



# Yogyakarta culture technology (Yogyakarta-cultech): Utilizing user-friendly gamification-based platforms to revitalize Yogyakarta's culture in enhancing digital literacy and achieving SDG 11

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## ABSTRACT

**Background:** The development of digital technology provides great opportunities for the preservation and revitalization of local culture, but on the other hand, it also presents challenges in the form of declining interest among the younger generation in regional culture and low digital literacy rooted in local wisdom values. Amidst the tide of globalization and the dominance of popular digital culture, Yogyakarta culture risks being marginalized if it is not adapted to a medium that is relevant to the character of the current generation. To address these issues, an innovation called Yogyakarta Culture Technology (Yogyakarta-Cultech) was developed. This innovation was developed through a digital platform development approach using a system design method based on literature review, user needs analysis, and the use of gamification concepts. **Methods:** This study adopts a qualitative descriptive development approach to examine the use of a gamification-based digital platform as a strategy for cultural revitalization and the strengthening of city branding authenticity. Data were collected through literature review, needs analysis, and expert validation, and analyzed using thematic qualitative techniques grounded in cultural revitalization, digital literacy, and place branding perspectives. **Findings:** Yogyakarta-Cultech is a user-friendly and interactive cultural learning platform that integrates gamification elements to increase the participation and interest of the younger generation in Yogyakarta's culture. This platform has main features such as Explore Culture Map, Quiz Time, and Friend Challenge, which encourage exploration and active user engagement. **Conclusion:** Yogyakarta-Cultech aims not only to revitalize Yogyakarta's culture in the digital space, but also to improve the community's digital literacy in a contextual and sustainable manner. **Novelty/Originality of this article:** This innovation is expected to contribute to supporting the preservation of local culture, strengthening cultural identity, and achieving Indonesia's 2030 Sustainable Development Goals (SDGs), particularly target 11, which is sustainable cities and communities.

**KEYWORDS:** culture; platform friendly; Yogyakarta-Cultech.

## 1. Introduction

Indonesia is widely recognized for its rich cultural diversity, which significantly shapes the nation's identity and uniqueness (Samongilailai & Utomo, 2024). This diversity arises from Indonesia's large population distributed across approximately 17,000 islands and encompasses around 300 ethnic groups, 19 traditional cultural regions, and more than 300

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languages spoken by its communities (Thohiroh, 2024). Cultural diversity has given rise to a wide range of cultural heritage passed down through ancestral oral traditions (Lestari et al., 2023), particularly in the Province of Yogyakarta, which is endowed with abundant cultural assets. Yogyakarta is renowned for its rich and meaningful traditions, including the Serimpi Dance, Bedhaya Dance, distinctive Javanese gamelan music, Yogyakarta batik with philosophical motifs, as well as traditional songs and wayang kulit (shadow puppetry) that serve as cultural identities of the local community (Prabhawati & Wahjuni, 2018). The cultural heritage of Yogyakarta is not merely a historical legacy but also a source of identity and pride for its people (Indrawati & Sari, 2024). However, the rapid pace of modernization has led some younger generations to gradually distance themselves from local culture. Therefore, digital cultural literacy has become increasingly important as an effort to preserve, develop, and reintroduce Yogyakarta's cultural heritage in order to ensure its continued relevance in the global era.

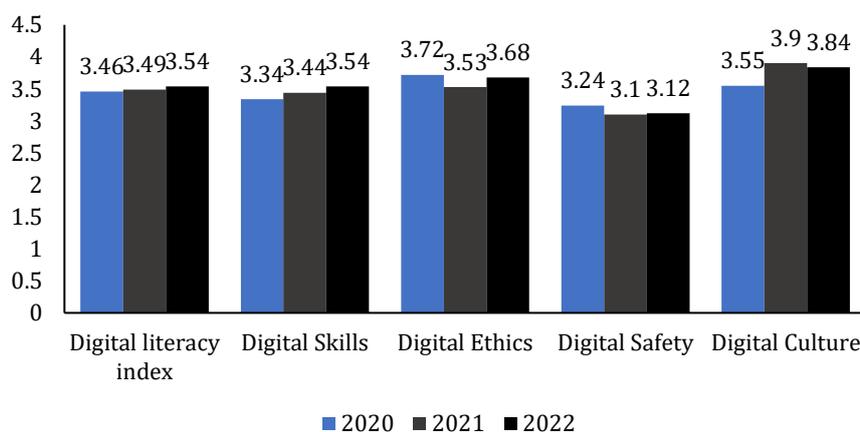


Fig. 1. Digital literacy survey data chart (Annur, 2023)

This is supported by a survey conducted by the Ministry of Communication and Informatics/*Kementerian Komunikasi dan Informatika* (Kominfo) and the Katadata Insight Center in 2022, which revealed that Indonesia's national digital literacy index stood at only 3.54 out of a maximum score of 5.00 (Annur, 2023). This finding indicates that the ability to access, understand, and critically filter digital information still requires significant improvement, particularly among students who are now part of the digital generation (Aliyah & Sapitri, 2024).

On the other hand, the utilization of gamification based on digital platforms in cultural preservation efforts has begun to demonstrate significant potential (Botacini & Giaccone, 2022; Wu et al., 2023). Gamification is able to provide more interactive, participatory, and contextual cultural learning experiences for the community (Zhang et al., 2022). However, most existing digital cultural platforms still focus on one-way information delivery, without integrating elements of emotional engagement, local wisdom values, and digital media ethics. As a result, the process of cultural introduction through digital media tends to be less engaging and has not yet been able to foster a meaningful connection between users and local culture.

To address these challenges, the government has begun adopting literacy corners across various areas of the Yogyakarta Province. However, existing solutions have not yet been fully effective, as most literacy corners remain concentrated in urban areas. Therefore, this scholarly article proposes an innovative concept known as Yogyakarta Culture Technology (Yogyakarta-Cultech), a user-friendly platform aimed at revitalizing Yogyakarta's cultural heritage. This initiative is expected to serve as a sustainable solution to support the community in enhancing literacy on cultural diversity within the Yogyakarta Province while simultaneously contributing to the achievement of Indonesia's Sustainable

Development Goals (SDGs) 2030, particularly Goal 11 on sustainable cities and communities.

The purpose of this article is to highlight the potential for preserving Yogyakarta's cultural heritage through digital transformation manifested in a creative innovation, namely a gamification-based platform designed to strengthen the community's digital cultural literacy. This innovation not only focuses on documenting and reintroducing cultural heritage such as traditional dances, batik, gamelan, and Yogyakarta's distinctive wayang kulit (shadow puppetry), but is also aimed at creating an interactive space that encourages active participation from younger generations in safeguarding their regional cultural identity. By integrating technology, education, and local wisdom, this paper seeks to propose an adaptive, inclusive, and sustainable model of cultural preservation, in which local communities play a central role as key actors in revitalizing, developing, and promoting Yogyakarta's cultural richness in the era of Society 5.0.

## 2. Methods

The Special Region of Yogyakarta is one of Indonesia's national cultural centers, characterized by a high level of cultural heritage richness and an increasing penetration of digital technology, making it a strategic choice for the research location. This study adopts a qualitative descriptive design with a development study approach, aimed at analyzing the utilization of gamification through a user-friendly platform as an effort to revitalize local culture by strengthening community digital literacy. The collected data are organized in narrative form and analyzed based on theories of cultural revitalization, digital literacy, as well as relevant policies on cultural preservation and digital transformation. Data on cultural potential, levels of digital literacy, and the utilization of digital platforms were collected over the period from 2018 to 2025. This research is grounded in the premise that technology-based cultural innovations should be designed by considering local cultural potential, the real needs of the community, and the experiences and direct involvement of cultural practitioners and digital platform users.

