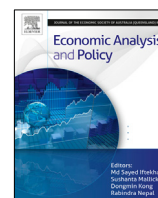https://www.tarjomano.com

Contents lists available at ScienceDirect

Economic Analysis and Policy

journal homepage: www.elsevier.com/locate/eap

Full length article

Role of information technology in the development of e-tourism marketing: A contextual suggestion

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ARTICLE INFO

ABSTRACT

The travel industry is a financial, social, and societal anomaly formed by individuals who travel to foreign nations or regions for personal or business reasons. Tourism and technological advance have been tightly interwoven for over 25 years. Internet and information technologies are crucial on all operational, structural, marketing, and strategic levels to facilitate global communication between suppliers, consumers, and intermediaries. E-tourism establishes commercial links via the Internet to supply tourism-related items/products, such as flights, hotel reservations, and vehicle rentals. This allows businesses to increase their overall efficiency and effectiveness. This article explored the primary elements of information technology that have impacted and continue to impact tourist industry activities. Two issues were chosen for the travel industry examination, including innovation progression and its impact on the traveller market. In addition, this research addresses future e-travel technologies that will impact the traveller's business strategy.

1. Introduction

Extreme levels of greenhouse gases (GHGs) and carbon dioxide (CO_2), both of which are primarily the result of human activities like the burning of fossil fuels and the destruction of forests, have made climate change a pressing issue in the 21st century (Dornan, 2014). Consistent CO_2 emissions are expected to have disastrous effects on global climate, with tragic repercussions for every part of the planet (Williams et al., 2017). For this reason, lowering CO_2 emissions and improving environmental conditions have become global priorities for preserving long-term growth and mitigating climate change's adverse effects. Furthermore, China has envisioned Sustainable Development Goals (SDGs) for 2030, focusing on promoting access to low-cost, renewable energy sources; fostering inclusive, long-term economic growth; and fostering technological innovation to mitigate the effects of climate change (Poudineh et al., 2020). Climate change, which has already manifested itself in several nations, has heightened China's burden. China is the world's eleventh-highest emitter of CO_2 (Tayal and Evers, 2018). China has lately adopted aggressive domestic emission reduction goals compared to 2000, in reducing the carbon emissions by 2050 and generating half of all power from renewable sources by 2060. Examining the factors driving this statistic can provide insight into how China might reduce its CO_2 emissions, which is a major challenge.

China has one of the dirtiest energy systems in the region, and its high power consumption per capita is primarily due to the country's economic expansion being fuelled by energy consumption, which generates a significant increase

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in CO_2 emissions. As of 2015, China has the 15th highest per capita energy consumption rate worldwide. The World Bank estimates that in 2007, China used 180.6 million tonnes of oil equivalents or around 2.4 percent of global energy. It was predicted that China's annual CO_2 emissions from fossil fuel burning would be around 500 million metric tonnes between 2014 and 2017, with annual per capita emissions hovering around 4 tonnes. During these years, China was responsible for an average of 1.4% global emissions. As a result, the public has become increasingly concerned about rising emissions, particularly those related to the energy industry. As fears about energy security, climate change, and ecological sustainability have emerged, the relevance of renewable energy has increased (Ababneh, 2021). Global corporate markets are moving steadily toward greener energy technologies (Youssef et al., 2017) in response to the increasing depletion of fossil fuel supplies and the severe ecological consequences they impose. Renewable energy secures a global financial framework over the long run while reducing the demand for conventional energy sources (Liu et al., 2019). Renewable energy is essential to reach the global emission reduction efficiency goal of 50% by 2060 (Hameed et al., 2020) since it provides carbon-free power and can address energy security challenges. China has many renewable energy resources, and the government has adopted policies to encourage their utilisation. Despite all of this, only a few studies have been conducted in China on the prospect of reducing CO_2 emissions through renewable energy.

All aspects of the tourist business are digitised under the e-tourism system. One of the objectives of e-tourism is to streamline the processes involved in executing transactions and exchanging and disseminating data (Tehreem et al., 2020). Based on the traveller's tastes and the available resources, a tourism recommendation system (TRS) makes recommendations to organise the vacation better. Over the last several years, the concept of an "e-tourism system" has emerged to describe the general use of ICT in the tourism industry (Li et al., 2022). Tourism is one of the most prominent industries that has rapidly adopted e-tourism and offers smart tourism' as part of their new technologies. According to (Rezaei et al., 2020), the primary goals of the "smart tourism" industry are to deliver accurate data, understanding of context, and individualised experiences. This approach enhances the quality of life for tourists and creates a user-friendly environment for individuals dealing with the system. Abdin and Mérida (2019) provide a fair description of intelligent tourism, distinguishing it from e-tourism by highlighting that the former creates digital connectivity between the business and the customer.

