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Evaluating ICT advancement in Algerian travel agencies: Construction of a formative scale based on customer perceptions

تقييم مستوى تقدم تكنولوجيا المعلومات والاتصال في وكالات السفر الجزائرية: بناء مقياس تكويني اعتمادًا على تصورات العملاء

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Abstract :

This study aims to develop and validate a formative scale for measuring the degree of ICT advancement in Algerian travel agencies from the customer perspective. Building on an extensive review of literature on technology adoption and digital transformation in tourism services, a multidimensional formative measurement instrument is constructed. Data were collected from 184 customers of Algerian travel agencies and analyzed using partial least squares structural equation modeling (PLS-SEM). The findings support the reliability and validity of the proposed formative scale and identify the key technological solutions customers associate with advanced travel agencies.

Key words: Information and Communication Technologies (ICT), Travel Agencies, Formative Scale Development, Customer Perceptions, Tourism.

JEL classificationcodes:L83, M31, C38.

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1. Introduction.

The tourism industry has long been closely associated with the development and adoption of information and communication technologies (ICT)(Kuzman, Petkovic, & Milovancevic, 2024). Over the past decades, tourism organizations have progressively integrated ICT into their competitive strategies, creating a strong interdependence between technological innovation and service performance. This reliance has intensified with the digital transformation of tourism services and the growing role of technology in shaping the customer journey(Ukpabi & Karjaluoto, 2016).

In the context of travel agencies, ICT plays a very important role throughout the service process. Customers use digital technologies when searching for travel information through websites and social media platforms, comparing offers online, booking services via digital interfaces, and interacting with agencies through mobile applications and instant communication tools(Berry, Shukla, Singh, & Satpute, 2025). After the travel experience, customers continue to engage digitally by sharing reviews, ratings, and feedback on online platforms. These practices illustrate the broader shift toward digitalized and smart tourism ecosystems, where value creation increasingly depends on technological integration(Ukpabi & Karjaluoto, 2016).

In emerging markets such as Algeria, ICT adoption represents a key lever for travel agencies competitiveness, service differentiation, and customer satisfaction. Advanced digital solutions,such as online booking systems, CRM platforms, secure payment gateways, virtual assistance tools, and social media integration, can enhance service efficiency, transparency, and responsiveness(Gonzalez, Gasco, & Llopis, 2020). However, despite the strategic importance of ICT in travel agencies, limited research has focused on developing robust measurement instruments to assess the degree of technological advancement from the customer perspective.

Most existing studies emphasize technology adoption from the organizational viewpoint, while fewer attempts have been made to conceptualize and operationalize ICT advancement as perceived by customers. Yet, customer perceptions of technological sophistication may significantly influence key behavioral outcomes such as perceived value, trust, satisfaction, and loyalty.

Accordingly, the present study pursues two main objectives.

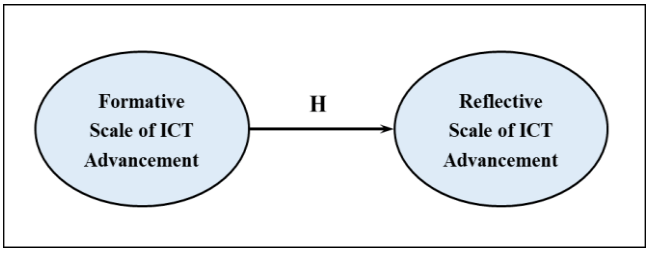
- First, it reviews the literature on ICT in tourism services, with particular emphasis on customer-centered approaches.
- Second, it proposes and validates a formative scale designed to measure the degree of ICT advancement in Algerian travel agencies based on customer perceptions.

Thus, the central research problem of this study can be formulated as follows:

- How can the degree of ICT advancement in Algerian travel agencies be conceptually defined and empirically measured from the customer perspective?

To respond to this problem, the study conceptualizes ICT advancement as a multidimensional formative construct composed of several complementary technological components, including digital information systems, online transaction capabilities, communication tools, and customer data management solutions.Based on this, the following conceptual model is proposed:

Fig 1. Conceptual model of the technological advancement scale with formative and reflective indicators.