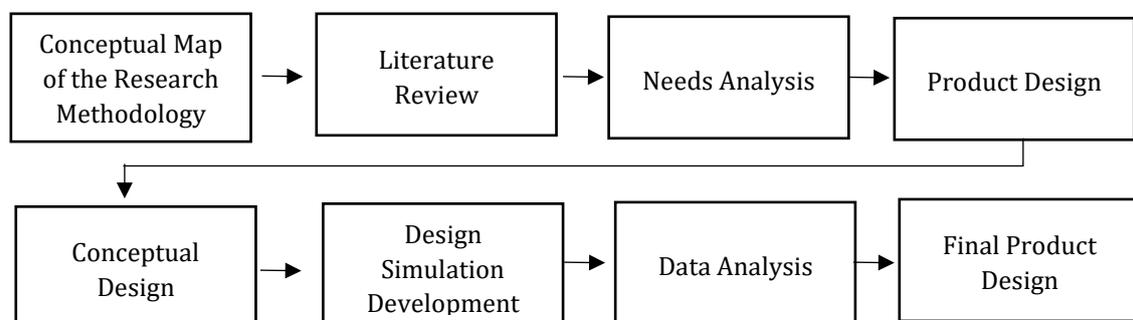


Fig. 2. Flow of research methodology stages for Yogyakarta culture technology

The first step in this research was to conduct a literature review to establish a strong conceptual foundation (Hanifah et al., 2025). This review encompassed theories related to the use of gamification-based digital technology in cultural preservation, local cultural revitalization, community digital literacy, and the role of user-friendly digital platforms in enhancing public participation. The literature sources were obtained from reference books, scholarly journals, documents, and other official sources. The literature review was employed to understand recent developments in the field while also identifying gaps that have not yet been addressed by existing digital systems (Vassilakopoulou & Hustad, 2023; Xames & Topcu, 2024).

Subsequently, a needs analysis was conducted to identify the main challenges faced by the community, particularly younger generations, in accessing and understanding local cultural content through digital platforms. This analysis was based on an examination of field conditions and evolving social phenomena, such as declining interest in traditional

culture, the dominance of global digital content, and the limited availability of interactive media capable of attractively integrating local cultural values (Zahrani et al., 2025). These findings served as the primary foundation for designing the system architecture and features of the Yogyakarta Culture Technology (Yogyakarta-Cultech) platform.

The development process was carried out by designing features aligned with the identified needs. The main features proposed include interactive gamification-based cultural content, a reward and leveling system to enhance user engagement, the integration of accurate and curated local cultural information, and digital literacy modules emphasizing media ethics and contextual cultural understanding. The initial design of the platform was articulated through user interface sketches, system workflows, and detailed descriptions of the functions of each proposed feature.

The developed design was subsequently tested through a concept validation process. This validation involved a limited focus group consisting of academics, cultural practitioners, and digital platform developers (Sugiyono, 2020). Participants were asked to evaluate the alignment of the platform design with on-the-ground cultural preservation needs, as well as the effectiveness of the proposed features in enhancing digital literacy and public participation. The feedback obtained from this process was used to refine the design before proceeding to the next stage.

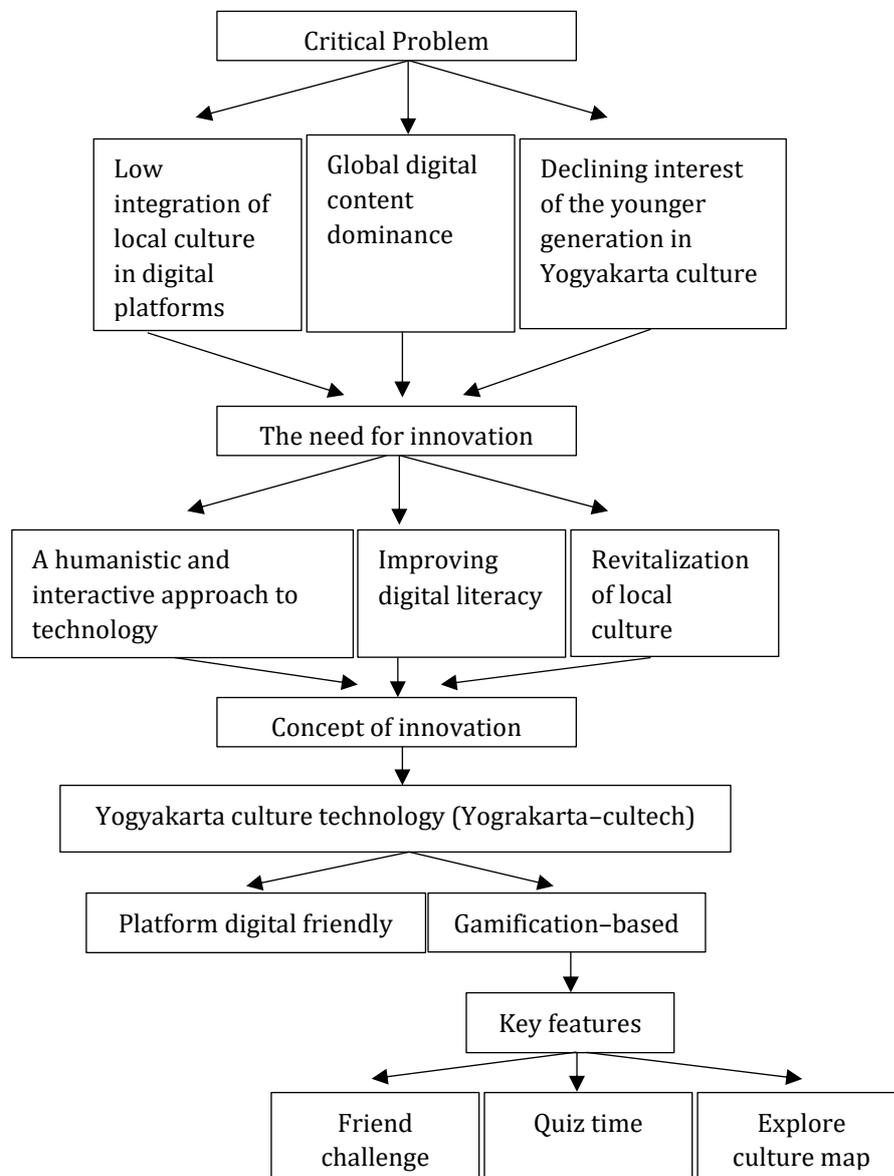


Fig. 3. Conceptual framework flow of the Yogyakarta culture technology platform

All data collected from the literature review, needs analysis, and validation processes were analyzed using a qualitative descriptive analysis technique. This technique involves three stages: data reduction, data presentation, and conclusion drawing (Qomaruddin & Sa'diyah, 2024). Data reduction was conducted to filter relevant information, which was then organized into thematic narratives aligned with the research focus (Ahmed et al., 2025). Subsequently, the data were systematically presented to illustrate the relationships among the identified problems, theoretical frameworks, and the proposed innovation design. Conclusions were drawn based on identified patterns of needs and field findings that had been verified against the applied theoretical perspectives (Nurhayati et al., 2024).