In contrast, the latter focuses on bridging the digital and physical worlds using currently existing technologies such as the Internet of Things, cloud computing, and social media. Recent developments in the study of cutting-edge e-tourism systems have centered on two main subfields: tourist marketing and traveller relationship systems (TRS). In e-tourism, numerous studies on TRS and assessment methodologies, along with their pros and limitations, have been published so that readers can become acquainted with them (You and Kim, 2020). Innovative tourism management requires extra research in this area. By offering Internet services to tourist facilities, such as transportation, hotels, and travel attractions, an intelligent tourism data system may achieve data integrity, which is vital to database systems, to improve tourism management and services. Dynamic systems provide adequate access to widespread sensor nodes and tourist platforms, and intelligent tourism data systems are often considered scalable. This technology assists businesses and the tourism industry (Gholami et al., 2016) by settling transactions, offering intelligent tour guides, intelligently promoting tourist sites, and data-managing them. Aiming to provide tourists more time to explore neighbouring attractions, the tourism industry's recommendation system should be well-managed to address the issue of data overload (Nabavi-Pelesaraei et al., 2014). The availability of large volumes of tourist data in digital form has opened up new opportunities for creating value offerings for tourism sector professionals.

The most prevalent research advancements in modern e-tourism frameworks may be divided into traveller showcasing and concept. Several studies in e-tourism have been done in various locations to examine the topic of context-oriented based concepts for the tourism sector. Their benefits and limitations are close to being evaluated. In the field of shrewd vacationers, the board, further examination is required. The integrity of data, which is essential for any data set system, could be achieved in a brilliant traveller data system by providing web forms of assistance to the travel industry offices, such as transportation, lodging, and travel destinations, to improve the travel industry administrations and the executives.

Brilliant traveller data frameworks are adaptable, and dynamic frameworks give fast admittance to many sensor hubs and the travel industry stages. This framework upholds organisations and the travel industry by providing exchange settlement, shrewd aides, savvy showcasing, and insight to the executives of traveller locales. The conceptual framework for the travel industry should find a solution to relieve the problem of information overload by providing travellers with an additional opportunity to consider tangential issues. Many tourism-related resources are now accessible online and can be utilised to interact with local authorities. The remainder of the study is structured as follows: Section 2 discusses the major components of E-Tourism; Section 3 discusses the evolution of innovation; Section 4 discusses mechanical advancement and its impact on the E-Tourism business; and Section 5 concludes the article.

2. Strategic agility and tourism value

2.1. Strategic agility

'The English word "agility" comes from the Latin word "agility", which may be translated as "this agilis". The term originates in the body's physiology, as it describes a set of skills necessary for effective directional changes, including equilibrium, velocity, strength, and coordination. Therefore, it is a term for kinetic skills, such as those required for

Fig. 1. Significant concepts of E-Tourism.

various athletic endeavors. The notion was first developed in the early 1990s by Lehigh University scholars interested in the intersection of business and production (Li et al., 2017). Since then, the idea has been widely discussed in educational and study communities and many social disciplines, including administration and operations. This paper examines strategic agility, defined as "management's capacity to continually perceive and react to a changing environment by making strategic movements and adjusting the appropriate organisational configuration for effective execution". Business continuity and competitiveness are enhanced by a company's strategic agility when it can quickly adjust to and profit from changes in the external environment. Numerous organisations must adjust to changing technologies and market conditions without compromising efficiency. Multiple studies have demonstrated that tactical agility is vital to this process.

In light of this, organisations' adaptability to the needs of their consumers is crucial to their continuous growth, competitiveness, and market viability (Ã and Spreng, 2007). Agile organisations can use the digital age's resources to establish and manage online customer communities to crowdsource ideas, do market research, and receive direct product feedback. Businesses may utilise the resources and skills of third parties more efficiently when they are nimble in developing and maintaining partnerships and alliances (including suppliers, distributors, and subcontractors) (Ghimire and Kim, 2018). Due to the collaborative online platforms and systems made possible by developments in data technology, businesses are better able to utilise the knowledge and skills of their partners. To be operationally agile, a business must coordinate its internal processes and resources rapidly and effectively to take advantage of emerging technological opportunities, such as the creation of brand-new products and services. In their pursuit of supply chain integration, operationally agile businesses are flexible, knowledge-driven, and resourceful. By making corporate operations more flexible and integrated, information technology helps improve operational agility (Nikas et al., 2019). However, the transformation of businesses into agile entities needs substantial and concerted efforts from crucial firm participants. This includes numerous abilities, tactical planning, administration, and vision (Ilangkumaran and Kumanan, 2009). As a result, digitalisation administration is crucial for adaptable businesses in today's society, as technological improvements may introduce new opportunities and threats (see Fig. 1).

2.2. Tourism value creation and value delivery

The tourism industry, which relies significantly on people having great experiences, strives to present visitors with unforgettable moments (Zheng et al., 2019). Value creation may be viewed as a result, including use and exchange value; therefore, it is generated correctly only if consumers perceive advantages in services to their needs. The notions of value creation and experience are now important to the tourism sector. Academic and industrial personnel in the tourism business should be aware of these preferences to maximise travellers' satisfaction. In addition, consumers' decisions regarding whether or not to remain with a given provider are influenced by the anticipated benefits they will receive from that company.

