

Understanding railway passengers' E-ticketing usage intention in an emerging economic context: application of an extended technology acceptance model

Railway
passengers'
E-ticketing
usage intention

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Abstract

Purpose – This techno-centric and too much busy day-to-day living style of citizens pressurizes the implementation of E-ticketing service to adapt with change. Thus, this study aims to examine the factors influencing railway passengers' E-ticketing service acceptance and usage intention in Bangladesh and to extend the widely used Technology Acceptance Model through inserting two new constructs.

Design/methodology/approach – This paper employs structural equation modeling to test model's paths developed through theoretical research framework. Moreover, a structured questionnaire was administered at different railway stations in northern and western parts of Bangladesh to collect data. Total of 302 responses were considered for statistical analysis to test hypotheses after considering anomalies and outliers in raw data.

Findings – The study results show that technology trust (TT) has the strongest impact on passengers' E-ticketing usage intention rather than perceived ease of use and perceived usefulness (PU). Meanwhile, the easiness of using technology to reserve tickets does matter to female passengers rather than male passengers wherein PU and TT do not do that.

Originality/value – The findings of this study might be helpful for the railway authorities to improve the ticket reservation service quality online by developing the advanced booking application and minimizing the pressure on other transportation. Therefore, this empirical study will contribute to this domain for further study that ensures full satisfaction of passengers and uplift the railway passengers' usage intention for E-ticketing which then helps the government to implement the digitization slogan with efficiency and effectiveness.

Keywords Electronic ticketing, Technology, Trust, Railways, Technology acceptance model

Paper type Research paper

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1. Introduction

As part of digitalization motto, Government of the People's Republic of Bangladesh did an excellent job in the field of railways, bus and airline transportation and it brings a radical change in the entire railway service system. Bangladesh railway has shifted from their traditional ticket booking system to online system which minimizes the hardship of the railway passengers a lot. E-ticketing service in the field of Bangladesh railway was started on May 29, 2012 (Al-Hossienie and Barua, 2013; Ferdous, Islam, Rahman, & Rumi, 2021).

To keep peace in the day-to-day hectic and busy working life as citizens of an emerging economic country, E-ticketing service seems a blessing especially for railway passengers in Bangladesh. Bangladesh Economic Review (2021) reported that yearly Bangladesh railway carried approximately 93 million passengers. According to Farazi, Murshed, and Hadiuzzaman (2022), a total of 3018.88 km of rail lines make up Bangladesh's railway system which links 52 passenger train routes to 43 of the country's 64 districts. This empirical evidence highlights the impact of Bangladesh railways in a more precise way to relieve the pressure of dense population on country's transportation. Guan, Wu, and Jia (2020) found a significant positive impact of E-ticket booking experience of railway passengers on their level of satisfaction which might get them back to the decision of repurchasing tickets using digital platforms and technologies.

Previous studies in this domain examined the significance of E-ticketing on passengers' satisfaction (Ashour, Magatef, & Alzaghal, 2022). Thus, the present study looks for factors affecting the passengers' acceptance of E-ticket booking system based on an extension of the familiar technology acceptance model (TAM) research paradigm. To the best of the author's knowledge, no previous studies investigated to disclose the customers' E-ticketing usage intention (ETUI) using an extended TAM by inserting passengers' technology trust (TT) as independent variable and gender as control variable in the context of Bangladesh. Extending the widely used TAM theoretical paradigm by inserting railway passengers' TT and gender to predict their attitudinal intention toward using technology-based platforms or applications to confirm train ticket is regarded as one of the major significant study gaps in this empirical cross-sectional work. Based on identified study gap, this study focuses on the following objectives.

- (1) To extend TAM through inserting two new constructs
- (2) To examine the predictors which influence the railway passengers' E-ticketing usage intention

The findings of this study will hopefully address the major unaddressed paradox in this domain. It basically fills up the country gap since this work was not previously conducted in Bangladesh using the same predictors and theoretical grounding. As well as, the outcome of the present study satisfies the industry and theoretical gaps since no single study was conducted, to the best of the authors' knowledge, through extending the TAM theoretical paradigm by incorporating passengers' TT and gender together to predict railway passengers' ETUI.