### 3. Results and Discussion

#### 3.1 *The Yogyakarta culture technology (Yogyakarta-Cultech) concept as a cultural revitalization initiative*

Referring to the draft of the National Long-Term Development Plan (RPJPN) 2025–2045, one of the major challenges faced by Indonesia is the declining resilience of its socio-cultural fabric due to the rapid pace of globalization and digitalization that has not been fully balanced by adequate efforts to preserve local culture. This condition has directly contributed to a decrease in young people's appreciation of national cultural values, including in the Province of Yogyakarta, which possesses a rich cultural heritage (Sabila et al., 2025). In this context, the RPJPN 2025–2045 emphasizes the importance of Social Transformation through strengthening national identity, character education, and sustainable development rooted in local culture. Furthermore, among the 17 national development directions particularly Mission 5 on Socio-Cultural and Ecological Resilience (IE13: Inclusive Religiosity and Advanced Cultural Development) the strengthening of regional culture is highlighted as a strategic element in maintaining social cohesion and national competitiveness. Accordingly, the preservation of Yogyakarta's cultural heritage through digital innovations such as Yogyakarta-Cultech represents a concrete step toward supporting the RPJPN 2025–2045 vision of building a culturally sovereign Indonesia that is resilient to change and characterized by strong values on the path toward Indonesia Golden Vision 2045

The policy framework of the National Long-Term Development Plan (RPJPN) 2025–2045, along with the potential of advancing digital technology, serves as the primary foundation for formulating the Yogyakarta-Cultech innovation. The authors propose the utilization of gamification-based, user-friendly platforms integrated with interactive digital systems as a means of revitalizing Yogyakarta's cultural heritage. This innovation is expected to strengthen digital cultural literacy. Accordingly, it represents an adaptive, participatory, and sustainable form of digital implementation for cultural preservation.

The concept underlying this innovation aims to empower the people of Yogyakarta as well as the broader Indonesian society to access, learn about, and preserve their regional cultures through technology. The specific objectives of this initiative include: (a) revitalizing and preserving cultural heritage through the utilization of digital technology to ensure that cultural assets are not eroded over time; (b) expanding public access to cultural information through easily accessible digital platforms; and (c) encouraging community participation in safeguarding and developing cultural heritage through creative digital spaces.

In its implementation, Yogyakarta-Cultech is designed as a digital platform that integrates elements of local culture with educational and inclusive gamification mechanisms. Each feature of the platform is developed to encourage active user engagement through interactive learning experiences. This approach functions not only as a learning medium but also as a means of strengthening cultural identity and enhancing community digital literacy, particularly among younger generations (Adha et al., 2025). Through the use of user-friendly technology, Yogyakarta-Cultech is expected to bridge the gap between technological advancement and the sustainable preservation of local cultural values, while also contributing to the achievement of the Sustainable Development Goals.



Fig. 4. Yogyakarta–Cultech logo

The Yogyakarta–Cultech logo features modern typography with a dominant gold color, representing the values of grandeur, wisdom, and the nobility of Yogyakarta’s culture. Its minimalist visual design combined with a futuristic nuance reflects the synergy between traditional cultural heritage and the advancement of digital technology. The logo functions not only as a visual identity but also conveys a philosophical meaning that represents the vision of Yogyakarta–Cultech as an innovative platform for revitalizing local culture through an adaptive and sustainable technological approach.

### *3.2 Integration of the internet of things in innovation development*

Advances in access to technology, information, and communication must be leveraged to optimize local resource potential as an initial step toward realizing Indonesia Golden Vision 2045 (Shintya & Dwiwarman, 2025). At present, technological development has entered the era of Society 5.0, and the utilization of the Internet of Things has begun to permeate various aspects of life, including cultural preservation (Tavares et al., 2022). This condition indicates that digitalization continues to grow and has become a driving force within Indonesia’s education sector (Machmud et al., 2024; Rakhmadi et al., 2025). Recent data from the Indonesian Internet Service Providers Association (APJII), an institution related to digital technology development, indicate that the number of internet users in Indonesia continues to increase steadily. In early 2021, the number of internet users in Indonesia reached 202.6 million, with approximately 73.7% of the total population having access to the internet (Anugrah et al., 2023). Public enthusiasm for digital technology has created significant opportunities for cultural preservation through digital literacy approaches (Sari & Virgy, 2024). Therefore, as a timely and relevant innovation, the concept of Yogyakarta–Cultech emerged as a digital initiative focused on a user-friendly platform for cultural revitalization, ensuring that cultural heritage remains preserved, widely recognized, and contributes to sustainable development.

This innovation is conceived as a digital technology–based medium for cultural literacy and preservation. It is designed to address the challenges of the digital era while providing broader access for the community—particularly younger generations—to recognize, understand, and preserve regional cultural heritage. Through an interactive digital approach, users not only gain knowledge about Yogyakarta’s cultural heritage but are also encouraged to develop creativity grounded in local wisdom. Accordingly, this innovation is expected to serve as a bridge between culture and technology, while supporting Indonesia Golden Vision 2045 and Indonesia’s Sustainable Development Goals (SDGs) 2030, particularly Goal 11 on sustainable cities and communities.

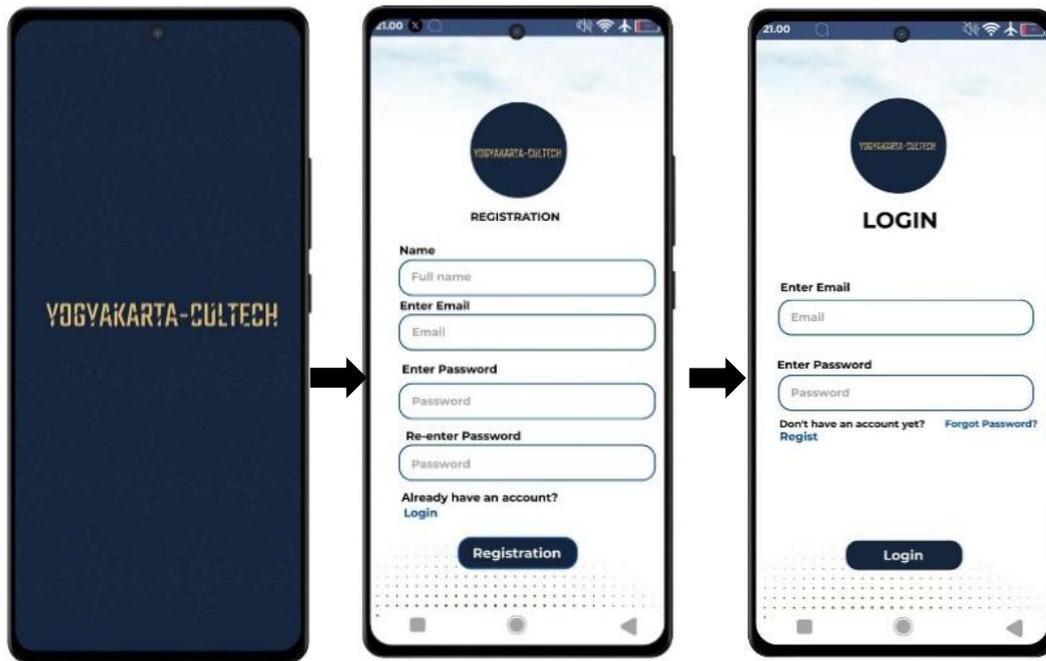


Fig. 5. Initial interface of the Yogyakarta–Cultech innovation

Figure 5. This view illustrates the login and registration page of the Yogyakarta–Cultech platform for users. The interface is designed to be user-friendly and accessible to various age groups, particularly younger generations and the general public interested in exploring Yogyakarta’s culture. On this page, users can choose to register as visitors or as registered users, and then provide basic information such as name, email, and password. A dominant dark blue color with gold accents is applied to create an elegant and comfortable impression while reflecting cultural values and technological innovation. Additionally, quick login options through Google or integrated social media accounts are available. The interface is designed to facilitate users in starting their digital cultural exploration in a practical, personalized, and sustainable manner.