The source of value in the tourist sector is the customised, one-of-a-kind experiences each visitor has (Ojo et al., 2020). Customers are viewed as active co-creators of value which help businesses develop new services. Managers, employees, and consumers are vital to generating value. These three are interdependent. Consequently, the value chain may consist of multiple stages that each centre on one of them. Managers at the value proposition stage, workers at the value delivery stage, and customers at the value exchange stage can all play a role (Gunnar et al., 2016). Customers' expectations affect and shape the design process of firms' value propositions (Suharti and Sugiarto, 2020), illustrating how all stakeholders are engaged in co-creating value. The tourism value chain is comprised of numerous stakeholders and their separate processes.

Engle and Granger (1987) note that it can be difficult for tourism enterprises to properly manage the interrelationships between value proposition and value delivering, as well as value offering and perceived use value at the time of value exchange. In a service environment, there is also the challenge of simultaneous offering/delivery and consumption, reducing space for mistakes (Muisyo et al., 2021). In addition, several risks and barriers may impede the value growth process for tourism businesses. For instance, the current pandemic drove the firm to its knees due to concerns over the spread of COVID-19. Communication and travel constraints decreased the service quality (Yang and Shi, 2017). To ensure the health and safety of its customers and staff, airlines, hotels, and restaurants have implemented stricter and stricter hygiene and safety measures. In order to convince their anxious customers that they had taken all essential safeguards, companies in the service sector employed efficient marketing methods. Additionally, they severely decreased their rates and levies to promote bookings (Malik, 1996). To keep their businesses running as normally as possible, those in the hotel sector swiftly moved their attention to residential tourism and local tourists.

2.3. Strategic agility in tourism, digitalisation, and customer value

Multiple studies have shown that strategic agility improves tourist businesses' chances of survival and success in the marketplace. According to (Druker et al., 1996), the tourist business needs strategic agility to deal with many external factors, including ecological shocks and fluctuating consumer preferences. Adaptability is essential in the tourism business at times of crisis, like the recent Covid-19 outbreak and earlier global economic downturns. Despite these enormous consequences, the tourism industry is under constant pressure to adapt quickly to changing client needs and preferences. These changes often include higher requirements, such as the need for cutting-edge tools (Santosa and Devi, 2021). Because of this, it is necessary to handle these consequences and changes in a timely and effective manner for tourism and hospitality management, tourism stakeholders, and destinations as a whole. The sustainability of tourist businesses and, more crucially, the preservation of value creation for visitors rely on the sector's speedy response to these risks, repercussions, and issues (Wright and Boswell, 2002).

Tourism activities often occur in a digital economy, where businesses must adapt quickly to new circumstances while contending with intense competition. According to a study, the capacity to adapt and deploy new creative technologies in the face of fluctuating market situations and external shocks is vital to the tourism industry because it is responsible for preserving and increasing the sector's value. As a result of changes in the industry, several companies in the tourist sector have embraced new technology. Tourism-related businesses are rapidly turning to digital and other types of technology to streamline their processes, engage with their target audiences more effectively, acquire a competitive edge, and boost their revenues (Tang et al., 2018). Since the generation of value in tourism is closely tied to experiences, such innovations are often used to enhance the quality of such encounters. Digital marketing is being used to promote and launch tourism products, cities are developing visitor-friendly mobile apps (Liu et al., 2017), museums are incorporating virtual and augmented reality exhibits, and hotels are using AI, robots, and service automation to improve guest experiences. Adopting new technology has been crucial in enabling tourism businesses to withstand the impacts of the current Covid-19 outbreak and continue to provide value to travellers (Hoff et al., 2021).

Tourists in a location with high social segregation are urged to download an app that warns them when the beaches are crowded. Virtual tours have been created to give tourists a taste of what it would be like to visit museums, national parks, and other locations without leaving their homes. Thus, they protected their business, reputation, and customer communication (Wang and Yang, 2020). Intriguingly, the business shifted its focus to robots during the epidemic, using them to serve meals to visitors and sanitise the air and surfaces in guest rooms. As a result, the tourism and hospitality business kept producing, providing, and delivering value to customers.

Tourism sector research has underlined the importance of innovation and digitalisation to the strategic agility of a tourism organisation. They note that IT enables hotels to be more adaptable to changing conditions by better comprehending their visitors' preferences and needs and customising their offers accordingly. Research shows that innovation orientations improve tourism's tactical flexibility. Emphasises the significance of technology orientation in developing tactical flexibility of tourist supply chain entities. To guarantee their continued success and competitiveness in the tourist sector, academics like (Carraro et al., 2012) have advised all participants in the supply chain to embrace technological developments. Federal, global, and regional organisations are urging tourism businesses to adopt "digital innovation", which they define as creating and distributing new goods and services. The European Commission, for instance, has launched a variety of steps to help the tourist industry and tiny and medium-sized enterprises (SMEs) adopt digital strategies.

