

Acceptance and use of ICT in tourism: the modified UTAUT model

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Abstract

Purpose – This study aims to investigate the technology usage behaviour of the tourists in line with the modified unified theory of acceptance and use of technology (UTAUT) model.

Design/methodology/approach – Data were collected from a survey of 265 tourists using the random sampling technique. Partial least squares-based structural equation modelling (PLS-SEM) technique was used to analyze the data.

Findings – The findings revealed that performance expectancy, hedonic motivation and habit significantly influence the behavioural intention of tourists to use information and communication technology (ICT), while effort expectancy, social influence, and facilitating conditions do not have a significant influence. However, actual ICT usage behaviour largely depends on the behavioural intention of the tourists, and their habits, while the facilitating conditions do not have any influence in this case.

Practical implications – The findings uncover the core factors influencing tourists' actual ICT use behaviour that can assist the concerned stakeholders in designing tourism planning and sales. The study results also offer pathways for the world's tourism industry for a healthy recovery from the COVID-19 pandemic.

Originality/value – The findings have made robust contributions by extending the existing UTAUT-based literature by adding two new moderators in the relationship between behavioural intention and actual ICT usage behaviour.

Keywords Tourism, Behavioural intention, ICT usage behaviour, Moderator, Modified UTAUT, COVID-19

Paper type Research paper

1. Introduction

Information and communication technology (ICT) provides unique opportunities for tourists and tourism businesses (Lu *et al.*, 2015) that promote the globalization of the industry. ICT tools can help the organization acquire, process, analyse, store, retrieve, disseminate and apply its key information (Jadhav and Mundhe, 2011). The application of ICT has transformed tourism businesses from local ethnocentric thinking to global orientation (Pencarelli, 2020). This new understanding of tourism business creates better prospects for the firms to survive and increase their competitive position (Law *et al.*, 2009). Therefore, the application of ICT in the tourism sector has become inevitable for the development, transformation and upgradation of this industry (Wu, 2017). The development and adoption of ICT change the behavioural pattern of the economic agents as well as enhance their collaboration with the social and economic conditions (Gossling, 2021) that are particularly true in the tourism industry during the COVID-19 pandemic. Travel consumers receive significant savings for exploring the amenities with the internet, smartphone and other technologies that help their holiday planning. Therefore, applying ICT for marketing tourism products is a viable alternative for tourism business success (Mahajan *et al.*, 2011).

The technology-bound transformation in the tourism industry reflects the online-based customer reservation system to global distribution systems (Carlisle *et al.*, 2021). Internet-based

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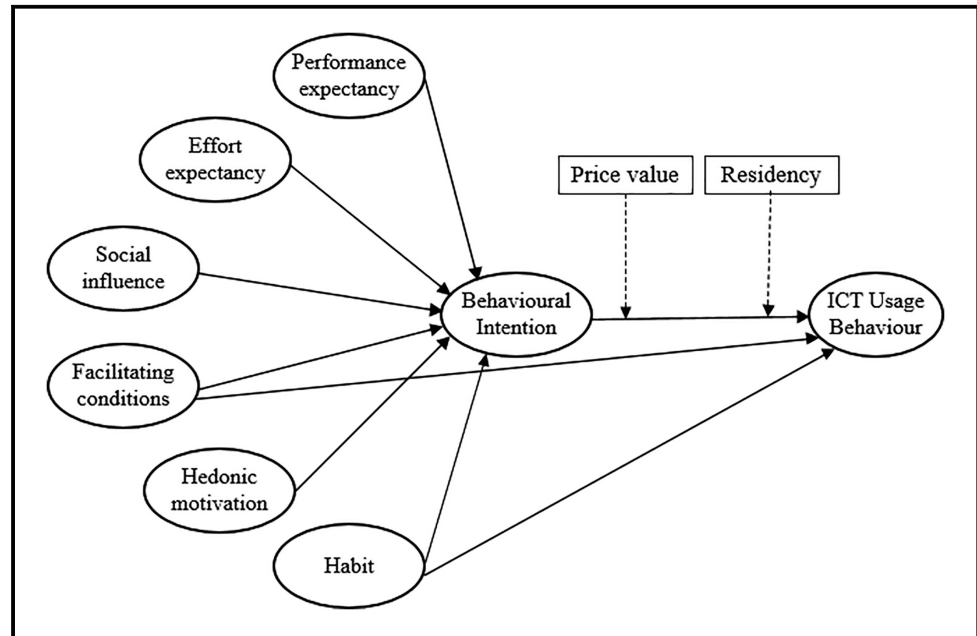
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technologies, social networking devices and mobile technologies have allowed tourism businesses and consumers to engage, interact and yield experiences to an unprecedented scale. Particularly, instituted by the new collaborative dimensions of technologies, the marketplace has shifted towards the increased power and control of consumers (Alt and Klein, 2011). The application of technology is well discussed in the unified theory of acceptance and use of technology (UTAUT) model of Venkatesh *et al.* (2003). Later, Venkatesh *et al.*, (2012) extended the UTAUT model known as UTAUT2, which incorporates significant improvements in consumer technology adoption literature (Satama, 2014). Earlier studies reviewed the adoption of technologies in various sectors, that is, mobile commerce (Rahman and Sloan, 2017), e-mail systems (Alraja, 2015), online shopping (Alsharif, 2013) and wireless LAN technology (Anderson and Schwager, 2004). This important innovation has received very little attention among the tourism stakeholders, particularly the tourists, for purchasing tourism products. As such, the extant literature loosely explores ICT usage behaviour among tourists. This situation also impedes the growth of the tourism industry due to the limited use of ICT, particularly in developing countries.

