

Visitors' experiences of smart heritage tourism in Ipoh Old Heritage Town: The role of smart city initiatives

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Abstract

Nowadays, changing visitor demands for high-tech services and enhanced experiences require new approaches to tourism development. Smart tourism arrives at a timely moment to offer innovation-driven technology; however, challenges in meeting visitors' needs for technology adoption arise, while cost efficiency and limited information about visitors' demographics pose additional constraints. Ipoh Old Heritage Town is preparing for smart heritage tourism to boost its popularity and attract more visitors and investors. Inspired by these challenges, this paper aims to evaluate visitors' experiences with smart heritage tourism elements in Ipoh Old Heritage Town within the context of smart city initiatives. The study employed a questionnaire administered using Google Forms to 100 participants. The analysis of perceived experiences (perceptions) was based on a 6-point Likert scale. The findings reveal that the visitors are moderately to highly satisfied with 21 assessed elements, with mean values ranging from 3.57 to 4.80. Those elements include internet coverage (4.80), e-hailing services (4.72), road signs (4.71) and trash bins (4.43). No element was rated as highly satisfied (a mean above 5.17), thus indicating room for interventions, in particular at the development planning review stages. This study contributes to empirical research on smart heritage tourism in Malaysia, benefiting tourism stakeholders including visitors, businesses and the local community by providing insights into the importance of visitors' perceptions and engagements and ensuring the long-term sustainability of historical building assets.

Keywords: Heritage buildings, IoT, Ipoh Old Heritage Town, smart heritage tourism, smart city initiatives

Introduction

Malaysia has diverse tourist attractions, including agrotourism and ecotourism, which are popular in rural areas, as well as health tourism, urban tourism and sports tourism. Currently, smart tourism is gaining tremendous popularity in urban areas. In the digital era, smart tourism is increasingly embraced due to its integration of advanced technology, well-connected infrastructure, modern amenities (Baraniewicz-Kotasinska, 2022) and seamless tourism operations (Lee et al., 2020). It

benefits tourists by enhancing travel experiences, ensuring safety and promoting sustainable tourism practices (Galih, 2024). Smart tourism enables visitors to access real-time information about tourist destinations, restaurants and local events, while also improving safety and security through AI-powered monitoring systems and smart sensors (Gajdosik, 2020). More importantly, it encourages sustainable tourism by promoting eco-friendly transportation and reducing pollution through technology-based waste monitoring (Indumathi, 2020; Lin, 2022).

Malaysia has significant potential to become a leading smart tourism destination due to its advanced urban infrastructure (MIDA, 2024). It includes transportation and urban mobility infrastructure, particularly in the Klang Valley and other big cities such as Johor Bahru, which have improved connectivity of urban activity systems, making it easier for tourists to move between airports, hotels, attractions and city centres, thus increasing convenience and accessibility. Another example is smart digital infrastructure, as Malaysia progressively moves towards 5G and IoT technologies that enhance digital services such as e-booking, cashless payments, wayfinding, free Wi-Fi and seamless transit. Countries such as Singapore, South Korea, Japan, the United States, Hong Kong, France and the United Kingdom have successfully developed their smart tourism industries through global marketing campaigns (Zhao, 2021). In 2023, Malaysia ranked second among 20 countries for international tourist arrivals, welcoming 20.1 million international visitors and generating tourism revenue of RM71.3 billion (Khalid, 2024). This highlights Malaysia's growing appeal as a tourist destination and underscores the need for further smart tourism initiatives to maintain competitiveness.

Despite its potential, Malaysia faces challenges in implementing smart tourism, particularly in providing and managing advanced infrastructure, integrating and adapting technology and achieving cost efficiency (Shen et al., 2020; Lee et al., 2020). This is due to changing tourist demands for high-tech services and improved experiences, which require new approaches, particularly in the utilisation of technology (Rahman et al., 2020). Those challenges, if not addressed as policy-based solutions, will impact Malaysia's tourism industry and destination competitiveness. Adopting smart tourism technologies will enable more effective marketing and promotional strategies, improve visitor experiences and engagement and enhance the management of historical sites (Iwona et al., 2022). Indeed, smart tourism arrives at the right time, offering innovative technology services that meet visitors' needs and drive technology adoption and smart city transformation.