Despite these advances, the connection between digitisation and consumer results in the tourist industry has yet to be thoroughly explored. Some research has shown that innovations may improve strategic agility in the context of tourist

value offerings (Jin and Han, 2018). Still, little is known about how agility affects the uptake of digital technology for making and selling tourist attractions. Given the rapid pace at which technological advancements are altering the nature of the corporate world (Banga, 2019), we must learn how tourism organisations can develop the skill necessary to take advantage of emerging digital innovations to maintain or improve the value they provide to their customers.

3. Impact of information technology on the E-tourism market

Data advancements put a definitive customer in the course of creation. Every guest is particular with their arrangement of encounters, intentions, and solicitations (Camioto et al., 2016). Modern clients are becoming unable to wait for interest data; therefore, the key to success in the travel industry is promptly identifying clients' needs and welcoming potential clients with as diversified, customised, and up-to-date arrangements as possible under the conditions. Data innovation influences the seriousness of an organisation; thus, two key elements of seriousness were altered: cost fluctuation and benefit.

Furthermore, it is now vital for tour operators to include information technology in their attempts to enhance the quality of service because information technology permits businesses to differentiate themselves and specialise dynamically across (Qiu et al., 2020) a range of services and products. As a result, undertakings in the tourism industry did not need to rely on the distribution power of intermediaries. The Internet then compelled tourism businesses to modify their dynamic strategy.

The flexibility of the Internet enables tourism-related enterprises to tailor their message to each market segment, with clients considered dynamic, mobile targets to which marketing professionals direct marketing materials. Before the advent of the Internet, directors in the tourism industry had no choice but to rely on the capabilities of intermediary agencies and tour operators. The perusers rely on the accuracy and timeliness of the intermediaries' information delivery.

The Internet enables businesses to sell their products directly through various channels (Bekaerta and Harvey, 1997). The tertiary intermediaries, such as online travel agencies, search engines, and profile web directors, are effective at spreading static and dynamic information, such as pricing and availability. Online intermediaries are exerting growing pressure on conventional distribution. Expedia and Lastminute.com, for instance, urge Thomson and Thomas Cook to reassess their business arrangements.

The public internet-based dab deals venues, for example, eBuy.com, those for cost examination, and those for wandering review value movement pose a significant danger to the busybodies' potential profit source (Cary, 2020). A well-educated customer is more capable of managing neighbourhood assets adequately. Potential customers are becoming increasingly independent and savvy using various tools to plan their visits. This has contributed to their ability to locate labour and products that address these issues. Among these are reservations and online tourism associations (such as Expedia), programmes, objective administration frameworks, social networks and web search entryway 2.0, and sites that allow customers to compare prices (such as Kelkoo).

Customers place more trust in the organisation than in advertising and marketing material; hence, virtual communities are gaining popularity in the tourism industry. A virtual local area is a group of people or coworkers who share a common interest. The contact is supported or potentially intervened by innovation and administered by specific shows or principles (Lakshmi and Visalakshmi, 2016). Virtual people groups have been perceived and rehearsed for some time as an Internet-based mingling field where social aggregations emerge from the Net when sufficient numbers of people participate in an open discussion for an extended period of time and with sufficient human emotion to form networks of individual associations in the Internet.

In the tourism sector, a virtual local area facilitates the acquisition of information, forming relationships, and selecting a holiday destination. In recent years, the unprecedented rise of web-based media platforms such as Facebook, YouTube, and Twitter has been increasingly felt in the travel and tourism business. As per a Google survey from 2011, practically 40% of explorers expressed that informal organisation remarks impacted their excursion arranging, while half dependent their movement game plans on others' appraisals and encounters (Lewandowski et al., 2003). Bloggers gain confidence by interacting with their readers/followers via web-based media and presenting ideas based on their experiences and perspectives.

TripAdvisor (www.tripadvisor.com) is perhaps the most famous social medium destination in the dynamic business, allowing clients to rate inns worldwide and associate them through discussions. The travel industry firms might better comprehend their customers' prerequisites and conduct by breaking down virtual networks, which offers them the chance to upgrade their contributions (Freire-González and Ho, 2019). They may also contribute to the brand's reputation by using online communities. It is possible to promote specific engaging items on each level by determining how various types of clients respond to various products and services. Lastminute.com, for instance, collects data to modify the weekly newsletters sent to customers by identifying the sections they visit, allowing for a complete personalisation shortly thereafter.

The Internet is one of the developments that has considerably impacted tourist behaviour. According to surveys, travellers who obtain information about travel locations via the Internet spend much more than those who rely on other information sources. It was found that the vacationer business has the greatest assortment of advanced trade applications (Luthra et al., 2015). However, given that the primary function of these programmes is to facilitate online payment, clients are wary of the integrity of this exchange class.

