Geojournal of Tourism and Geosites
ISSN 2065-0817, E-ISSN 2065-1198

Year XVIII, vol. 61, no. 3, 2025, p.1638-1648
DOI 10.30892/gtg.61322-1532

# THE FUTURE OF OPERA: ENHANCING INTANGIBLE CULTURAL HERITAGE THROUGH MULTIMEDIA COMMUNICATION TECHNIQUES

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**Citation:** Ding, J., & Haris, F.M.H. (2025). The future of opera: Enhancing intangible cultural heritage through multimedia communication techniques. *Geojournal of Tourism and Geosites*, 61(3), 1638–1648. https://doi.org/10.30892/gtg.61322-1532

**Abstract:** Opera is an important part of China's intangible cultural heritage (ICH). However, it faces increasing challenges in the digital age. Changes in how people consume culture, gaps between generations, and limited access are major issues. This study looks at how multimedia communication techniques (MCT), information technology (IT), digital skills (DC), and government support (GS) help preserve and improve opera in today's society. Using a framework that combines communication theory and cultural preservation, the study examines the relationships between these factors and their impact on opera. A quantitative research design was used, with a structured survey given to 290 university students from three major Chinese institutions. The researchers analyzed the data using the Partial Least Squares Structural Equation Modeling (PLS-SEM) method through SmartPLS 4.0. The results show that multimedia communication techniques and information technology strongly promote opera. Furthermore, digital skills greatly improve the effectiveness of multimedia strategies, especially when people's cultural awareness is high. Cultural awareness emerged as a key factor that strengthens the connection between MCT, digital marketing, and opera engagement. Government support also plays an important role, boosting the impact of digital tools when there is institutional backing. Additionally, combining MCT and digital marketing has a greater effect on promoting opera than using them separately. This finding highlights the important synergies between communication strategies and technological platforms. The study provides valuable evidence for a comprehensive framework that highlights the importance of technology, education, and institutional support in preserving traditional cultural expressions. It offers practical recommendations for cultural policymakers, educators, and media professionals. These include increasing investment in digital infrastructure, providing targeted funding for projects that digitize opera, and integrating cultural education with digital literacy training. Overall, the research offers important insights into how traditional art forms like opera can be preserved, updated, and promoted through digital change. It emphasizes the need for collaboration among government, academia, and creative industries to support the survival and growth of cultural heritage in a rapidly changing media environment.

**Keywords:** intangible cultural heritage, multimedia communication, opera, digital competences, government support, information technologies

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## INTRODUCTION

The conservation and protection of ICH are steadily becoming something deserving of consideration as the world turns digital. Opera, a significant component of intangible cultural resources, reflects the definite culture and its values and practices that define the cultural members of society and align them with their history (Lercari et al., 2022). Data, social, and visual media communication techniques have slightly affected the flow whereby the desire to maintain Opera as an intangible cultural heritage has been well enhanced. These techniques provide some form of a new approach to arresting cultural practices through documentation, sharing, and advocating for them. Social media platforms, in particular, potentially increase opera interest and availability among the public through presented performance records and artifacts (Pasca et al., 2021). Technologies applied to information, such as VR and AR, have prospects of increasing the degree of presence with cultural heritage (Boboc et al., 2022). Nevertheless, they are yet to be interrogated regarding the extent to which they enabled the continuation of Opera as a cultural practice. Promoting these technologies requires digital competencies, implying that better digital skills can enhance the management and promotion of opera heritage (Yende, 2023). Financial support from the government is crucial to applying these tools in promoting and undertaking the conservation and management of these heritage components. Government regulations that encourage multimedia communication and information technologies and policies supporting financial and infrastructural development can enhance the intensification of multimedia communication and information technologies (El-belkasy & Shehata, 2024).

However, thanks to the opportunities for multimedia communication and information technologies, there is a growing possibility of improving the functioning and dissemination of such heritage. Since engagement with web 2.0 applications is still relatively new, the interaction with and contribution of these technologies to opera heritage and the significance of digital

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skills and governmental aids have not been adequately examined yet. Taking cues from these perspectives, this paper seeks to find out how all these factors influence opera heritage preservation. The present research is intended to fill this gap by examining the role of multimedia communication technologies and information technologies in supporting and maintaining Opera as an element of the cultural heritage. For these reasons, we assert that heritage preservation can be significantly boosted with adequate digital competencies, support from the government, and the innovative use of the mentioned digital tools. In particular, six hypotheses regarding the impact of these factors on opera heritage and their interactions are considered.

The research is limited to the opera subdomain of intangible cultural heritage. In particular, it focuses on the effects multimedia communication forms, IT, and competencies have on the conservation and promotion of the opera. This study also aimed to establish the moderating function of government support on these linkages. The study locates itself in China to understand how university students – the younger generation – envisage opera heritage and engage with it in the digital sphere.

Of course, works that address the contribution of digital technologies to cultural heritage have been of great interest in the past, but very few works focus on how these digital technologies influence the preservation of opera, an intangible cultural heritage. Furthermore, there appears to be a lack of studies on the moderating impact of government support and the involvement of digital competencies in this regard. Indeed, this research aims to fill these research gaps by offering actual data regarding multimedia communication techniques, information technologies, digital competencies, and government support to improve opera heritage. In this study, the author adds to the existing knowledge by investigating how digital tools and government support for Opera intertwine with digital competencies.

The study gives practical recommendations to policymakers and cultural stakeholders, including cultural institutions and educators, on utilizing these tools to protect cultural heritage.

## LITERATURE REVIEW

### Modern Communication Technologies in Opera and the Promotion of Intangible Cultural Heritage

Traditional operas are incorporating modern communication technologies to promote and retain cultural transmission. The use of technologies such as VR and meta-media has transformed the opera into something immersive and relatable for younger audiences (Jiang et al., 2024; Wu, 2024). For instance, VR could provide realistic and experiential depictions that are consistent with modern sensibilities and enrich Chinese opera (Jiang et al., 2024). In addition, interactive media blurs the distinction between traditional and modern aesthetics by creating a participatory cultural environment (Zhai, 2024). These tools lead to the expression of creativity and help manage large audiences, but have their difficulties in ensuring cultural integrity together with technological advancements (Boh & Adoka, 2023). However, the combination of analog performance with digital tools helps teach generational values (Jiang et al., 2024; Xiaoyu, 2024). Furthermore, Zhang (2024) stresses that digital archives of, and online platforms for, traditional opera ensure its accessibility and thereby allow it to be preserved beyond the stage.