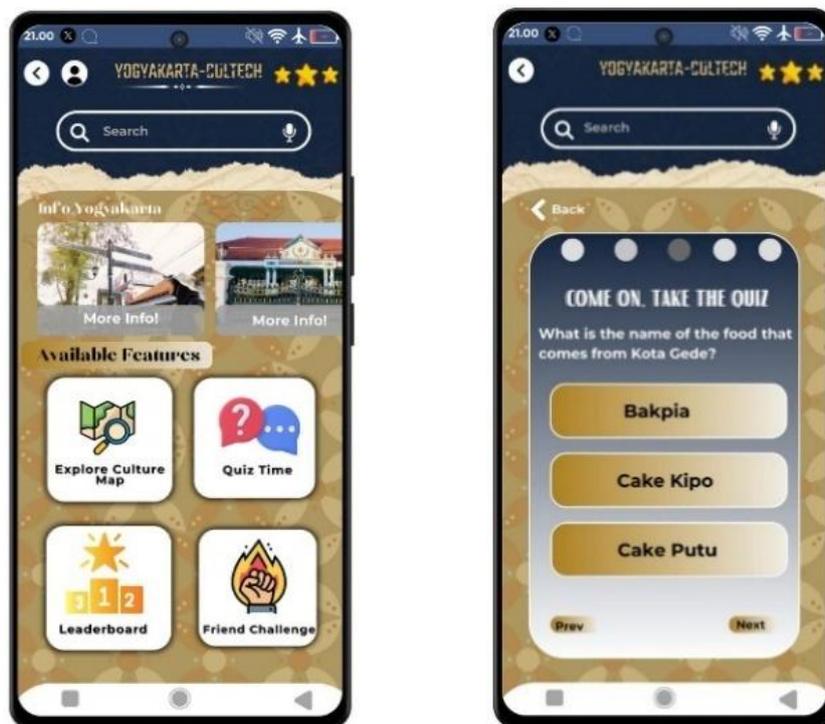




Fig. 6. Design and concept of the Yogyakarta-Cultech innovation

The design and detailed explanation of the innovation’s features can be seen in Figure 6 and Table 1. Yogyakarta-Cultech represents a modern-era innovation that utilizes digital technology to preserve cultural heritage and strengthen community literacy. This innovation serves as a solution to the challenges posed by the declining interest of younger generations in local culture, which is increasingly impacted by globalization. Furthermore, if digitalization is effectively maximized, it can create significant opportunities for national advancement while simultaneously preserving regional cultural identity (Anatasya et al., 2024). In addition, Yogyakarta-Cultech promotes a personalized and adaptive cultural learning experience. Each user can tailor their learning path according to their interests, ranging from arts and culinary traditions to local customs, making the process of understanding culture more engaging and relevant. This approach not only enhances the motivation of younger generations to explore cultural heritage but also strengthens their emotional connection to local identity, ensuring that cultural preservation is experienced in everyday life rather than remaining purely theoretical.

Table 1. Feature description of the Yogyakarta-Cultech innovation

| Feature             | Description   |
|---------------------|---|
| Explore Culture Map | The Explore Culture Map feature serves as the main information hub, presenting an interactive map that includes various elements of Yogyakarta’s distinctive culture, such as traditional houses, museums, and culinary sites. Through this feature, users can explore each region within the Yogyakarta Province and discover local cultural richness presented in visual, narrative text, and audio-visual formats. |
| Quiz Time           | The Quiz Time feature functions as an interactive learning tool based on educational games (gamification). Users are provided with quizzes about Yogyakarta’s culture with varying levels of difficulty, ranging from basic introductions to in-depth knowledge of history, customs, and local arts. Each correct answer generates points that can be accumulated on a leaderboard.                                   |
| Friend Challenge    | The Friend Challenge feature allows users to challenge friends or other users in quizzes or digital cultural activities. This feature naturally fosters social interaction in cultural preservation in an engaging and enjoyable manner. In addition to increasing user engagement, it also strengthens the spirit of togetherness and collective effort in promoting Yogyakarta’s culture in the digital space.      |

The design of the Yogyakarta–Cultech innovation incorporates three main features aimed at strengthening digital cultural literacy and enhancing community engagement. All these features are freely accessible through the Yogyakarta–Cultech application, which can be installed on users' digital devices. The first step for users is to register an account via the sign-up feature or log in on the application's home screen. The registration process is verified via email to ensure account security and system integration. Once successfully logged in, users can immediately explore the main features, such as Explore Culture Map, Quiz Time, and Friend Challenge. These features are designed not only as a source of entertainment but also as an interactive educational medium that introduces Yogyakarta's culture through engaging and immersive digital experiences. Furthermore, users can provide direct feedback through the application, enabling continuous updates to the Yogyakarta–Cultech system in accordance with community needs and preferences. With these three features, Yogyakarta–Cultech functions not only as an educational application but also as an interactive space connecting technology with local wisdom. This innovation is expected to make cultural learning engaging, inclusive, and relevant for the current generation while simultaneously strengthening Yogyakarta's cultural identity in the sustainable digital era.

### 3.3 User-friendly platform design for the community

This innovation is dedicated to the people of Yogyakarta as well as to the broader Indonesian society as a strategic effort to optimize the diverse cultural heritage of Yogyakarta Province. The initiative is designed not merely as a digital medium but as a participatory ecosystem that encourages active community engagement in the preservation, learning, and sustainable development of local culture. Through a user-friendly technology approach combined with gamification mechanisms, Yogyakarta–Cultech targets various segments of society, including students, educators, cultural communities, and the general public, enabling inclusive access to and utilization of cultural information. To ensure effective implementation and sustainability, a target and management design scheme has been developed, illustrating the relationships among users, administrators, and relevant stakeholders in supporting the achievement of cultural revitalization and enhancement of digital literacy based on local wisdom. The design scheme for innovation targets and management can be seen in Figure 8.

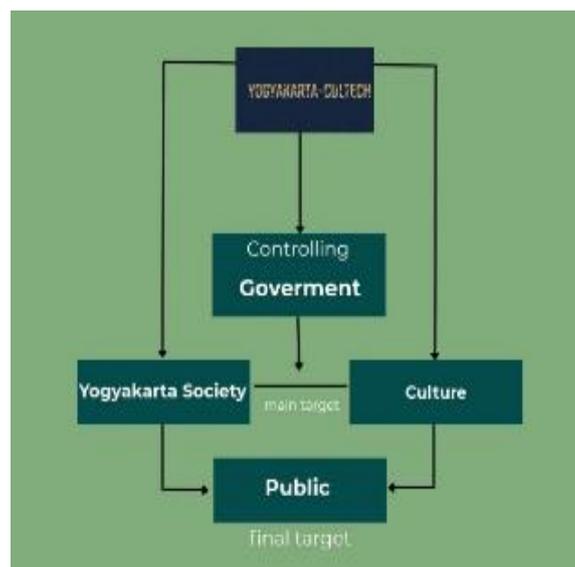


Fig. 7. Target and management design of Yogyakarta–Cultech

Yogyakarta–Cultech is designed and managed by the Government of Yogyakarta Province as the primary driver in implementing digital-based cultural preservation innovation. The main targets of this innovation are the people of Yogyakarta and the cultural

heritage as the inheritors of local cultural values that constitute the region's identity. Ultimately, the objectives of this innovation are the establishment of strong digital cultural literacy, sustainable cultural preservation, and increased community participation in safeguarding ancestral heritage. This gamification, and digital technology-based platform functions to ensure that Yogyakarta's culture remains alive, easily accessible, and relevant in the era of Society 5.0 through the integration of interactive features within the innovation. Consequently, the government can carry out integrated management, cultural communities and academics are supported in documenting and promoting local wisdom, while the community enjoys engaging cultural learning experiences. This collaborative flow directly contributes to strengthening cultural identity, enhancing digital literacy, and achieving the Sustainable Development Goals (SDGs) target 11, namely sustainable cities and communities, as a foundation toward Indonesia Golden Vision 2045 that is culturally rich, competitive, and sustainable.