Table 1

Variables' specification.

Variable	Definition	Data sources
T	No. of tourist arrivals	WDI
R	Renewable energy as a percentage of total energy consumption	WDI
C	ICT goods exports as % of total exports	WDI
G	GDP constant at 2010 US$	WDI
N	Total natural resources rent as % of GDP	WDI
A	Ageing of population % of total	WDI
I	Industrial value-added as % of GDP	WDI

Table 2

Definition of variables and descriptive statistics.

Variable	Definition	Mean	Max.	Min.	St. deviation
T	No. of tourist arrivals	21.432	21.543	21.710	1.123
R	Renewable energy as a percentage of total energy consumption	2.8815	3.947	1.172	0.949
C	ICT goods exports as % of total exports	0.590	2.390	−1.690	1.432
G	GDP constant at 2010 US$	31.019	31.790	31.290	0.910
N	Total natural resources rent as % of GDP	1.690	2.080	0.290	0.71
A	Ageing of population % of total	21.710	21.590	15.490	1.132
I	Industrial value-added as % of GDP	2.410	2.789	3.543	0.190

These doubts are the consequence of online infractions, which is the significant motivation behind why a few clients are hesitant to share data about their financial instruments. We might incorporate data fraud, spam, and sham as the most well-known web offences (Rubel et al., 2021). As a result, businesses should pay more attention to defending their own interests and those of their customers to prevent the harm caused by these illegal activities.

3.1. Theoretical framework

This research uses the theoretical framework that investigates the hypothesis inside a Cobb–Douglas manufacturing function (Falcone, 2020). To demonstrate the aggregate output function, we may use the following essential Cobb–Douglas manufacturing function under the assumption of a constant rate of returns.

$$Y_t = f\left(K_t, L_t\right) \tag{1}$$

GDP capital and productive labour are measured in Kt, Lt, and t, respectively.

Financial development and using fossil fuels to generate electricity are linked to increased carbon emissions. The following function is produced at time t under the assumption of market clearing, where CO_2 emissions equal financial development and fossil fuel energy demand.

$$T_t = f(R_t; C_t; G_t; N_t; A_t; I_t) \tag{2}$$

Gt represents GDP at time t, Nt represents Total natural resources rent at time t, A represents Ageing of population % of the total at time t, and It Industrial value added at time t (see Table 1).

4. Results and discussion

Renewable energy investigated outcomes demonstrate its potential to mitigate China's ecological harm over time. This explains why the rapid growth of China urban population owing to people moving from rural to urban regions threatens the country's environment (Li et al., 2023). The results show that the increased use of fossil fuel energy is attributable to China's renewable energy, which increased CO2 emissions. CO2 emissions have a significant impact, but this is expected given that their origins can be traced back to only three sectors: electricity usage, housing, industrial development, and transportation. Supporting the current study's findings are studied (Sarangi, 2019). Increased R causes an increase in energy consumption, which in turn causes greenhouse gas emissions and ecological degradation in metropolitan areas. As the metro area is already one of the most electricity-intensive parts of the country, the rising demand for electronic devices has resulted in CO2 emissions. In addition, the positive effects of R on financial growth might increase CO2 emissions (Lee, 2020). Therefore, a sustainable urban development policy must be implemented in China before renewable energy becomes unsustainable as presented in Table 2.

This study discovered a strong correlation between tourism and carbon dioxide emission in China, indicating that increased tourist traffic may worsen air quality by hastening environmental deterioration. According to the findings, an increase in international tourists to China has a negative impact on global warming by increasing the country's energy consumption. Arif et al. (2021) confirmed the current study's findings corroborate the positive relationship between tourism and CO2 emission. However, the tourism industry contributes significantly to the deterioration of the ecosystem.,

Table 3
Crossectional dependence and Slope homogeneity test.

Variables	Pesaran (2004) CD-test	P-values	Pesaran (2015) Weak CD-test	P-values
T	10.510	0.000	12.966	0.000
R	3.290	0.021	14.121	0.000
C	−1.653	0.071	12.21	0.000
G	14.169	0.000	14.134	0.000
N	6.432	0.000	13.881	0.000
A	8.059	0.000	15.256	0.000
I	4.048	0.000	14.410	0.000
Slope Homogeneity test	*Delta*		*Adj delta*	
T-model	3.610	0.000	4.790	0.000
R-model	4.321	0.000	6.190	0.000

Table 4
Pesaran CIPS and CADF results.

Variables	CIPS		CALF			
	Level	First diff	Level	P-values	First diff	P-values
T	−1.863	2.793	−1.953	0.314	−3.292	0.000
R	−1.821	−3.229	−1.637	0.580	−3.229	0.001
C	−2.696	−4.133	−2.428	0.065	−2.614	0.028
G	−0.786	−2.759	−0.973	0.950	−2.759	0.013
N	−2.005	−3.842	−2.081	0.223	−2.864	0.007
A	−1.859	−2.435	−1.679	0.114	−2.756	0.013
I	−3.370	−3.762	−3.232	0.001	−2.907	0.005

Table 5
Cointegration results for T-model.