**Hypothesis 1:** The integration of modern communication technologies in opera has a positive impact on the promotion of intangible cultural heritage.

### 1. Digital Marketing and the Promotion of Opera as a Medium for Intangible Cultural Heritage

Digital marketing has revolutionized cultural heritage promotion by reaching and being relevant to a wider audience. Social media, influencer campaigns, and short-form videos (TikTok) have attracted younger audiences to Chinese opera (Gagliano, 2020; Hammou et al., 2020). TikTok platforms amplify the cultural visibility through the 'algorithmic content distribution' by engaging audiences who have no prior exposure and have little or no interest in opera (Sudiantini et al., 2024; Zhou, 2024). These tools allow the creation of accessible, entertaining content that would resonate with users while breaking the traditional norms of cultural dissemination (Todorova-Ekmekci, 2021). However, the echo chamber and content ethics remain concerns (Sandra et al., 2024; Zhou, 2024). However, digital platforms can be a strong tool to support cultural revival and promotion (Gan et al., 2023) as long as they can be used responsibly.

**Hypothesis 2:** Digital marketing significantly enhances the promotion of opera as a medium for intangible cultural heritage.

### 2. Cultural Awareness of Opera and the Promotion of Intangible Cultural Heritage

Assuming younger generations are more culturally aware, they will continue growing traditional art forms through digital means. Social media marketing, short-form video, and other such technologies allowed cultural institutions to create targeted campaigns that could attract a wider audience (Golovach, 2023; Trach, 2024). According to Cham et al. (2022), digital analytics and media optimization have made it simpler for opera to personalize content, thereby making the opera more relevant in its modern cultural context. However, many institutions have yet to fully adopt digital tools (Nataliya Golovach). Unlike many tools like TikTok, which introduce new users to culture through short videos (Liu, 2024; Zhou, 2024), museums foster interactive engagement and actively involve communities (Li & Yu, 2024). Branding techniques in media improve market presence and cultural appreciation, while community media practices promote intercultural exchange (Li & Tay, 2024; Zhu & Mustaffa, 2024). All of these trends indicate that opera can become more of a cultural phenomenon, which may help to increase the interest in it, provided that there is a real interest in it and also that it is supported with robust promotional strategies (Peters et al., 2017).

**Hypothesis 3:** Cultural awareness of opera positively influences the promotion of intangible cultural heritage.

### 3. Combined Use of Modern Communication Technologies and Digital Marketing in Opera

With cultural engagement to come in the linear use of communication technologies and digital marketing, it will amplify it globally. Li & Yu (2024), Montanari et al. (2024), Zhu & Mustaffa (2024), Zou et al. (2024) make use of tools like 3D

modeling, multimedia presentation, and visual narrative in expanding cultural documentation and audience outreach. However, concerns also exist regarding data privacy and commercialization (Lee et al., 2024; Zou et al., 2024) and curation is now being augmented by immersive, interactive artificial intelligence. VR and semantic-driven digital scenography have become strategically used for redefining audience engagement and pushing the appeal of traditional opera beyond (Jiang et al., 2024; Liang et al., 2022). Moreover, digital twin technology fosters sustainable global communication of cultural assets (Prasad et al., 2022; Zou et al., 2024). The combination and the convergence of modern tech and marketing delivered these approaches, highlighting the revitalizing and deepening of the cultural resonance of traditional opera.

**Hypothesis 4:** The combined use of modern communication technologies and digital marketing in opera has a greater impact on the promotion of intangible cultural heritage than either method used alone.

### 4. Cultural Awareness of Opera as a Mediator between Modern Communication Technologies and the Promotion of Intangible Cultural Heritage

Communication tools shape heritage engagement through cultural awareness. According to Kozulin (2023), cultural mediation determines the way technology affects self-awareness. Likewise, Liu (2024) points out that even advanced technologies, without cultural grounding, will not preserve heritage completely. Cultural communication is an important source to maintain authenticity and produce the visitor's deep experience in tourism (Kinderknekht & Kolada, 2022). Regarding translation, mediation is equally important to enable cross-cultural understanding. Therefore, these findings assume that cultural sensitivity at the core of their use achieves the potential of preserving communication technologies (Abdelfattah, 2019).

**Hypothesis 5:** Cultural awareness of opera mediates the relationship between modern communication technologies and the promotion of intangible cultural heritage through opera.

### 5. Cultural Awareness of Opera as a Mediator between Digital Marketing and the Promotion of Intangible Cultural Heritage

Digital marketing for intangible heritage is effective only when culture is central to it. In line with what Prasad et al. (2022) mention, marketing should not just use digital tools to exploit them but to elevate cultural understanding. Rich and informative content about the opera helps to market it and also makes it more relevant in the culture (Zhu & Mustaffa, 2024). Digital tools save and disseminate culture but also integrate it into contemporary life. Nonetheless, there are still commercialization risks and ethical issues remaining that need to be addressed strategically while keeping in mind that the culture of the recipient country/region has to be respected (Yatsunami, 2024). Digital marketing serves as a valuable instrument in maintaining and enhancing cultural traditions. Hypothesis 6: Cultural awareness of opera mediates the relationship between digital marketing and the promotion of intangible cultural heritage through opera. Multimedia communication techniques (MCT), information technologies (IT), and digital competencies (DC) can thus be used to develop valuable intangible cultural heritage (ICH) through opera (Figure 1). These components modernize opera and make it more obtainable, rewarding, and well-connected to the present crowd. All three of these components are crucially enabled by government support. This provides institutional backing and infrastructural support for the effective digital transformation and preservation of opera. Based on these constructs, the framework proposes that when used together, they create a sustainable cultural ecosystem supporting the presence of opera as a living tradition for the modern digital age, particularly within the Chinese context.