### 3.4 Implementation steps of the Yogyakarta-Cultech innovation

The implementation stages of the Yogyakarta-Cultech innovation are designed to illustrate the systematic and targeted process of applying the innovation, from the planning phase to the evaluation and sustainable development phase. These stages serve as an operational framework to ensure that each step of implementation aligns with user needs, stakeholder readiness, and environmental conditions that support the development of both the innovation and digital technology. Through these implementation stages, it is ensured that the processes of development, testing, deployment, and scaling of the innovation are conducted in a measured, adaptive, and sustainable manner, enabling Yogyakarta-Cultech to deliver tangible impacts in supporting local cultural preservation and the optimal utilization of technology, this can be seen in Figure 9.

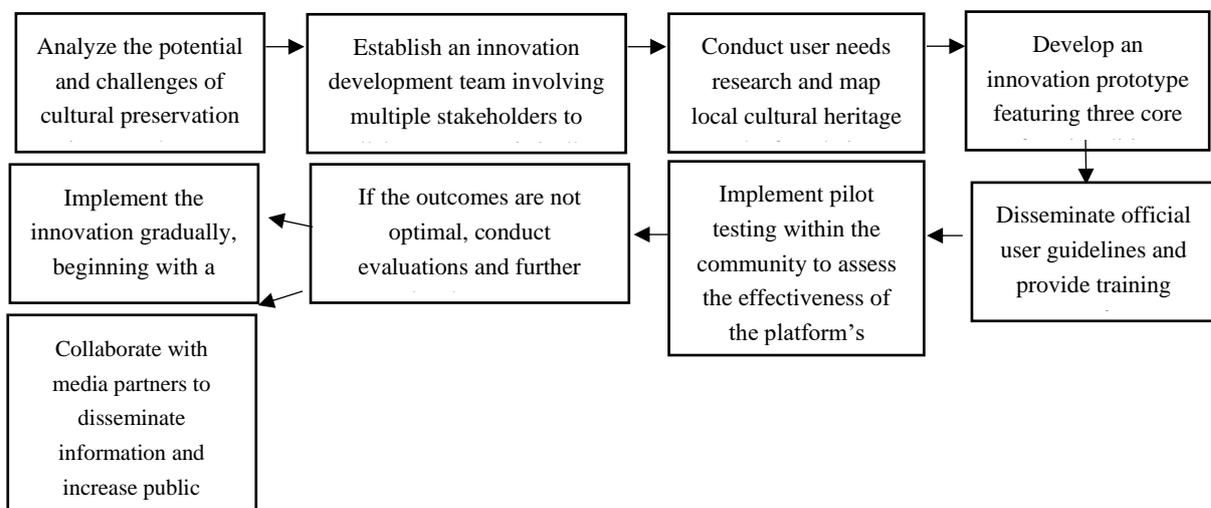


Fig. 8. Implementation stages of Yogyakarta-Cultech

### 3.5 SWOT framework analysis of the Yogyakarta-Cultech innovation

The following SWOT analysis is developed to identify and evaluate various internal and external factors that influence the success of the development and implementation of the Yogyakarta Culture Technology (Yogyakarta-Cultech) platform. This analysis aims to provide a strategic mapping of the internal conditions of the innovation, encompassing strengths and weaknesses in terms of concept, technology, and management, as well as external factors in the form of opportunities and threats arising from the social, cultural, policy, and digital technology environments. The results of the SWOT analysis presented in Table 2 offer a concise yet comprehensive overview of the strengths that can be maximized,

weaknesses that need to be addressed, opportunities that can be leveraged, and potential threats that must be anticipated in the sustainable development and implementation of the platform.

Table 2. SWOT Analysis of the Yogyakarta–Cultech Innovation

| Strengths   | Weakness  |
|---|---|
| <ol style="list-style-type: none"> <li>1. Cultural content based on Yogyakarta’s heritage such as traditional houses, traditional attire, dances, local cuisine, regional languages, and traditional songs strengthens local identity and preserves regional cultural values</li> <li>2. The platform supports digital literacy by serving as a medium for cultural education while simultaneously enhancing the digital literacy skills of the community.</li> </ol> | <ol style="list-style-type: none"> <li>1. Limited resources pose a challenge, as the development and sustainability of the platform require a multidisciplinary team consisting of technology experts, designers, and cultural specialists to ensure content accuracy and quality.</li> </ol> |
| Opportunities   | Threats   |
| <ol style="list-style-type: none"> <li>1. Strong support from government institutions and cultural organizations for cultural digitalization programs, which are frequently endorsed by both regional and central governments.</li> <li>2. The concept implemented in Yogyakarta–Cultech has high scalability and can be replicated for other regional cultures across Indonesia.</li> </ol>  | <ol style="list-style-type: none"> <li>1. Without long-term commitment and sustained support from key stakeholders, the program risks discontinuation before achieving its full impact.</li> </ol>  |

### 3.6 Political, economic, social, technological, environmental and legal (PESTEL) analysis of the Yogyakarta–Cultech innovation

The PESTEL analysis is conducted to identify and evaluate various external factors that may influence the development, implementation, and sustainability of the Yogyakarta–Cultech platform. This analysis serves as a strategic framework to understand the dynamics of the external environment, encompassing political, economic, social, technological, environmental, and legal aspects relevant to culture-based digital innovation. Through this approach, potential opportunities that can be leveraged and challenges that need to be anticipated in the platform’s development are identified, particularly in terms of public policy, community readiness, technological support, and applicable regulatory frameworks. The results of the analysis, as presented in Table 3, comprehensively summarize the opportunities and challenges across each PESTEL dimension. Therefore, this analysis provides a strategic foundation for formulating adaptive and sustainable development strategies for Yogyakarta–Cultech, while ensuring alignment with sustainable development objectives.

Table 3. PESTEL Analysis of the Development of Yogyakarta–Cultech

| Indicator | Analysis   |
|-----------|--|
| Political | The Yogyakarta–Cultech innovation aligns with the government’s agenda to enhance digital literacy while preserving and promoting local culture in the era of digital transformation. This innovation supports the implementation of national policies such as the National Long-Term Development Plan (RPJPN) 2025–2045, the digital transformation agenda, and efforts to achieve the Sustainable Development Goals (SDGs). |
| Economic  | Potential collaborations with startups, corporate social responsibility (CSR) programs, and other supporting initiatives may help reduce development and operational costs. In addition, the platform has the potential to create employment opportunities, particularly in the fields of content design, cultural documentation, and software development.  |

|               |   |
|---------------|---|
| Social        | This innovation serves as an effective medium to increase public awareness of Yogyakarta's cultural potential, which is increasingly threatened by globalization. The gamification-based approach makes cultural learning more interactive, engaging, and aligned with current digital trends, thereby enhancing community participation, especially among younger generations.   |
| Technological | Advancements in technology provide opportunities for integrating innovative features such as gamification, augmented reality (AR), virtual reality (VR), and social media connectivity to expand user engagement and platform reach. These technological integrations enable Yogyakarta-Cultech to deliver immersive and interactive cultural learning experiences that are aligned with current digital trends and user expectations.  |
| Environmental | The utilization of digital platforms in the Yogyakarta-Cultech innovation contributes to reducing the use of printed media, thereby supporting environmental conservation efforts through paper savings and the reduction of physical waste. The digitalization of cultural content allows information dissemination to be conducted more efficiently and in an environmentally friendly manner. Moreover, this platform has the potential to promote and educate the public on culture-based ecotourism and environmental sustainability issues, including the preservation of cultural heritage sites, local wisdom in natural resource management, and cultural practices that align with sustainability principles. |
| Legal         | The development of Yogyakarta-Cultech must take into account legal considerations, such as cultural intellectual property rights, digital content licensing, and formal agreements with cultural communities. Ensuring legal compliance is essential to protect cultural assets, maintain ethical standards, and support the long-term sustainability of the platform.  |

