

Enhancing Madura's Tourism Potential: Financial Inclusion, Digital Technology, and the Moderating Effect of Digital Literacy

Analysis of Financial Inclusion and Digital Technology

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Evaliati Amaniyah

Universitas Trunojoyo Madura; Bangkalan, Indonesia

E-Mail: evaliati.amaniyah@trunojoyo.ac.id

Samsuki

Universitas Trunojoyo Madura; Bangkalan, Indonesia

E-Mail: samsuki@trunojoyo.ac.id

Aprilina Susandini

Universitas Trunojoyo Madura; Bangkalan, Indonesia

E-Mail: aprilina.susandini@trunojoyo.ac.id

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ABSTRACT

Tourism plays a vital role in regional economic growth and community empowerment, particularly in island regions such as Madura, where abundant coastal and marine resources hold significant potential for sustainable tourism development. This study aims to analyse how financial inclusion and the use of digital technology can promote the development of tourism potential in Madura, with digital literacy as a moderating variable. Data was obtained through a survey of tourism stakeholders and related MSMEs in the Madura region. The analysis technique used was Partial Least Squares Structural Equation Modelling (PLS-SEM). The results indicate that financial inclusion and digital technology have a positive and significant impact on tourism potential development. Digital literacy also has a direct positive impact on tourism potential; however, its role as a moderating variable yields varied results. Digital literacy does not significantly moderate the relationship between financial inclusion and tourism potential, while in the relationship between digital technology and tourism potential, digital literacy negatively moderates the relationship. This study provides policy implications for local governments and financial institutions in expanding targeted financial access and digital education to strengthen the local economy through tourism.

Keywords: Digital Literacy, Digital Transformation, Financial Access, Tourism Development.

ABSTRAK

Pariwisata memiliki peran penting dalam pertumbuhan ekonomi daerah dan pemberdayaan masyarakat, terutama di wilayah kepulauan seperti Madura, yang memiliki sumber daya pesisir dan laut yang melimpah dengan potensi besar untuk pengembangan pariwisata berkelanjutan. Penelitian ini bertujuan untuk menganalisis bagaimana inklusi keuangan dan pemanfaatan teknologi digital dapat mendorong pengembangan potensi pariwisata di Madura, dengan literasi digital sebagai variabel moderator. Data diperoleh melalui survei terhadap pemangku kepentingan pariwisata dan UMKM terkait di wilayah Madura. Teknik analisis yang digunakan adalah Partial Least Squares Structural Equation Modelling (PLS-SEM). Hasil penelitian menunjukkan bahwa inklusi keuangan dan teknologi digital berdampak positif dan signifikan terhadap pengembangan potensi pariwisata. Literasi digital juga berdampak positif langsung pada potensi pariwisata; Namun, perannya sebagai variabel moderasi menghasilkan hasil yang beragam. Literasi digital tidak secara signifikan memoderasi hubungan antara inklusi keuangan dan potensi pariwisata, sedangkan dalam hubungan antara teknologi digital dan potensi pariwisata, literasi digital secara negatif memoderasi hubungan tersebut. Studi ini memberikan implikasi kebijakan bagi pemerintah

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INTRODUCTION

Madura is one of the islands in Indonesia, precisely part of East Java, which has a fairly long coastline with the number of beaches reaching approximately 53. The average land level on this island varies from 8 meters above sea level to 47 meters above sea level so the primary tourism offered on this island is the potential for marine and coastal natural tourism. Each district on this island offers marine natural tourism and very fascinating beaches, such as Lombang Beach, Slopeng Beach, Ponjung Beach, and Sembilan Beach. Beaches in Madura are divided into three parts, namely the north coast, the south coast, and the beaches on small islands. On the north coast, there are many beaches located on the side of the main road so access to the beach can be said to be very easy. While on the south coast, the beach tends to be far from the main road, but access is also quite easy. Both beaches on the northern and southern coasts and on small islands have begun to be used and developed as tourist destinations managed by the government or the private sector. The management of coastal areas into tourist destinations is a step that can increase the economic value of the coastal area itself (Ali et al., 2024; Wahyuningsih & Wahyudi, 2024).