2. Literature review and hypotheses development

2.1 Technology acceptance model

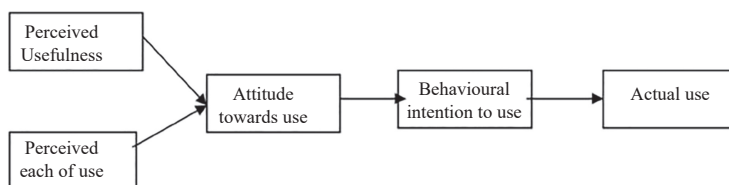
Figure 1 shows TAM which was originally developed by Davis (1989) that was adapted from Fishbein and Azen's (1975) Theory of Reasoned Action which focuses on different dimensions of human behavior at the time of accepting technology. Furthermore, TAM is regarded as a widely used model to confirm theoretical grounding of conceptual research framework especially in the domain of information system (Natasia, Wiranti, & Parastika, 2022). TAM model is regarded as one of the most convenient theories to test users' readiness to adapt with new technology. An, Eck, and Yim (2023) stated that TAM applies to predict customers' intention to accept and to adapt with new technology and to experience new

innovative products and services such as e-commerce services, e-food delivery services and e-shopping services.

According to Davis (1989), TAM is grounded on basic five constructs including Perceived Ease of Use (PEU), Perceived Usefulness (PU), Attitude toward Using New Technology, Technology Using Intention (IU) and Actual Use of Technology. This empirical work takes a few constructs from TAM model to support the theoretical framework of this study such as PEU, PU and IU.

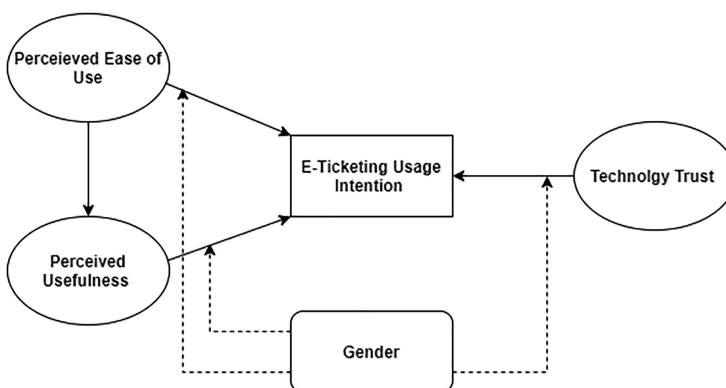
2.2 Extended and modified technology acceptance model

Prior studies in the domain of users' acceptance of technology extended and somewhat modified the extensively used TAM theory. TAM theoretical framework incorporates the innovative products' users' PEU and PU toward accepting new technology which is formed by some of the external factors such as technology users' attitude and trust (Na, Heo, Han, Shin, & Roh, 2022). Meanwhile, scholars postulated their rational opinion and evidenced behind the psychological and motivational reasoning of human beings which seems to be missed in the initially proposed model by Davis (1989). After the emergence and application of TAM to predict user's intention to use information technology (IT), the scholar in this domain tried a lot to propose required extension in the original TAM model to understand the users' attitude, intention and actual use in a more transparent manner through inserting new variables (Fussell and Truong, 2022; Zhang, Shu, Luo, Yuan, & Zheng, 2022). Thus, to contribute to the existing theoretical grounding, the present study extends TAM research paradigm by inserting railway passengers' TT as a study-independent variable and passengers' gender as a study control variable with the help of Figure 2.



Source(s): Figure courtesy of Davis 1989

Figure 1. TAM model developed by Davis (1989)



Source(s): Figure by authors

Figure 2. Extended TAM model

2.3 Perceive ease of use – antecedent to behavioral intention

Simply PEU denotes the user's perception regarding using a particular technology very easily to complete a specific job or to attain a certain goal. [Cheema et al. \(2020\)](#) explained PEU as the customers' mindset that they might be free from difficulty in using a particular technology. From technological perspective, PEU refers to the user's belief that they do not need to provide too much effort to get the advantage from a technology-based platform ([Almaiah et al., 2022](#)).

Meanwhile, the behavioral intention as a study-dependent variable indicates an individual's willingness or desire as a result of an attitudinal response to perform in positive or negative manner ([Chen, Huang, & González, 2022](#)).

Existing literature on passengers' acceptance of E-ticketing based on TAM model does not give vast information since the number of studies in this field is limited. But several studies stated that PEU affects user's intention to use something for doing job directly and their PU which then influences their better performance too ([Benzine and Tiar, 2022](#); [Zhong, Oh, & Moon, 2021](#)). Thus, we hypothesize that if railway passengers could enjoy a hassle-free and extra effortless ticket booking system, they will hook themselves to book train tickets using online-based platforms. Thus,

H1a. Perceived ease of use positively affects passengers' acceptance of E-ticketing.

H1b. Perceived ease of use positively affects passengers' perceived usefulness.

2.4 Perceived usefulness – antecedent to behavioral intention

PU states the users' perception of getting advantage from using something or using something will boost the performance of an individual employee. Furthermore, the connection between doing job and receiving outcome is positive in a system which holds the PU ([Chen and Aklirikou, 2020](#); [Tavitiyaman, Zhang, & Tsang, 2022](#)).