Correspondingly, Ipoh, the capital city of Perak and one of Malaysia's major cities, is actively advancing its development as a smart heritage tourism destination as a part of the Ipoh Smart City Action Plan (smart city initiatives) by enhancing promotional efforts and expanding attractions to draw more visitors and potential investors. In addition to this, in 2022, the CNN Travel portal mentioned Ipoh as the first destination in the 18 of Asia's Most Underrated Places (New Straits Times, 2022). In 2025, Ipoh was again recognised by Tatler Asia as the 2nd most underrated foodie city in Asia after Fukuoka in Japan (Tatler, 2025). This recognition highlights the uniqueness and diversity of food in Ipoh, distinguishing it among the eight cities in Asia. It reflects not only culinary excellence but also the city's multicultural—Malay, Chinese and Indian communities—local identity and preservation of historical buildings. However, how does the city, which has yet to fully utilise technological tools to meet visitors' expectations, simultaneously promote tourism and enhance heritage attractions?

Inspired by this thought-provoking question, this paper aims to evaluate visitors' experiences with smart heritage tourism initiatives in Ipoh Old Heritage Town. This provides significant insights into the smart city intervention strategies (roles) for synergising Ipoh as a smart

city while promoting it as a smart heritage tourism destination in Malaysia. It is an empirical study of Ipoh Old Heritage Town to promote its position as a leading smart heritage destination, benefiting visitors, businesses and the local community, while ensuring the long-term sustainability of its historical buildings.

Literature review

Emerging smart tourism and its importance for tourism promotion

Smart tourism is revolutionising the tourism industry by integrating cutting-edge technologies such as artificial intelligence (AI), the Internet of Things (IoT), big data, augmented reality (AR) and virtual reality (VR) to enhance visitor experiences and improve destination management (Gretzel et al., 2020). As visitor expectations evolve, smart tourism provides personalised, real-time services through AI-powered chatbots and digital assistants, offering recommendations based on visitor preferences (Li et al., 2021). Additionally, IoT and big data allow tourism operators to monitor visitor flows, manage crowds and optimise resource use, ensuring a seamless experience while reducing infrastructure strain (Xiang et al., 2020). Sustainability is another major advantage, as smart tourism encourages eco-friendly or green travel options, such as electric public transport, bike-sharing and mobile apps that promote responsible tourism behaviour (Gossling & Scott, 2021; Li et al., 2021). The use of AR and VR further enhances visitor engagement, allowing travellers to experience historical sites interactively or take virtual tours, making tourism more immersive and accessible for people with mobility limitations (Neuhofer & Buhalis, 2021).

The COVID-19 pandemic accelerated the adoption of digital transformation in tourism, prompting destinations to introduce virtual tours, contactless services and digital health passports to adapt to new travel norms (Sigala, 2020). This shift reinforced the importance of real-time data and digital tools for managing health and safety measures while restoring tourism activities. Beyond technological benefits, smart tourism helps destinations remain competitive, as cities that embrace AI-driven services, language translation apps and digital payments attract and retain more visitors (Li et al., 2021). Furthermore, big data analytics also play a vital role in destination management, enabling tourism operators to understand visitor patterns, seasonal trends and infrastructure demands, allowing for data-driven decision-making (Xiang et al., 2020). By leveraging these technologies, tourism destinations can improve operational efficiency while enhancing visitor experiences and learning. As global tourism continues to evolve, adopting smart tourism strategies is crucial for destinations to remain relevant, adaptive, competitive and sustainable in an increasingly digital world. This is what is emerging in Ipoh Old City to promote smart heritage tourism.

Smart tourism applications for heritage cities

Smart tourism is transforming heritage cities by integrating digital technologies, such as AR, VR, AI and the IoT, to enhance visitor experiences and ensure sustainable tourism planning and management (Gretzel et al., 2020). Heritage cities are historically and culturally significant urban areas that preserve architectural landmarks, monuments and traditions, playing a crucial role in local and global history (Di Giovine, 2020). These cities must balance preserving their heritage while also meeting the needs of modern tourists. However, they face challenges such as over-

tourism, environmental change and urbanisation, which can lead to congestion, commercialisation and damage to historical sites (Seraphin et al., 2020). To address these challenges, many historic cities integrate smart tourism and digital technology to safeguard their heritage while adapting to modern needs. Tools such as mobile apps, AR and VR enable visitors to experience virtual tours and interactive historical reconstructions, thus helping to manage tourist numbers and reduce environmental impact (Gretzel et al., 2020; Neuhofer & Buhalis, 2021).