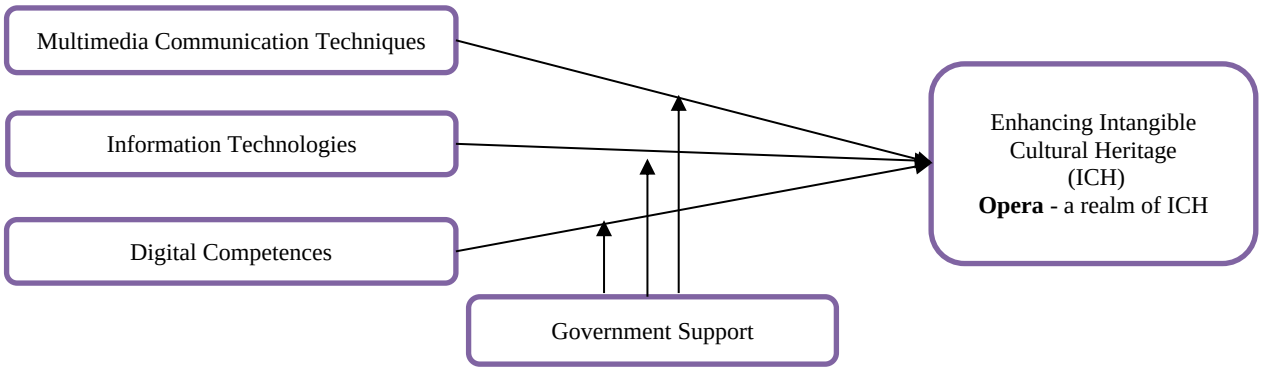


Figure 1. Conceptual Framework, Adapted Constructs, and the Items

## METHODS

This study uses a quantitative research design to explore how multimedia communication techniques (MCT), information technology (IT), digital competence (DC), and government support (GS) impact opera as a form of intangible cultural heritage (EICH). The formulated research model was based on established related constructs, while the measurement items were adapted from previous validated studies to guarantee conceptual validity and reliability (Table 1). Multimedia Communication Techniques (MCT) is a construct with 6 items related to the multimedia tools application for opera promotion: increasing the audience's interest, using interactive content, live streaming, and virtual and augmented reality in cultural education (Stieglitz et al., 2014). Six items are linked to digital archiving, using databases, tools for digitizing content, having opera available online, educational platforms, and IT in opera production (Alavi & Leidner, 2001). Digital competencies (DC) measure five skills useful for promoting opera using digital platforms: video editing, content creation, social media proficiency, digital marketing, and platform usage (Kannan & Li, 2017). Five items in the

Government Support (GS) construct look at the involvement of the public sector in funding, policy formulation, grant provision, infrastructure development, and awareness campaigns toward opera digitization (Trimarchi, 2016). Finally, the Enhancing Intangible Cultural Heritage (EICH) construct is measured from four items reflecting the impact of multimedia on the preservation of opera, the cultural value of digitization, the level of public engagement of digital initiatives, and the long-term preservation of heritage through a digital approach (Timothy & Boyd, 2006).

Table 1. Constructs with Corresponding Items Focusing on Enhancing Opera as Intangible Cultural Heritage

| Construct | Items | Adapted from |
|---|---|---|
| Multimedia Communication Techniques (MCT) | MCT1: Employment of multimedia in the promotion of Opera. | (Stieglitz et al., 2014) |
| | MCT2: The use of multimedia to increase audience interest. | |
| | MCT3: Integration of the use of interactive content. | |
| | MCT4: Making live opera performances available online. | |
| | MCT5: Application of virtual and augmented reality into Opera. | |
| | MCT6: Multimedia as a tool for cultural education. | |
| Information Technologies (IT) | IT1: Optical recording of opera productions. | (Alavi & Leidner, 2001) |
| | IT2: Databases are used to manage opera content. | |
| | IT3: Technological tools for digitizing Opera. | |
| | IT4: Accessibility of Opera through IT. | |
| | IT5: Online platforms for opera education. | |
| | IT6: Information systems supporting opera production. | |
| Digital Competences (DC) | DC1: Skill in using digital marketing for Opera. | (Kannan & Li, 2017) |
| | DC2: Proficiency in video editing for opera content. | |
| | DC3: Knowledge of social media for promoting Opera. | |
| | DC4: Ability to create digital content for Opera. | |
| | DC5: Competence in using online platforms for opera promotion. | |
| Government Support (GS) | GS1: Funding for multimedia opera projects. | (Trimarchi, 2016) |
| | GS2: Policy support for digital opera initiatives. | |
| | GS3: Grants for opera digitization. | |
| | GS4: Public campaigns supporting Opera. | |
| | GS5: Infrastructure development for cultural heritage. | |
| Enhancing Intangible Cultural Heritage (EICH) | EICH1: Impact of multimedia on preserving Opera. | (Timothy & Boyd, 2006) |
| | EICH2: Public participation in digital opera initiatives. | |
| | EICH3: Cultural value of digitized Opera. | |
| | EICH4: Long-term preservation of Opera through digital means. | |

Table 2. Convergent validity

| Constructs | Items | Loadings | Alpha | CR | AVE |
|---|---|---|---|---|---|
| Multimedia Communication Techniques | MCT1 | 0.853 | 0.903 | 0.925 | 0.674 |
| | MCT2 | 0.81 | | | |
| | MCT3 | 0.808 | | | |
| | MCT4 | 0.784 | | | |
| | MCT5 | 0.858 | | | |
| | MCT6 | 0.809 | | | |
| Information Technologies | IT1 | 0.748 | 0.88 | 0.888 | 0.57 |
| | IT2 | 0.832 | | | |
| | IT3 | 0.814 | | | |
| | IT4 | 0.744 | | | |
| | IT5 | 0.628 | | | |
| | IT6 | 0.747 | | | |
| Digital Competences | DC1 | 0.802 | 0.852 | 0.892 | 0.624 |
| | DC2 | 0.796 | | | |
| | DC3 | 0.754 | | | |
| | DC4 | 0.79 | | | |
| | DC5 | 0.806 | | | |
| Government Support | GS1 | 0.859 | 0.922 | 0.941 | 0.761 |
| | GS2 | 0.871 | | | |
| | GS3 | 0.879 | | | |
| | GS4 | 0.866 | | | |
| | GS5 | 0.888 | | | |
| Enhancing Intangible Cultural Heritage | EICH1 | 0.82 | 0.841 | 0.893 | 0.676 |
| | EICH2 | 0.837 | | | |
| | EICH3 | 0.804 | | | |
| | EICH4 | 0.826 | | | |

