, Pareeyawadee Ponanake and Akarakrit Pattanasumpan; methodology, Pareeyawadee Ponanake; formal analysis, Pareeyawadee Ponanake; investigation, Akarakrit Pattanasumpan; draft preparation, Pareeyawadee Ponanake; writing—review and editing, Akarakrit Pattanasumpan. All authors have read and agreed to the published version of the

manuscript.

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Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the Committee of Burapha University (protocol code IRB2-116/2569; approval date: May 28, 2026).

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The raw data supporting the conclusions of this article will be made available by the authors on request.

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Conflicts of Interest

The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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