Several prior studies ([Oyman, Bal, & Ozer, 2022](#)) explored a positive and statistically significant effect of technology users' PU on their willingness to continue the technology-based platforms such as mobile applications, websites, etc. Meanwhile, another empirical study conducted by [Zhao, Sun, Zhou, Cui, and Liu \(2022\)](#) revealed that technology users' belief regarding hassle-free technology using opportunity has an insignificant impact on their behavioral intention. That's why, this domain requires more rigorous study to find out precise output which will contribute for further study. One of the most significant and recent studies in this domain conducted by [Sinha and Bag \(2023\)](#) emphasized more specifically on the existing positive association between PU and behavioral intention. [Sinha and Bag's \(2023\)](#) study determined students' intention to use online platform which is directly influenced by their perception of using technology from positive viewpoint. To draw up a parallel picture of this study with the previous study line, we predict that PU of railway passengers will positively affect their intention to reserve train tickets using websites and applications. Thus,

H2. Perceived usefulness of passengers affects positively their behavioral intention to book train tickets via information technology.

2.5 Technology trust – antecedent to behavioral intention

TT indicates the passenger's belief that they might be able to get advantage from a specific technology which is safe and trustworthy, therefore it will work properly. When they have belief in technology and its outcomes, it emphasizes the usefulness of technology from where the passengers will continue their ticket booking via online platforms ([Lee and Wan, 2010](#)).

Literature in this domain explored mixed results regarding the impact of trust in technology on the users' behavioral intention. Meanwhile, another study found a statistically direct impact of TT on PU as well as behavioral attitude and intention; the higher the trust, the higher the intention to adopt information systems (Chauhan, 2015). Su, Nguyen, Nguyen, Luu, and Nguyen-Phuoc (2022) reported that a mediating effect of trust has on all factors based on TAM to investigate consumers' belief in smartphone-based food distribution application. Furthermore, Berakon, Wibowo, Nurdany, and Aji (2023) stipulated that TT of users has a mediating impact on the linkage between PEU and technology users' intention as well as PU and technology users' willingness to accept technology. A recent study based on TAM theoretical framework explored that users' trust in technology directly influences their intention to use technology-based navigation system (Ge, Qi, & Qu, 2023). Thus, we propose the following hypothesis in the context of our study:

H3. Technology trust affects positively the passengers' E-ticketing usage intention.

2.6 Gender as a moderator

Gender as a moderator is used in the study as part of the extension of TAM. The literature gives interesting information regarding the effect of gender on the relationship of PEU, PU and TT with the passenger's attitude, intention and actual action toward using technology. The present study shifts from the original ground of TAM to extend a bit. It actually focuses only ETUI of railway passengers by incorporating TT as direct effect on ETUI and Gender as moderating effect on different direct paths.

Al-Gahtani (2008) found the moderating impact of gender on the association of PEU rather than PU with users' attitude and intention to use technology. Another empirical study on E-learning acceptance stated that gender only moderates the association between PEU and behavioral intention but does not moderate the PU and behavioral intention-based connection (Tarhini, Hone, & Liu, 2014). Literature clearly evidences that technology users' gender also has a moderating effect on the association between their TT and IU. Therein, Alshurideh, Al Kurdi, Masa'deh, and Salloum (2021) reported that users' gender moderates the relationship of their trust issue with their e-payment usage intention.

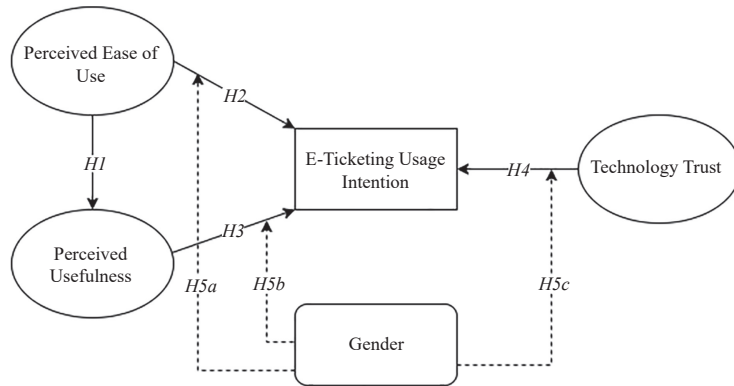
Thus, we posit three hypotheses under the umbrella of gender of passengers as a moderator among the direct paths such as PEU-ETUI, PU-ETUI and TT-ETUI.

H4a. Gender moderates the direct relationship between perceived ease of use and E-ticketing usage intention.

H4b. Gender does not moderate the direct relationship between perceived usefulness and E-ticketing usage intention.

H4c. Gender moderates the direct relationship between technology trust and E-ticketing usage intention.