Source: Adapted by the author from previous studies

In line with this conceptualization, the study proposes thefollowing main research hypothesis:

- **H: The technological advancement of travel agencies (FSA) positively influences the reflective criterion construct (RSA);**

By developing and validating a context-specific formative scale for measuring ICT advancement from the customer perspective, this study contributes to the literature on tourism marketing and digital transformation. It provides a psychometrically sound instrument that enables both researchers and practitioners to evaluate the technological development of travel agencies in alignment with customer perceptions and competitive demands.

Previous studies:

- **The study by (Ruiz-Molina, Servera-Francés, Arteaga-Moreno, & Gil-Saura, 2018)**examined the role of ICTs in tourism companies and developed a formative scale to measure

the degree of technological advancement in hotels from the perspective of Spanish hotel guests. Following a literature review, the authors validated the scale using a multiple-indicator, multiple-cause model estimated through partial least squares (PLS) regression with data from 197 guests.The results confirmed the validity of the formative scale, identifying ICT solutions that guests associate with highly technologically advanced hotels. This scale can support future research exploring how customer perceptions of hotel technology influence key consumer behavior outcomes, such as perceived value and satisfaction.

- **The study of (Wagaw & Mulugeta, 2018),**investigated the integration of ICT in the Ethiopian tourism sector to enhance the promotion of tourist attractions and strengthen its contribution to economic development. Based on the Unified Theory of Acceptance and Use of Technology developed by Viswanath Venkatesh et al. (2003), the research proposed a conceptual model incorporating core UTAUT constructs along with two additional variables from the literature.

  Using quantitative methods and data collected from tourism organizations, the study identified key determinants influencing ICT adoption. The findings highlighted the role of technological integration in improving destination promotion and organizational performance, providing practical implications for policymakers and tourism managers.

2. Literature review on ICT in tourism services

2.1. The evolution and types of ICT in tourism services

a. The evolution of ICT in the tourism industry

Information and Communication Technologies (ICT) refer to the suite of digital tools, systems, and applications that enable the creation, storage, processing, and exchange of information electronically. ICT encompasses hardware (computers, mobile devices, servers), software (applications, databases, booking platforms), and communication networks (internet, wireless technologies, cloud services). In the context of tourism, defined by the World Tourism Organization (OWT, 2012)as a social, cultural, and economic phenomenon encompassing the movement of

individuals to destinations outside their usual environment for leisure, personal, or business purposes, ICT constitute a fundamental enabler of sectoral development. It supports the efficient management, distribution, and consumption of travel-related information and services, thereby optimizing operational processes, enhancing market connectivity, and improving the overall quality of the tourist experience(Basque, 2005).

Thus, the integration of ICT in tourism has evolved considerably over the past few decades. Initially, ICT in tourism was limited to basic reservation systems and digital communication via emails or websites(Kuzman, Petkovic, & Milovancevic, 2024). With the rise of the internet in the 1990s, online travel agencies (OTAs) emerged, enabling travellers to search, compare, and book services independently. Subsequently, mobile technologies and smartphone applications have transformed tourism, providing real-time information, location-based services, and personalized recommendations(Januszewska, Jaremen, & Nawrocka, 2015).

Recent innovations include virtual reality (VR) and augmented reality (AR) for destination previews, big data analytics for market segmentation, and artificial intelligence (AI) chatbots for customer support. This evolution demonstrates a shift from ICT as a back-office operational tool to a strategic enabler of customer experience and engagement (Buhalis & Law, 2008).

b. Types of ICT in tourism services

According to Almunawar et al. (2013),ICTassume both strategic and operational functions within travel agencies and tourism service provision. At the strategic level, ICT contributes to competitive positioning, service innovation, and market expansion. At the operational level, it enhances the efficiency of core processes, including reservation management, customer relationship management, information dissemination, and service coordination(Almunawar, Anshari, & Susanto, 2013).

The literature distinguishes two main categories of ICTs used in travel agencies (Ruiz-Molina, Servera-Francés, Arteaga-Moreno, & Gil-Saura, 2018):

- **Internal ICT solutions,** which are primarily aimed at improving organizational productivity. These technologies support the coordination of operational tasks and facilitate

more efficient communication and information flows within the agency. As a result, they contribute to better resource management, enhanced operational efficiency, and improved overall productivity.