A structured questionnaire was developed using a 5-point Likert scale (1—strongly disagree to 5 — strongly agree) and pretested for clarity and reliability. A purposive sample of 290 university students from China who had been exposed to cultural and digital education environments was sampled to administer the questionnaire. The sample size of the data meets the minimum requirements to be used for PLS-SEM analysis (Hair, Risher, et al., 2019; Hair, Sarstedt, et al., 2019; Sarstedt

et al., 2019), and it also enables robust structure modeling. The Institutional Ethics Committee also approved this study, adhering to the research ethics that govern research involving human participants. Before the data collection, all the participants gave their consent and assurance of anonymity, confidentiality, and voluntary participation.

**RESULTS**

The analysis of the data based on the relationships between the multimedia communication techniques, information technologies, digital competencies, government support, and the improvement of opera as an intangible cultural heritage is presented in this section (Table 2). The measurement model and structural model were both evaluated using SmartPLS 4.0. The reliability and validity of the constructs were checked with confirmatory factor analysis, and then the hypothesis was tested using path coefficients, t values, and significance levels obtained from bootstrap. The results provide empirical evidence of how digital tools and institutional support matter for sustaining cultural heritage for opera.

Multimedia communication techniques (MCT) consist of six items labeled as MCT1 to MCT6. The factor loadings for these items range from 0.784 to 0.858. The overall reliability of the scale is 0.903, and the composite reliability is 0.925. The average value (AVE) is 0. A coefficient of 0.674 indicates that the detected construct would account for a substantial portion of the observed variation. This construct focuses on promoting Opera through multimedia communication techniques, aiming to enrich Opera as a cultural form. Regarding these elements, a higher loading suggests that in order to engage with modern audiences and sustain the Opera, digital approaches such as virtual performances, interactive content, and streaming platforms are crucial. For the second construct - Information Technologies (IT) - the items (IT1 to IT6) have loadings ranging from 0.628 to 0.832, indicating strong reliability. The scale's overall reliability is measured by Alpha, 0.88, and composite reliability (CR) is 0.888. The average value of 0.570 implies an adequate amount of variability being captured. Information technologies play a vital role in preserving Opera by utilizing them for archiving performances, managing operational data, and implementing technological improvements to collect and distribute historical performances to global audiences. As for the methods of introduction, the emphasis is placed on the importance of these technologies for the preservation and further evolution of Opera as a lively image of the culture.

Digital competences (DC) include the items from DC1 to DC5. Their loadings vary from 0. 754 to 0. 806 and have a good measure of reliability with the Alpha value of 0. 852, and the composite reliability (CR) was 0.892. The average value of AVE was 0. In predicting the construct's validity, 624 indicates that the construct is responsible for much of the variance. Digital competencies are the best practices and expertise to apply advanced technologies in advocating for Opera. Such an emphasis strengthens the need and ways of using social networks, video editing software, marketing platforms, and other means to interact with the audience and introduce Opera as a culture. Concerning the loadings for this government support (GS) construct, they lie within the range of 0.859 to 0.888, Alpha coefficient of reliability of 0.922, and a composite reliability of 0.941. The AVE of 0.761 shows that this construct indexes much variation. Fundamentally, government intervention is usually fundamental in offering the right resources, financing, and framework to facilitate Opera's being a component of intangible cultural heritage. The high loadings of these elements show that the attempts to preserve Opera will be significantly improved if government aid to multimedia projects is granted.

Enhancing intangible cultural heritage (EICH) refers to improving and preserving intangible cultural practices. In this context, items EICH1 to EICH4 have loadings that vary from 0, suggesting that they are the primary means of transferring information in organizations. The Alpha reliability was 0.841, and the composite reliability was 0.893.

The average (AVE) of 0.676 indicates a significant level of representation of the construct. This construct encompasses all the actions taken to enhance Opera as a cultural heritage asset. Similarly, the influence of several elements indicates that multimedia communication techniques supported by information technology, digital skills, and government promotion and support are crucial for marketing and sustaining Opera in the digital realm.

Table 3. Fornell Larcker

| | DC | EICH | GS | IT | MCT |
|---|---|---|---|---|---|
| DC | **0.790** | | | | |
| EICH | -0.180 | **0.822** | | | |
| GS | -0.114 | 0.399 | **0.873** | | |
| IT | -0.131 | 0.411 | 0.648 | **0.755** | |
| MCT | -0.071 | 0.512 | 0.431 | 0.460 | **0.821** |

The Fornell-Larcker criterion is part of the validity assessment in structural equation modeling and is used to evaluate discriminant validity. Discriminant validity ensures that a construct is distinct from others by not correlating too highly. Each construct is critical to promoting and preserving Opera using modern tools and support structures.

The diagonal values (bolded) are the square roots of the Average Variance Extracted (AVE) for each construct (Table 3). They reflect the degree to which the construct explains the variance of its indicators.

These values should be higher than the corresponding inter-construct correlations (off-diagonal values) for the constructs to have adequate discriminant validity. This means each construct is more closely related to its indicators than others. Off-diagonal values represent the correlations between constructs. For instance, the correlation between DC and EICH is -0.180. The correlation between GS and MCT is 0.431. With a high AVE (0.790), digital competencies, such as skills in using digital marketing, are critical for effectively promoting Opera in the digital era. The low negative correlation with EICH (-0.180) suggests that while digital competencies are crucial, they may not directly translate into immediate enhancements in intangible cultural heritage without the support of other factors like IT and government support. The construct EICH (enhancing intangible cultural heritage) has a strong AVE (0.822), underscoring its importance in

preserving and promoting Opera as a cultural heritage. The correlations with MCT (0.512) and IT (0.411) suggest that these technologies significantly enhance the cultural value and long-term preservation of Opera. With an AVE of 0.873, government support emerges as a key enabler for other constructs like MCT (0.431) and IT (0.648). This implies that governmental policies and funding significantly influence the effectiveness of multimedia and IT in preserving opera. The construct information technologies (IT) has a moderate AVE (0.755), indicating its role in converting and preserving Opera digitally. Its strong correlation with GS (0.648) highlights that government initiatives are essential in enhancing the impact of information technologies. Multimedia communication techniques (MCT) show a strong AVE (0.821), reflecting its effectiveness in engaging modern audiences through digital means like streaming and virtual reality. The positive correlations with EICH (0.512) and IT (0.460) indicate that multimedia techniques are vital for promoting and preserving Opera. The findings of the Fornell-Larcker criterion indicate that although each construct is separate, they are connected in significant ways, especially in how government support can strengthen the influence of digital competencies, IT, and multimedia techniques in improving the intangible cultural heritage of Opera. This interaction highlights the importance of using various methods that combine technology, talents, and support systems to secure the future of Opera in the digital era.

