Factors influencing tourist co-creation value in smart tourism: The role of resources, participation, and technology experience on satisfaction and loyalty

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ARTICLE INFO

DOI:10.46223/HCMCOUJS.econ.en.16.4.5073.2026

Received: November 25th, 2025
Revised: December 23rd, 2025
Accepted: December 31st, 2025

JEL classification code:
L83; Z32; M31; O33; D83

Keywords:
co-creation; Ho Chi Minh City; smart tourism; smart city; tourists' resources; tourist participation; technology experience; value co-creation

ABSTRACT

In the smart tourism environment, digital platforms enable tourists to actively participate in creating new tourism values. This study aims to examine how "Tourists' Resources", "Tourist Participation", and "Technology Experience" impact "Co-Creation" and "Co-Creation Value", as well as how these factors impact "satisfaction" and tourist loyalty in Ho Chi Minh City. Using Service-Driven Logic as the theoretical foundation, data were collected from 256 tourists and analyzed using PLS-SEM. The findings show that "Tourists' Resources" have a strong positive impact on "Participation" and "Co-Creation". Meanwhile, "Technology Experience" significantly moderates the relationship between "Participation" - "Co-Creation" and "Participation" - "Co-Creation Value", which changes their directions. This finding suggests an important insight: while digital technologies stimulate proactive engagement, they can undermine emotional engagement, thus limiting the effectiveness of value co-creation. These findings advance the theoretical understanding of technology-enabled co-creation in the context of smart tourism and provide practical implications for designing flexible, technology-enabled, customer-centric short-term tours that enhance meaningful tourism experiences in Ho Chi Minh City.

1. Introduction

"Tourists' Resources", "Tourist Participation", "Technological Experience", "Co-Creation", and "Co-Creation Value" have become central constructs in understanding how smart tourism shapes contemporary travel behavior. Together, these variables determine how tourists interact with digital platforms, contributing to the shaping of experiences and the creation of "Co-Creation Value", which in turn influences tourist satisfaction and loyalty. Despite their importance, previous studies have often considered these constructs in isolation rather than as an integrated mechanism operating in the tourism environment in the era of technological development.

The rapid development of digital technology has transformed management and marketing activities in the tourism industry. Smart services, such as digital tour design, online engagement, and real-time reviews, are reshaping the way tourists book tours, participate in experiences, and interact with service providers. In smart tourism, tourists are no longer passive

consumers but active contributors, designing, personalizing, and providing feedback on their experiences (Buhalis & Amarangana, 2015; Neuhofer et al., 2015). Digital platforms and AI tools now enable tourists to make instant decisions and co-create experiences through continuous technological interaction (Bui et al., 2025; Gretzel et al., 2015).

Although "Co-Creation Value" has been widely studied in the context of leisure, heritage, and accommodation (Campos et al., 2018; John & Supramaniam, 2024), "Co-Creation" in urban tourism has not received due attention - for example, in urban areas with many distinct characteristics from rivers to seas such as Ho Chi Minh City, where travel is often short-term, combined with meetings and visits to relatives, thus requiring technological support and high autonomy. Previous studies (Yin et al., 2024; Zhang & Prebensen, 2025) have not fully addressed how tourists' skills, knowledge, and emotional competencies interact with technological experiences to shape their participation in the co-creation process.

Given the rise of smart tourism ecosystems, a more integrated theoretical approach is needed. This study combines Service-Dominant Logic (S-D Logic) with digital tourism frameworks to examine how human capital and technological capabilities jointly determine the formation of co-created value. Most previous studies have isolated tourist engagement or technology effects, without clarifying how these factors interact to influence satisfaction and loyalty. This gap is particularly evident in Ho Chi Minh City, where short-stay tourists rely heavily on technology to select, book, and experience tourism services.

Therefore, this study develops and tests a comprehensive model linking tourists' resources, engagement, and technological experiences with co-creation value and satisfaction. Ho Chi Minh City - which has recently expanded towards Vung Tau and Binh Duong, with its diverse cultural landscape, coastal and urban areas, industrial zones, and commercial centers - provides a dynamic environment to study how human and digital resources intersect to create meaningful tourism experiences. The research results are expected to contribute to the co-creation theory in the context of smart cities and provide practical suggestions for travel companies in enhancing satisfaction and loyalty through personalized experiences and encouraging tourist participation.

2. Theoretical basis

2.1. Literature review

This study is based on the Service-Dominant (S-D) Logic proposed by Vargo and Lusch (2004), which emphasizes that "Value Co-Creation" is the result of interactions between suppliers and consumers, rather than inherent in goods or services. With this perspective in the tourism context, it is appropriate to identify tourists as active participants and co-creators in creating their own valuable experiences (Prahalad & Ramaswamy, 2004; Rihova et al., 2018). Recent research by John and Supramaniam (2024) indicates that tourists' resources and participation are central elements in the "Co-Creation" process, which is fully consistent with the Service-Dominant Logic of Vargo and Lusch (2004).