Managing a tourist destination certainly requires synergy between the community, the government, and other authorized parties (Nasution et al., 2024). Not only that, to support the management of tourist destinations, funding or financing is also needed so that these tourist destinations can be managed properly and have adequate facilities. One of the main obstacles is limited access to formal financial services and relevant digital technologies (Supartoyo, 2022; Mavlutova et al., 2022). On the other hand, digital transformation and financial inclusion can open up great opportunities for the development of the tourism sector, especially in the digital economy era (Ma & Ouyang 2023; Xia et al., 2024; Ratna et al., 2024).

In fulfilling development costs, tourist destination managers should understand financial literacy and inclusion. Understanding financial inclusion is expected to help tourist destination managers and business actors around tourist attractions in developing tourist destinations, so that the process can be easier and faster (Vaz et al., 2025). Digital literacy is important because the use of technology will not be maximized without a basic understanding of tourism actors (Lasibey et al., 2023; Naredia et al., 2023).

Despite studies by Stevenson and Ardiansyah (2024) and Luo et al. (2024) highlighting the positive role of technology integration and digital financial inclusion in promoting tourism development, Trianto and Susandini (2024) report that financial inclusion does not significantly impact tourism development. This inconsistency reveals a research gap regarding the conditions under which financial inclusion effectively contributes to tourism growth, suggesting the need to explore potential moderating factors such as digital literacy.

Thus, the purpose of this study is to examine how digital technology and financial inclusion have influenced Madura tourist development, as well as how digital literacy influences these connections. This study adds to the literature by integrating financial inclusion, digital technology, and digital literacy in island-based tourism development. Its novelty lies in examining digital literacy as both a direct factor and a moderating variable that strengthens the influence of financial inclusion and digital technology on tourism potential. This perspective highlights that communities with stronger digital competence are more capable of accessing financial services, adopting innovation, and promoting tourism effectively. Practically, the findings are expected to guide policymakers and local stakeholders in enhancing digital literacy and financial accessibility to foster inclusive and sustainable tourism growth in Madura.

LITERATURE REVIEW & HYPOTHESIS DEVELOPMENT

Financial Inclusion and Tourism Potential

Financial inclusion refers to the equitable access of individuals and businesses especially marginalized groups to essential financial products and services such as savings, credit, insurance, and payment systems through sustainable financial institutions (Cnaan, 2012; Bhattacharya, 2020; Goel, 2023; Ananda et al., 2024). Financial inclusion is a key enabler of economic empowerment and poverty reduction, as highlighted in the United Nations Sustainable Development Goals (SDG 8.10), which emphasize expanding access to financial services to foster inclusive growth (Muschert et al., 2024). In the tourism sector, financial inclusion supports the development of Micro, Small, and Medium Enterprises (MSMEs) by improving access to financing and payment systems, thereby promoting sustainable business practices and regional economic resilience (Zhang et al., 2023).

Empirical studies support these theoretical perspectives. Shi et al. (2021) and Nugroho et al. (2025) found that key dimensions of financial inclusion, such as accessibility, institutional depth, and efficiency positively influence tourism development indicators, including domestic tourism growth and business expenditures. Similarly, Luo et al. (2024) and Abedalrhman (2025) revealed that digital financial inclusion significantly enhances tourism receipts and contributes to GDP growth. Financial inclusion serves as synergistic drivers of tourism potential, fostering sustainable and inclusive economic development

H1: Financial inclusion positively influences tourism potential.

Digital Technology and Tourism Potential

Digital technology plays a pivotal role in transforming social, economic, and industrial systems through tools such as information technology, artificial intelligence, and the Internet of Things, providing a foundation for innovation and efficiency across sectors (Cheryl et al., 2021; Cornelia et al., 2025; Jige, 2025). In the context of tourism, these technologies enhance communication, marketing, and operational processes, enabling tourism organizations to improve competitiveness, service quality, and visitor satisfaction (Antipov et al., 2020; Yekimov et al., 2021). ICT services, in particular, act as catalysts for tourism activity by facilitating access to tourism products, optimizing operational efficiency, and supporting the survival and adaptability of tourism businesses in rapidly changing environments (Bănescu et al., 2021). The integration of digital solutions allows tourism operators to reach wider markets, respond to dynamic consumer behaviors, and deliver personalized services while reducing costs and enhancing marketing effectiveness.