The commercialisation of heritage raises concerns about cultural authenticity, as some traditions may be altered to cater to tourist expectations. To maintain historical integrity while ensuring economic growth, heritage cities must implement strict zoning laws, urban planning strategies and sustainable and smart tourism initiatives (Richards, 2021). Strategies such as promoting domestic tourism, utilising digital tourism platforms and supporting local businesses can help historic cities remain resilient and safeguard their cultural and historical legacy for future generations.

AR and VR technologies enable visitors to explore historical sites interactively, providing real-time historical overlays and virtual tours, thereby making tourism more immersive while reducing environmental impact (Neuhofer & Buhalis, 2021). Moreover, big data and IoT help manage visitor flows in crowded heritage sites, as seen in Amsterdam, Barcelona and Venice, where digital monitoring systems distribute tourists across various locations to prevent congestion and damage to historical structures (Xiang et al., 2020; Seraphin et al., 2020). This is the fact that promotes eco-friendly behaviours, encouraging visitors to use sustainable transport and digital guides, reducing the reliance on printed materials (Li et al., 2021). Additionally, it aids in cultural preservation through 3D modelling and digital archiving, ensuring that historic sites remain accessible for future generations (Neuhofer & Buhalis, 2021).

Despite its benefits, implementing smart tourism in heritage cities presents challenges. One major issue is the digital divide, as not all tourists have access to or knowledge of smart technologies, thus limiting inclusivity (Richards, 2021). Heritage cities must ensure user-friendly technology and provide alternative access, such as printed guides for those who are unfamiliar with digital tools. Another challenge is the over-commercialisation of cultural heritage, where heritage sites risk becoming profit-driven attractions rather than preservation sites (Cohen & Cohen, 2019). To prevent this, heritage cities must balance technological advancements with cultural integrity, reinvesting tourism revenue into heritage conservation rather than prioritising profits. Additionally, virtual tourism, which has gained popularity during the COVID-19 pandemic, offers alternative revenue streams through online exhibitions and digital tours, ensuring economic resilience while maintaining tourism sustainability (Sigala, 2020). By addressing these concerns, smart tourism can help heritage cities create a more engaging, sustainable and inclusive tourism experience and preserve their historical and cultural legacy.

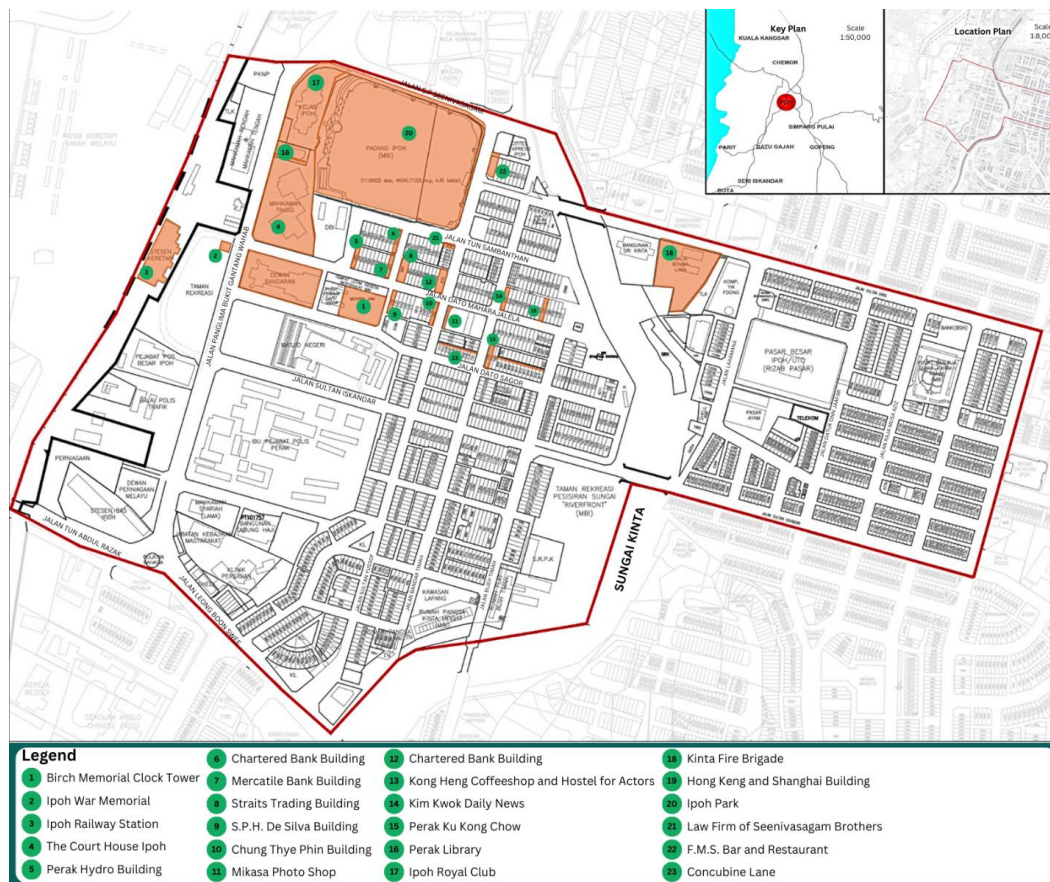
Tourism destinations such as Ipoh Old Heritage Town can benefit from smart tourism solutions to attract youths and international travellers (MIDA, 2024). Moreover, several smart heritage tourism-related elements (initiatives) have been implemented according to the smart city action plan proposed by Majlis Bandaraya Ipoh (MBI). Notably, visitors' opinions play a crucial role in determining the reputation and popularity of a heritage site (Smith & Richards, 2020) and offer a strategic intervention in adopting cutting-edge technologies for smart heritage tourism. This also helps to preserve and present cultural and historical elements effectively and enhances visitor experience, as authenticity remains a key motivator for heritage tourism (Garrod & Fyall, 2018). Furthermore, it enriches visitor perception by making sites more engaging and forward-thinking (Neuhofer et al., 2019). In addition, safety and hygiene significantly impact visitor satisfaction, as