### 3.7 Plan, do, check, and action (PDCA) analysis of the Yogyakarta-Cultech innovation

The PDCA analysis is applied as a systematic approach to ensure that the development and implementation processes of the Yogyakarta-Cultech platform are conducted in a well-planned, measurable, and sustainable manner. This approach enables continuous evaluation at each stage of the innovation process, allowing the platform to be continuously refined in accordance with user needs and the dynamics of the external environment. In the Plan stage, the development planning of the platform is carried out based on the results of literature reviews, needs analysis, and external environmental analysis. This stage includes the formulation of innovation objectives, identification of target users, the design of a local culture-based gamification concept, and the development of key features that support cultural revitalization and the enhancement of digital literacy among the Yogyakarta community.

Table 4. PDCA analysis of the development Yogyakarta-Cultech

| Indicator                      | Plan  | Do  | Check  | Action   |
|--------------------------------|---|---|--|--|
| Innovation Visualization       | Designing a simple and user-friendly interface that is easy to understand | Conducting an initial survey and developing a prototype     | Collecting user feedback and conducting periodic evaluations   | Implementing improvements to address system-related issues |
| Innovation Service Performance | Ensuring transparency in every ongoing activity                           | Conducting initial testing by the internal development team | Measuring innovation performance based on registered user data | Continuously improving service performance                 |
| User Comfort                   | Developing an innovation development roadmap                              | Designing a complaint-handling service within the system    | Collecting user feedback regarding satisfaction levels         | Providing support services to address user-related issues  |

|                                      |  |   |  |   |
|--------------------------------------|--|---|--|---|
| User Understanding of the Innovation | Ensuring that users are able to understand the innovation through clear explanations and detailed feature descriptions | Conducting initial training sessions on the use of the innovation | Implementing hands-on practice in using the innovation | Improving features that are difficult for users to understand |
|--------------------------------------|--|---|--|---|

The Do stage represents the implementation of the planned strategies. At this stage, the development of the Yogyakarta–Cultech platform prototype is conducted, along with the creation of interactive cultural content and the integration of gamification mechanisms such as point systems, levels, and cultural challenges. Initial implementation is carried out on a limited scale to test platform functionality and to assess preliminary user responses. Subsequently, the Check stage involves evaluating the platform’s performance and effectiveness based on user feedback, expert validation results, and observations of user engagement levels and comprehension of cultural content. This evaluation aims to identify strengths, weaknesses, as well as technical and non-technical challenges that arise during the implementation phase. Finally, the Act stage serves as a follow-up phase based on the evaluation outcomes from the previous stage. This stage focuses on refining system design, improving features, and strengthening cultural content to ensure greater relevance, attractiveness, and accessibility. Through this continuous improvement process, Yogyakarta–Cultech is expected to evolve as an adaptive, user-centered, and sustainable digital platform for cultural preservation.

3.8 *Specific, measurable, achievable, relevant, and time-bound (SMART) analysis of the Yogyakarta–Cultech innovation*

The SMART analysis is conducted to ensure that the objectives of developing and implementing the Yogyakarta–Cultech platform are formulated clearly, measurably, realistically, relevantly, and within a defined timeframe. This analysis serves as a strategic planning framework to guide the innovation in maintaining its focus on the revitalization of Yogyakarta’s cultural heritage through the utilization of gamification-based digital technology. Through the SMART approach, each development target can be evaluated using specific and measurable success indicators, enabling systematic monitoring of progress and outcomes. The results of this analysis provide a foundation for determining feature development priorities, implementation strategies, and performance evaluation of the platform. Consequently, the Yogyakarta–Cultech innovation can be developed effectively, sustainably, and in alignment with the objectives of sustainable development. The results of the SMART analysis formulated by the authors are presented in Table 5.

Table 5. SMART Analysis of Yogyakarta–Cultech Development

| No | Analysis   | Implementation of the Innovation  |
|----|------------|---|
| 1  | Specific   | The implementation of the Yogyakarta–Cultech innovation utilizes a gamification-based, user-friendly digital platform to preserve Yogyakarta’s cultural heritage, enhance digital cultural literacy, and support the achievement of Sustainable Development Goals (SDGs) target 11 (sustainable cities and communities).  |
| 2  | Measurable | The success of the Yogyakarta–Cultech innovation can be measured through a combination of quantitative and qualitative indicators. These include the number of application downloads, daily and monthly active users, and user retention rates over specific periods. In addition, completion rates of quizzes, cultural missions, and gamified challenges serve as indicators of user engagement in the digital cultural learning process. |

|   |            |  |
|---|------------|--|
| 3 | Achievable | The development objectives of Yogyakarta–Cultech are realistic and achievable, considering the high level of digital technology and gamification adoption among Indonesian society, particularly among younger generations. Support from government institutions and educational organizations serves as a key enabling factor in the implementation of this innovation. |
| 4 | Relevant   | Yogyakarta–Cultech is highly relevant in supporting the achievement of SDGs target 11, namely sustainable cities and communities, as well as the national agenda of Indonesia Emas 2045.   |
| 5 | Time-Bound | This innovation is designed within a four-year timeframe for the design phase, pilot testing, and initial implementation, followed by one year dedicated to evaluation and periodic expansion to various regions on an annual basis as part of a long-term development roadmap.  |

### 3.9 McKinsey 7S framework analysis of the Yogyakarta–Cultech innovation

The McKinsey 7S analysis is employed to examine the level of alignment and integration among the internal elements that support the implementation of the Yogyakarta Culture Technology (Yogyakarta–Cultech) innovation. This framework encompasses strategy, organizational structure, systems, shared values, leadership style, human resources, and core competencies, which collectively represent the organization’s readiness to manage and develop the platform in a sustainable manner. Through this analysis, it is possible to identify the extent to which each element mutually reinforces one another in achieving the innovation’s objectives as an adaptive, inclusive, and gamification-based digital literacy ecosystem oriented toward the preservation of local culture. Furthermore, the McKinsey 7S approach enables the assessment of potential internal gaps that may hinder implementation effectiveness, allowing the findings to serve as a foundation for organizational strengthening strategies and performance enhancement of the innovation. Figure 9 presents an in-depth McKinsey 7S Framework analysis, providing a holistic overview of Yogyakarta–Cultech’s internal readiness to respond to the dynamics of the digital environment and the demands of sustainable development.