- **External ICT solutions,** which are designed to facilitate and enhance communication with external stakeholders, including tourism service providers and customers. These technologies enable travel agencies to strengthen their relationships with partners such as airlines and hotels, while also improving customer interactions by facilitating access to information, reservation processes, and the overall delivery of tourism services (Buhalis & Law, 2008).

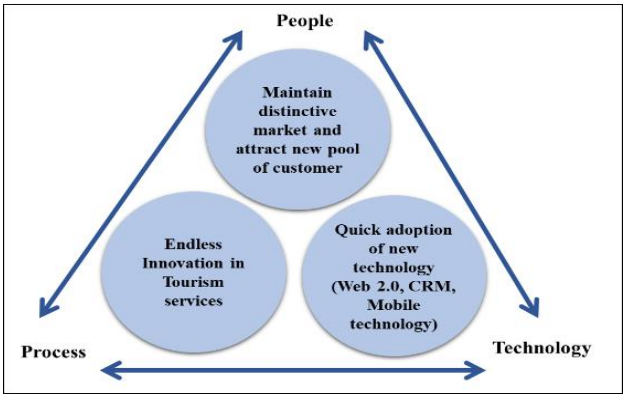
Overall,the evolution of ICT in tourism illustrates a progression from simple operational tools to sophisticated platforms that shape customer experiences, influence purchasing behaviors, and drive innovation in service delivery. Its role is not limited to operational efficiency; ICT has become a strategic instrument for enhancing competitiveness, enabling customer-centered services, and fostering a more interactive, informed, and personalized travel experience(Gonzalez, Gasco, & Llopis, 2020).

2.2. Applications and impacts of ICT on tourism operations and customer experiencein the Algerian tourism sector

a. Applicationsof ICT on tourism operations

In recent years, online travel bookings have continued to grow substantially at the global level, reflecting the consolidation of digital channels as a primary distribution system for tourism services. Worldwide revenues from online travel sales now account for a dominant share of total travel transactions, driven by the expansion of e-commerce platforms such as Booking.com, Expedia, and Airbnb. This evolution confirms that making travel arrangements, namely searching, comparing, reserving, and purchasing tourism products online, has become a central component of the global tourism economy (Berry, Shukla, Singh, & Satpute, 2025).

Fig 2. Applications of ICT on tourism operations



Source: Adapted from (Almunawar, Anshari, & Susanto, 2013)

As presented in figure 2 ,ICT adoption enhances operational processes by enabling continuous service innovation and improving efficiency. At the same time, its effectiveness depends on employees' digital competencies and their ability to leverage technological tools to deliver personalized and responsive services. The alignment between technological advancement, optimized processes, and skilled human resources ultimately strengthens customer perceptions, supports market differentiation, and enhances the overall tourism experience (Buhalis & Law, 2008).

In the Algerian context, although the digital transformation of tourism is progressing at a more gradual pace compared to highly digitized markets, the adoption of online booking practices has increased significantly in recent years. The expansion of internet penetration, the widespread use of smartphones, and the growing availability of electronic payment solutions have encouraged Algerian consumers to rely more heavily on digital platforms when planning travel. Local travel agencies are increasingly integrating online reservation systems and social media channels into their commercial strategies in order to remain competitive and meet evolving customer expectations (Debbah, Rehalia, & Boughazi, 2025).

Similarly, social media platforms such as Facebook, Instagram, and TikTok have become influential sources of tourism information in Algeria. Consumers use these platforms not only to obtain details

about destinations and services, but also to consult reviews, share experiences, and interact directly with travel agencies. Consequently, digital platforms now play a strategic role in shaping travel decisions and redefining the relationship between tourism providers and customers in the Algerian market (Kara, Chemma, & Benahmed, 2024).

b. Impacts of ICT on customer experience

The rapid adoption of digital technologies by consumers has significantly transformed the travel industry. Modern travelers increasingly rely on online platforms to search, compare, and book travel services, as well as to share their experiences through digital channels. This evolution reflects a process of value co-creation between travel agencies and customers, in which technology plays a central role in shaping the travel experience (Qalati, Ostic, Sulaiman, Gopang, & Khan, 2022).