Table 4. Cross-loadings

| | DC | EICH | GS | IT | MCT |
|---|---|---|---|---|---|
| DC1 | **0.802** | -0.112 | -0.083 | -0.108 | -0.052 |
| DC2 | **0.796** | -0.148 | -0.128 | -0.147 | -0.070 |
| DC3 | **0.754** | -0.103 | -0.047 | -0.036 | -0.005 |
| DC4 | **0.790** | -0.149 | -0.048 | -0.097 | -0.067 |
| DC5 | **0.806** | -0.175 | -0.124 | -0.109 | -0.070 |
| EICH1 | -0.152 | **0.820** | 0.315 | 0.378 | 0.430 |
| EICH2 | -0.153 | **0.837** | 0.336 | 0.324 | 0.401 |
| EICH3 | -0.161 | **0.804** | 0.360 | 0.389 | 0.463 |
| EICH4 | -0.120 | **0.826** | 0.291 | 0.237 | 0.375 |
| GS1 | -0.094 | 0.333 | **0.859** | 0.537 | 0.325 |
| GS2 | -0.096 | 0.351 | **0.871** | 0.590 | 0.387 |
| GS3 | -0.108 | 0.326 | **0.879** | 0.536 | 0.361 |
| GS4 | -0.098 | 0.387 | **0.866** | 0.571 | 0.409 |
| GS5 | -0.102 | 0.335 | **0.888** | 0.587 | 0.391 |
| IT1 | -0.102 | 0.177 | 0.673 | **0.748** | 0.251 |
| IT2 | -0.123 | 0.425 | 0.399 | **0.832** | 0.437 |
| IT3 | -0.103 | 0.444 | 0.360 | **0.814** | 0.434 |
| IT4 | -0.097 | 0.182 | 0.672 | **0.744** | 0.251 |
| IT5 | -0.046 | 0.162 | 0.621 | **0.628** | 0.279 |
| IT6 | -0.100 | 0.175 | 0.664 | **0.747** | 0.259 |
| MCT1 | -0.105 | 0.488 | 0.358 | 0.396 | **0.853** |
| MCT2 | -0.010 | 0.435 | 0.355 | 0.420 | **0.810** |
| MCT3 | -0.022 | 0.405 | 0.348 | 0.393 | **0.808** |
| MCT4 | -0.107 | 0.423 | 0.331 | 0.366 | **0.784** |
| MCT5 | -0.031 | 0.419 | 0.377 | 0.332 | **0.858** |
| MCT6 | -0.073 | 0.314 | 0.355 | 0.349 | **0.809** |

Table 4 provides insight into how well the items (DC1, EICH1, etc.) represent their respective constructs (Digital Competences, Enhancing Intangible Cultural Heritage, Government Support, Information Technologies, and Multimedia Communication Techniques). Cross-loadings are used in structural equation modeling to assess the discriminant validity of the constructs by ensuring that each indicator (item) loads more strongly on its associated construct than on other constructs. This provides credibility that the items are good indices of the different constructs.

Regarding the DC construct, each item has a significant amount of loading, with loadings ranging from 0.754 to 0.806. The fact that this is the case suggests that these items are adequate indicators of digital capabilities. The fact that the items had significantly lower loadings on other constructs (EICH, GS, IT, and MCT) proves that these pieces of information are separate from DC. As an illustration, DC1 has a loading of 0.802 on DC. However, it has significantly lower values in EICH (-0.112), GS (-0.083), IT (-0.108), and MCT (-0.052). Hence, this implies that digital competencies are well-defined and distinct from the other constructs, reflecting the importance of specific skills in using digital tools to promote Opera.

The items load strongly on EICH, ranging from 0.804 to 0.837. This suggests that these items effectively capture the essence of enhancing intangible cultural heritage. As a result of the decreased cross-loadings on other constructs, it can be established that these characteristics are distinct from EICH. One example is that EICH1 loads 0.820 on EICH, significantly higher than 0.315 on GS and 0.430 on MCT. The things included in this construct bring to light the significance of various tactics and practices aimed at maintaining and promoting Opera as an intangible cultural resource.

The items also have good loadings on GS, ranging from 0. 859 to 0. 888, clearly showing that the two are good predictors of government support. While some moderate cross-loading on IT, such as GS2 with 0. 590, the primary loading on GS is much higher, thus supporting the assessment of government support as a different construct. Through cross-loading analysis, the result shows that government support is the significant predictor of using digital and multimedia tools in improving Opera, and the items adequately reflect this construct. This means that the loadings on IT vary between 0. 628 to 0. 832, indicating that these items are pretty effective in measuring the extent of information technologies' role. The cross-loadings are as follows: Some moderate with GS (e.g., IT2 = 0. 590), but the loadings on IT are still the highest,

supporting the uniqueness of this construct. Based on the analysis, it can be noted that the said items adequately reflect the contribution of information technologies in the protection and development of Opera, signifying a strong value of IT in contemporary culture conservation. The items from MCT1 to MCT6 reveal high factor loading of multimedia communication technique (MCT) with loading 0. 784 to 0. 858, which helps to state their effectiveness as the number of multimedia communication techniques. The items have a relatively low cross-loading on other constructs; however, the highest loading is on EICH, for instance, MCT1= 0. 488; nonetheless, the loading values on MCT are considerably higher.