The digitalization process has accelerated the development of most industrial sectors across the globe. Still the ICT-based tourism platform has not been properly developed in most developing countries (Rahman, 2021). In their study, Jeon *et al.* (2020) explored the UTAUT theory to identify and validate the antecedents influencing customers' intention to adopt self-service technology. Cang *et al.* (2022) described blockchain-based UTAUT and examined the determinant factors affecting the acceptance of new technology in Korea, where tourism is the dominant business. Kamboj and Joshi (2021) studied the UTAUT model perspective on smartphone apps at a tourism destination. Sharma *et al.* (2020) explored consumer behaviour in purchasing travel online in Fiji and Solomon Islands using UTAUT framework. Considering the extension of the UTAUT model, Phaosathianphan and Leelasantitham (2019) investigated the antecedent factors that influence user acceptance of the intelligent travel assistant (ITA) for eco-tourism. Therefore, most of the existing literature studied technology adoption processes in different contexts in different geographic locations and examined the role of various influencing factors, highlighting the UTAUT model. However, there is still a paucity in the literature that exclusively studied the influence of the antecedent factors of ICT usage intention and actual usage behaviour in tourism and hospitality research.

Besides, the existing ICT-based model UTAUT, particularly explained the predictors [i.e. performance expectancy (PE), effort expectancy (EE), social influence (SI) and facilitating conditions (FC)] of behavioural intention (BI) and actual usage behaviour. Later on, UTAUT2 included three additional factors [i.e. hedonic motivation (HM), price value (PV), and habit (Hbt)] as the predictors for the same endogenous variables. There is, however, a dearth of studies that exclusively addressed the above-mentioned aspects and their interplaying effects for tourism booking and reservation, as well as its marketing and sales. To date, literature is also sparse that examined the interaction effect for any of the predictor variables used in earlier UTAUT models. These gaps in the literature uncover new research agenda, which has given the scope of conducting the current study. To fill the much-needed gaps in the literature, we proposed the modified UTAUT model (see, Figure 1) with the combination of the antecedents and new moderators of ICT usage behaviour in tourism. Thus, we were interested in examining the interaction effects of an observed variable (i.e. price value) with a demographic variable (i.e. residency). Although price value is extensively related to many facets, its influence on tourists' behavioural intention and actual usage behaviour is hardly discussed in the existing literature. Residents of different locations have different views on ICT usage (Galliano *et al.*, 2011). Thus, the residents from all eight divisional areas of Bangladesh have been taken for the current investigation. These divisions are substantially different in terms of income, education, and profession, impacting tourists' ICT usage behaviour (Akhter and Sumi, 2014). Hence, the geographic location of the tourists (i.e. residency) can also influence the rate of ICT usage that will be examined in this study. Our understanding of the new recipes in the modified UTAUT model can better explain the ICT usage behaviour in the tourism industry that the empirical evidence will essentially explore.

Figure 1 Modified UTAUT model



The current study is particularly interested in examining the effects of technology-based factors on users' intention and usage behaviour of ICT in tourism purchase among Bangladeshi tourists. Bangladesh is considered for the field study as it has a wide variety of tourism attractions (Akter *et al.*, 2020), but the ICT usage rate among the tourists is low (Roy and Ahmed, 2019). Hence, the current study finds substantial merit in conducting this research in Bangladesh as a field of study. The following section discusses the background literature and hypotheses. Then, the methodology is presented, followed by the analysis of data. Discussion and implications are shown in the later part of the paper concluding with the future research directions.

2. Background literature and hypotheses

Before the development of the UTAUT model, the study of ICT usage behaviour was based on eight models, such as the technology acceptance model (TAM) of Davis (1989), the theory of planned behaviour (TPB) of Ajzen (1985), a model combining TAM and TPB (C-TAM-TPB) of Taylor and Todd (1995), the motivational model (MM) of Davis *et al.* (1992), the model of PC utilization (MPCU) of Thompson *et al.* (1991), the social cognitive theory (SCT) of Bandura (1986) and the diffusion of innovation (DOI) theory of Rogers (1995). Most of these theoretical models were established for the diffusion and adoption of innovation in ICT. For this research, a framework was developed based on the theoretical foundation of UTAUT and UTAUT2, together with the TPB model, to fill the much-needed gaps in the literature. This framework has proposed the antecedents (i.e. PE, EE, SI, FC, HM and Hbt) of ICT usage behaviour. The proposed framework also accommodates the price value and residency as the moderators of the relationship between BI and ICT usage behaviour.

2.1 Performance expectancy (PE)

Performance expectancy is similar to perceived usefulness used in the TAM model (Davis, 1989; Neo *et al.*, 2014). PE can be explained in several dimensions: usefulness, convenience, time-saving and productivity (Gupta and Dogra, 2017). Others demonstrate usefulness, enhanced performance, effectiveness, increased productivity and time-saving as the indicators of performance efficiency (Rahman and Sloan, 2017). PE is an important factor in explaining

consumers' e-travel adoption and online travel purchasing behaviour (Alsharif, 2013). Past studies also established PE as an imperative predictor for technology adoption (Ayeh *et al.*, 2013). Thus, the following hypothesis was developed for examining with the empirical evidence.