well-maintained and hygienic sites foster trust and encourage positive word-of-mouth recommendations (Lee & Tussyadiah, 2021). All these will be appraised through the visitors' perceived experiences, as in the case of Ipoh Old Heritage Town.

Methodology

Introduction to the study area

The study area (Figure 1), Ipoh Old Heritage Town, which is located in the heart of Ipoh City, is situated in the western part of the Kinta District. The area is well-connected through major transportation routes, with the North-South Expressway serving as its primary access point. Additionally, two main transportation terminals, Ipoh Bus Terminal and Ipoh Railway Station, enhance its connectivity and accessibility, facilitating domestic and international tourist arrivals. This designated area encompasses the city's historical core, which is characterised by well-preserved colonial architecture, cultural landmarks and a rich heritage that reflects Ipoh's significance as a former tin mining town, becoming one of the popular heritage tourism destinations in Perak State.



Source: The authors, 2024

Figure 1. Map of the study area (Old Ipoh Heritage Town) and distribution of heritage buildings

Methods of data collection

This study employed a visitors' questionnaire survey, administered face-to-face using a QR Code Scanner or a Google Form and thus employed non-probability sampling. Therefore, the results are only representative of the respondents, rather than the total population. Besides that, it involves observation of sites where heritage buildings are distributed to gain information related to the existing elements of smart heritage tourism, such as types and distributions and operations as implemented based on the Ipoh Smart City Action Plan by Majlis Bandaraya Ipoh (MBI). The survey was conducted in three weeks, starting on 23 December 2024 and ending on 12 January 2025. The questionnaire is designed as a reliable tool to gather accurate and meaningful data, contributing to the overall success of the research. It includes two types of questions, closed-ended and open-ended and is divided into five sections consisting of: Section A- respondent profiles; Section B- visitors' behaviour and interest; Section C- perception of the existing smart heritage initiatives; Section D- understanding and future suggestions for smart heritage tourism initiatives; and Section E- general opinions and recommendations.

The non-probability sampling technique used for this study is convenience sampling, which selects participants based on their accessibility to the researcher (Golzar et al., 2022). The sample size is based on Krejcie and Morgan's (1970) recommendations, with a total of approximately 843,265 recorded visitors in 2022 (Tourism Malaysia, 2019). The calculated sample size with a confidence level of 90% or 3.841 and a margin of error of 10% is established at 100 samples. This sample size is considered acceptable for providing reliable results.