Based on the above literature review, the study gaps are crystal clear to be filled with noteworthy contributions. To the best of our knowledge and searching on available literature, no prior studies paid focus on gender of railway passengers to predict passengers' ETUI based on extended TAM research paradigm by inserting passengers' TT. Afterward, previous extended TAM missed to check out the direct impact of TT on railway passengers' ETUI. Furthermore, no significant study based on extended and modified TAM was conducted to understand railway passengers' ETUI in the context of Bangladesh. Thus, the present study aims to fill up these theory-based, industry-based and country-based gaps to contribute to the existing literature by offering a unique as well as an extended TAM model. Figure 3 shows the theoretical research model.



Source(s): Figure by authors

Figure 3.
Theoretical framework
based on extended
technology
acceptance model

3. Research methodology

3.1 Methods and sampling

The present study based on cross-sectional research design uses structural equation modeling with the help of partial least square (PLS-SEM). Prior studies applied various versions of PLS to employ structural equation modeling specially to predict human behavioral intention as a chain effect of some psychological and environmental constructs (Ilyas *et al.*, 2020; Dogra & Kaushal, 2022). PLS 4, the latest version of the next-generation statistical software, is applied to complete the inferential analysis of the present study. This study uses five-point Likert scale questionnaire ranging from strongly agree (5) to strongly disagree (1) to collect data as primary source from respondents.

The present study employs non-probability sampling, specifically convenience sampling, as a widely used method to collect data with the help of field visit. All of the major railway stations in the northern and western parts of Bangladesh (Chilahati, Parbatipur, Santahar, Natore, Rajshahi, Kushtia, Jessore and Khulna) are considered as the study area for the present study. The hard copies of the questionnaire were directly distributed to the railway passengers who were waiting at the above-mentioned station's platforms to catch up intercity train to reach their destination. The rationality of choosing northern and western parts of Bangladesh as study areas is that these two territories cover three divisions (Rangpur, Rajshahi and Khulna) along with 26 districts out of total 64 which might be the complete representation of railway passengers' behavioral intention to use E-ticketing of other parts of the country.

The questionnaire was first developed in English and then translated into Bengali. Both of the versions were included in the questionnaire to get actual responses since the present study is conducted at the root level where literacy might be the considerable issue to some extent. After developing and translating the questionnaire, a pilot test was conducted with the help of five scholars in this domain and ten prospective respondents who regularly travel by train. In each of the eight stations, total of 39 close-ended questionnaires were distributed to the waiting passengers. Total of 312 complete questionnaires were collected between March 10, 2022 and June 12, 2022. Response rate of receiving the questionnaire is 100% since the questionnaire was distributed to the waiting passengers and it was difficult for them to ignore in front of research assistants.

3.2 Instrument development

All of the items regarding study constructs are adopted and adapted from the previous studies. To match with the context and content of the present study theme, items were

modified a little bit. Meanwhile, five items were used to measure PEU as a study-independent variable which was adopted from these previous works (Davis, 1989; Benzine and Tiar, 2022); to develop PU, five measurement items were adopted from (Rafique, Anwer, Shamim, & Minaei-bidgoli, 2018; Rafique, Almagrabi, Shamim, Anwar, & Bashir, 2020); TT used as an extending construct was designed with five items adapted from (Usman, 2017; Usman, Monoarfa, & Marsofiyati, 2020); finally ETUI as a study-dependent construct was measured with six measurement items are adopted from the previous related studies conducted by Benzine and Tiar (2022), Alsamydai (2014) and Huang, Chang, Yu, and Chen (2019). All the items are displayed in a tabular form in Appendix part of this study.

3.3 Data collection

Table 1 shows the respondent's demographic characteristics which are divided into three specific segments including their gender, age and occupation. SPSS analysis reveals that out of 312 respondents, 162 (51.92%) are male and 150 (48.08%) are female. In the age cluster, the majority of the respondents fall in the range from 18 to 25 years (105, 33.65%); range from 26 to 35 years (97, 31.09%); range from 36 to 45 years (54, 17.31%); more than 45 years (56, 17.94%). Finally, respondent's occupation category shows that most of the respondents (212, 67.95%) out of 312 are professionally attached to a specific job; where total of 75 respondents (24.04%) are students; 12 respondents (3.85%) are housewives and finally only 13 respondents (4.17%) are out of the mentioned category in occupation cluster. After data coding, editing, and screening against outliers and data unfitness, total of 302 responses were used for the purpose of descriptive and inferential analysis.