- H1. Performance expectancy has a significant positive influence on the behavioural intention of tourists in responding to ICT usage.

2.2 Effort expectancy (EE)

Curtis *et al.* (2010) defined effort expectancy as the degree of ease of technology adoption in social media that influences users' intention. EE captures several dimensions such as perceived ease of use, complexity, understandable and expertise/skillfulness (Rahman and Sloan, 2017; Gupta and Dogra, 2017; Ibukun *et al.*, 2016). EE also has a strong influence on online travel shopping (Amaro and Duarte, 2015). Existing literature confirmed that the lower the attempt to make out the technology, the higher the intent to accept it (Kang, 2014). Effort expectancy is a vital antecedent for both the TAM and UTAUT model that can affect the usage intention of the new technology. As a determinant of the TAM model, effort expectancy was empirically tested and found to be a significant predictor of behaviour in several earlier studies in different countries (Bigné *et al.*, 2010). However, other studies did not find evidence to support its effect on behavioural intention (Lu and Su, 2009). Thus, this study intends to test the relationship between EE and BI by examining the following hypothesis:

- H2. Effort expectancy has a significant positive influence on the behavioural intention of tourists in responding to ICT usage.

2.3 Social influence (SI)

Social influence is similar to the subjective norm, which is discussed in the TPB model (Venkatesh *et al.*, 2003). When people feel unsecured about technology use, they tend to search for consolidations of others (Ibukun *et al.*, 2016). Several studies found the relationship between SI and BI for adoption and usage of innovation in developed countries (Hariri, 2014) and newly industrialized countries (Yueh *et al.*, 2015). Similar results were stated by Lu and Su (2009) in their technology adoption research. The existing study provides limited understanding of social influence on ICT usage behaviour in the tourism and hospitality industry. Thus, we proposed to test the hypothesis as:

- H3. Social influence has a significant positive impact on the behavioural intention of tourists in responding to ICT usage.

2.4 Facilitating conditions (FC)

Facilitating conditions indicate the resources and knowledge necessary to use a system. It is the condition where managerial and technical arrangements exist to support the usage of the system (Ibukun *et al.*, 2016). Facilitating conditions include several dimensions in existing research, that is, compatibility, resource necessary, knowledge necessary, specific person and help of others (Gupta and Dogra, 2017; Ibukun *et al.*, 2016), and hardware and accessory devices (Alsharif, 2013). UTAUT model suggests that the surrounding environment either encourages or restricts technology adoption and usage (Venkatesh *et al.*, 2003). Therefore, available facilitating conditions to use ICT are expected to influence actual ICT usage behaviour positively. However, there have been substantial debates among scholars about the role of facilitating conditions on its endogenous variables (see Kim and Hall, 2020; Venkatesh *et al.*, 2012). Thus, we developed the following hypotheses:

- H4. Facilitating conditions have a significant positive influence on the behavioural intention of tourists to ICT usage.
- H8. Facilitating conditions have a significant positive influence on the actual ICT usage behaviour of tourists.

2.5 Hedonic motivation (HM)

Hedonic motivation can be defined as pleasure and enjoyment which is derived from the post-usage behaviour of technology (Venkatesh *et al.*, 2012). Existing literature explored hedonic motivation with distinctive measures, that is, fun, enjoyable and entertainment (Ibukun *et al.*, 2016; Gupta and Dogra, 2017). Studies recognized that hedonic motivation is the key determinant in m-banking and m-commerce (Baptista and Oliveira, 2015). Brown and Venkatesh (2005) also stated that hedonic motivation is considered a powerful predictor of technology adoption and usage behaviour. When entertainment offers a worthwhile perception of using a specific technology, users' intention to use technology rises (Zhang *et al.*, 2012). Information systems literature also established that hedonic motivation has positively influenced technology adoption and usage behaviour (Thong *et al.*, 2006). However, literature is scant in tourism studies which exclusively examined the influence of hedonic motivation in assessing BI and actual ICT usage behaviour, which led to testing the following hypothesis:

- H5. Hedonic motivation has a significant positive influence on the behavioural intention of tourists to ICT usage.

2.6 Habit (Hbt)

Habit can be defined as the degree to which an individual has the propensity to perform certain behaviours (Limayem *et al.*, 2007). It can infer that the tendency to use technology is directly proportional to past habits. The habit was studied with several dimensions, that is, habit, addiction to using, must use and natural (Gupta and Dogra, 2017; Ibukun *et al.*, 2016). The use of ICT becomes a habit for a specific group of people when others are reluctant to use it (Ibukun *et al.*, 2016). Liao *et al.* (2006) found behavioural intention is influenced by the habit of using e-commerce services. A similar finding was reported by Lewis *et al.* (2013) that the intention to adopt classroom technology is affected by habit. Studies found both positive and negative influences of habit on behavioural intention, which creates the opportunity to re-investigate the phenomena (Herting *et al.*, 2020; Venkatesh *et al.*, 2012). Thus, we developed the following hypotheses:

- H6. Habit has a direct significant positive influence on the behavioural intention of tourism stakeholders in responding to ICT in tourism.
- H9. Habit has a direct significant positive influence on the actual ICT usage behaviour of tourism stakeholders in responding to ICT in tourism.