Results and discussions

Visitors' demographic profiles

The demographic profile discussed in various features, such as gender, age, race, occupation, income, education level and visitors' usual place of residence, provides a reliable background of the respondents. From Figure 1, of the 100 respondents, 68% were females, while 32% were males. They belong to the age group of 19–30 years (86%), followed by 31–40 years (11%). The percentages for the 41–50 years, 51–60 years and 60 years and above age groups are each 1%. In terms of race, the respondents consist of 96% Malay, 3% Chinese and 1% Indian. The majority of individuals are students, accounting for 47% of the sample. Other groups include those in the government sector (29%), the private sector (23%) and retirees (1%). Their income levels are as follows: 65% earn below RM3,400, 25% earn between RM3,401 and RM7,694, 7% earn between RM7,695 and RM15,866 and only 1% earn above RM15,867. The highest level of education shows that the majority have a bachelor's degree (66%), followed by a Diploma (27%), SPM (5%) and a master's degree (1%). Unsurprisingly, most of the visitors who participated in this study came from outside of Perak State (69%), followed by 22% of visitors from other districts; only 9% were local visitors due to the popularity of Ipoh City, which is considered the most underrated tourism destination in Asia in the years 2022 and 2025. Unfortunately, no foreign visitor was involved in this study.

Table 1. Demographic profiles of respondents

Category	Variable	Frequency (<i>f</i>)	Percentage (%)
Gender	Male	68	68.0
	Female	32	32.0
	Total	100	100.0
Age	19-30 years old	86	86.0
	31-40 years old	11	11.0
	41-50 years old	1	1.0
	51-60 years old	1	1.0
	61 years old and above	1	1.0
	Total	100	100.0
Race	Malay	96	96.0
	Chinese	3	3.0
	Indian	1	1.0
	Total	100	100.0
Occupation sectors	Government	29	29.0
	Private	23	23.0
	Student	47	47.0
	Retired	1	1.0
	Total	100	100.0
Income	Below RM3,400	65	65.0
	RM3,401 – RM7,694	25	25.0
	RM7,695 – RM15,866	7	7.0
	More than RM15,867	1	1.0
	Total	100	100.0
Highest education level	SPM	5	5.0
	Diploma	27	27.0
	Bachelor's degree	66	66.0
	Master's degree	1	1.0
	Total	100	100.0
Visitors' usual place of residence	Kinta District	9	9.0
	Other districts in Perak State	22	22.0
	Other states	69	69.0
	Total	100	100.0

Source: The authors, 2024

The demographic profiles outlined above demonstrate the significant characteristics of the study's respondents. Consequently, more valuable responses and feedback are anticipated, which will enhance the assessment and presentation of the results, thereby reflecting their validity and reliability.

Visitors' behaviour and interest

Further essential investigation concerns the visiting information and visitors' behaviours and interests that can influence visitor experiences and their expectations regarding smart tourism initiative developments, targeted marketing and promotion, future planning intervention, etcetera. Besides that, as a fundamental characteristic indicating competitiveness and visitors' choices, it includes sources of information, types and purposes of visits, frequency, types of accommodation, expenses and so on. Table 2 shows that social media (43.2%) is the most influential source of information, followed by friends (26.2%) and family (14.8%). This suggests that word-of-mouth and digital platforms are crucial in tourism marketing and promotion. The official tourism website (12%) is a notable source, though it ranks lower than social interactions. Meanwhile tourism agencies and others contributed only 3.8%. The findings indicate that online presence and peer recommendations significantly impact visitors' decisions and choices.

Table 2. Visitors' related information, behaviours and interests

Aspects		Frequency (f)	Percentage (%)
Sources of information about the study area*	Social media	79	43.2
	Friends	48	26.2
	Family	27	14.8
	Official tourism website	22	12.0
	Tourism agency	5	2.7
	Others	2	1.1
	Total	183	100.0
Type of visit	Family/spouse	45	45.0
	Friends	42	42.0
	Alone	13	13.0
	Total	100	100.0
Purpose of visit*	Vacation	64	30.3
	Food experience	46	21.8
	Recreation	42	19.9
	Enjoying the architecture	29	13.7
	Learning about heritage	17	8.1
	Attending a special event	10	4.7
	Other matters	3	1.4
	Total	211	100.0
Frequency of visit	First time	19	19.0
	Two times	3	3.0
	Three times	30	30.0
	More than three times	48	48.0
	Total	100	100.0