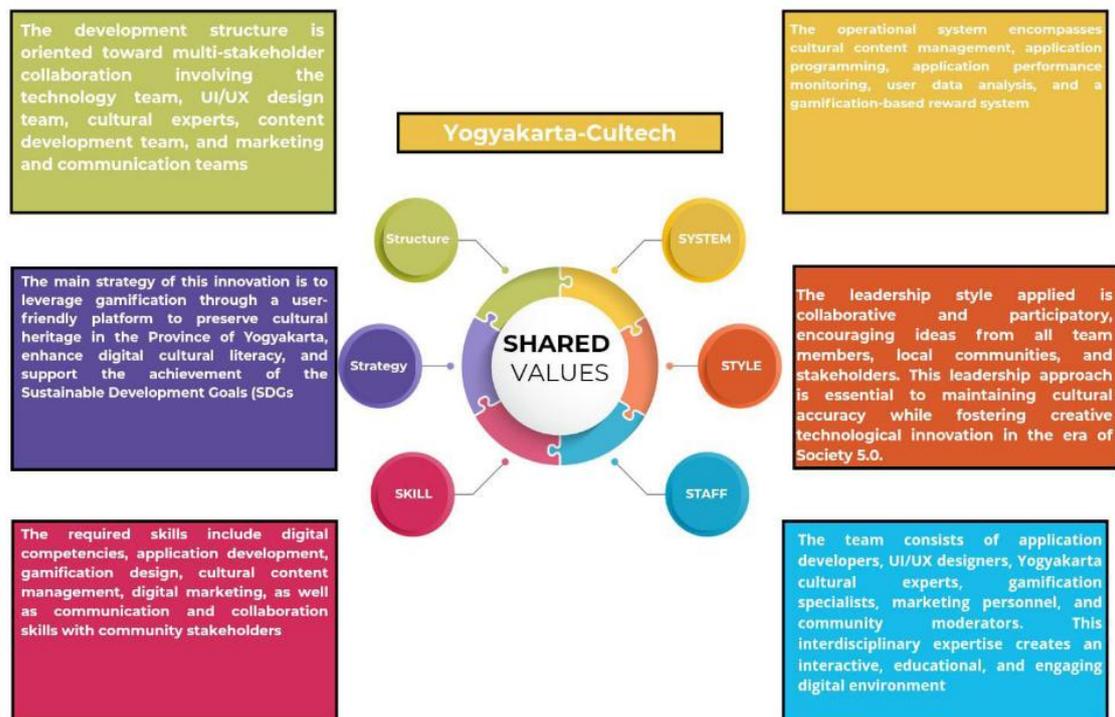


Fig. 9. McKinsey 7S Analysis of the Yogyakarta–Cultech Innovation

### 3.10 The house model for the development of Yogyakarta–Cultech

The House Model analysis is applied to systematically map the conceptual framework for the development of the Yogyakarta Culture Technology (Yogyakarta–Cultech) innovation. In this model, the vision is positioned as the roof of the structure, representing the primary goal of the innovation, namely the utilization of a user-friendly digital platform to support the revitalization of Yogyakarta’s culture, enhance digital cultural literacy, and contribute to the achievement of the Sustainable Development Goals (SDGs). The objectives serve as the foundation, affirming the direction of cultural content development that encompasses traditional arts, language, customs, history, and local wisdom for diverse segments of society.

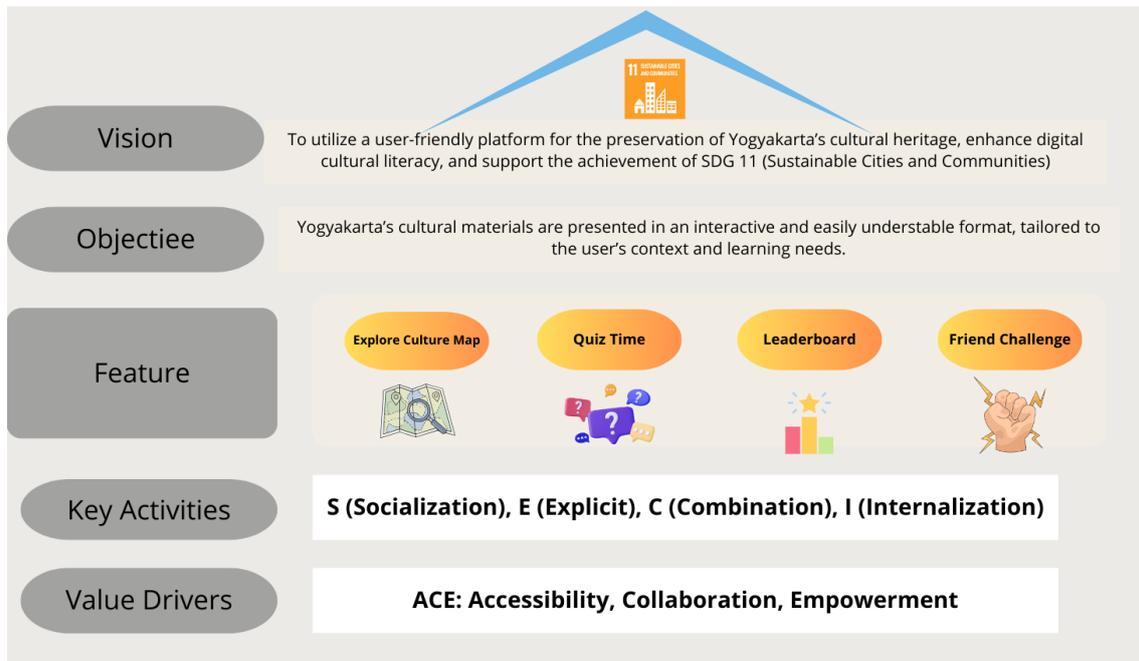


Fig. 10. The house model of Yogyakarta–Cultech development

Within the feature component, Yogyakarta–Cultech integrates gamification mechanisms such as cultural exploration maps, interactive quizzes, ranking systems (leaderboards), and collaborative challenges among users to enhance engagement and learning motivation. The key activities in this model refer to the knowledge creation cycle, which includes the processes of socialization, externalization, combination, and internalization, ensuring that users not only access information but also develop deeper cultural understanding and experiential learning. Meanwhile, the driving values that underpin the operational foundation of the innovation include accessibility, collaboration, and empowerment, ensuring that Yogyakarta–Cultech evolves as an inclusive, participatory, and sustainable digital cultural literacy ecosystem. The visualization of this analysis is presented in Figure 10.

### 3.11 Attention, interest, desire, and action (AIDA) and balanced scorecard framework analysis of Yogyakarta–Cultech

The AIDA Framework analysis is employed to understand and design communication strategies as well as user engagement in the development and implementation of the Yogyakarta–Cultech platform. This framework assists in identifying the psychological stages experienced by users, starting from initial awareness to active engagement with the platform. The analysis is illustrated in Figure 11.



Fig. 11. AIDA framework analysis of the Yogyakarta–Cultech innovation

The Balanced Scorecard (BSC) analysis is applied as a strategic framework to comprehensively and integratively evaluate the performance and sustainability of the Yogyakarta–Cultech innovation. This approach extends beyond a sole focus on financial aspects by incorporating customer perspectives, internal business processes, and organizational learning and growth. Through this analysis, the development of Yogyakarta–Cultech can be strategically aligned with its vision of technology-based cultural preservation, while simultaneously ensuring operational effectiveness, user satisfaction, and the continuous enhancement of human resource capacity involved in the innovation.



Fig. 12. Balanced scorecard analysis of the Yogyakarta–Cultech innovation

The results of the Balanced Scorecard analysis serve as a foundation for formulating Key Performance Indicators (KPIs) across each perspective, enabling innovation managers to monitor performance outcomes in a measurable and sustainable manner (Nofiyanti et al., 2025). Consequently, this analysis functions as a strategic evaluation tool that supports informed decision-making, continuous improvement of platform service quality, and the strengthening of synergy between cultural values, technological advancement, and sound governance practices.