2.7 Behavioural intention (BI) and ICT usage behaviour (ICTUB)

Behavioural intention is often regarded as the predictor of actual behaviour. Kwok and Gao (2005) stated that individuals tend to be engaged in a particular behaviour if their intention towards that behaviour is positive, and vice versa. BI significantly impacts usage behaviour framing with intention to continue use, predict to use, try to use and plan to use (Gupta and Dogra, 2017; Ibukun *et al.*, 2016). Studies on ICT usage behaviour in tourism demonstrated that BI has a direct and positive effect on actual ICT usage behaviour (Parsaei *et al.*, 2014). Therefore, the influence of BI on the usage of technology increases as the ICT experience increases. Thus, we developed the following hypothesis to test with the empirical data.

- H7. Behavioural intention has a direct significant positive influence on actual ICT usage behaviour in responding to ICT in tourism.

2.8 Moderators

As mentioned earlier, the respondents' price value and place of residency can moderate the relationship between ICT usage intention and actual usage behaviour. The existing studies include several indicators to define price value, such as reasonable cost, worth of the cost and good value (Gupta and Dogra, 2017; Ibukun *et al.*, 2016). The price value becomes optimistic when the

perceived benefits of the technology are superior to the monetary cost, which further significantly impacts the usage behaviour (Venkatesh *et al.*, 2012). Thus, the following hypothesis was developed to test with the empirical data.

H10a. The effect of behavioural intention on actual ICT usage behaviour is significantly moderated by the price value, as higher the price value of ICT, the higher the effect on ICT usage.

The residency of the respondents was another important moderator of the ICT usage behaviour in this study. The availability and usage rate of ICT of tourists depend on where they are living. Commonly, people living in the cities have more chances to use ICT applications than those living in the countryside (Galliano *et al.*, 2011), because cities are more equipped with ICT infrastructure. Previous research examined the interaction effect of residency on the perceived need for support for students' academic performance (Menekse *et al.*, 2020). However, the impact of residency on ICT usage has not been tested in prior research. Thus, we logically hypothesized that:

H10b. The effect of behavioural intention on actual ICT usage behaviour will significantly be moderated by the residency of tourists, and as such, the effect will be stronger for tourists living in the capital city than those living outside the capital city.

3. Methodology

In the realm of the positivist paradigm, this study examines the antecedents of ICT usage intention and actual ICT usage behaviour through quantitative investigation. The target population was the students of different universities of Bangladesh, particularly those tourists who use ICT devices for purchasing tourism products.

The study holds 29 reflective type indicators under eight constructs for estimating the proposed research model. The measures for each of the constructs were adopted from existing UTAUT model-based literature (e.g. Alsharif, 2013; Ibukun *et al.*, 2016; Gupta and Dogra, 2017; Rahman and Sloan, 2017; Davis, 1989; Bagozzi and Lee, 2002; Mutlu and Der, 2017; Venkatesh *et al.*, 2012). The details of the indicators under each construct can be found in Table 2. The survey instrument was designed from the selected indicators under each construct modelled in this research. All responses were measured with a 6-point Likert type scale, where 6 represents strongly agree, and 1 means strongly disagree. The questionnaire also contained demographic profiles of the participants. Before the final survey, the questionnaire was pretested for its accuracy and ease of understandability to the respondents. In the pretesting process, required amendments and corrections were taken place. Once, the questionnaire was completed, a pilot study of 18 samples was conducted to check the data trends.

This study employed both online and face-to-face survey. University students from Bangladesh (who were studying either bachelor's or master's courses) were selected as the sample population of the study. University students were chosen for the survey because they tend to use technology more than other groups in tourism purchases (Bhuiyan *et al.*, 2020). For the final survey, respondents were randomly selected from three groups: Facebook, tourist club and university residential halls. The structured questionnaire was uploaded to the individual Facebook accounts of the randomly selected students from the University of Dhaka and University of Khulna, Bangladesh. Other respondents were also randomly selected from the members of the tourist club of the University of Rajshahi and the university residential halls of the Islamic University, Bangladesh. These respondents were approached face-to-face for the survey. A total of 300 questionnaires were distributed to the respondents both online and in person. Among 300 distributed questionnaires, 265 primary samples were collected from the respondents, with a response rate of 88.33%. However, 27 responses were discarded due to outlier and incomplete answers. Finally, the study analysed 238 data using SPSS 26 and SmartPLS 3.2.9 software.