Previous studies demonstrate the tangible benefits of digital technology in tourism development. Bahagia and Subiyantoro (2022) found that digital tools serve as essential communication channels that simplify tourism activities and positively influence overall tourism performance. Similarly, the adoption of digital platforms enables businesses to implement targeted marketing strategies and maintain high service standards, which are critical for attracting and retaining visitors (Triwahyono et al., 2023). Collectively, these findings highlight that digital technology not only facilitates operational and promotional efficiency but also strengthens the potential of tourism destinations by increasing engagement, accessibility, and innovation. This underscores the importance of further investigating how digital technologies interact with other factors, such as financial inclusion or digital literacy, to optimize tourism potential in diverse contexts.

H2: Digital technology positively influences tourism potential.

Digital Literacy and Tourism Potential

Digital literacy refers to the capacity of individuals and organizations to understand, use, and manage information and communication technologies effectively in everyday activities. In the tourism sector, digital literacy is a foundational capability that supports operational efficiency, innovation, and the enhancement of tourist experiences (Rumanti et al., 2025). Adequate digital knowledge and skills shape critical and creative thinking, enabling individuals and tourism actors to actively participate in information exchange, access up-to-date content, and critically evaluate digital information, including identifying and countering misinformation in the modern digital environment. As tourism activities increasingly rely on digital platforms for promotion, service delivery, and customer interaction, digital literacy becomes essential for ensuring that stakeholders can engage productively and responsibly within digital ecosystems.

The relationship between digital literacy and tourism development has been widely discussed in previous studies. Increasing digital literacy is considered a key enabler for tourism industry actors to adopt and adapt to emerging digital technologies effectively (Elfaki & Ahmed, 2024). Amelia and Prasetyo (2023) argue that digital literacy determines the sustainability of tourism businesses, as it influences how stakeholders respond to feedback, criticism, and suggestions from visitors and other parties in a constructive manner. Moreover, in the broader economic and tourism context, digital literacy plays a strategic role in supporting financial inclusion and the effective use of technology for regional development, including tourism potential (Al-Romeedy, 2024). Digital literacy also enhances financial behavior and decision-making processes, which subsequently strengthen financial inclusion and economic well-being, contributing to sustainable tourism development (Al-Afeef & Alsmadi, 2025).

H3: Digital literacy positively influences tourism potential.

Digital Literacy as Moderating Variable

Financial inclusion provides individuals and MSMEs, especially marginalized groups, with affordable access to financial services such as savings, credit, insurance, and payments. It promotes economic empowerment and aligns with SDG 8.10 to expand inclusive access and reduce poverty (Muschert et al., 2024). In tourism, financial inclusion strengthens MSME growth and tourism performance through improved financial accessibility. Digital technology further enhances efficiency, innovation, and competitiveness in tourism via ICT, IoT, and digital platforms that support marketing, engagement, and operations (Bogea et al., 2022). Digital financial inclusion also increases tourism revenues and economic growth (Luo et al., 2024).

Digital literacy is the ability to use technology to search, analyze, and communicate information through internet applications (Park et al., 2021; Mei, 2024; Al-Shami et al., 2024; Rahmani et al., 2025). It represents the skills required for digital competence, namely the confident and critical use of ICT for learning, communication, and employment (Tomczyk & Eger, 2020; Puebla et al., 2024). Digital literacy enables effective participation in the digital economy through informed financial decisions and secure electronic transactions (Eltanskaya et al., 2024). It promotes financial inclusion, enhances economic well-being, and supports technology adoption in regional tourism development (Al-Romeedy, 2024; Al-Afeef & Alsmadi, 2025).