The application of digital technology in smart tourism has further strengthened the role of co-creation for tourists, expressing personal emotions through digital data interactions of the practical experience of tours (Gretzel et al., 2015). This perspective supports the idea that tourists' resources, participation, and technological experiences together determine the level of co-creation value, thereby affecting their satisfaction and loyalty (Neuhofer et al., 2015). Yin et al.'s (2024) research has also added to the theoretical framework of co-creation in the context

of smart tourism, emphasizing that not only technology (smart environment) is important, but also personal interactions have increased awareness of participation in the travel journey to bring about the success of the co-creation experience.

The objective of this study is to propose an integrated framework that combines the principles of Service-Dominant Logic (S-D) and smart tourism ecosystem to examine the relationship of Tourists' "Personal Resources", "Participation", and "Technological Experience" affecting "Co-Creation Value" in the tourism context in Ho Chi Minh City.

2.2. Key concepts

Tourists' Resources (TR)

"Tourists' resources" refer to the personal competencies, knowledge, and skills that tourists contribute to the co-creation process (John & Supramaniam, 2024; Prebensen et al., 2013). These resources are reflected in the level of personalization of tourists in making their contributions to the new tourism product. In smart tourism, personal resources of digital communication competence play an important role in helping tourists interact effectively with service providers (Campos et al., 2018; Yin et al., 2024).

Tourist Participation (TP)

Tourist participation is reflected in the extent to which tourists contribute to the design of the tour and provide feedback on their travel experiences (Grönroos & Voima, 2013). Tourists with high levels of participation demonstrate close interactions with tourism service providers, thereby enhancing "Co-Creation" (Mathis et al., 2016). Research by Prebensen et al. (2013); Tussyadiah and Park (2018); John and Supramaniam (2024) indicates that "Tourist Participation" behavior has transformed their resources into "Co-Creation" outcomes in tourism products (John & Supramaniam, 2024; Prebensen et al., 2013; Tussyadiah & Park, 2018).

Co-Creation (CCR) and Co-Ceated Value (CCV)

Co-creation refers to the active participation of tourists in contributing ideas for tour design, feedback, and customization to co-create a suitable tour experience (John & Supramaniam, 2024; Prahalad & Ramaswamy, 2004). Through this "Co-Creation" role, tourists and suppliers together create better use value for a tourism product, and thereby enhance tourists' perceived usefulness of the tour (Rihova et al., 2018). The role of the "Co-Creation" factor has led to the "Co-Creation Value" of a tour through customer interactions, and it has created an enjoyable, practical feeling for each tourist (Mathis et al., 2016).

Satisfaction (SAT) and Loyalty (LOY)

Tourist satisfaction represents the emotional evaluation of tourists through the experience of a tourism product that they co-create with the value of this product (Cheng & Lu, 2013). When tourists perceive that "Vaule Co-Creation" meets their needs, they will be more satisfied, thereby promoting loyalty intentions to the tourism company, such as re-visiting or recommending to acquaintances (Kim et al., 2017; Silitonga et al., 2025). "Satisfaction" and "Loyalty" are the main outcomes that link the co-creation process in terms of customer behavior.

Technology Experience (TE)

Technological Experience refers to tourists' confidence and familiarity in actively interacting with smart technology throughout their travel experiences (Neuhofer et al., 2015; Yin et al., 2024). In a smart tourism environment, with "Technological Experience", tourists can

use digital platforms and applications to interact with travel agencies more quickly and effectively, thereby shaping their journeys better (Buhalis & Amaranggana, 2015). "Technological Experience" not only facilitates engagement but also strengthens customers' relationships with "Value Co-Creation", because high "Technological Experience" is more likely to enhance interactions, thereby creating more meaningful travel experiences (Lo et al., 2024; Tussyadiah & Park, 2018).

2.3. Research hypotheses and model

2.3.1. Hypotheses

Based on S-D Logic and previous empirical studies, the following hypotheses are proposed:

Tourists' resources that are knowledge and communication skills of tourists, together with previous travel experiences that become resources, and that facilitate the participation of tourists in the "Co-Creation" process of a tourism product (Vargo & Lusch, 2004). Tourists with richer resources tend to participate more actively and increase the product value of "Co-creation", which is supported by recent systematic literature reviews (Campos et al., 2018; John & Supramaniam, 2024; Prebensen et al., 2013).

H1: Tourists' Resources (TR) have a positive influence on tourist participation

Tourist Participation in this study is understood as the participation of tourists in creating attractive tourism products, through enhancing engagement, actively participating in exchanging ideas with service providers about tourism product packages (Buonincontri et al., 2017; Grönroos & Voima, 2013; Prahalad & Ramaswamy, 2004). This active participation leads to tourists having a greater role in the "Co-Creation" process. Some recent empirical evidence in the context of smart tourism shows that active participation in the use of digital technologies in tourism has significantly facilitated the transition of tourists' roles from "Participation" to "Co-Creation" (Mathis et al., 2016; Neuhofer et al., 2015; Rihova et al., 2018; Yin et al., 2024).

H2: Tourist Participation (TP) has a positive influence on the Co-Creation

When tourists participate and contribute to "Co-Creation", they share their experiences and feedback to adjust tourism services and interact with digital technology, thereby increasing the value of tourism services (Grönroos & Voima, 2013; Neuhofer et al., 2015). Some previous studies have shown that tourists' active participation in "Co-Creation" will enhance the "Co-Creation Value" of tourism services (Campos et al., 2018; Jiang et al., 2025; Silitonga et al., 2025).