4. Data analysis

4.1 Sample profile

The socio-demographic profiles of the samples were estimated through frequency distribution analysis in SPSS software (see Table 1). It was found that the majority of the respondents were between 21 and 30 years old (82.8%), and 10.5% were between 18 and 20 years. Regarding education, the majority of the tourists (74.8%) were at the graduate level and 21.9% were at the postgraduation level. It also found that 22.3% of the respondents' families earned less than BDT 10,000 a month, 26.1% were between BDT 10,001 and BDT 20,000 income level and the remaining 31.9% of respondents' family incomes were between BDT 20,001 and BDT 30,000. Results also showed that male (77.3%) tourists have more travel tendency than female (22.7%) tourists. Regarding marital status, 88.2% of the total respondents fall into single compared to married respondents (10.9%). Regarding the profession, the majority (85.7%) of respondents were

Table 1 Socio-demographic characteristics of the sample

Category	Sub-category	Frequency	Percentage (%)
Age	18–20 years	25	10.5
	21–30 years	197	82.8
	31–40 years	15	6.3
	41–50 years	0	0.0
	Above 50 years	1	0.4
	<i>Total</i>	238	100
Profession	Student	204	85.7
	Govt. employee	7	3.0
	Non-govt. employee	25	10.5
	Businessman	1	0.4
	Unemployed or housekeeper	0	0.0
	Other	1	0.4
	<i>Total</i>	238	100
Education	SSC level	3	1.3
	HSC level	4	1.7
	Graduation level	178	74.8
	Postraduation level	53	22.2
	<i>Total</i>	238	100
Income	Less than Tk.10, 000	53	22.3
	10,001–20,000	62	26.0
	20,001–30,000	76	31.9
	30,001–40,000	28	11.8
	40,001–50000	12	5.0
	Above 50,000	7	3.0
	<i>Total</i>	238	100
Gender	Male	184	77.3
	Female	54	22.7
	<i>Total</i>	238	100
Marital status	Single	210	88.2
	Married	26	11.0
	Other	2	0.8
	<i>Total</i>	238	100
Residency	Rajshahi	98	41.2
	Dhaka	33	13.9
	Chattagram	25	10.5
	Khulna	34	14.3
	Barishal	3	1.3
	Sylhet	3	1.3
	Rangpur	35	14.6
	Mymensingh	7	2.9
	<i>Total</i>	238	100

Source(s): Field study

Table 2 Reliability and validity

Item code	Item description	Mean	SD	Loadings
<i>PE</i>	<i>Performance expectancy (CR = 0.84; AVE = 0.57)</i>			
PE1	ICT is useful for me	5.28	0.87	0.76
PE2	ICT helps to accomplish task more quickly	5.04	0.97	0.80
PE3	ICT brings convenience to my work when travelling	4.85	1.04	0.66
PE4	ICT can enhance quality of services	4.77	1.13	0.81
<i>EE</i>	<i>Effort expectancy (CR = 0.80; AVE = 0.50)</i>			
EE1	We are ready to use ICT as ICT is easy to understand	4.54	1.10	0.71
EE1	Using interfaces of ICT is less complex	4.28	1.01	0.60
EE3	ICT is easy to use ICT	4.53	0.94	0.84
EE4	ICT is easy for me to become expert/skilful	4.72	1.03	0.70
<i>SI</i>	<i>Social influence (CR = 0.78; AVE = 0.50)</i>			
SI1	People around me think that ICT should be used	4.72	0.96	0.64
SI2	Family and friends have important role in using ICT	4.50	0.98	0.70
SI3	ICT usage seems prestigious/admirable while travelling	4.51	1.05	0.66
SI4	I will discuss the feeling of using ICT when travelling with my family and friends	4.52	1.06	0.74
<i>FC</i>	<i>Facilitating conditions (CR = 0.81; AVE = 0.52)</i>			
FC1	We can afford digital devices for using ICT	4.74	1.00	0.75
FC2	I have necessary resources to use ICT	4.35	1.09	0.66
FC3	ICT is compatible with the technological devices that I use	4.50	1.00	0.74
FC4	I can get help from others when I have difficulties in using ICT	4.50	1.04	0.71
<i>HM</i>	<i>Hedonic motivation (CR = 0.79; AVE = 0.56)</i>			
HM1	Using ICT is fun to me	3.81	1.43	0.80
HM2	ICT application is enjoyable to me	4.77	1.00	0.80
HM3	ICT application is a kind of entertainment to me	4.61	1.01	0.61
HM4	ICT use increases my tourism experience	4.82	1.13	0.83
<i>Hbt</i>	<i>Habit (CR = 0.87; AVE = 0.62)</i>			
Hbt1	The use of ICT has become a habit for me	4.04	1.31	0.74
Hbt2	I must use ICT when travelling	4.30	1.28	0.81
Hbt3	I am addicted to using ICT due to its benefits	4.01	1.39	0.82
Hbt4	Using ICT has become usual to me	4.29	1.31	0.78
<i>BI</i>	<i>Behavioural intention (CR = 0.83; AVE = 0.54)</i>			
BI1	I intend to continue using ICT in future	4.82	1.06	0.70
BI2	I plan to continue to use ICT frequently	4.54	1.10	0.74
BI3	I predict I would use ICT in the near future	4.68	1.10	0.77
BI4	I wish to make others aware to use ICT when travelling	4.80	1.21	0.74
<i>ICTUB</i>	<i>ICT Usage behaviour (CR = 0.73; AVE = 0.50)</i>			
ICTUB1	How long have you been using ICT in tourism	2.38	0.97	0.74
ICTUB 2	On average, how frequently do you use the ICT for tour planning	2.78	1.36	0.72
ICTUB3	How frequently do you use ICT in purchasing tourism products	2.89	1.04	0.61

Source(s): Field Study

students, and the remaining 14.3% were service holders and self-employed. Finally, 14% of the respondents lived in the capital city, while the majority (86%) were from other parts of the country.