Types of accommodation	Hotel	70	70.0
	Motel, guest house, hostel	12	12.0
	Homestay	11	11.0
	Family house	5	5.0
	Did not stay	2	2.0
	Total	100	100
Accommodation is located in the study area	Yes	44	44
	No	56	56
	Total	100	100.0
Length of stay	A few hours	8	8.0
	One day	35	35.0
	2-3 days	51	51.0
	More than 3 days	6	6.0
	Total	100	100.0
Accommodation expenses	Below RM 150	31	31.0
	RM 151 – RM 300	55	55.0
	RM 301 – RM 500	13	13.0
	RM 501 and above	1	1.0
	Total	100	100.0
Visitors' most engaged activities during the visit*	Food and dining experiences	86	93.6
	Shopping for local crafts	55	59.8
	Interactive exhibition	21	22.8
	Cultural performances	18	19.6
	Guided tours	3	3.3
	Total	183	100.0
Total expenses	Below RM 500	66	66.0
	RM 501 – RM 1000	25	25.0
	RM 1001 – RM 1500	7	7.0
	More Than RM 1501	2	2.0
	Total	100	100.0
The study area is easy to access by public transport	Yes	78	78.0
	No	22	22.0
	Total	100	100.0

Note: The total numbers exceed 100 because respondents were allowed to select more than one item.

Source: The authors, 2024

Most visitors come with family or a spouse (45%), followed by friends (42%) and only a small number come alone (13%). Vacationing is the primary reason for visiting (64%), followed

by food experiences (46%) and recreation (42%), highlighting Ipoh Old Town's appeal as a holiday, foodie and leisure destination. Other motivations include appreciation of architecture (29%) and learning about the heritage (17%). Regarding visit frequency, 78% have visited thrice or more, indicating a strong return rate. This suggests that Ipoh Old Town has a loyal group of visitors, particularly for holidays, foodies, leisure and cultural activities, emphasising the need for continued engagement through smart tourism initiatives to enhance visitor experiences and make them feel connected and safe (Galih, 2024; Baraniewicz-Kotasinska, 2022).

Most visitors prefer staying in hotels (70%), followed by motels, guest houses or hostels (12%), homestays (11%) and opt for family houses (5%). Notably, 56% of visitors stayed outside the study area, suggesting a need to enhance accommodation options to cater to visitors' preferences and increase local economic benefits. The majority of visitors stayed for 2-3 days (51%), followed by one day (35%) and 6% stayed for more than three days, which is appropriate for short-term holiday periods. Regarding accommodation expenses, the majority spent up to RM300 (86%), indicating a preference for affordable stays.

The most engaged activities in the study area are food and dining experiences (96.3%). This supports the Tatler Asia recommendation that Ipoh is a second-ranked underrated Asian foodie city (Tatler, 2025). Another preferred activity among respondents is shopping for local crafts (59.8%), which is a typical or complementary activity for popular tourism destinations. For the total expenses during the stay, 91% of visitors spent up to RM1000, indicating low to moderate expenses but valuable experiences. Concerning its high accessibility—using public transportation, such as train and bus terminals—78% of respondents indicated agreement. Therefore, Ipoh Old Heritage City has significant potential to increase its visitor numbers. Thus, implementing smart city initiatives (smart heritage tourism) could further facilitate this growth by enhancing visitor satisfaction, experiences and engagement.

Visitors' perceptions of the existing smart heritage tourism initiatives

Perception studies provide insight into the effectiveness, satisfaction and operations of the elements in smart heritage initiatives, guiding strategy interventions. Most visitors define or understand smart heritage tourism as the use of smart technologies that enrich the cultural and historical value of heritage tourism experiences, thereby making them more appealing to younger generations. The definitions appeared to be inspired by younger respondents, who dominated the group (see Table 1). The results of visitors' perceptions of the existing smart elements by seven domains, as proposed in the Malaysia Smart City Framework (MSCF) (Ministry of Housing and Local Government, 2019), are Smart Government (SG=1), Smart Economy (SE=1), Smart Mobility (SM=10), Smart Living (SL=3), Smart Digital Infrastructure (SDI=3) and Smart Environment (SEv=3), as shown in Table 3. No existing initiative or element was identified for the domain of Smart People (SP) for this study.