H3: Co-Creation (CCR) has a positive influence on co-creation value

Co-creation value has been identified as a main driver of tourist satisfaction (Cheng & Lu, 2013; Prebensen et al., 2013). When tourists perceive higher value from "co-created" tourism services, they express positive emotions and increase satisfaction. This view is supported by recent empirical studies (John & Supramaniam, 2024; Rihova et al., 2018; Silitonga et al., 2025; Yin et al., 2024).

H4: Co-Creation Value (CCV) has a positive influence on tourist satisfaction

Tourist satisfaction of a tourism service is very important to lead to "Loyalty", which they show through behaviors such as intention to revisit and recommend to acquaintances (Chen & Phou, 2013; Kim & Tang, 2017; Mathis et al., 2016). The study of John and Supramaniam (2024), it was demonstrated that the results obtained from "Co-Creation Value" are tourist satisfaction and the ability to lead to loyalty to the tourism service provider.

H5: Tourist satisfaction (SAT) has a positive influence on tourist loyalty

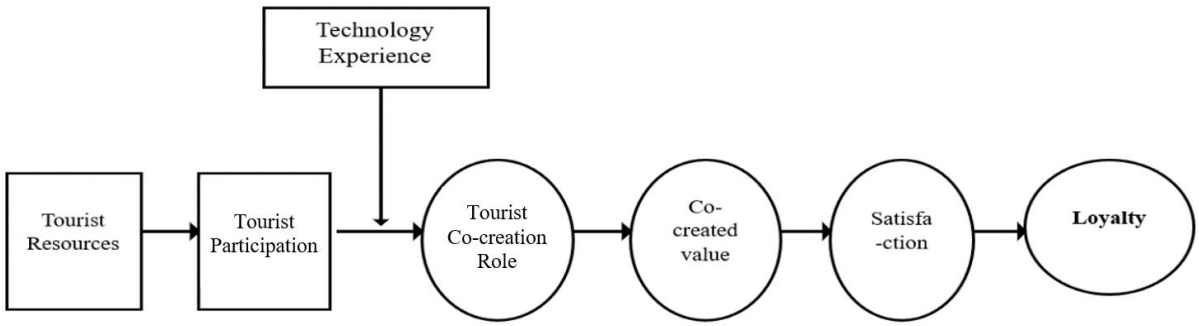
"Technology Experience" reflects tourists' ability and confidence in using digital technology in tourism activities (Neuhofer et al., 2015). Higher tourists' ability and confidence in using digital technology that leads to increased interaction, richer personal feedback, and thus increased "tourist participation" in tourism activities (Buhalis & Amaranggana, 2015; Tussyadiah & Park, 2018). "Technology Experience" is more likely to modify the impact level of "Participation" on "Co-Creation", becauses digital technology is both a facilitator and a substitute for social interaction (Bui et al., 2025; Yin et al., 2024).

H6: Technology experience positively moderates the relationship between tourist participation and co-creation role

2.3.2. Proposed research model

Figure 1

Model Research



Note. Compiled by authors

This model illustrates how Tourists' Resources (TR) and Tourist Participatory (TP) behaviors lead to Co-Creation Value (CCV) outcomes, moderated by their Technological Experience (TE), ultimately affecting satisfaction (SAT) and loyalty (LOY) in smart tourism contexts.

All constructs in the model were measured using reflective indicators adopted from validated scales in prior studies. Each indicator was measured on a 5-point Likert scale. The measurement model includes seven latent constructs: TR, TP, TE, CCR, CCV, SAT, and LOY.

3. Methodology

3.1. Sampling methodology

The study used a convenience sampling method with 260 customers taking short-term trips in Ho Chi Minh City. With the consent of 06 travel companies, the study conducted a survey from May 25, 2025, to September 5, 2025 (summer and holiday season in Vietnam). The results collected after 14 short-term trips were 260 survey forms, of which the forms of tourists under 17 years old were eliminated; the number of official forms included in the analysis was 256 forms.

3.2. Analysis method

Data were analyzed using PLS-SEM because this method is suitable for models with many latent variables, non-normally distributed data, and the goal of predicting travel behavior. According to Hair et al. (2019), PLS-SEM is especially suitable for forecasting-oriented studies

with complex model structures and moderate sample sizes. Therefore, applying PLS-SEM helps the study to ensure flexibility in exploring the phenomenon while maintaining reliability in testing hypotheses.

The PLS-SEM analysis process includes: (1) Evaluating the measurement model through reliability and convergent validity indices (Cronbach's Alpha, CR, AVE, factor loadings) and discriminant validity testing (HTMT); (2) Evaluating the structural model based on VIF, path coefficient, R^2, f^2, Q^2, and bootstrapping indices (Hair et al., 2019).

3.3. Measuring scales

The scale (survey questionnaire) was designed on Google Form with a 5-point Likert scale from low to high to measure the statements (completely disagree to completely agree). After discussing with 05 lecturers on tourism, a total of 28 survey questions were created, based on the theoretical framework of Prahalad and Ramaswamy (2004) and inheriting previous studies, such as Ranjan and Read (2016); Zhang and Luo (2020); Neuhofer et al. (2015); Brodie et al. (2013); Grissemann and Stokburger-Sauer (2012). They were sent to tourists through the support of tour guides.