Tourism potential refers to a region's capacity to attract visitors and stimulate the economy through its natural, cultural, and social assets (Sadykov, 2023). It drives job creation, local growth, and cultural preservation. Key tourism components include resources, infrastructure, and environmental interactions that inform sustainable development strategies (Nekhvyadovich et al., 2022). In Madura Island, realizing tourism potential requires integrated support through improved financial inclusion, digital technology utilization, and enhanced digital literacy. As a moderating variable, digital literacy strengthens the effects of financial inclusion and digital technology on tourism potential, fostering inclusive, competitive, and sustainable tourism development.

H4: Digital literacy moderates the relationship between financial inclusion and tourism potential.
H5: Digital literacy moderates the relationship between digital technology and tourism potential.

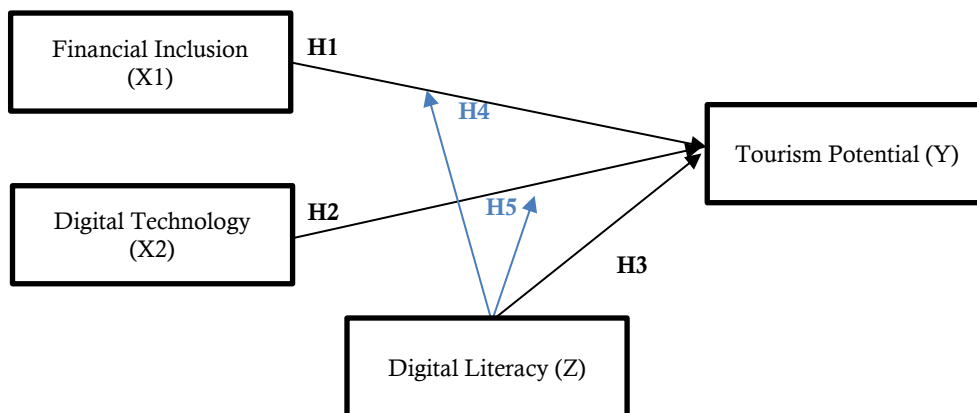


Figure 1. Theoretical Framework

Figure 1 research framework shows how digital technology, digital literacy, financial inclusion, and tourist potential are related to one another. Digital technology (H2) and financial inclusion (H1) both have a lot to offer the travel industry. Digital literacy (H3) also has a direct positive impact. However, its moderating effects reveal mixed outcomes: it does not significantly strengthen the relationship between financial inclusion and tourism potential (H4), while it significantly but negatively moderates the relationship between digital technology and tourism potential (H5). This indicates that higher digital literacy does not always enhance, and may even reduce, the effectiveness of digital technology in tourism development.

RESEARCH METHODS

This study applies to a quantitative research approach, which, according to Sugiyono (2018), is a type of research that emphasizes objective measurement and statistical analysis of numerical data obtained from a specific population or sample. The method was selected because it enables the researcher to investigate causal linkages between variables and test hypotheses in a methodical manner within the framework of Madura's tourist growth. Business players and Micro, Small, and Medium-Sized Businesses (MSMEs) that operate in the Madura region are the subjects of this study, especially those involved in tourism and making use of digital technologies and financial services.

This study employed a non-probability sampling method, with purposive sampling utilized to select participants. Sugiyono (2018) defines non-probability sampling as a technique that does not provide equal opportunities for each member of the population to be selected as a sample. To make sure that only respondents who fulfilled particular requirements were included, purposeful sampling was used, namely, MSMEs and tourism-related business actors who actively use financial services and digital technology in their operations. This method is appropriate because it focuses on participants who are most relevant to the study's objectives. The variables analyzed include Financial Inclusion (X1) and Digital Technology (X2) as independent variables, Tourism Potential (Y) as the dependent variable, and Digital Literacy (Z) as a moderating variable. To analyze the data, the study employed Partial Least Squares Structural Equation Modelling (PLS-SEM) using SmartPLS 3.0. The analytical process consisted of validity and reliability testing to ensure instrument accuracy, coefficient of determination (R-square) to assess explanatory power, and hypothesis testing to evaluate both direct and moderating effects among variables. This methodological design was expected to provide robust and reliable

insights into how financial inclusion, digital technology, and digital literacy interact to influence tourism potential in Madura.