Table 3. Perception of the existing smart heritage tourism elements

Elements	Visitors' perceptions by rating scales						Mean
	1	2	3	4	5	6	
Smart Government (SG)							
Level of maintenance of historic buildings	1	3	6	41	40	9	4.34

Smart Economy (SE)							
E-Payment services	1	3	3	17	48	28	4.45
Smart Mobility (SM)							
E-hailing services	1	-	11	21	48	19	4.72
E-vehicle charging facilities	14	5	19	40	16	6	3.57
Availability of public transport	1	2	18	36	35	8	4.26
Bus stop	2	3	17	42	30	6	4.13
Availability of public parking	-	13	21	27	32	7	3.99
Censored traffic lights	6	1	17	31	33	12	4.20
Road CCTV	7	4	18	35	28	8	3.97
Pedestrian crossing	2	3	19	36	30	10	4.19
Pedestrian lane	1	4	18	36	26	15	4.27
Road signs	1	-	5	37	35	22	4.71
Smart Living (SL)							
Availability of public toilets	4	11	20	33	25	7	3.60
LED streetlight	6	4	14	32	32	12	4.16
Benches	2	11	21	27	26	13	4.03
Smart Digital Infrastructure (SDI)							
Heritage information signage	-	6	20	28	31	15	4.29
Internet coverage	1	-	10	22	41	26	4.80
Road bollard	8	3	18	34	26	11	4.00
Smart Environment (SEv)							
Solid waste management	7	5	13	39	27	9	4.01
City cleanliness services	2	3	10	32	43	10	4.41
Trash bin	2	1	9	39	38	11	4.43

* Notes: 1- No Idea, 2- Very Dissatisfied, 3- Dissatisfied, 4-Moderate, 5-Satisfied, 6- Very Satisfied; Interpretation of the 6-point Likert scale: 1.00 – 1.82= Very low, 1.83 – 2.66= Low, 2.67 – 4.32= Average/Moderate, 4.33 – 5.16= High, 5.17 – 6.00= Very High

Source: The authors, 2024

As shown in Table 3, about 21 existing elements of smart heritage tourism were identified and assessed for visitors' perceptions based on a 6-point Likert scale ranging from very satisfied (6), satisfied (5), moderate (4), dissatisfied (3), very dissatisfied (2) and no idea (1). Overall, the results indicate that visitors are moderately to highly satisfied with these elements, with mean values ranging from 3.57 to 4.80. No particular element received a very highly satisfied rating, thus the mean was below 5.17. The mean values may be influenced by responses from a few visitors who are unaware and very dissatisfied with each element, indicating there is room for intervention, particularly at the initiative development stage. The SG, for instance, was assessed by the level of maintenance of historic buildings, with a 4.34 mean value (or at a highly satisfied), suggesting that despite efforts to preserve historical heritage, there are still shortcomings in the implementation and management of maintenance to provide added value to the communities and visitors.

The e-payment services (the SE element) scored 4.45, due to having responses with ratings of 3 and below. The SM with 10 elements show two different levels: moderate and high. E-vehicle charging facilities (3.57), availability of public parking (3.99) and Road CCTV (3.97) recorded a moderate level of satisfaction. While e-hailing services (4.72), road signs (4.71) and five other

elements received high satisfaction. Moreover, on the SL, the availability of public toilets (3.6), LED street lighting (4.16) and bench facilities (4.03) received a moderate satisfaction. Similar results can be observed from the SDI and SEv elements, which scored a moderate satisfaction level, except for the internet coverage, city cleanliness services and trash bin, which recorded a high satisfaction with a mean value of 4.80, 4.41 and 4.43, respectively.

Indeed, all these perceptions reflect the visitors' expectations or desired outcomes when visiting a tourism destination such as Old Ipoh Heritage Town. As previous researchers have mentioned, visitors are very concerned about travel experiences, connectedness, accessibility, safety and security, cleanliness, smart tourism practices and the promotion of sustainable tourism (Galih, 2024; Indumathi, 2020; Lin, 2022; Gajdosik, 2020). Therefore, the elements should not only be smart or merely available, but should also meet visitors' expectations to be rated higher. E-vehicle charging facilities, for instance, have been rated only 3.57, perhaps due to their limited availability and unsuitable locations or unsatisfactory technology specifications. Thus, this aspect requires a well-planned decision and people-centric engagement. Moreover, although the internet coverage recorded the highest mean score of 4.80, it should be expected to exhibit a higher satisfaction level (above the overall mean of 5.17), given that Old Ipoh Heritage Town, situated at the core of Ipoh city within the commercial and business district serves as a central urban hub. This is due to visitors expecting more, such as faster internet, more service providers, free Wi-Fi, etcetera. It indicates that the demographic profiles of visitors significantly influenced their perceptions and experiences. Addressing these challenges necessitates expert guidance in technology provision, choices and adaptation, data analytics, cost efficiency, strategic smart collaborations, etc. (Shen et al., 2020; Lee et al., 2020). Urban sectors including urban planners and tourism stakeholders must actively confront and resolve these challenges, not in silos, but by empowering people-centred (e.g. tourist, visitor, etc.) initiatives to plan and implement smart tourism effectively.