3.4 Inclusion and exclusion criteria

Table 2 shows that this study considered respondents who are mentally sound, whose age is more than 18, who are male and female in gender and considered peer-reviewed original

Demographic variable		Frequency	Percentage
Gender	Male	162	51.92
	Female	150	48.08
Age (years)	18–25 years old	105	33.65
	26–35 years old	97	31.09
	36–45 years old	54	17.31
	More than 45 years old	56	17.94
Occupation	Student	75	24.04
	Professional	212	67.95
	Housewife	12	3.85
	Others	13	4.17

Source(s): Table by authors

Table 1.
Respondents' profile

Inclusivity of the study	Exclusivity of the study
Considering respondents whose age is more than 18	Ignoring respondents whose age is less than 18
Considering male and female as study respondents	Ignoring common gender as study respondents
Considering railway passengers who are mentally and physically sound	Ignoring railway passengers who are mentally unsound and physically handicapped
Using peer-reviewed originally published research paper for background study	Not using survey paper or unpublished work

Source(s): Table by authors

Table 2.
Inclusion and
exclusion criteria

published papers. Seemingly, this study ignored respondents whose age is less than 18, who are in common gender, who are mentally unsound and physically handicapped and who skipped common survey paper or unpublished work in this domain.

4. Data analysis and results

The present study applies SmartPLS v4 and SPSS v23 to conduct inferential analysis to confirm measurement model's reliability, validity and structural model's hypotheses testing.

4.1 Common method bias test

In order to check out the dataset's readiness for conducting partial least square based structural equation modeling, it's always the very first attempt of scholars to examine the presence of common method bias in the dataset of the present study. This study uses the extensively applied Harman's single factor test (Harman, 1967) to confirm that the dataset is bias-free. The SPSS factor analysis result reveals that the extraction sums of squared loadings of the current dataset are 31.17% which is less than the threshold value. The threshold value of common method bias is less than 50% (Podsakoff, MacKenzie, & Podsakoff, 2012; Malibari and Bajaba, 2022). Therefore, it explores that the dataset is completely bias-free and ready for use toward PLS-SEM.

Meanwhile, this study uses Harman's single factor test to investigate CMB since the dataset of the present study is based on self-administered questionnaire and respondents of exogenous and indigenous variables are same (Muniz, Popadiuk, Batistela, Nakanishi, & Rodriguez, 2022).

4.2 Assessment of measurement model

4.2.1 Cronbach's alpha, composite reliability and convergent validity. Table 3 shows the result of measurement model's assessment of the study. The present study has total of four measurement models along with several indicators. Primarily, the factor loading column

Latent variable and sources	Items	Factor loading	Composite reliability	Average variance extracted	Cronbach's alpha (α)
<i>Perceived Ease of Use (PEU)</i> Davis (1989) and Benzine and Tiar (2022)	PEU1	0.716	0.889	0.622	0.724
	PEU2	0.901			
	PEU4	0.736			
	PEU3	0.712			
<i>Perceived Usefulness (PU)</i> Rafique <i>et al.</i> (2018, 2020)	PU1	0.862	0.821	0.626	0.801
	PU2	0.765			
	PU3	0.712			
	PU4	0.818			
	PU5	0.712			
<i>Technology Trust (TT)</i> Usman (2017) and Usman <i>et al.</i> (2020)	TT1	0.776	0.858	0.623	0.849
	TT2	0.798			
	TT3	0.738			
	TT4	0.810			
	TT5	0.824			
<i>E-Ticketing Usage Intention (ETUI)</i> Benzine and Tiar (2022), Alsamydai (2014) and Huang <i>et al.</i> (2019)	ETUI1	0.846	0.852	0.684	0.843
	ETUI2	0.870			
	ETUI4	0.789			
	ETUI5	0.792			
	ETUI3	0.792			

Table 3.
Factor loadings, CR,
AVE and CA

Source(s): Table by authors

shows how much the indicators of indigenous and exogenous variables are strong enough to confirm validity and reliability of the measurement model. The usual cutoff threshold to discard items from constructs existed between 0.70 and 0.94 (Bagozzi & Yi, 1988; Kacmar and Carlson, 1997) which is applied in this study to keep the stronger indicators. The present study factor analysis explores 0.901 as maximum loading and 0.712 as minimum loading. Indicators including PEU3, PEU5, PU5, ETUI3 and ETUI6 were removed from the final dataset to make it usable for the rest of the statistical analysis. The present study satisfies the threshold criterion to confirm reliability and convergent validity. According to Nunnally (1978) and Hair, Black, Babin, and Anderson (2010), the threshold for Cronbach's alpha and Composite reliability should be higher than 0.70 and all the latent variables of this study explore the Cronbach's alpha ranging from 0.724 to 0.849 and study result regarding composite reliability ranging from 0.821 to 0.889, for both cases actual output exceeds the threshold. This result proves that measurement model has internal consistency reliability. Meanwhile, average variance extracted from all the latent variables confirms the convergent validity since it exists between 0.622 and 0.684 which crosses the threshold value 0.50 (Hair *et al.*, 2013; Demir, 2022; Adu-Gyamfi *et al.*, 2022). The result of AVE reveals that all the indicators in each measurement model follow a unique direction.