According to Ruiz Molina et al., ICT solutions in travel agencies can be classified into three levels of engagement from the customer's perspective:

- **At the basic level,** conventional technologies facilitate service delivery but do not enable interaction, such as simple online booking systems or informational websites.
- **The intermediate level**,includes technology-assisted solutions that support service delivery and communication, but offer limited customer interaction, for example, advanced online booking platforms, automated confirmations, and static travel information portals.
- **The advanced level,** technology-enhanced and technology-empowered experience, enables active participation and co-creation of travel experiences. This includes interactive platforms, social media engagement, mobile applications, instant messaging tools, and emerging technologies such as virtual or augmented reality, which allow clients to engage deeply with travel planning, interact with agencies, and enhance their overall experience.

In Algerian travel agencies, adopting ICT at these higher levels can facilitate customer involvement in the creation of their travel experiences, improve service quality, and increase perceived value. Understanding customer perceptions of these technologies is essential, as they influence satisfaction, trust, and loyalty.

3. Research Design and Methods

3.1. Sampling and statistical overview

a. Data collection methods

To develop and validate a formative scale for measuring the degree of ICT advancement in Algerian travel agencies, a quantitative study was conducted through a survey targeting customers of travel agencies across major cities in Algeria, including Algiers, Oran, and Constantine. These cities represent key tourism and travel hubs in the country, serving both domestic and international clients. A questionnaire was designed to capture customers' perceptions of the use and intensity of various ICT solutions by travel agencies, as well as their perceived level of technological advancement.

An initial catalogue of advanced ICT solutions used by travel agencies was developed based on an extensive review of academic literature, institutional reports, and industry publications. This preliminary list was reviewed by a panel of eight experts–four academics specializing in tourism marketing and ICT adoption, and four managers from Algerian travel agencies representing different ownership structures and market segments. The experts evaluated the list independently, suggesting the removal of widely implemented solutions and the inclusion of emerging ICT developments that signal innovativeness to clients. Achieving broad expert consensus on the indicators was critical to ensuring construct and face validity of the formative scale.

All items were measured using a five-point Likert scale. To ensure both conceptual and linguistic equivalence, the questionnaire shown in Table 1 was initially developed in Arabic and French and later back-translated into English.

Table 1. Survey framework for the measurement of technological advancement in Algerian travel agencies

Code	Items	References
Formative Scale of Technological Advancement in Travel Agencies (FSA) : These items collectively define the degree of technological advancement.		
FSA1	Travel agencies have interactive and regularly updated websites.	(Ruiz-Molina, Servera-Francés, Arteaga-Moreno, & Gil-Saura, 2018)
FSA2	Travel agencies allow customers to book and manage travel services online (e.g., reservations, modifications, e-documents).	
FSA3	Travel agencies actively communicate with customers through social media platforms.	
FSA4	Travel agencies use instant messaging applications (e.g., WhatsApp, Messenger) to interact with	

	customers.	
FSA5	Travelagenciesprovide digital travel documents (e-tickets, electronicinvoices, digital itineraries).	
FSA6	Travel agencies use technological tools to personalize travel offers and recommendations.	
FSA7	Travelagenciesoffervirtual tours, multimediapresentations, or interactive destination content online.	
FSA8	Travel agencies use modern technological systems to improve service efficiency and customer experience.	
Reflective Scale of Technological Advancement in Travel Agencies (RSA): These items reflect the overall perceived technological advancement of travel agencies.		
RSA1	Travel agencies invest significantly in ICTs.	(Wu, Yeniyurt, Kim, & Cavusgil, 2006)
RSA2	Travel agencies use advanced technologies in delivering their services	
RSA3	Compared to other service sectors, travel agencies are technologically advanced.	
RSA4	Overall, travel agencies can be considered technologically innovative.	

Source: Adapted by the author from the literature review.

Fieldwork was conducted during July and August 2025. A comprehensive list of travel agencies was established based on official directories provided by the Algerian Ministry of Tourism in order to identify potential respondents. Data were collected through face-to-face administration, with interviewers approaching 650 customers at agency premises, tourism fairs, and affiliated partner locations. This process resulted in 213 usable questionnaires, corresponding to a response rate of 32.8%.