Multimedia communication techniques appear necessary for attracting modern audiences to Opera, and this construct seems to be adequately captured by the respective items. As indicated by the cross loads in Table 3, everything has loaded more on the construct it should be a part of, affirming good discriminant validity. This means the identified constructs have captured various perspectives on improving multimedia communication techniques for the ICH of Opera. The relative dissimilarity of these constructs can be viewed as evidence for the stability of the model as a means of illustrating the diversity of tasks undertaken by contemporary technologies and assistance systems to maintain and foster the development of Opera.

In Structural equation modeling, Heterotrait-Monotrait Ratio (HTMT) is an index used for Discriminant validity assessment. It assesses whether the constructs in a model are unique. In general, HTMT< 0.85 or 0.90 (based on the source) indicates adequate discriminant validity in this study, indicating that the constructs examined are unique.

Table 4 helps to evaluate the degree of uniqueness of the key constructs that you have defined, including Digital Competences (DC), Enhancing Intangible Cultural Heritage (EICH), Government Support (GS), Information Technologies (IT), and Multimedia Communication Techniques (MCT). All the HTMT values of DC are significantly lower than the other constructs, with the cut-off value of < 0.85 (Henseler et al., 2015), which corroborates that discriminant validity is also satisfactory. This implies that digital competencies, skills, and abilities required for using digital tools differ from factors such as media richness in enhancing cultural heritage and multimedia communication techniques.

The fact that opera companies are distinct amplifies the need for targeted and appropriate digital competencies in the contemporary promotion of Opera. Overall, the HTMT values between EICH and the other constructs are higher than those of the other constructs. However, all the values are below the cut of 0.70, which shows adequate discriminant validity. This means that, even as several facets of intangible cultural heritage assets can be promoted through various factors, such as government support and multimedia techniques, the construct of enhancing intangible cultural heritage is still discrete. This obvious but essential distinction helps to emphasize the measures and approaches required to propagate Opera as a historical and artistic phenomenon in its own right, devoid of other contingents.

It can be seen then that the HTMT values of GS and IT are 0.792, and of GS and MCT, they are 0.471, which indicates a moderate level of shared variance but reveals that these constructs are different. The fact that the HTMT value between GS and IT is relatively higher than that between GS and IT shows that while the two objects are interconnected, they are not identical. This shows how policy support for IT influences the conservation of culture.

In our case, the HTMT value between IT and MCT is equal to 0.451, which shows that these constructs are different and, at the same time, related. This makes sense in the context of your research, as information technologies are often used as platforms for multimedia communication techniques. However, the distinction between these constructs is essential to ensure each is recognized for its unique contribution to promoting Opera. The HTMT values involving MCT and other constructs are below the threshold, confirming that multimedia communication techniques are distinct. This highlights the importance of specific methods like virtual reality, streaming, and digital marketing in engaging modern audiences with Opera.

The HTMT analysis in Table 5 demonstrates that the constructs in your study (DC, EICH, GS, IT, MCT) exhibit good discriminant validity, meaning they are sufficiently distinct. This supports the robustness of your model, where each construct uniquely enhances the intangible cultural heritage of Opera through modern techniques and support structures. The discriminant validity analysis findings show interconnections between digital competencies, government support, and multimedia techniques. Each plays a distinct role in the preservation and promotion of Opera. The discriminant validity confirmed by the HTMT analysis ensures that the constructs are well-defined and contribute uniquely to the overall model.

Table 5. Heterotrait Monotrait ratio

| | **DC** | **EICH** | **GS** | **IT** | **MCT** |
|---|---|---|---|---|---|
| DC | | | | | |
| EICH | 0.203 | | | | |
| GS | 0.123 | 0.447 | | | |
| IT | 0.137 | 0.376 | 0.792 | | |
| MCT | 0.086 | 0.573 | 0.471 | 0.451 | |

Figure 2 presents a path model, which visually represents the relationships between the study's constructs (latent variables). Each construct is depicted as a blue circle, with the associated indicators (observed variables) as yellow boxes. The arrows indicate the direction and strength of the relationships between these constructs. The loadings for the indicators on the DC construct range from 0.754 to 0.806, suggesting that these items are strong measures of digital competencies. The diagram shows DC's direct paths to GS (Government Support) and MCT (Multimedia Communication Techniques), suggesting that digital competencies influence both constructs in promoting Opera. The GS indicators' loadings vary from 0.859 to 0.888. However, from this index, we can conclude that government support is actively reinforced. GS has links to give access to IT (Information Technologies) and EICH (Enhancing Intangible Cultural Heritage). The intensity of the paths indicates that the government's support positively influences the practicality of I&T and the improvement of ICH. The loadings for the IT indicators are from 0.628 to 0.832. Also, according to Table 3, the current health promotion IT measures

range from moderate to vigorous. This construct avails input from GS, and it, in turn, affects EICH. This suggests that information technologies act as a buffer between government support and ICH (intangible cultural heritage) improvement. The loadings vary in the case of the MCT indicators, with a minimum loading of 0. 784 to 0. 858, which such authors consider to be a substantial measure of multimedia communication techniques. MCTs are a condition sine qua non promoted through digital competencies, and government support has become the primary tool for successfully popularizing Opera as ICH.