Specifically as follows:

- The Tourists' Resources scale is inherited from the research of Ranjan and Read (2016) and adapted to the Vietnamese context. There are 05 questions reflecting the skills, experiences, and knowledge of tourists in carrying out tours, which become valuable resources contributing to the value co-creation process.

- The Tourist Participation scale consists of 04 questions that were inherited from the study of Zhang and Luo (2020) and adjusted to suit the Vietnamese tourism context. The questions reflect the level of participation of tourists, such as their cognitive, emotional about the tourism product, and their interactive behavior towards that trip to create co-creation value for the tourism product.

- The Technology Experience scale consists of four questions that were adapted from Neuhofer et al. (2015), and adapted to the Vietnamese tourism context. The questions reflect tourists' perceptions of the usefulness, enjoyment, and interaction with digital technology during their trip.

- The Co-Creation Scale has 04 questions which are inherited from the study of Grissemann and Stokburger-Sauer (2012) and adjusted to suit the Vietnamese tourism context. The questions reflect the tourists' perception of the tourism product they are about to participate in, such as the responsibility to share and the desire to contribute, actively contribute to that tourism product.

- The Co-Creation Value scale consists of 05 questions that were inherited from the research of Ranjan and Read (2016) and adjusted to suit the actual conditions in Vietnam. The questions reflect tourists' perceptions of the useful value received from the tour they designed together with the tourism service provider.

- The Satisfaction scale has 03 questions which are inherited from Oliver (1997) and adjusted to suit the conditions in Vietnam Tourism. The questions reflect the level of satisfaction of tourists with their travel experiences.

- The Loyalty scale has 03 questions which are inherited from the research of Zeithaml et al. (1996) and adjusted to suit the conditions in Vietnam Tourism. The questions reflect the level of loyalty through behaviors such as intention to return, recommend to acquaintances, and priority to choose this tourism service provider.

4. Result and discussion

4.1. Result

4.1.1. Descriptive statistics of the survey sample

The survey sample obtained after screening had 256 participants. Table 1 describes the characteristics of tourists with the following information: gender, education level, main occupation, average monthly income, travel frequency, and frequency of using digital technology for tourism.

Table 1

Characteristics of the Survey Sample

Variable	Category	Frequency	%
Sex	Female	120	47.00
	Male	136	53.00
Age	17 - 22	51	20.00
	23 - 40	63	24.00
	41 - 50	59	23.00
	51 - 60	48	19.00
	Over 60	35	14.00
Education level	High School	28	11.00
	College	69	27.00
	University	98	38.00
	Postgraduate	61	24.00
Main occupation	Student	36	14.00
	Office staff (non-state organizations)	64	25.00
	Self-employed	69	27.00
	Civil servants (state organizations)	43	17
	Retired	31	12
	Other	13	5
Average monthly income (VND)	Under 10 million	66	26.00
	10 - 15 million	98	38.00
	16 - 20 million	51	20.00
	21 - 30 million	26	10.00
	Over 30 million	15	6.00

Variable	Category	Frequency	%
Type of tourism often involved in the Ho Chi Minh City	Day travel	70	27.00
	2 days 1 night travel	64	25.00
	Weekend travel	79	31.00
	Business/conference travel (MICE)	28	11.00
	Other	15	6.00
Frequency of arrival in the Ho Chi Minh City travel in the past 12 months	01 time	10	4.00
	02 - 03 times	98	38.00
	04 - 05 times	79	31.00
	More than 05 times	69	27.00
Have you ever used any smart travel applications or websites when coming to the city	Never used	5	2.00
	Yes, sometimes	59	23.00
	Yes, often	192	75.00

Note. Authors' statistics (2025)

4.1.2. Measurement model evaluation

Table 2

Construct Reliability and Validity Test

Construct	Item	Loadings	Alpha	CR	AVE
Tourists' Resources (TR)	TR1	0.869	0.887	0.916	0.689
	TR2	0.866			
	TR3	0.895			
	TR4	0.777			
	TR5	0.739			
Tourist Participation (TP)	TP1	0.654	0.851	0.896	0.688
	TP2	0.395			
	TP3	0.514			
	TP4	0.492			
Technology Experience (TE)	TE1	0.525	0.971	0.979	0.921
	TE2	0.529			
	TE3	0.534			
	TE4	0.541			
Tourist Co-Creation Role (CCR)	CCR1	0.563	0.966	0.975	0.907
	CCR2	0.571			
	CCR3	0.593			
	CCR4	0.538			

Construct	Item	Loadings	Alpha	CR	AVE
	CCV1	0.526			
	CCV2	0.531			
Co-created Value (CCV)	CCV3	0.526	0.972	0.978	0.900
	CCV4	0.576			
	CCV5	0.584			
	SAT1	0.583			
Satisfaction (SAT)	SAT2	0.564	0.982	0.988	0.966
	SAT3	0.559			
	LOY1	0.477			
Loyalty (LOY)	LOY2	0.446	0.979	0.986	0.960
	LOY3	0.423			

Note. The authors analyze and synthesiz

The results of Table 2 show: Factor loadings, Cronbach's Alpha coefficients, Composite Reliability (CR), and Average Variance Extracted (AVE). Specifically, as follows: (1) Standardized factor loadings are all within the allowable range, which indicates that each index strongly represents its underlying construct (Hair et al., 2019; Nunnally & Bernstein, 1994); (2) Alpha and CR values are all higher than the minimum allowable level of 0.70, which indicates satisfactory internal consistency reliability across all concepts (Fornell & Larcker, 1981; Hair et al., 2019); (3) AVE values range from 0.688 to 0.966, exceeding the standard of 0.50, which indicates convergent validity of the variables in the scale (Fornell & Larcker, 1981). These results provide strong evidence that the measurement model is both reliable and valid, meeting the scientific requirements for further structural model analysis.