4.2.2 Discriminant validity. Present study applies two extensively accepted criteria including Fornell and Larcker criterion and Heterotrait-Monotrait (HTMT) criterion to confirm the constructs' validity. Discriminant validity confirms that all the latent variables employed in the study have a distinction from each other. Meanwhile, discriminant validity previously denoted by the scholar as "the extent to which a construct is empirically distinct from other constructs in the path model" (Sarstedt, Ringle, Smith, Reams, & Hair, 2014, p. 108) might be tested through Fornell and Larcker criterion and HTMT criterion as suggested from Henseler, Ringle, and Sarstedt (2015) which then extensively used to confirm discriminant validity.

4.2.2.1 Fornell and Larcker criterion. Table 4 shows the result of Fornell and Larcker criterion to confirm the discriminant validity of the study. According to Fornell and Larcker criterion, the square root of average variance extracted (AVE) of a latent variable must be higher than the correlation of it with other connected variables (Fornell and Larcker, 1981; Voorhees, Brady, Calantone, & Ramirez, 2016; Nia *et al.*, 2022). The present study reveals that the square root of AVE for ETUI (0.825) is higher than the correlation of ETUI with PEU, EU and TT; the square root of AVE for PEU (0.798) is also higher than its associated correlation with ETUI, PU and TT; therein, the square root of AVE for PU (0.791) crosses the connected correlation of it with other latent variables including ETUI, PEU and TT; finally, the TT's square root of AVE is also larger than its associated correlations with ETUI, PEU and PU as the study's latent variables. So, the explored result of this study confirms the discriminant validity of the measurement model.

4.2.2.2 Heterotrait-Monotrait (HTMT) criterion. HTMT is defined as "the mean value of the item correlations across constructs relative to the (geometric) mean of the average

	ETUI	Gender	PEU	PU	TT
ETUI	0.825				
Gender	-0.012	1			
PEU	0.201	-0.054	0.789		
PU	0.575	0.003	0.025	0.791	
TT	0.574	-0.005	-0.071	0.735	0.79

Note(s): PEU – Perceived Ease of Use; PU – Perceived Usefulness; TT – Technology Trust; ETUI – E-ticketing Usage Intention

Source(s): Table by authors

Table 4.
Fornell and Larcker
criterion

correlations for the items measuring the same construct” (Hair, Risher, Sarstedt, & Ringle, 2019, p. 9).

The result of PLS-SEM as shown in Table 5 confirms the discriminant validity of all constructs since the calculated HTMT values are lower than the suggested threshold at 0.90 (Hair, Hollingsworth, Randolph, & Chong, 2017).

4.3 Assessment of structural model and hypotheses testing

4.3.1 Assessment of structural model with goodness-of-fit indices. Table 6 shows the result of structural model assessment with goodness of fit test to proceed with further analysis. In the case of PLS-SEM, usually Standardized Root Mean Square Residual (SRMR) and Normed Fit Index (NFI) are being focused by the authors. To align with the existing methodology lineup, this study emphasizes on these two criteria to ensure model’s goodness-of-fit test. Table 6 displays that SRMR in saturated model is 0.066 which is less than the threshold 0.10 (Hu and Bentler, 1998; Yew, Kong, Awang, & Yi, 2022); and less than the threshold 0.08 (Sarma, Alam, & Begum, 2022). Meanwhile, the NFI in saturated model is 0.8 that touches the threshold value between 0.8 and 1 (Gunaratne, Lee, & Hitigala Kaluarachilage, 2021). Both of the widely used criteria express that the structural model of this study has goodness of fit.

4.3.2 Hypotheses testing through structural model. PLS-SEM algorithm analytical technique is applied to test the hypothetical paths of the conceptual model based on extended TAM. The latest version of SmartPLS is version 4 that applies here to complete the inferential statistics. Here, Figure 4 displays the output of PLS-SEM analysis to test the hypotheses.

The statistical result of path testing, as shown in Table 7, focuses on Beta value, T-value and P-value of each direct and moderating path of the study model to accept or reject the alternative hypotheses.