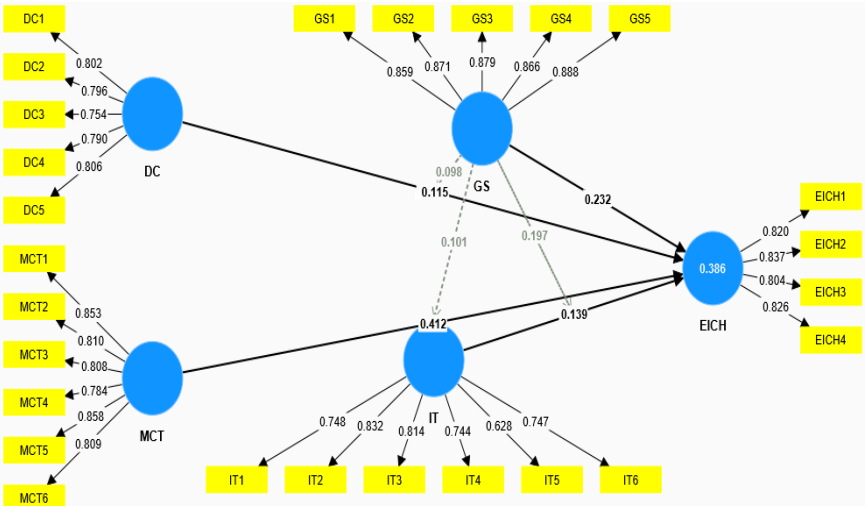


Figure 2. Measurement assessment model

The loadings for EICH indicators can be as low as 0.804 to 0.837, which is regarded as a strong index in this construct. The findings indicated that each factor, MCT, IT, and GS, affected EICH positively. This implies that the improvement of Opera as an intangible cultural heritage combines the listed factors. The model concludes that the result is improving intangible cultural heritage, Opera in particular, using multimedia technologies as a result of effectiveness criteria with the support of information technologies and government, based on the priorities of digital competencies.

Table 6. Path analysis

| Relationships | Beta | Standard deviation | T statistics | P values |
|---|---|---|---|---|
| DC -> EICH | 0.115 | 0.043 | 2.692 | 0.008 |
| GS -> EICH | 0.232 | 0.077 | 3.004 | 0.003 |
| IT -> EICH | 0.139 | 0.068 | 2.033 | 0.045 |
| MCT -> EICH | 0.412 | 0.054 | 7.646 | 0.000 |
| GS x IT -> EICH | 0.197 | 0.060 | 3.263 | 0.002 |
| GS x DC -> EICH | 0.098 | 0.043 | 2.277 | 0.025 |
| GS x MCT -> EICH | 0.101 | 0.046 | 2.215 | 0.029 |

Table 6 presents the results of the structural model, showing the relationships between various constructs (digital competencies, government support, information technologies, multimedia communication techniques, and their interactions) and the outcome variable, enhancing intangible cultural heritage (EICH). The relationships are evaluated through Beta coefficients, standard deviations, T statistics, and P values. For digital competencies, the positive and significant beta value (0.115) indicates that digital competencies positively impact the enhancement of intangible cultural heritage. The T statistic (2.692) and P value (0.008) confirm this relationship is statistically significant. This suggests that individuals or organizations with higher digital competencies are more effective in utilizing digital tools and techniques to preserve and promote Opera as a cultural heritage. For government support, the beta coefficient of 0.232 indicates a strong positive impact of government support on the enhancement of intangible cultural heritage. The T statistic (3.004) and P value (0.003) show this relationship is highly significant. This highlights the crucial role of government policies, funding, and other forms in promoting and preserving Opera. The positive beta value (0.139) of the construct information technologies indicates that information technologies significantly enhance intangible cultural heritage. The T statistic (2.033) and P value (0.045) suggest that this effect is statistically significant, though relatively modest. This means that the effective use of IT, such as digital archives, streaming, and other technologies, contributes positively to promoting Opera. The beta coefficient of 0.412 indicates a powerful positive impact of multimedia communication techniques on enhancing intangible cultural heritage.

This relationship is highly significant, with a T statistic of 7.646 and a P value 0.000. This underscores the pivotal role of multimedia tools, such as virtual reality, social media, and digital marketing, in engaging modern audiences and promoting Opera as an important cultural asset. The interaction effect of government support and information technologies on enhancing intangible cultural heritage is positive and significant (beta = 0.197). The T statistic (3.263) and P value (0.002) indicate that this interaction significantly strengthens the impact of IT on the promotion of Opera when supported by government initiatives. This suggests that government support enhances the effectiveness of IT in cultural heritage projects. The interaction between government support and digital competencies has a significant positive effect on enhancing intangible cultural heritage (beta = 0.098). The T statistic (2.277) and P value (0.025) confirm this relationship. This

suggests that combining digital competencies with government support enhances their impact on promoting Opera as a cultural heritage. The positive and significant interaction effect (Beta = 0.101) indicates that government support enhances the effectiveness of multimedia communication techniques in promoting Opera as an intangible cultural heritage. The T statistic (2.215) and P value (0.029) support the significance of this interaction, emphasizing the synergistic effect of these two factors.

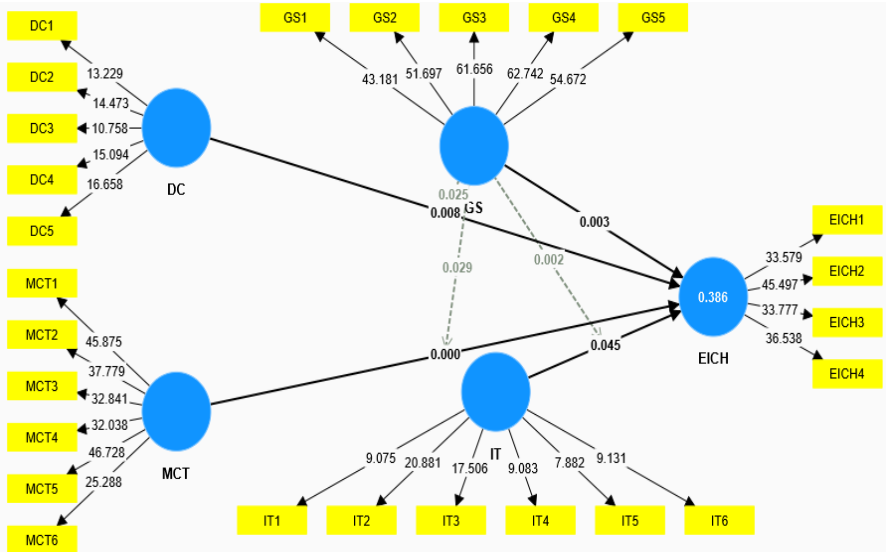


Figure 3. Structural assessment model

Figure 3 showcases the relationships between different constructs (latent variables) and their observed variables (items). The arrows pointing from DC to its items (DC1 to DC5) show that these items are the observed variables that measure the latent construct of Digital competencies. The numbers next to the arrows represent factor loadings, indicating the strength of each item when measuring the construct. The arrows from MCT to its items (MCT1 to MCT6) indicate that these items are used to measure Multimedia Communication Techniques. The arrows from IT to its items (IT1 to IT6) indicate how they measure Information Technologies. Government Support (GS) is measured by items GS1 to GS5, as indicated by the arrows from GS to these items. Enhancing Intangible Cultural Heritage (EICH) is measured by EICH1 to EICH4, showing the role of these items in capturing the latent construct. The numbers on the arrows connecting the latent constructs (e.g., DC → EICH) represent the path coefficients, which show the strength and direction of the relationship between constructs. For instance, the path from DC to EICH has a coefficient of 0.386, indicating a positive and moderately strong relationship. Likewise, the path from GS to EICH has a coefficient of 0.045, suggesting a weaker positive relationship. Again, the path from IT to EICH is also positive, with a coefficient of 0.003, which is relatively small, indicating a minimal direct effect.