Table 3

HTMT Index Analysis Results

	TR	TP	TE	CCR	CCV	SAT	LOY
TR		0.717	0.603	0.644	0.623	0.619	0.488
TP	0.707		0.797	0.677	0.604	0.579	0.489
TE	0.603	0.797		0.821	0.645	0.574	0.501
CCR	0.644	0.677	0.821		0.779	0.648	0.504
CCV	0.623	0.604	0.645	0.779		0.902	0.626
SAT	0.619	0.579	0.574	0.648	0.902		0.703
LOY	0.488	0.489	0.501	0.504	0.626	0.703	

Note. The authors analyze and synthesize

The results of Table 3 show that the HTMT ratio (heterogeneity-monogeneity index) of the research variables (TR, TP, TE, CCR, LOY) is less than 0.85 (0.488 - 0.821), which is within the discriminant value threshold (Kline, 2011) or more liberal threshold of 0.90 (Henseler et al., 2015). Conclusion: they have discriminant value between latent constructs.

Only the HTMT ratio between Co-Creation Value (CCV) and Satisfaction (SAT) is 0.902, which exceeds the threshold, but their theoretical distinction is still maintained and should be retained for analysis. Because Co-Creation Value reflects the tourists' cognitive outcomes of Co-creating value, while Satisfaction captures the post-consumption affective evaluation, according to research by (Oliver, 1997; Rihova et al., 2018). Therefore, the discriminant validity is considered acceptable based on theoretical grounds.

4.1.3. Structural model evaluation results

Table 4

Results of Coefficients R^2

	Coefficient (β)	**p-value**	**R^2 (for dependent)**
TR → TP	0.607	< 0.001	R^2 (TP) = 0.367
TP → CCR	0.482	< 0.001	
TE → CCR	0.387	< 0.001	R^2 (CCR) = 0.641
TP×TE → CCR	0.137	< 0.001	
CCR → CCV	0.651	< 0.001	R^2 (CCV) = 0.571
CCV → SAT	0.912	< 0.001	R^2 (SAT) = 0.777
SAT → LOY	0.684	< 0.001	R^2 (LOY) = 0.476

Note. The authors analyze and synthesize

The results of Table 4 show the R^2 (explanatory power) for the endogenous variables: TP (0.367), CCR (0.641), CCV (0.571), SAT (0.777), LOY (0.476). These values show that the model has a good level of explanation, especially SAT and CCR have high R^2 (Cohen, 1988; Hair et al., 2019).

Table 5

Results of Coefficients Q^2

Model	**Q^2**
TP (TR → TP)	0.352
CCR (TP,TE,TP×TE → CCR)	0.619
CCV (CCR → CCV)	0.559
SAT (CCV → SAT)	0.772
LOY (SAT → LOY)	0.468

Note. The authors analyze and synthesize

The results of Table 5 show that $Q^2 > 0$ for all models, which indicates that the model has good predictive ability (Hair et al., 2019). The predicted relevance values (Q^2) were positive across all endogenous constructs: TP (0.352), CCR (0.619), CCV (0.559), SAT (0.772), and LOY (0.468), indicating strong predictive validity of the model.