Subsequently, the data were screened for language consistency and completeness. Questionnaires exhibiting more than 20% missing values were excluded from the analysis, leading to a final sample of 184 valid responses, representing 28.3% of the initial contacts and 86.4% of the returned questionnaires.

b. Data analysis techniques

Once data collection was complete, the conceptual model proposed in this study was estimated using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach. The analysis was performed through the open-access statistical software Jamovi (version 2.3.28), which provides functionality for estimating structural equation models using PLS path modeling techniques.

The selection of PLS-SEM is methodologically appropriate given the predictive and exploratory nature of the research, as well as the presence of formative constructs within the model. Unlike covariance-based SEM, PLS-SEM is particularly suitable for complex models that incorporate formative measurement specifications, as it focuses on maximizing the explained variance (R^2) of endogenous constructs. Furthermore, this approach is robust to non-normal data distributions and is well adapted to studies with moderate sample sizes.

The analytical procedure was conducted in two main stages :

- First, the measurement model was assessed to evaluate the reliability and validity of the constructs. Particular attention was devoted to the formative scale measuring ICT solutions, through the examination of indicator weights, their statistical significance, and multicollinearity diagnostics using variance inflation factors (VIF). This step ensured that each formative indicator contributed uniquely and meaningfully to the construct.
- Second, the structural model was evaluated to test the hypothesized relationships between ICT solutions and perceived technological advancement in Algerian travel agencies. Path coefficients, significance levels, and explanatory power (R^2 values) were examined to determine the strength and relevance of the relationships.

3.2. Empirical Results

a. Overview of sample descriptive results

The following table summarizes the key characteristics of the study sample, providing descriptive statistics on respondents' gender, age groups, educational attainment, and primary travel motivations among clients of Algerian travel agencies:

Table 2. Demographic characteristics of the study sample

Variable	Category	Frequency N=184	Percentage (%)
Gender	Male	88	48.0
	Female	96	52.0
Age	18–29 years	26	14.2
	30–39 years	38	20.8
	40–49 years	50	26.9
	50 years and above	70	38.1
Level of Education	Without studies / Primary	20	11.1
	Secondary	78	42.6
	University degree	82	44.7
	Postgraduate	4	1.6
Trip Motivation	Leisure	164	89.3
	Business	12	6.6
	Others	8	4.1

Source: Results obtained fromJamovi (version 2.3.28)

The sample consists of 184 clients of Algerian travel agencies and presents a relatively balanced gender distribution, with females (52%) slightly outnumbering males (48%).

Regarding age, the clientele is predominantly composed of middle-aged and older individuals. Respondents aged 50 years and above represent the largest segment (38.1%), followed by those aged 40–49 years (26.9%) and 30–39 years (20.8%). Younger clients aged 18–29 account for 14.2% of the sample. This distribution suggests that travel agency services are mainly utilized by economically active and mature adults.

In terms of educational attainment, the majority of respondents possess either a university degree (44.7%) or secondary education (42.6%), indicating a relatively well-educated customer base. Only a small proportion reported primary education (11.1%) or postgraduate qualifications (1.6%).

Finally, leisure constitutes the dominant travel motivation (89.3%), while business (6.6%) and other purposes (4.1%) represent marginal shares. This finding confirms that Algerian travel agencies primarily serve leisure-oriented tourism demand.

b. Reliability and validity of the measurement model

To achieve the study's objective, the psychometric properties of the measurement instrument were first evaluated. An initial PLS analysis showed that all formative indicators had positive weights, confirming their contribution and supporting the retention of all items in constructing the formative scale to measure the degree of technological innovation in Algerian travel agencies.

Table 3. Reliability analysis results (Cronbach's Alpha)

Variables		No. of items	Cronbach's alpha	Decission
Independent variable	Formative Scale of ICT Advancement	8	0.80	Reliable
Dependent variable	Reflective Scale of ICT Advancement	4	0.94	Reliable
Total		12	0.88	Reliable

Source: Results obtained from Jamovi (version 2.3.28)

Regarding scale reliability, Cronbach's alpha was 0.88, well above the recommended threshold of 0.7 (Santos, 1999). For all four reflective items, Cronbach's alpha decreased if any single item was removed, confirming that each item meaningfully contributed to the reliability of the scale (As shown in table 3).