4.2 Measurement model

Before analysing the measurement model, we assessed the mean and standard deviation (SD) scores of the observed variables. The results suggested that mean and SD scores are between 5.28 and 2.38, and 0.87 and 1.43, respectively. Further, all the items under a single factor were evaluated with the dimension reduction technique, confirming that all the items represent their corresponding factor. Then, this study conducted PLS-SEM analysis in two steps: (1) testing the reliability and validity of the measurement model and (2) the assessment of the structural model.

Reliability and validity: The statistical programme evaluates the psychometric attributes of the measurement model and estimates the parameters of the structural model. The indicator reliability

of the measurement model is assessed by looking at the item loadings. According to the guiding principle of reliability of measures, the loading of each item is required to be ≥ 0.70 ; however, in exploratory studies, loading of 0.40 is acceptable (Hair *et al.*, 2013). The accepted loadings score in this study is ≥ 0.60 (see Table 2), which suggests that indicators are reliable. The composite reliability (CR) of each of the constructs exceeds the threshold of 0.7 (Hair *et al.*, 2013); thus, the measurement model has satisfactory internal consistency reliability. Table 2 also shows that the CR for the constructs ranges between 0.73 and 0.87, which is above the recommended threshold of 0.7 (Hair *et al.*, 2013).

Table 2 shows that all the constructs have substantial AVE scores within the thumb rule of ≥ 0.50 (Hair *et al.*, 2013). The study assessed discriminant validity at the item level, examining the cross-loadings matrix. All items demonstrated substantial discriminant validity as the loading of the individual items within a construct was greater than their cross-loadings (Barclay *et al.*, 1995). Further, the findings of the intercorrelation matrix suggest adequate discriminant validity of the measurement model as the square root of AVE of a specific construct exceeds the intercorrelations score of its corresponding construct(s) (Fornell and Larcker, 1981) (see, Table 3). In addition, we found the maximum heterotrait-monotrait (HTMT) ratio of correlation value of 0.74, which is below the most conservative critical HTMT value of 0.85. The study results suggested substantial discriminant validity, both at the item and construct levels of the model. Thus, our findings confirmed the validity and reliability of the measurement model. Finally, we found a satisfactory model fit with a substantial score for standardized root mean square residual (SRMR) and normed fit index (NFI) that are 0.07 and 0.59, respectively.

4.3 Regression model

A PLS bootstrapping procedure was assessed with 5,000 iterations to determine the path relationships in the structural model. The results of hypotheses testing suggested that PE ($\beta = 0.22, t = 2.98$), HM ($\beta = 0.24, t = 2.82$) and Hbt ($\beta = 0.27, t = 3.69$) had statistically significant influence on BI, and BI ($\beta = 0.14, t = 1.94$) and Hbt ($\beta = 0.21, t = 2.97$) had also statistically significant influence on actual ICT usage behaviour. Thus, H1, H5, H6, H7 and H9 were supported. However, EE, SI, FC on BI, and FC on actual ICT usage behaviour do not explain significant influence. Thus, the empirical data did not support the hypotheses H2, H3, H4 and H8. The detailed results of the path coefficient and corresponding *t*-statistics are summarized in Table 4.

This study estimated the explanatory power of the exogenous latent constructs in the study model. The R^2 value of behavioural intention of ICT usage (38%) and actual ICT usage behaviour (10.3%) suggest the satisfactorily predictive ability of the research model. Our results of the f^2 effect size showed weak effects of latent constructs on the dependent constructs (see, Table 4). However, we found substantial predictive relevance of the exogenous latent constructs on their corresponding endogenous constructs (i.e. BI = 0.17 and ICTUB = 0.04) through testing the constructs' cross-validation redundancy (Q^2) (Chin, 2010). We also assessed the q^2 value for the

Table 3 Discriminant validity (Fornell-Larcker criteria)

Construct	BI	EE	FC	HM	Hbt	ICTUB	PE	SI
BI	0.75							
EE	0.32	0.71						
FC	0.36	0.48	0.72					
HM	0.48	0.38	0.38	0.75				
Hbt	0.47	0.31	0.39	0.32	0.79			
ICTUB	0.26	0.11	0.17	0.21	0.28	0.69		
PE	0.45	0.42	0.44	0.44	0.34	0.18	0.76	
SI	0.37	0.44	0.48	0.48	0.35	0.13	0.43	0.68

Source(s): Field study data

Table 4 Result of the regression model

Hypotheses	f^2 effect size	q^2 value	Coefficient (β)	t Statistics	Decision
H1 PE → BI	0.04	0.02	0.22***	2.98	Supported
H2 EE → BI	0.001	0.00	0.01	0.08	Not supported
H3 SI → BI	0.001	-0.004	0.02	0.22	Not supported
H4 FC → BI	0.002	0.00	0.04	0.63	Not supported
H5 HM → BI	0.08	0.02	0.24***	2.82	Supported
H6 Hbt → BI	0.10	0.03	0.27***	3.69	Supported
H7 BI → ICTUB	0.02	0.01	0.14*	1.94	Supported
H8 FC → ICTUB	0.002	0.00	0.05	0.63	Not supported
H9 Hbt → ICTUB	0.03	0.01	0.21***	2.97	Supported

Note(s): t -2.58, t -1.96 and t -1.65 represent the significant level of 0.01, 0.05 and 0.10, respectively (Hair et al., 2011)

model and found mixed results (see, Table 4). Our results of the f^2 effect size and q^2 value of predictive relevance of the model were consistent with the hypothesis testing results.