The visitors were then asked to rate future elements for the Ipoh Old Heritage Town, as suggested in the literature for promoting smart heritage tourism. From the rating, only eight elements were rated very high, as listed in Table 4.

Table 4. Suggested future elements for smart heritage tourism initiatives

Elements	Visitors' perceptions by rating scales						Mean
	1	2	3	4	5	6	
Smart Economy (SE)							
Enforcing e-payment services	1	-	2	10	32	55	5.37
Smart Mobility (SM)							
Public parking with a sensor	2	1	4	14	28	51	5.18
Apps for parking space availability	1	1	1	12	30	55	5.34
Smart Living (SL)							
Smart pedestrian crossing at the attraction area	2	1	3	11	28	55	5.27
Emergency panic button for visitors attraction areas	2	1	3	9	32	53	5.27

CCTV at Ipoh Heritage Trail	2	1	3	16	25	53	5.20
Smart Digital Infrastructure (SDI)							
Free public Wi-Fi in the attraction areas	1	2	1	15	32	49	5.22
Smart Environment (SEv)							
Smart bin	-	2	4	16	29	49	5.19

* Notes: 1- No Idea, 2- Very Unimportant, 3- Unimportant, 4-Moderate, 5-Important, 6- Very Important; Interpretation of the 6-point Likert scale: 1.00 – 1.82= Very low, 1.83 – 2.66= Low, 2.67 – 4.32= Average/Moderate, 4.33 – 5.16= High, 5.17 – 6.00= Very High

Source: The authors, 2024

As depicted in Table 4, the elements that most visitors prefer are linked to aspects of a digital economy lifestyle, including e-payment, ease of parking access (smart parking), safety and security (smart pedestrian, smart panic button, CCTV), connectedness (free Wi-Fi) and cleanliness (smart bin). Other elements, such as tourism mobile apps, AR and VR technology for heritage tourism, only got a moderate level, indicating importance but not urgent for implementation. It is maybe due to some reasons, such as the digital readiness gap, cost and maintenance concerns, self-exposure, etc.

Overall, the study sheds light on the effectiveness of the existing smart heritage tourism elements provided in the Ipoh Old Heritage Town, simultaneously identifying the smart elements most preferred for future initiative direction in these areas. This study also provides a fundamental discussion of the behaviours and interests of visitors, which serve as critical inputs for effective urban tourism planning and development. Understanding visitor interests, activity patterns and expenses enables planners, policymakers and other tourism stakeholders to design targeted strategies that align with actual demands and desires. Moreover, by identifying emerging trends and expectations among visitors, stakeholders in the tourism industry can proactively shape more personalised, sustainable, smart and competitive tourism experiences, particularly with the help of today's technologies.

Conclusions

In summary, this study provides valuable insights into implementing smart heritage tourism elements in Ipoh Old Heritage Town, based on visitors' perceived experiences (perceptions). It evaluates the effectiveness of the current smart heritage tourism features, as well as the role of smart city initiatives by assessing visitor satisfaction levels and identifies the smart elements most preferred for consideration in future initiatives and development planning. Based on 21 assessed elements, the findings reveal that visitors are moderately to highly satisfied, with mean values ranging from 3.57 to 4.80. No particular element was indicated as highly satisfied (a mean above 5.17), indicating that there was room for interventions. This showed that the demographic profiles of the visitors influenced their perceptions and perceived experiences. Therefore, urban sectors including urban planners and tourism stakeholders must understand the visitors' demographic profiles, behaviours, interests and tourism activity patterns and proactively confront and resolve all related challenges to implement smart tourism initiatives effectively. This is to promote its

position as a leading smart heritage destination, benefiting visitors, businesses and the local community while ensuring the long-term sustainability of its historical building assets.

The limitations of this study include the exclusion of foreign visitors from the sample, limited access to existing data on smart heritage tourism elements and a sample size of 100, which may be too small for a perception study. As a result, the study lacks a comprehensive understanding of planning scenarios that accurately reflect the demand for smart heritage tourism initiatives in Ipoh Old Heritage Town. Future research should aim to conduct more thorough investigations into the demand for smart heritage tourism initiatives by integrating visitors' perceptions and the capabilities of tourism stakeholders particularly in terms of financial resources, technological readiness and long-term strategic planning.

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