Table 6

Hypothesis Results

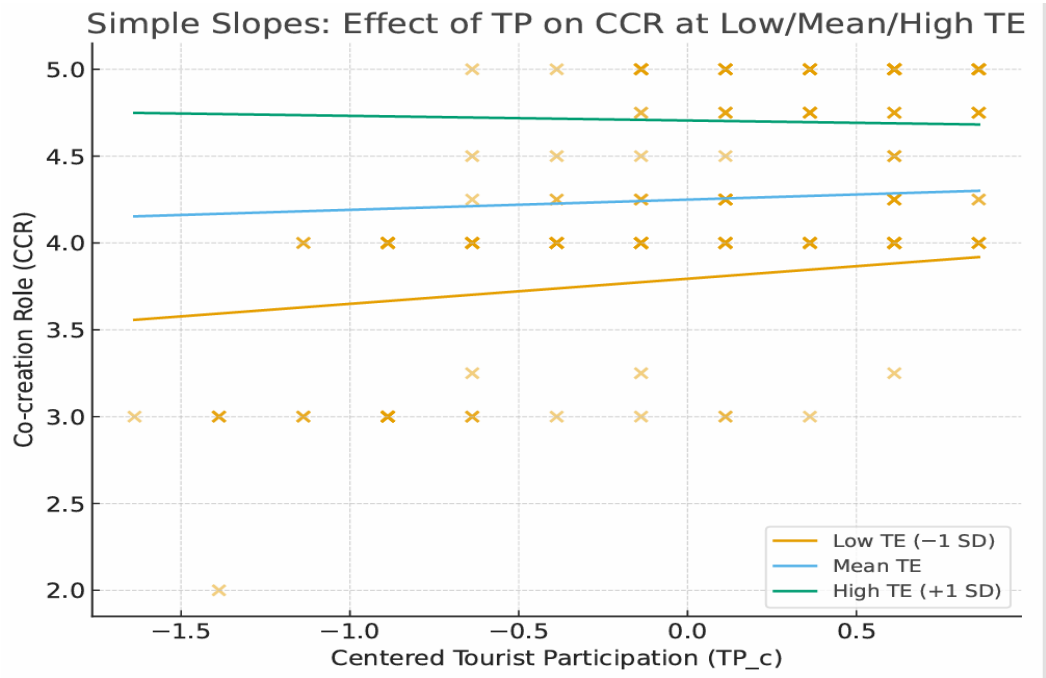
Hypotheses	Relationship	Origin β	Boot Mean	Boot SD	p-value	Conclude
H1	TR → TP	0.523	0.522	0.039	0.000	suported
H2	TP → CCR	0.058	0.054	0.059	0.182	Nosuported
H3	CCR → CCV	0.651	0.650	0.040	0.000	suported
H4	CCV → SAT	0.912	0.911	0.028	0.000	suported
H5	SAT → LOY	0.684	0.681	0.052	0.000	suported
H6	TP x TE → CCR	- 0.118	- 0.126	0.066	0.027	suported

Note. The authors analyze and synthesize

The results of Table 6 show the relationship between the variables (hypotheses), hypothesis H2 has a p-value (0.182) greater than 0.05, so it is not statistically significant. The other hypotheses all have p-value < 0.05, so they are statistically significant and supported for analysis (Hair et al., 2019).

Figure 2

Simple Slopes Graph (TP x TE → CCR)



Note. The authors analyze and synthesize

Figure 2 shows that: The curve shows that with high TE, the slope of the TP → CCR relationship is reduced (due to negative interaction), meaning that with higher technological experience, the increasing impact of participation on the co-creation role is weaker, which is consistent with the previous bootstrap results.

Evaluate the results obtained: After confirming the reliability and validity of the measurement model, the structural model was evaluated to test the proposed hypotheses (H1 - H6). The analysis was performed using partial least squares structural equation modeling

(PLS-SEM) with 5,000 bootstrap samples to estimate the path coefficient, coefficient of determination (R^2), and predicted relevance (Q^2).

The results of Table 6 show that the structural model exhibits significant explanatory power. Specifically, Tourists' Resources (TR) significantly influences Tourist Participation (TP) ($\beta = 0.523$, $p < 0.001$; $R^2 = 0.367$), hypothesis H1 is supported. This suggests that tourists with higher knowledge, skills, and emotional resources tend to actively participate in co-creation activities.

The results of Table 6 - the path from Tourist Participation (TP) to Co-Creative Role (CCR) ($\beta = 0.058$, $p > 0.05$) is not statistically significant, providing no direct support for H2. However, the results of Table 4, Technological Experience (TE) has an impact on CCR with ($\beta = 0.387$, $p < 0.001$, $R^2 = 0.641$), suggesting that tourists who are more familiar and comfortable with digital tools are more likely to take on an active co-creative role.

The subsequent paths were all positive and statistically significant: CCR → Co-Creation Value (CCV) ($\beta = 0.651$, $p < 0.001$; $R^2 = 0.571$), CCV → Satisfaction (SAT) ($\beta = 0.912$, $p < 0.001$; $R^2 = 0.777$), and SAT → Loyalty (LOY) ($\beta = 0.684$, $p < 0.001$; $R^2 = 0.476$). These results confirm H3 - H5, supporting the sequential mechanism from co-creation behavior to perceived value, satisfaction, and loyalty.

The moderating role (Interaction term) (TP x TE → CCR) is marginally significant ($\beta = -0.118$, $p < 0.05$), with a negative β indicating that technology experience moderates the relationship between TP and CCR in a negative direction, meaning that at higher TE levels, the incremental effect of CCR participation is weaker. This result accepts H6 (p-value < 0.05), which reflects the moderating role of "Technology Experience" in shaping the motivation for "Co-Creation".

Overall, these findings demonstrate that "Tourists' Resources" and the adoption of digital technologies in tourism jointly shape the outcomes of "Co-Creation" and "Co-Creation Value", as well as lead to the subsequent outcomes of "Satisfaction" and "Loyalty". This is also consistent with the theoretical framework of the Service Logic model combined with Smart Tourism.

4.2. Discussion

The objective of the study is to analyze the factors affecting "Co-Creation Value" to improve "Satisfaction" and "Loyalty" of tourists in smart tourism in Ho Chi Minh City. The findings of the study show that pushing the factors of "Resources" and "Participation" of tourists are important prerequisite factors in creating "Co-Creation" to form high-value tourism products for customers. At the same time, the application of digital technology in tourism activities is becoming more popular, so the factor of "Technology Experience" in smart tourism has moderated the relationship of the above prerequisite factors; it will change the level of impact of these relationships and affect the final results of "Satisfaction" and "Loyalty" of tourists.