RESULTS

Before testing the hypotheses, validity and reliability tests were conducted to ensure the accuracy and consistency of the measurement model. Convergent validity was assessed using the Average Variance Extracted (AVE), while reliability was measured through Composite Reliability and Cronbach’s Alpha. The following outcomes were attained after data processing with SmartPLS 3.0:

Table 1. Average Variance Extracted (AVE)

| Variable | Average Variance Extracted | Critical Values |
|---------------------|----------------------------|-----------------|
| Financial Inclusion | 0.798 | 0.5 |
| Digital Technology | 0.707 | |
| Digital Literacy | 0.802 | |
| Tourism Potential | 0.669 | |

Table 1 presents the results of the Average Variance Extracted (AVE) test for each construct. All variables show AVE values above the recommended threshold of 0.50, indicating adequate convergent validity. Financial Inclusion (0.798), Digital Technology (0.707), Digital Literacy (0.802), and Tourism Potential (0.669) each demonstrate that their indicators effectively represent the latent constructs. These results confirm that the measurement model has satisfactory convergent validity and that the indicators used are reliable in capturing the underlying concepts of each variable.

Table 2. Composite Reliability and Cronbach’s Alpha

| Variable | Cronbach’s Alpha | Composite Reliability | Critical Values | Information |
|-----------------------------|------------------|-----------------------|-----------------|-------------|
| Financial Inclusion Finance | 0.753 | 0.888 | 0.7 | Reliable |
| Digital Technology | 0.863 | 0.906 | | Reliable |
| Digital Literacy | 0.877 | 0.924 | | Reliable |
| Tourism Potential | 0.875 | 0.910 | | Reliable |

Table 2 shows the results of the reliability tests using Cronbach’s Alpha and Composite Reliability. All constructs have values exceeding the minimum threshold of 0.70, confirming that each variable is reliable and consistent in measuring the intended concepts. Financial Inclusion ($\alpha = 0.753$; CR = 0.888), Digital Technology ($\alpha = 0.863$; CR = 0.906), Digital Literacy ($\alpha = 0.877$; CR = 0.924), and Tourism Potential ($\alpha = 0.875$; CR = 0.910) all demonstrate strong internal consistency. These results indicate that the measurement instruments used in this study are dependable and suitable for further analysis.

Table 3. Coefficient of Determination (R-square)

| Test | Value |
|-------------------|-------|
| R-Square | 0.594 |
| Adjusted R Square | 0.577 |

According to Table 3, the Development of Tourism Potential endogenous construct has an R-squared value of 0.594, whereas the Adjusted construct has an R-squared value of 0.577. This demonstrates that 59.4% of the variation in tourism potential can be explained by the factors of financial inclusion, digital technology, and digital literacy taken together. This figure, which is comparatively high, demonstrates the model’s strong and distinct control on the dependent variables.

The process of hypothesis testing will result in a decision regarding the acceptance or rejection of a hypothesis. Therefore, statistical tests must be used to determine whether the hypothesis is valid. The following figure 2 serves as a visual representation of the hypothesis testing path diagram:

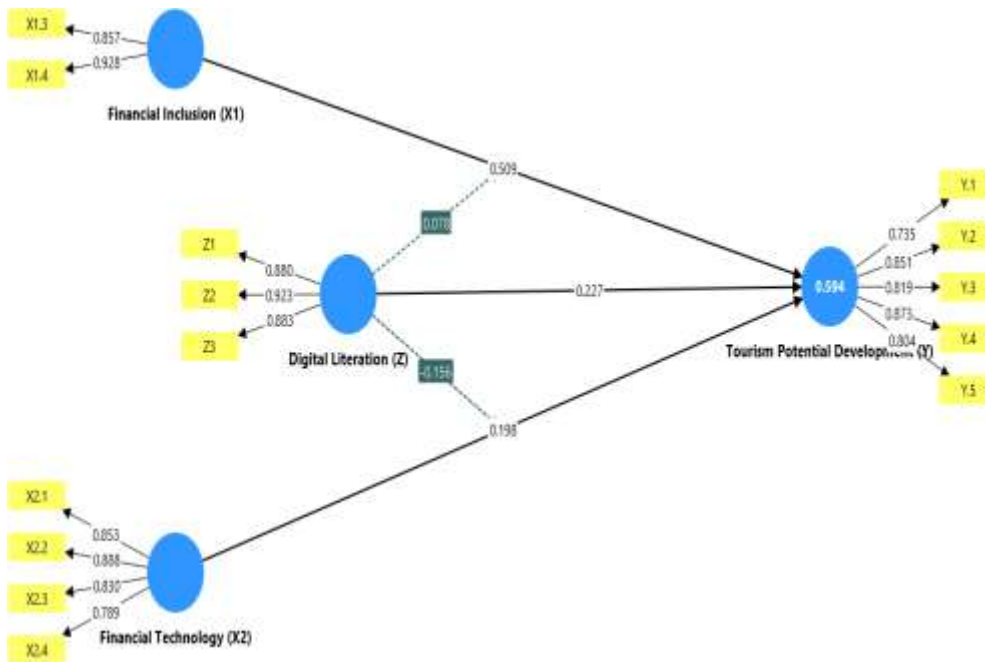


Figure 2. Hypothesis Testing Path Diagram

As can be seen from the path diagram in Figure 2, this study looks at how financial inclusion (X1), financial technology (X2), and digital literacy (Z) directly affect the growth of tourism potential (Y). It also tests how digital literacy moderation affects the relationship between X1 and X2 to Y. Each path shown in the diagram is statistically tested to find out whether the influence between these variables is significant or not. The full results of the test are presented in Table 4 below.

Table 4. Hypothesis Testing

| Path | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T statistics (O/STDEV) | P value |
|---|---------------------|-----------------|----------------------------|--------------------------|---------|
| Financial Inclusion (X1) → Tourism Potential Development (Y) | 0.509 | 0.501 | 0.075 | 6.814 | 0.000 |
| Financial Technology (X2) → Tourism Potential Development (Y) | 0.198 | 0.200 | 0.075 | 2.653 | 0.008 |
| Digital Literacy (Z) → Tourism Potential Development (Y) | 0.227 | 0.239 | 0.069 | 3.286 | 0.001 |

Based on Table 4, the hypothesis testing results indicate that all tested paths have a significant effect on tourism potential development. The path from financial inclusion (X1) to tourism potential development (Y) shows an original sample coefficient of 0.509, a t-value of 6.814, and $p < 0.001$, indicating a highly significant effect. The path from financial technology (X2) to tourism potential development (Y) has a coefficient of 0.198, a t-value of 2.653, and $p = 0.008$, also showing a significant positive effect. Finally, digital literacy (Z) positively and significantly affects tourism potential development, with a coefficient of 0.227, a t-value of 3.286, and $p = 0.001$. These results confirm that all three independent variables significantly influence the development of tourism potential.

Table 5. Moderation Effect Test

| Path | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T statistics (O/STDEV) | P value |
|--|---------------------|-----------------|----------------------------|--------------------------|---------|
| Digital Literacy (Z)* Financial Inclusion (X1) → Tourism Potential Development (Y) | 0.078 | 0.084 | 0.069 | 1.120 | 0.263 |
| Digital Literacy (Z)* Financial Technology (X2) → Tourism Potential Development (Y) | -0.156 | 0.153 | 0.062 | 2.508 | 0.012 |

Table 5 presents the results of the moderation effect test. The interaction between digital literacy (Z) and financial inclusion (X1) on tourism potential development (Y) is not significant (O = 0.078, t = 1.120, p = 0.263). In contrast, the interaction between digital literacy (Z) and financial technology (X2) significantly affects tourism potential development (O = -0.156, t = 2.508, p = 0.012), indicating that digital literacy moderates the relationship between financial technology and tourism potential development.

DISCUSSION

According to the analysis, financial inclusion (X1) has a positive and significant impact on tourist potential (Y), as demonstrated by the p-value of 0.000 (< 0.05), the original sample value of 0.509, and the T-statistic of 6.814. This finding suggests that greater access to financial services enhances investment, promotion, and management capacity within the tourism sector. These results align with Shi et al. (2021) and Nugroho et al. (2025), who emphasize that the dimensions of financial inclusion, such as institutional depth, accessibility, and efficiency. Financial inclusion play a crucial role in strengthening tourism development indicators, including business spending, direct contributions, and domestic tourism (Anter & Elmaghraby, 2025).