Table 4 . Initial eigenvalues derived from the correlation matrix

Facteur	Eigenvalue
1	3.19678
2	0.33612
3	0.00821
4	0.02858

Source: Results obtained from Jamovi (version 2.3.28)

Further evidence of reliability is provided by the eigenvalues of the correlation matrix shown in Table 4. The first eigenvalue (3.19678) is substantially higher than the second eigenvalue (0.33612) and clearly exceeds the (Kaiser, 1974) threshold of 1, while all subsequent eigenvalues are close to zero. This pattern indicates that a single factor explains approximately 80% of the total variance, thereby confirming the unidimensionality of the scale.

c. Convergent validityanalysis

Convergent validity was also assessed for the reflective construct RSA, with all four item loadings positive and significant, ranging from 0.629 to 0.651 ($p < 0.001$) surpassing the 0.5 threshold(Fornell & Larcker, 1981).This indicates that, on average, the construct explains a substantial portion of the variance in its indicators. Since the scale includes both reflective and formative measures of the same concept, assessing discriminant validity was not necessary.

For the formative construct FSA (Table 5), all eight indicator weights were positive and significant, ranging from 0.537 to 0.711 ($p<0.001$), and the variance inflation factor (VIF) values were below 4(Kleinbaum, 1988), indicating that each item contributed sufficiently distinct information. In other words, the eight indicators of the formative construct each provided unique input justifying their inclusion.

Table 5 . Standardized Estimates, Significance, and VIFs for Formative (FSA) and Reflective (RSA) Constructs.

Construct	Indicator	Estimate	Std. Error	Z	P	VIF
FSA	FSA1	0.630	0.079	7.99	<0.001	3.2
	FSA2	0.663	0.077	8.63	<0.001	2.9
	FSA3	0.545	0.075	7.29	<0.001	3.1
	FSA4	0.537	0.080	6.76	<0.001	2.8
	FSA5	0.711	0.070	10.09	<0.001	2.7
	FSA6	0.705	0.078	9.06	<0.001	2.6
	FSA7	0.592	0.079	7.46	<0.001	3.0
	FSA8	0.628	0.074	8.41	<0.001	3.3
RSA	RSA1	0.651	0.043	15.10	<0.001	–

	RSA2	0.646	0.042	15.52	<0.001	–
	RSA3	0.629	0.040	15.63	<0.001	–
	RSA4	0.637	0.041	15.44	<0.001	–

Source: Results obtained from Jamovi (version 2.3.28)

The overall model showed an excellent fit to the data, with :

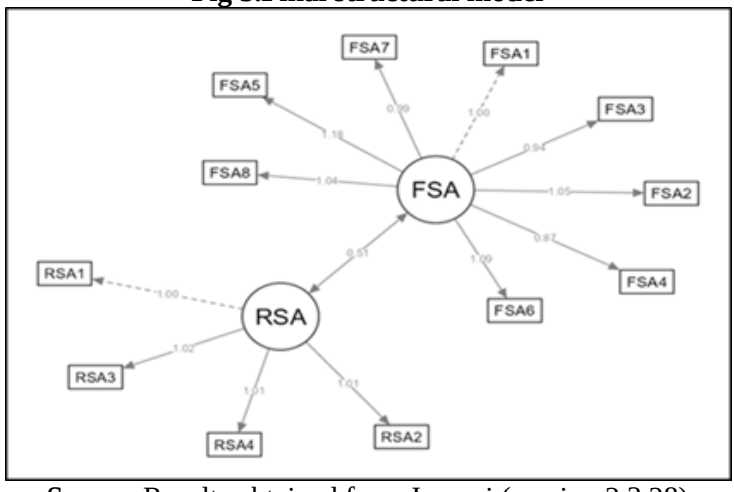
χ^2 = 50.6, df = 53, p = 0.567; CFI = 1.00; TLI = 1.00; RMSEA = 0.0318 (90% CI: 0.00–0.0432); and SRMR = 0.0432.

d. Assessment of external validation

Figure 3 presents the structural model used to assess the external validity of the formative construct. The results show a positive and statistically significant relationship between FSA and RSA (β = 0.51, p < 0.001). This indicates that the formative construct FSA has a substantial explanatory effect on the reflective construct RSA, supporting the criterion-related validity of the measurement model.