GS mediates the relationship between DC, IT, and EICH as indicated by the indirect paths through GS (e.g., DC → GS → EICH). These are weaker relationships, as shown by the smaller coefficients. The diagram suggests that Digital Competences (DC), Multimedia Communication Techniques (MCT), Information Technologies (IT), and Government Support (GS) all contribute to Enhancing Intangible Cultural Heritage (EICH). However, their contributions vary in strength, with Digital Competences (DC) having the most significant direct impact on EICH. Government Support (GS) also plays a role but with a smaller direct effect, potentially mediating the effects of DC and IT on EICH.

## DISCUSSION

It provides empirical evidence that modern communication technology and digital strategies may be instrumental in protecting and fostering opera as an expression of ICH. This conclusion is not different from the findings of Jiang et al. (2024) and Wu (2024), who indicate that virtual and augmented reality have a huge impact on creating more immersive scenes aimed at interacting with modern audiences as they see it. This discourse is extended further with the support of the current study, which solidifies the fact that, aside from making opera more accessible, such technologies are also active participants in the preservation of cultural narratives in digital forms so that they are effectively transmitted from one generation to the next. Finally, the results validate the significance of information technologies (IT) in heritage promotion (H2), reinforced by the past findings that point out that digitization, archival systems, and educational platforms are paramount for cultural sustainability (Alavi & Leidner, 2001; Zhang, 2024). The novelty of this study is to demonstrate that performance records in IT tools are not only about preserving records; they can also facilitate knowledge management and digital education beyond document archiving. The role of digital competencies (H3) is likely to corroborate that technology-based heritage promotion requires users to be competent with digital tools to navigate and maximize the available tools. Trach (2024) and Cham et al. (2022) assert that social media, content creation, and digital marketing skills play a crucial role in drawing in younger audiences.

The findings highlighted mutually reinforcing linkages between cultural heritage institutions' digital capacity and building up the public's digital literacy as key strategic levers for conservation. Most importantly, the interaction effects between institutional support and the main predictors (MCT, IT, DC) show that institutional backing facilitates the effectiveness of digital interventions (H4, H5, H6). This finding is in accordance with Trimarchi (2016) and Maietti (2023), who emphasized the need for policy frameworks, funding mechanisms, and infrastructure development to incorporate digital technologies into

heritage management systems. The support of the government legitimates and funds digital initiatives, impacts public perception and participation, and provides a valuable foundation for sustained cultural engagement. In addition, this study examines the mediating effect of cultural awareness by linking communication strategies with the outcomes of the ICH. Kinderknekht & Kolada (2022) argue that the enhancement of the cultural meaning of digital content and meaningful interaction are realized through cultural understanding. The concept agrees with Kozulin (2023), who considers cultural mediation indispensable for the adequate possession of technology in the cultural transmission.

This analysis shows that to ensure desired outcomes, technological tools must be built on cultural literacy. In brief, this study confirms and expands the theoretical foundations of digital heritage promotion and recommends practical approaches for policymakers, cultural educators, and media strategists. This implies digital, inclusive, and institutionalized heritage promotion in the 21st century, where the juxtaposition of traditional art with future technologies is advocated.

## CONCLUSION AND POLICY IMPLICATIONS

Based on the findings of this research, it is clear that multimedia communication techniques and information technologies were vital in promoting Opera as a cultural asset that is not tangible. These results highlight the role of digital competencies and government intervention in enhancing the utility of knowledge in question. Based on the findings of this study, the following policy implications have been made for the sustainable conservation of Opera and other intangible cultural heritage domains: First, governments must subsidize appropriate technology used in documenting and marketing cultural heritage. Secondly, creating detailed curricula may improve digital literacy among heritage professionals and practitioners. Thirdly, the study recommends that there should be political motivation towards policies that will support the financial and infrastructural support towards promoting digital solutions to preserve cultural heritage. Prospective, through the approaches above, stakeholders stand to harness the purported strategies and hence afford the operationalization of Opera and other forms of DOI to enhance the sustainability of intangible cultural heritage. The current study also offers direction for future research. Further studies should investigate whether multimedia communication techniques and information technologies have a strong positive or negative impact on documenting the opera heritage.

Comparative analysis may also be used to compare the benefits of diverse kinds of intangible cultural heritage from digital instruments and governmental aids in different cultural communities. Evaluation of different training interventions in developing digital skills for the effective management of heritage sites may also give more insight into how digital and governmental measures can enhance the sponsorship of intangible cultural heritage.

**Author Contributions:** Conceptualization, J.D.; methodology, J.D.; software, J.D.; validation, J.D. and M.F.M.H.; formal analysis, J.D. and M.F.M.H.; investigation, J.D.; data curation, J.D. and M.F.M.H.; writing - original draft preparation, J.D.; writing - review and editing, J.D. and M.F.M.H.; visualization, J.D. and M.F.M.H.; supervision, M.F.M.H.; project administration, M.F.M.H. All authors have read and agreed to the published version of the manuscript.

**Funding:** Not applicable.

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** The data presented in this study may be obtained on request from the corresponding author.

**Acknowledgements:** The research undertaken was made possible by the equal scientific involvement of all the authors concerned.

**Conflicts of Interest:** The authors declare no conflict of interest.

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Article history: Received: 14.03.2025 Revised: 31.06.2025 Accepted: 29.07.2025 Available online: 18.08.2025