Similarly, with an original sample value of 0.198, a T-statistic of 2.653, and a p-value of 0.008, financial technology (X2) shows a substantial positive impact on tourist potential. This suggests that the use of fintech tools, such as funding platforms and digital payments, enhances destination management and makes traveler transactions easier, which promotes sectoral growth. The results are consistent with Abedalrhman (2025) and Luo et al. (2024), who found that digital financial inclusion, measured through city-level indices in China, significantly boosts tourism receipts and contributes to GDP growth.

The results show that digital literacy (Z) has a significant positive impact on tourism potential, with an original sample value of 0.227, a T-statistic of 3.286, and a p-value of 0.001. This implies that enhancing public competence in utilizing digital devices and accessing online information is essential for strengthening tourism promotion and digital-based management. These findings are in line with Darubekti et al. (2022), who highlight that improving digital skills enables communities to better manage tourist flows and expand the economic benefits generated by the tourism sector.

The analysis indicates that the moderating role of digital literacy in the relationship between financial inclusion and tourism potential is not significant, with an original sample value of 0.078, a T-statistic of 1.120, and a p-value of 0.263 (> 0.05). Although the relationship shows a positive direction, the effect is statistically weak, suggesting that digital skills within local communities are insufficient to enhance the influence of financial inclusion on tourism development. This limitation is likely related to the relatively low use of digital technology in economic activities within the tourism sector, particularly among small-scale enterprises and community-based actors. These results are consistent with Adel (2024), who found that in some developing countries, higher levels of digital literacy do not necessarily reinforce financial inclusion. In fact, greater awareness and

critical evaluation of risks may reduce the willingness of users to engage with digital financial services, thereby limiting their role in supporting tourism development.

The results indicate that digital literacy significantly, yet negatively, moderates the relationship between financial technology and tourism potential, with an original sample value of -0.156 , a T-statistic of 2.508 , and a p-value of 0.012 . While financial technology exerts a direct positive effect on tourism development, its effectiveness tends to diminish among individuals with higher levels of digital literacy. This may be attributed to the tendency of digitally literate users to adopt a more critical and selective approach toward financial services, thereby reducing the overall impact of fintech on the sector. These findings align with May (2024), who noted that digital literacy can function as a negative moderator, as highly skilled users are generally more independent and skeptical in evaluating the benefits of financial technology. Consequently, external factors such as promotions or social influence appear less effective, suggesting that high digital literacy does not always enhance and may sometimes weaken the role of fintech in shaping user behavior and advancing tourism development.

CONCLUSION

The development of Madura's tourism potential is directly and significantly impacted by digital technology and financial inclusion, according to the findings of the study and debates. The potential for tourism is positively impacted by digital literacy as well. Its function as a moderating variable, however, yields contradictory findings: digital literacy considerably but negatively moderates the link between digital technology and tourism potential, while it does not significantly moderate the relationship between financial inclusion and tourism potential. According to these results, raising digital literacy does not necessarily improve the efficiency of digital technology in the travel industry and, in certain situations, may even lessen its effects.

This study thus answers its research objective by demonstrating the significant contributions of financial inclusion and digital technology to tourism development, while clarifying the complex role of digital literacy as both a supportive factor and a potential constraint. The findings provide important implications for local governments, MSME actors, and financial institutions to not only expand access to financial services and digital technologies but also to ensure that digital literacy programs are applicable, contextual, and aligned with the needs of local tourism stakeholders. Digital literacy initiatives should be directed toward not only understanding technology but also optimizing its use to strengthen sustainability and competitiveness in the tourism sector.

Future research is recommended to address the limitations of this study by applying comparative approaches across regions, incorporating longitudinal designs to capture changes over time, and integrating additional variables such as entrepreneurial orientation, policy frameworks, or cultural factors. A mixed-methods approach may also provide richer insights into how digital literacy shapes perceptions and behaviors within the tourism economy.

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