### 3.12 Stakeholder framework analysis of the Yogyakarta–Cultech innovation

Stakeholder analysis is conducted to identify key actors who possess roles, interests, and levels of influence over the success of the development and implementation of the Yogyakarta–Cultech platform. This analysis aims to map the involvement of various parties, both as direct users and as supporting institutions, in order to foster optimal synergy among stakeholders. Table 6 presents the Stakeholder Analysis Framework, illustrating the relationships and positions of each stakeholder in supporting the achievement of cultural revitalization objectives and the enhancement of technology-based digital literacy.

Table 6. Stakeholder Framework Analysis of the Yogyakarta–Cultech Innovation

| Stakeholder                          | Primary Role  | Form of Contribution   |
|--------------------------------------|---|--|
| Government                           | Regulator and policy support provider                     | Providing regulations, permits, and financial support (grants/CSR) to facilitate the implementation of Yogyakarta–Cultech in Indonesia.                        |
| Community                            | Beneficiaries and providers of feedback on the innovation | Local communities and youth utilize the gamification-based application and provide feedback related to usability, effectiveness, and feature adaptation needs. |
| Academics                            | Researchers and technology validators                     | Conducting research on Nusantara-based gamification, performing pilot testing, and validating the effectiveness of the innovation.                             |
| Private Sector / Technology Industry | Technology provider and production support                | Providing hardware and technological components to support production, as well as collaborating in application and device distribution.                        |
| Media                                | Information disseminator and awareness driver             | Educating the broader public through publications and outreach regarding the benefits of Yogyakarta–Cultech in supporting the vision of Indonesia Golden 2045. |

Through this analysis, it can be understood that the success of Yogyakarta–Cultech is strongly influenced by collaboration among the community as the primary users, cultural communities as providers of content and local values, local government as policy support, and academics as well as technology practitioners as system developers and evaluators. This approach ensures that each stakeholder has a clear and proportional role, enabling platform implementation to proceed in an adaptive, inclusive, and sustainable manner, while remaining aligned with sustainable development goals and the preservation of Yogyakarta’s cultural heritage.

### 3.13 The Role of Innovation in Achieving the Sustainable Development Goals (SDGs)

Yogyakarta–Cultech is designed to preserve and restore Yogyakarta’s cultural heritage through the strengthening of digital cultural literacy. This innovation was developed as a response to the limited utilization of technology in efforts to safeguard local culture. Through this platform, Yogyakarta’s cultural heritage can be sustainably preserved while contributing to the achievement of Indonesia’s Sustainable Development Goals (SDGs) by 2030, particularly Goal 11: *Sustainable Cities and Communities*.



Fig. 13. Goal 11 of Indonesia’s SDGs 2030 (United Nations, 2025)

3.14 Competitor analysis of similar innovations

The competitor analysis of similar innovations was conducted to identify and compare platforms that share aligned objectives in the fields of cultural preservation, technology-based education, and the enhancement of digital literacy (Al-Hail et al., 2024). This analysis aims to understand the position of Yogyakarta–Cultech within the existing innovation ecosystem, as well as to identify its competitive advantages and innovation gaps that have not been fully addressed by other platforms. The results of this analysis are presented in Figure 14.

| Value Proposition                          | Indonesia Heritage digital | Google Arts & Culture | Jogja Istimewa App | Yogyakarta Cultech |
|--|----------------------------|-----------------------|--------------------|--------------------|
| Revitalization and presentation of culture | ✓                          | ✗                     | ✓                  | ✓                  |
| Gamification-based education               | ✗                          | ✗                     | ✗                  | ✓                  |
| Digital cultural literacy                  | ✗                          | ✓                     | ✓                  | ✓                  |
| Free and Inclusive                         | ✓                          | ✓                     | ✓                  | ✓                  |

Fig. 14. Competitor analysis of the Yogyakarta–Cultech innovation

3.15 Budget and Financial Aspect Analysis of the Yogyakarta–Cultech Innovation

The analysis of budgetary and financial aspects is conducted to assess the feasibility of funding and the sustainability of the development and implementation of the Yogyakarta–Cultech innovation. This analysis includes planning the allocation of costs for platform development, cultural content production and curation, technology system management, as well as socialization activities and long-term maintenance. Through this analysis, potential

funding sources can be identified, including support from local governments, collaboration with educational institutions and cultural communities, as well as partnerships with the private sector and corporate social responsibility (CSR) programs. The results of this budget and financial analysis serve as a foundation to ensure that Yogyakarta–Cultech can be developed efficiently, accountably, and sustainably, while supporting the long-term goals of cultural revitalization and the enhancement of digital literacy. The detailed budget allocation is presented in Table 7.

Table 7. Cost Breakdown of the Yogyakarta–Cultech Innovation

| No    | Cost Category                        | Details   | Estimated Cost |
|-------|--------------------------------------|---|----------------|
| 1     | System Development & IoT Application | <ul style="list-style-type: none"> <li>● Simple UI/UX application design</li> <li>● Basic gamification integration within the application</li> </ul>  | IDR 7,000,000  |
| 2     | Devices & Infrastructure             | <ul style="list-style-type: none"> <li>● Application testing</li> <li>● Application prototype development and initial testing</li> <li>● IoT modules</li> <li>● <i>Hosting cloud basic</i></li> </ul> | IDR 10,000,000 |
| 3     | Human Resources                      | <ul style="list-style-type: none"> <li>● Programmer (freelance/ research students)</li> </ul>   | IDR 5,000,000  |
| 4     | Socialization & Pilot Testing        | <ul style="list-style-type: none"> <li>● Application designer</li> <li>● Community workshops</li> <li>● Development of innovation guidelines</li> <li>● Pilot testing in several regions</li> </ul>   | IDR 2,000,000  |
| 5     | Operational & Administrative Costs   | <ul style="list-style-type: none"> <li>● Local Transportation</li> <li>● <i>Miscellaneous</i></li> </ul>  | IDR 1,000,000  |
| TOTAL |                                      |   | IDR 25,000,000 |

#### 4. Conclusions

Indonesia possesses extraordinary cultural diversity, including the Province of Yogyakarta, which is rich in traditional heritage. However, the rapid pace of modernization has led some segments of society to gradually abandon local cultural values. Therefore, the concept of the Yogyakarta–Cultech platform is proposed as a viable solution. Yogyakarta–Cultech is expected to serve as a digital platform for the community that supports cultural restoration while fostering digital literacy. The Yogyakarta–Cultech platform features four main components, namely the explore culture map, quiz time, and friend challenge, which are designed to maximize the cultural potential of the Yogyakarta Province through the utilization of technology in the era of Society 5.0. This innovation is aligned with the achievement of Indonesia’s Sustainable Development Goals (SDGs) 2030, particularly Goal 11: Sustainable Cities and Communities. The authors recommend further development of this innovation by integrating advanced interactive features such as Augmented Reality (AR), Virtual Reality (VR), and Artificial Intelligence (AI). These technologies are strongly encouraged to enable Yogyakarta–Cultech to deliver a more immersive, educational, and engaging cultural learning experience that is highly relevant to the digital-native characteristics of the younger generation.

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#### Author Contribution

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**Declaration of Generative AI Use**

During the preparation of this work, the author used ChatGPT to assist improving grammar, clarity, and academic tone of the manuscript. After using this tool, the author reviewed and edited the content as needed and took full responsibility for the content of the publication.

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