The coefficient value of 0.51 suggests that the formative construct explains a meaningful proportion of the variance in the reflective construct. While a perfect coefficient of 1.00 would represent complete explanatory power, previous methodological studies indicate that explaining around 50% of the variance is considered acceptable for external validation of formative constructs(Ali, Rasoolimanesh, Sarstedt, Ringle, & Ryu, 2018).Therefore, the obtained coefficient confirms that the formative indicators collectively capture the underlying concept represented by the reflective scale.

Fig 3.Final structural model



Source: Results obtained from Jamovi (version 2.3.28)

Regarding the measurement structure, FSA is formed by eight indicators (FSA1–FSA8), each contributing to the construct with different weights ranging approximately between 0.87 and 1.18, indicating that all indicators contribute positively to the formation of the latent variable. Meanwhile, the reflective construct RSA is measured by four indicators (RSA1–RSA4) with loadings close to 1, suggesting strong internal consistency and reliability of the reflective scale.

Overall, the results offer empirical evidence supporting the external validity of the formative construct, demonstrating that its indicators effectively capture the underlying concept and are significantly associated with the expected reflective outcome, thereby confirming the study's main hypothesis

4. Conclusion :

The present study aimed to develop and validate a formative measurement scale designed to assess the technological innovation of travel agencies, with specific attention to the Algerian tourism sector. The study focused on identifying the main ICT applications adopted by travel agencies and examining how customers perceive these technologies as indicators of the agencies' overall technological development.

In the tourism sector, where service delivery increasingly relies on digital interaction, understanding how ICTs shape the tourist consumption experience has become essential. The findings of this study indicate that the intensive use of ICT tools by travel agencies, such as interactive websites, online reviews and forums, virtual customer support, communication through applications like WhatsApp, digital booking platforms, and other online technologies, can be considered formative indicators that collectively represent the degree of technological innovation within travel agencies. These technological elements do not act independently but together form a comprehensive picture of the agency's technological development and its ability to respond to evolving customer expectations in the digital tourism environment.

The results highlight the strategic importance of investing in digital technologies to enhance service delivery and strengthen the innovative image of travel agencies. Agencies seeking to differentiate themselves in an increasingly competitive tourism market should prioritize the adoption and effective use of ICT solutions that facilitate communication, information sharing, and service personalization. Technologies such as interactive websites, online review systems, digital booking platforms, virtual customer assistance, and instant messaging communication tools represent

practical and accessible means for agencies to improve customer engagement and operational efficiency. By integrating these technologies into their service processes, travel agencies can enhance the overall customer experience and reinforce their competitive position in the tourism industry.

Despite these contributions, the findings also reveal certain limitations related to the measurement of technological innovation through customer perceptions.

- Some missing responses in the collected data may reflect a limited level of awareness among customers regarding certain technological tools used by travel agencies, which may influence the reliability of their evaluations.
- In addition, perceptions of technological innovation may vary across different customer groups, particularly between younger customers who are more familiar with digital technologies and older customers who may place less emphasis on technological features.
- Furthermore, the rapid pace of technological change in the tourism industry suggests that technological solutions currently considered innovative may quickly become standard practices, requiring continuous adaptation and periodic revision of measurement instruments designed to assess technological advancement in service organizations.

In this regard, the following recommendations can be proposed:

- Travel agencies seeking to strengthen their competitive position should prioritize the adoption and effective use of ICT solutions such as interactive websites, digital booking platforms, and online communication tools in order to enhance customer engagement and improve service delivery.
- Agencies should encourage the integration of digital communication channels, including messaging applications and online feedback systems, to facilitate interaction with customers and to better understand their needs and expectations.
- Managers of Algerian travel agencies should invest in technological infrastructure and digital capabilities that support service personalization, operational efficiency, and the overall improvement of the tourist experience.
- Future research should complement customer-based evaluations with assessments of the actual technological

infrastructure of travel agencies and perspectives from managers and employees, while also extending the proposed formative scale to incorporate emerging digital technologies such as artificial intelligence–based assistants, automated travel updates, mobile service applications, and other advanced technological solutions that may shape the future of tourism services.

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