Westerlund cointegration		P-values
Some panels are cointegrated (Variance ratio)	−1.756	0.040
All panels are cointegrated (Variance ratio)	−1.770	0.038
Pedroni cointegration		
Modified PPt	1.514	0.065
Phillip Perron t	−1.967	0.025
ADF t	−2.035	0.021
Kao cointegration		
Modified Dickey fuller t	−2.023	0.022
DF t	−5.652	0.000
ADF t	−6.808	0.000
Unadjusted modified DF t	−10.609	0.000
Unadjusted DF t	−9.277	0.000

with increased CO_2 emissions, expected not just from the transportation sector but also the production of energy and heat as presented in Table 3.

Resorts that need to be better maintained have a higher CO_2 emission rate per visitor, as pointed out (Finance, 2013). In addition, tourism affects the biophysical and social environments. For example, physical sound and automotive road traffic are both significant contributors to the problem of excessive noise, to which tourism also heavily contributes T,R,C,G. The rise in emissions is also attributed to air travel, vacationing at resorts, and the use of motorised watercraft (Zeng et al., 2022). Therefore, sustainable tourism should be created to reduce the negative impacts of tourism on society, the ecosystem, the climate, and the economy. Alternatively, tourism is essential to China's economic growth and should be suitably promoted and increased is presented in Table 4.

While there are rising concerns that tourism is putting too much pressure on China's already vulnerable ecology, the country's continued participation in the industry's long-term growth is crucial. Paradigm shifts toward sustainable tourist growth and adopting polluter pay principles are required to decrease the negative consequences of using non-renewable energy (Gianfrate and Peri, 2019).

One of the most appealing aspects of participating in a peer cluster initiative, from the perspective of company owners, is the possibility of learning from and contributing to the successes of other firms. Cooper claims that "individuals view tacit information as the source of their competitive benefit" which explains their unwillingness to share or convey it is presented in Table 5.

However, the tendency to share information openly seen in these initiatives runs counter to this. The development of DM expertise in peer-facilitated cluster meetings and, in certain cases, on the projects" blogs and social media is one method tacit knowledge is made explicit, communicated, and transmitted (Cojoianu et al., 2020). As a result, businesseswere less concerned with learning the technical aspects of the technology than learning how to apply the innovation to their own company needs. As a result of working on these projects, business owners could stop seeing

Table 6
Results of T-model.

Dependent variable: LnT						
Variables	AMG estimates			D&K estimates		
	Coefficients	t-values	p-values	Coefficients	t-values	p-values
LnC	0.0897	1.79	0.073	0.455	6.040	0.000
LnG	1.4171	2.56	0.010	0.254	2.280	0.036
LnN	0.0033	0.04	0.968	0.082	0.410	0.685
LnA	−3.6533	−2.54	0.011	−2.000	−12.120	0.000
LnI	0.5122	8.536	0.000	1.995	12.250	0.000
Cons.	−16.4774	−1.01	0.312	12.572	3.155	0.001
Root mean square error (Sigma)	0.0502					

Table 7
Results of R-model.

Dependent variable: LnR						
Variables	AMG estimates			D&K estimates		
	Coefficients	t-values	p-values	Coefficients	t-values	p-values
LnC	−0.0376	−1.66	0.075	−0.082	−3.43	0.003
LnG	0.8833	4.07	0.000	0.655	7.300	0.000
LnN	−0.0953	−1.99	0.046	−0.200	−1.160	0.260
LnA	0.6793	4.27	0.000	2.318	9.980	0.000
LnI	0.3946	2.23	0.026	1.138	3.050	0.007
Cons.	25.0715	4.38	0.000			
Root mean square error (Sigma)	0.0249					

Table 8
Panel causality results.

Variable(s)	T	R	N	G	A	C	I
T	–	1.081	4.195[b]	3.131	4.188[a]	3.901[a]	3.530[c]
R	1.541	–	1.801	6.210[a]	1.329	3.299	1.219
N	0.881	5.861[a]	–	4.665[a]	3.614[c]	0.700	1.290
G	5.731[a]	1.141	0.904	–	7.217[a]	4.914[a]	3.012
A	2.671[a]	0.559	0.177	4.610[a]	–	1.461	3.241
C	3.819[a]	2.410[a]	3.131	3.221	0.912	–	1.970
I	0.649	4.388[a]	5.410[a]	6.293[a]	3.003	1.230	–

innovation as an end and start seeing it as a means to better DM. This helped them respond to the criticisms of the deterministic framework for T implementation raised by authors, who argue that this causes T to become insular and irrelevant to everyday business operations, is presented in Table 6.