"Resources", "Participation" and Co-Creation

The results (H1) show that Tourists' Resources (TR) have a significant impact on Tourist Participation (TP) with $\beta = 0.523$. This has been suggested by the service logic theory (Prahalad & Ramaswamy, 2004; Vargo & Lusch, 2008), which argues that consumers are operational resources, actively contributing to the creation of product/service value. Tourists with higher knowledge, competence, experience, and communication skills will be more willing and able to

participate in tourism products/services, to tailor tourism products to their needs. This finding is consistent with Campos et al. (2018), Rihova et al. (2018), John and Supramaniam (2024), who emphasize that participation depends on individual competence, experience, and motivation.

The results (H2) show that the direct relationship between "Tourist Participation" and "Co-Creation" is not statistically significant (p-value = 0.182), which suggests that "Participation" alone may not guarantee a positive "Co-Creation", as in the context of short-term or day trips, "Participation" is often limited to interactions or uninformed interactions. "Co-creation" is actually formed by the active and proactive contribution of tourists through the information provided by the provider. This finding complements previous studies that have suggested a positive direct relationship between participation and co-creation (Buonincontri et al., 2017; Neuhofer et al., 2015; Yin et al., 2024). This implies that additional supporting elements, such as full information of travel package from the service provider and ease of digital use, are needed to enhance "engagement" leading to meaningful "Co-Creation".

"Co-Creation Value", "Satisfaction" and "Loyalty"

The results of hypotheses (H3 - H5) were strongly supported with p-value < 0.05, confirming the logical chain of the theory from "Co-Creation" to the desired outcome of "Loyalty".

Specifically, the result of H3 shows a positive relationship of "Co-Creation" and "Creation Value", with ($\beta = 0.651$; $p < 0.001$). This result is consistent with previous studies (Campos et al., 2018; John & Supramaniam, 2024; Rihova et al., 2018; Silitonga et al., 2025), confirming that tourists who actively participate in "Co-Creation" perceive greater value in experiential tourism products.

The H4 result shows a strong relationship between "Co-Creation Value" and "Satisfaction", with ($\beta = 0.912$, $p < 0.001$), demonstrating that "Co-Creation Value" has brought about higher emotional satisfaction, which is also consistent with Oliver's (1997) post-consumption evaluation model.

The H5 result shows a positive relationship between "Satisfaction" and "Loyalty" with ($\beta = 0.684$, $p < 0.001$), which confirms that "satisfaction" is still the main driver of "loyalty" in smart destinations, which is consistent with (Chen & Phou, 2013; Kim & Tang, 2017).

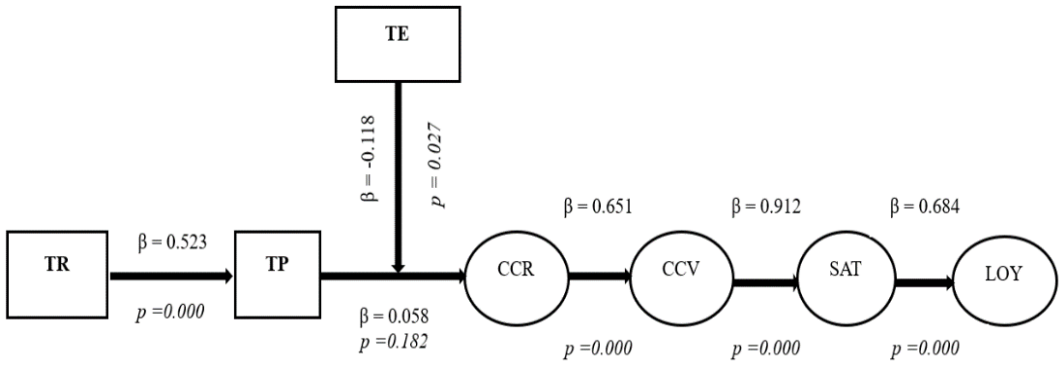
"Technological experience" is a moderating variable

The results of H6 show that "Technological Experience" in the smart tourism environment moderated the relationship between "Participation" and "Co-Creation", which was statistically significant with p-value < 0.05. However, there was a negative coefficient (TP x TE → CCR, with $\beta = -0.118$), which means there was a negative interaction (Table 6 and Figure 2).

The negative moderator coefficient with the impact size ($\beta = -0.118$) was an insignificant negative moderator of the TP → CCR relationship. This surprising result suggests that when tourists' "Technological Experience" of Tourists is high, the positive effect of "Participation" on their contribution to "Co-Creation" will decrease. This may explain that when tourists are tech-savvy and over-using, they may rely more on digital interfaces rather than real interpersonal participation or collaboration. Thus, digital technology increases independent participation, but it can also reduce traditional social interactions and joint co-production behaviors (Buhalis & Amaranggana, 2015; Zhang & Luo, 2020). This result suggests the dual role of digital technology as both an enabler and a constrainer of direct participation. This finding contributes new insights to the literature on co-creation in smart tourism.