4.4 Interaction effect

We further assessed the moderating effects of price value and residency of the respondents using the process macro of Hayes (2013) in the SPSS. The interaction effect showed that PV has a statistically significant positive effect on the relationships between BI and ICTUB, whereas respondents' residency has a significant negative effect on the same relationship path (see Table 5).

4.5 Mediating effect

Existing studies have only looked into the direct relationship of FC to ICTUB and Hbt to ICTUB. In this study, we were further interested in examining the mediating relationship of those paths through BI to ICT usage. We also used the process macro of Hayes (2013) to assess the mediation effect of BI. Results found a significant positive mediating effect of BI on FC to actual ICT usage behaviour as there is no zero value between the lower limit and upper limit of the bootstrapping confidence interval (i.e. 0.0250 and 0.0944) (see Table 6). From a similar understanding, we were also interested in testing the mediation effect of BI in the relationship between habit and actual ICT usage behaviour. The result reveals no zero value between the lower and upper limits of the bootstrapping confidence interval (i.e. 0.0171 and 0.0969), which further signifies a positive mediating effect of behavioural intention.

Table 5 Moderation effects price value and residency

Hypotheses	Path	Effect	LLCI	ULCI	t -value
H10a	BI→ICTUB (W1= PV)	0.17*	0.01	0.33	1.71
H10b	BI→ICTUB (W2= Residency)	-0.35*	-0.67	-0.03	-1.79

Source(s): Field survey

Table 6 Results of mediation analysis

Path	Indirect effect	BootLLCI	BootULCI
FC-BI- IUB	0.0561	0.0250	0.0944
Hbt-BI- IUB	0.0533	0.0171	0.0969

Source(s): Field survey

5. Discussions and implications

The study was undertaken to meet the growing needs of ICT application in the tourism industry and examine the possibility of sustainable ICT-based tourism infrastructure in developing countries. In this study, we critically examine the technology acceptance and its use by tourists. We have found that most technology users in tourism are young adults between 20 and 30 years old. This segment of tourists has sufficient income for travelling, education and the ability to use ICT-enabled devices. We considered six antecedent latent constructs with two endogenous constructs essentially taken from the UTAUT and UTAUT2 model. The empirical data reflect substantial reliability and validity of the model. The assessment of path relationships reveals mixed findings.

The findings suggest that performance expectancy is a significant predictor that has a direct and positive influence on the behavioural intention of tourists. This result is consistent with the existing studies (e.g. [Rahia et al., 2019](#); [Gupta and Dogra, 2017](#); [Ibukun et al., 2016](#)). The finding indicates the users have a higher BI to ICT choices if higher PE is associated with using ICT. Thus, performance expectancy is a critical predictor of ICT usage intention. Existing literature asserts that the lower the efforts to understand a technology, the more the intention to adopt the technology ([Kang, 2014](#); [Satama, 2014](#)). The current study, however, shows an insignificant influence of effort expectancy on BI. This result is consistent with [Lu and Su \(2009\)](#) but contradicts the existing UTAUT ([Venkatesh et al., 2003](#)) and UTAUT2 ([Venkatesh et al., 2012](#)) models.

The statistical analysis related to the impact of social influence nevertheless reveals insignificant finding consistent with the existing studies (e.g. [Mutlu and Der, 2017](#); [Gupta and Dogra, 2017](#); [Baptista and Oliveira, 2015](#)). However, this finding is inconsistent with other studies (e.g. [Venkatesh et al., 2003](#)). The result shows that SI becomes less important when individuals have limited experience with online services. Therefore, tourism organizations must ensure that users have a continuous positive experience when using ICT because their experience may affect their colleagues and fellow people. The relationship between facilitating conditions and BI to using ICT was also found insignificant. This result indicates that respondents show limited intention towards using ICT in the tourism sector, assuming that they do not have the relevant facilitating conditions that would enable them to do so. This result contradicts existing studies (e.g. [Venkatesh et al., 2012](#)) that revealed the potential of facilitating conditions to significantly impact predicting BI. Other findings limit the effect of FC on predicting technology usage behaviour ([Skoumpopoulou et al., 2018](#)). Our study reveals that greater FC can increase the actual ICT usage, but not significantly. This finding is consistent with the existing research (e.g. [Martins et al., 2014](#)).

Hedonic motivation has a direct significant positive influence on BI and the actual ICT usage behaviour of tourists. Similar findings were also found in earlier UTAUT-based studies (e.g. [Baptista and Oliveira, 2015](#); [Venkatesh et al., 2012](#); [Gupta and Dogra, 2017](#)). These suggest that tourism practitioners need to establish ICT infrastructure in a way that they feel more entertaining, enjoyable and easy to use in tourism. Furthermore, the finding states that habit has a direct significant positive influence on the BI of tourists in responding to ICT usage in tourism. It is a fact that people who are habituated to ICT usage feel comfortable using it for other endeavours. The current findings support earlier studies on the habit-intention relationship (e.g. [Luo et al., 2010](#); [Venkatesh et al., 2012](#)). Habit is also found as the predictor of ICT usage behaviour, assuming that they have the relevant habit that enables tourists' intention to use ICT, which is consistent with that of [Gupta and Dogra \(2017\)](#). Thus, tourism providers need to address some features of ICT in the selling process that essentially associate tourists' habits. This means tourism products must comply with other products and services that are largely available on the online platforms.