This aids startups in avoiding the risks of making hasty decisions to stay ahead of the technological curve when there is no compelling commercial rationale. Given their limited means, it is not unexpected that small enterprises, according to them, only adopt innovations after ensuring that the associated expenditures or modifications are doable. The entrepreneurs were able to evaluate the project's viability to some degree, thanks to the sharing of DM solutions.

In addition to a focus on tacit information, which (He et al., 2019) define as the "practical information required to complete a job", the businesses surveyed showed an interest in pursuing more strategic goals, such as marketing partnerships amongst sectors within the tourist industry (Geddes et al., 2020) remark that people in business need to understand the relevance to their company for information transference to take place is supported by the reasons why they participate in the initiatives; in this respect, peer networks have been proven to be more beneficial than conventional training (Taghizadeh-Hesary et al., 2021) is presented in Table 7.

Table 7 shows the Model for integrating Mode 1 and Mode 2 learning and teamwork. The researchers aim to propose a paradigm that tourist support agencies may adopt to reap the advantages of merging Mode 1 and Mode 2 information with business knowledge. The necessity for further state assistance for small enterprises to connect with DM is highlighted in tourism and other industries.

Our methodology also yielded intriguing insights about the variability of the tourism-poverty nexus, which helped to explain why different empirical investigations produced inconsistent results. Measuring tourism and poverty, study context, estimating parameters, and publishing venues are all potential causes for this variation. In our multi-level analysis, we found that the T factor for poverty had a lesser impact size than other poverty-based indicators. While the poverty headcount ratio looks only at the poor, the R coefficient considers all income levels are presented in Table 8.

As a result, the larger sample population used to calculate the matching T coefficient is most likely to blame for the observed disparity. Just as how anything is measured is essential, how tourism is estimated is also necessary. Non-standardised metrics are linked to lesser impact sizes than standardised ones (Ngo et al., 2021). By reducing the impact

of data and model variability, standardised values can improve the precision with which effect sizes are evaluated. When we compare the various forms of tourism, we find that foreign travel has a more significant overall impact than domestic travel. Money from international tourism has a more significant multiplier effect on a country's economy than income from domestic tourism, which stays inside the country without being exchanged for another currency. The results also show that developed nations, with their more fair allocation systems that benefit those of lower incomes, help more from tourism's ability to alleviate poverty. The impact size of tourism improves when models use causality assumptions or instrumental factors to control for endogeneity. Therefore, deviating estimates may be effectively addressed by applying endogeneity treatments, such as those involving omitted factors, assessment error (Tuhkanen and Vulturius, 2020) or simultaneity. Finally, we found that tourism's long-term influence on poverty reduction is more significant than its short-term consequences. Hysteretic elements, such as multiplier effects and trickle-down impacts, mean that tourism's long-term potential to reduce poverty will be realised only gradually.

The findings of this study only supported some of the originally proposed hypotheses. According to the calculated values, the variable mid-year does not affect the tourism-poverty link over time. Research looking at more recent times has shown effect sizes commensurate with those of prior studies (Wang et al., 2021). There may be no fundamental shift in the redistribution of wealth generated by tourism because, even when technical progress throughout time increases demand for tourists and revolutionises the supply of tourism, it still needs to affect the redistribution of wealth created by tourism fundamentally. We also found that the impact size of the tourism-poverty nexus was similar when we used fixed-effects estimates. This is because much empirical research incorporates control variables, which may help mitigate the omitted variable biases that fixed effects estimates can correct.

Stakeholders are more likely to support and cooperate with government anti-epidemic actions when working toward a common objective (Cui et al., 2020). The stakeholders were frightened by the severe COVID-19 outbreaks in surrounding cities, which bolstered their resolve to protect Macao. Macao could only keep Mainland Chinese visitors and open up new prospects if it maintained its cleanliness and safety. During the COVID-19 tourist crisis, various ground rules arose to fulfilment of agreed aims. For instance, the Central Government was tasked with deciding and controlling regulations regarding severe travel restrictions. As a result, numerous groups went about getting their messages to Beijing in their unique ways. The temporary suspension of schools and work and the temporary closure of casinos and public facilities further showed the administration's resolve to stop the spread of the epidemic. Respondents emphasised the need for the sector to be ready to endure temporary hardships should the pandemic scenario develop.

Then, officials and businesspeople discussed potential strategic routes, such as expanding the local market, forging partnerships with the Greater Bay Area (GBA), and using digital tools. The administration spearheaded the initiative to invest in digital platforms, promote and subsidise new growth, and connect global business alliances with domestic businesses. The sector welcomed the steps, which aimed to maintain operations and prepare the ground for growth.