Figure 3

Final Model



Note. The authors synthesize

The results of PLS-SEM analysis showed that the final model retained most of the initially hypothesized relationships, except for the path from Participation (TP) to Co-Creation (CCR), which did not reach statistical significance (p = 0.182). Tourists' Personal Resources (TR) had a strong influence on Participation (β = 0.523, p < 0.001), while CCR significantly influenced Co-Creation Value (CCV) (β = 0.651, p < 0.001). CCV continued to positively influence Satisfaction (SAT) (β = 0.912, p < 0.001), and SAT led to Loyalty (LOY) (β = 0.684, p < 0.001). In addition, Technological Experience (TE) significantly moderated the relationship between TP and CCR (β = -0.118, p = 0.027), indicating the role of technological familiarity in the co-creation process. The final model clearly reflects the value structure formed mainly through CCR → CCV → SAT → LOY, and emphasizes that TR and TE are two important components that promote the co-creation mechanism in the context of smart urban tourism.

5. Conclusions & managerial implications

5.1. Conclusions

The study extends the Service Logic (S-D Logic) theory by integrating human resources and digital technology to explore the relationship between personal resources, participation, and technology experience of tourists, impacting on "Co-Creation Value", "Satisfaction", and "Loyalty" in the context of smart tourism in Ho Chi Minh City.

The survey results from 256 participants confirmed that "Tourists' Resources" are the foundation for actively initiating "Tourist Participation", and they are the main driving force to create "Co-Creation" for tourism products/services and thereby enhance the "Co-Creation Value" of tourism services. Moreover, "Technology Experience" also positively moderates the relationship between "Participation" and "Co-Creation". However, the research results show that the higher the technological competence of tourists, the more autonomy they have in "Co-creation" but this weakens the social interaction of the process, lacking the real human emotion in the interaction. This finding provides a deeper insight into how digital technology can be used in tourism product design to effectively bring about "Co-Creation Value".

5.2. Managerial implications

Theoretical significance

This study contributes to the theoretical development of the service-dominant logic (Vargo & Lusch, 2008) and smart tourism framework (Gretzel et al., 2015) by integrating human elements (Resources; Participation) and digital technology (Technology Experience).

The findings show that digital technology empowers tourists to act autonomously, but at the same time can reduce interpersonal interactions in co-creation. This duality enriches the understanding of value co-creation through technology.

Practical significance

These findings suggest some strategic actions for travel and tourism business managers: First, tourism service providers should empower tourists through accessible digital platforms that facilitate interaction, customization, and feedback on tourism products/services. Setting up signage and sharing necessary information helps visitors build the knowledge and confidence needed to effectively participate in co-creation activities.

Second, tourism service providers should change their thinking and practice of tourism service design by replacing standard tourism service packages with flexible and open tourism packages that allow tourists to co-design and personalize activities.

Third, smart technologies such as AI-based systems, AR/VR applications, and mobile applications should be utilized advantageously to enhance the interaction and value of tourism products.

Fourth, service providers need to guide tourists to interact through smart technology to maintain the authentic feelings of tourists in the tourism packages. The application of digital technology in smart tourism should integrate human touch points. Digital technology is a supplement, not a substitute for human participation.

Finally, Tourism Associations and Travel companies, and online travel communities, should develop criteria for measuring the level of co-creation participation as part of their tourism performance metrics.

Tourism service providers need to pay attention to enhancing the role of the "Co-Creation" factor combined with "Technology Experience" in tourism service management strategies to exploit the rich potential of Ho Chi Minh City, improving "Satisfaction" and "Loyalty" of tourists, so that it is worthy of being a smart urban tourism destination in Southeast Asia.

Limitations and future research

This study has contributed to the theory and practice of tourism operations in the digital age, but there are still some limitations. First, the data were collected from customers who traveled to several destinations in Ho Chi Minh City during the summer vacation season. Second, the cross-sectional research design limits the ability to capture changes in co-creation behavior over time. Third, this study relied mainly on tourists' self-reported perceptions on digital platforms, which limits the ability to investigate actual emotions in interactions. Finally, future studies should add other moderating factors, such as specific destination image and trust in digital technology, to better explain how digital technology experiences interact in the smart tourism ecosystem.

SCIENTIFIC CONTRIBUTION

The manuscript clearly identifies a research gap; the manuscript extends or refines existing theories; the manuscript proposes a new theoretical or analytical model; the manuscript provides new datasets or empirical evidence; the manuscript presents statistically and practically significant findings; the manuscript offers policy/managerial/technological implications; the manuscript opens new directions for further research.

AUTHOR CONTRIBUTIONS

CRediT: **Vu Truc Phuc**: Conceptualization, Methodology, Software, Validation, Formal Analysis, Resources, Writing - Original Draft, Visualization, Project Administration; **Nguyen Giang Chau**: Investigation, Data Curation, Writing - Review & Editing, Visualization, Supervision, Funding Acquisition.

ACKNOWLEDGMENTS

The authors would like to thank all the travel agencies and tourists who enthusiastically supported this research.

We would also like to thank the tourism professionals and tour guides who helped and provided additional information for this research.

FUNDING

This research received no external funding.

NO CONFLICT OF INTEREST STATEMENT

The authors declare that they have no conflicts of interest in this study.

This research was conducted independently and it is the personal initiative in the academic research of the authors.

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