	ETUI	Gender	PEU	PU	TT	Gender x PEU	Gender x PU	Gender x TT
ETUI								
Gender	0.042							
PEU	0.225	0.094						
PU	0.683	0.039	0.104					
TT	0.666	0.059	0.130	0.884				
Gender x PEU	0.198	0.005	0.162	0.063	0.055			
Gender x PU	0.119	0.000	0.080	0.074	0.098	0.030		
Gender x TT	0.118	0.000	0.062	0.098	0.119	0.066	0.738	0.059

Table 5. Heterotrait-monotrait ratio (HTMT) – matrix

Note(s): PEU – Perceived Ease of Use; PU – Perceived Usefulness; TT – Technology Trust; ETUI – E-ticketing Usage Intention
Source(s): Table by authors

	Saturated model	Estimated model
SRMR	0.066	0.193
d_ULS	0.676	5.678
d_G	0.251	0.455
Chi-square	450.277	637.987
NFI	0.8	0.716

Table 6. Model fitness

Note(s): SRMR – Standardized Root Mean Square Residual; NFI – Normed Fit Index
Source(s): Table by authors

Railway passengers' E-ticketing usage intention

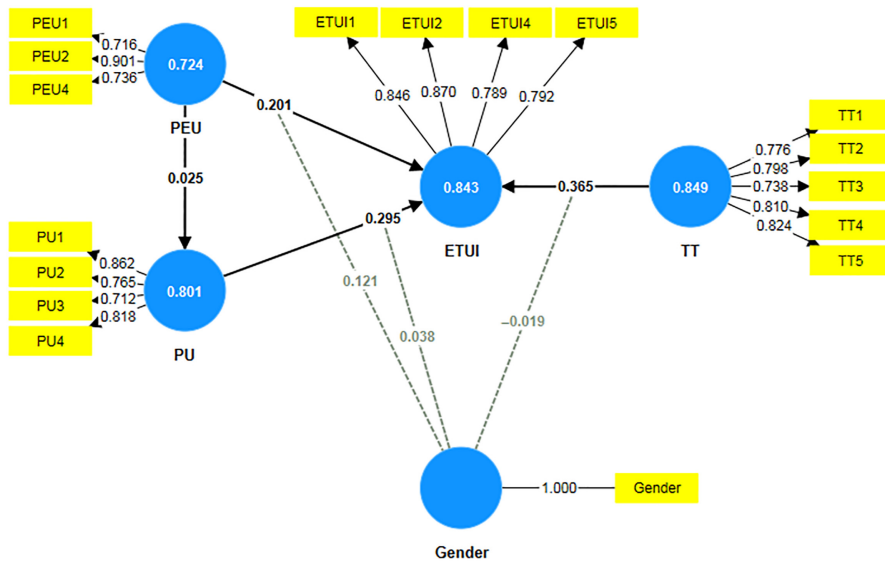


Figure 4. Structural equation model to support hypotheses

Source(s): Figure by authors

Hypotheses	Relationship	Std. Beta	T statistics (o/stdev)	p-values	Decision
H1a	PEU → ETUI	0.201	2.726	0.006	Supported
H1b	PEU → PU	0.025	0.220	0.826	Not Supported
H2	PU → ETUI	0.295	4.200	0.000	Supported
H3	TT → ETUI	0.365	5.802	0.000	Supported
H4a	Gender-PEU → ETUI	0.121	2.011	0.044	Supported
H4b	Gender-PU → ETUI	0.038	0.530	0.596	Supported
H4c	Gender-TT → ETUI	-0.019	0.297	0.766	Not Supported

Note(s): PEU – Perceived Ease of Use; PU – Perceived Usefulness; TT – Technology Trust; ETUI – E-ticketing Usage Intention

Source(s): Table by authors

Table 7. Path testing

The study results show that PEU has a positive but statistically insignificant impact on PU ($\beta: 0.25, T: 0.220, p > 0.05$); but PEU as independent variable has a positive and statistically significant influence on ETUI as dependent variable ($\beta: 0.201, T: 2.726, p < 0.05$); meanwhile, the association between PU and ETUI is positive and statistically significant ($\beta: 0.295, T: 4.200, p < 0.05$); Surprisingly, TT has the strongest positive and statistically significant impact on ETUI ($\beta: 0.365, T: 5.802, p < 0.05$). Therefore, the study results successfully satisfy H1a, H2 and H3 but fail to satisfy H1b in testing the direct connection between endogenous and exogenous variables. The present study also focuses on moderating effect of respondents' gender. In this state, the PLS-SEM results denote that gender fails to moderate the association between PU and ETUI ($\beta: 0.038, T: 0.530, p > 0.05$); and it also fails to moderate the relationship between TT and ETUI ($\beta: -0.019, T: 0.297, p > 0.05$); but respondents' gender successfully moderates the path between PEU and ETUI ($\beta: 0.121, T: 2.011, p < 0.05$). Therefore, the findings support only H4a and H4b but fail to support H4c in the moderation part of this study. Therein, gender of respondents only be able to alter the relationship between PEU and ETUI in this study.