5. Conclusions and policy implications

For more than 25 years, tourism has been inextricably linked to technological advancements. Internet and information technologies are crucial on all operational, structural, marketing, and strategic levels to facilitate global communication between suppliers, consumers, and intermediaries.E-tourism establishes commercial links via the Internet to supply tourism-related items/products, such as flights, hotel reservations and vehicle rentals, allowing businesses to increase their overall efficiency and effectiveness. The T- model estimator was used to showing the effects of environmental factors over time. The data suggest that an increase of 1% in China's GDP, fossil fuel use, renewable energy, or tourism might lead to proliferation of 0.45%, 1.7%, 0.10%, and 0.04% in the country's CO_2 emissions, accordingly. Further, increases of 1 percentage point in using renewable energy sources and agricultural production might decrease 0.6% points and 0.2% in CO_2 emissions, respectively. The results provide fresh light on the potential for China to employ renewable energy and increase agricultural output to achieve ecological sustainability. Strategy suggestions were given in this article for achieving sustainable growth in China via implementing robust regulatory mechanisms to reduce environmental harm.

The current study's findings on pollution caused by increased tourism highlight the need for a new strategy that prioritises ecotourism and long-term sustainability. Legislation that is both appropriate and effective may promote energy conservation and ecological preservation while also lending a hand to the tourist industry, which would help the economy grow. To encourage the provision of transportation services that minimise their impact on the environment, governments have begun offering incentives such as free or discounted use of "green" public transportation, tax exemptions, and other reductions in price to taxpayers who provide such services. To further set an example, the government may implement energy-efficient measures in structures and facilities in the most visited tourist spots, allowing visitors to significantly reduce their energy consumption and expenditures. Energy efficiency preserves taxpayer money and creates openings over time and gaps reduces air pollution and greenhouse gas emissions. It may be possible for hotels and eating establishments to utilise the amount of energy that they need, and this power might originate from renewable sources. The China government may establish guidelines that hold locals, tourists, and other actors accountable for their impact on the environment in China's tourism hotspots. If all parties involved in tourism could be encouraged to adopt more environmentally friendly policies and procedures, travellers would benefit from a more fulfilling experience and be better informed. Travellers from all walks of life might be taught how to preserve years of progress toward more efficient power use. In addition to informational pamphlets and leaflets, the public could be made aware of the importance of energy

conservation, environmental protection, and the incorporation of green practices into everyday life through Education campaigns that include comprehensible infographics and updates on the administration's initiatives and progress toward sustainability. Moreover, it is essential to promote technological breakthroughs in transportation, such as using energy-efficient aircraft, high-speed trains, and battery-powered autos. The increased revenue from the entertainment industry may be reinvested in municipal construction, energy conservation, and waste administration to reduce carbon dioxide emissions. The government may mandate and regulate ecological fees to keep popular tourist spots clean and safe for visitors.

Furthermore, the regime may make it easier for businesses to employ green and low-carbon methods and alternative energy sources in areas such as road transportation, logistical support, hotels, and other tourism-related operations. As a bonus, this would reduce carbon dioxide emissions and stop the excessive use of natural resources. The use of energy-efficient lighting, environment air conditioning, decreased water use, and cost-effective boilers are just some of the possibilities available to you if you are willing to fork over the dough for tracking and regulating technology. To address the issue of tourism's detrimental effects on the environment in other developing nations, China may improve the current environmental indicators it has in place. Sustainable, efficient tourism is something that the administrations of China countries should work together to promote. This includes environmentalism, research travel, leisure activities, adventure tourism, and cultural tourism.

Researchers concluded that better ecological circumstances might be achieved via increased agricultural output and suggested this approach to Mexican officials. New agro-based technologies, such as high-yielding and disease-resistant crops and land use planning, as well as persuading farmers to eschew traditional farming methods in favour of more progressive agrarian strategies, are essential to increasing agricultural production. Development and value addition in agriculture may be boosted with modern agricultural knowledge, improved seedlings, and new agricultural commodities. By adopting organic and low-carbon agricultural practices, sustainable agriculture may reduce emissions while improving carbon sequestration. Long-term agricultural productivity may be attained if governments encourage more cost-effective energy facilities and facilitate the shift to cleaner, more efficient power generation in agriculture. Because it increases agricultural productivity and helps fight climate change and global warming, the government may encourage using renewable energy, mainly reasonably clean renewable like solar and wind. Greenhouse gas reduction and cost savings for the business might result from promoting the use of renewable energy in farming. To attain a zero-emission future, non-renewable energy in irrigation systems could be substituted with renewable energy sources. Inspiring farmers to use photovoltaic tube wells for irrigated agriculture, organic agriculture, tunnel cultivation, shifting from conservation tillage to no-till, and reducing fertiliser consumption are other key agricultural innovations that help diminish the negative impact on the environment. These cutting-edge practices might help farmers save costs, boost productivity, and lessen their environmental impact. Preventing the overuse of fertilisers and insecticides and opting for "green farming" is a top priority for sustainable agriculture and lowering emissions. Changing to a more organic farming method might have a profound and far-reaching impact on the natural world. To reduce emissions from China's agricultural sector and boost agricultural production, increasing international collaboration must be used to promote agrarian funding in China.

Funding acknowledgement

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.eap.2023.03.010.

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