The statistical analysis reveals that the usage intention of ICT in tourism services is an important predictor of actual ICT usage behaviour. The results are consistent with earlier findings ([Mutlu and Der, 2017](#); [Gupta and Dogra, 2017](#)). However, we find this relationship marginally significant. Our measurement model reflects below-average loadings for all three indicators of actual ICT usage behaviour. We predict that tourists of Bangladesh have a strong intention of ICT usage; however, ICT infrastructure, particularly in the tourism sector, is still undeveloped. It is for hope that

Bangladesh government has considered ICT development as the fast-track agenda for its tourism expansion.

The study findings offer a novel contribution to the existing technology acceptance and usage-based literature, particularly in travel and tourism. Earlier UTAUT-based literature signifies the influence of six predictor variables (i.e. PE, EE, SI, FC, HM and Hbt) on behavioural intention for using ICT. This study has found a significant positive influence of PE, HM and Hbt to predict tourists' behavioural intention and actual ICT usage behaviour but has found no significant influence of EE, SI and FC on the same relationship paths. However, the noticeable contribution of this study refers to the moderation effect of PV and residency of the respondents. Our empirical findings statistically prove that PV can better interplay with BI, rather than as a predictor; it is especially applicable in the ongoing COVID-19 pandemic situation. Since 2020, people around the world have been incrementally using ICT for their necessities, whether for purchasing foods and shopping goods or household supplies. According to study data, people always prefer cost-effective ICT devices along with their virtual platforms. Similarly, current findings indicate that tourists perceive higher PV as they need more technology-driven services to make a travel plan during the pandemic situation that can better influence ICT usage behaviour. Thus, our understanding of the new role of PV offers further insights into technology acceptance and use in tourism. We also tested the moderating effect of residency as a distinct demographic variable, which has not been tested in earlier UTAUT-based studies. We found tourists who live in the capital city (i.e. Dhaka) are more inclined towards ICT usage than those who do not live in the capital city. This finding also suggests that tourists residing away from the capital city have limited ICT facilities. The findings reflect the modified UTAUT model. So policy-makers can use these findings as an important input for future decision-making purposes to expand ICT facilities across the country.

In addition, we are interested in examining the mediation effects of behavioural intention in the relationships of FC → ICTUB and Hbt → ICTUB to expand the theoretical contribution of the study. This research has established the mediating role of behavioural intention in FC → ICTUB and Hbt → ICTUB relationships. This finding affirms that BI significantly mediates the relationship between facilitating conditions and actual ICT usage behaviour. Although the direct effect of FC on actual ICT usage behaviour was not found significant, in the FC→ICTUB relationship through BI, FC can significantly influence the actual ICT usage behaviour of tourists. In line with the other studies, we established a link of the UTAUT model with TPB in tourism study by accommodating behavioural intention and actual usage behaviour, which is considered further theoretical contribution to the ICT-based tourism literature. Thus, the modified UTAUT model has confirmed its wider applicability from the findings of the current research. In particular, the study model largely contributes to the application and adoption of technology in tourism.

Besides the theoretical contributions, the study findings refer to several practical implications. *First*, the results uncover the core factors influencing tourists' actual ICT usage behaviour. *Second*, this study suggests that tourists' ICT usage behaviour is the function of various facets (see, [Figure 1](#)). Thus, the findings will assist tourism businesses in designing technology-oriented tourism planning and sales so that their services and offerings comply with the tourists' needs which resultantly can maximize the socio-economic welfare of the destination communities. *Third*, the findings will inform the government at both local and national levels about the growing demand for ICT in the tourism sector, which can assist the government in taking the necessary measures and formulating policy for the sound tourism industry in the developing country. As the Bangladesh government has taken several projects to develop ICT-based tourism, the findings benefit both public and private stakeholders for better awareness of the market needs for ICT application. In this way, the dissemination of shared information at different levels of government can assist in taking the necessary measures to formulate balanced policy in the growing demand for the ICT-enabled tourism sector in developing countries, and Bangladesh in particular. *Last but not least*, researchers and practitioners can also gain novel insights from the current findings for designing future tourism research agendas where technology is a key component.

6. Conclusion and future research directions

This study investigates the factors relating to tourists' ICT usage behaviour. Prior studies conclude to usefulness and ease of use as the pioneer attributes of ICT usage, leading to their adoption. The study findings support the ICT application for purchasing tourism services. The study findings confirmed salient constructs that influence ICT application in tourism to meet the demand of the 21st century.

The study, however, oversees several issues that would widen the scope of tourism research. This research depends only on cross-sectional data, which limits the depth of the findings. The findings can also be more generalized if they can be confirmed with the qualitative investigation. The limitations thus open up for further research scope. This research investigates tourists only; the ICT practices of other tourism stakeholders need to be included in future research, including the tourism supply chain. Future research may focus on the resistance to ICT acceptance and use in tourism. In addition, further studies could extend current research by analysing cross-cultural differences in determining the factors affecting behavioural intention of ICT usage in the tourism sector.

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