4.3.3 Moderating effect of gender. The present study uses two-way linear interaction method suggested by [Aiken and West \(1991\)](#), [Dawson \(2014\)](#) and [Dawson and Richter \(2006\)](#) to plot the interaction effects of railway passengers' gender on the direct PLS-SEM path between PEU and ETUI. This study mainly shows the moderating graph only for PEU-ETUI path rather than PU-ETUI and TT-ETUI since gender positively and significantly moderates PEU and ETUI. [Figure 5](#) shows that the rapport between PEU and ETUI is stronger for men than women. The moderating graph tells the fact which reveals that perception of hassle-free technology using opportunity sharply directs male passengers toward using E-ticketing rather than female passengers.

5. Discussion and implications

5.1 Discussion of findings

This study mainly investigates the railway passengers' acceptance of online platform-based ticket booking in the context of Bangladesh. Along with this, this study uses an extended form of TAM to support the theoretical foundation. Three independent variables are used to predict railway passengers' ETUI and passengers' gender is considered to know the moderating effect on three direct paths of the study model. The study findings support the previous result in this domain.

The study findings reveal that PEU positively influences ETUI which is supported by the empirical study conducted by [Hong, Choi, Choi, and Joung \(2021\)](#), [Silva, Dias, and Rodrigues \(2022\)](#), [Inthong, Champahom, Jomnonkwo, Chatpattananan, and Ratanavaraha \(2022\)](#) and [Ashour et al. \(2022\)](#). This result clearly denotes that if railway passengers perceive the process of booking train tickets as hassle-free they will accept the E-ticketing and might continue their involvement in online-based ticket booking system. Meanwhile, [Inthong et al. \(2022\)](#) found in their study that the PEU has the strongest impact on the technology users' attitude and intention to accept and adapt with new technology. But, the present study results reveal that the TT is the strongest predictor to determine the passengers' ETUI among all the independent latent variables. And this result is sufficient as evidence to support the previous studies ([Muangmee, Kot, Meekaewkunchorn, Kassakorn, & Khalid, 2021](#); [Zhao and Bacao, 2020](#); [Ashour et al., 2022](#)). Hereby, it can be concluded that when the passengers believe that the E-ticket managing institution is trustworthy to keep its promises, to ensure users' personal details maintaining security and privacy, therefore they will accept the E-ticketing system to travel by train from here to there. On the other hand, PU significantly and positively influences railway passengers' ETUI which was previously

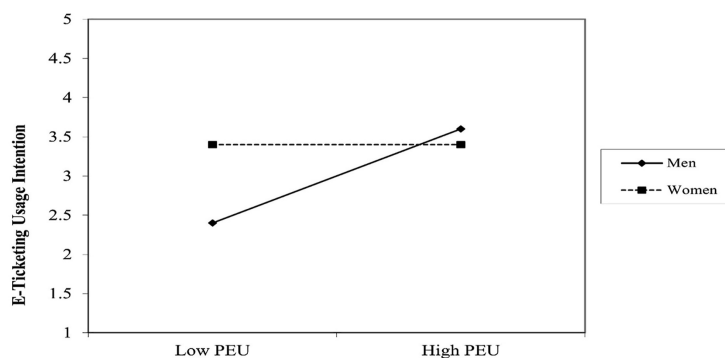


Figure 5.
Moderating impact of
gender on PEU-ETUI

Source(s): Figure by authors

founded (Malik and Annuar, 2021; Aji, Berakon, & Md Husin, 2020). This path testing result evidences that the passengers' perception regarding the advantages of applying technology to buy ticket gets them hooked to express their willingness toward purchasing train ticket via online platforms. But, surprisingly PEU in the present study has a positive but insignificant effect on PU, though previous findings related to this domain say something different and it was a positive and statistically significant connection between PEU and PU (Benzine and Tiar, 2022). PEU has a positive but insignificant impact on PU because of having several reasons in the present study. Firstly, this study excludes factors influencing users' perceptions of the usefulness of the system such as the social environment or individual characteristics of the user. Secondly, the current study model examines the moderation effect of gender on the association between PEU and ETUI and PU and ETUI. In consideration of the above-mentioned reasons, the PLS-SEM path testing result shows a finding that varied a little bit from the existing literature.

So, hereby this mixed result needs further clarification to contribute to the existing literature related to this domain.

The moderating section of the conceptual model reveals that gender as a moderator only moderates the relationship between PEU and ETUI rather than between PU and ETUI as well as TT and ETUI. This result clarifies that the direct effect of passengers' perception about easiness of using technology to enjoy better service from ticket booking system on their intention to use E-ticketing might be deviated from female passengers to male passengers. Wherein the gender issue does not have contribution to alter the influence of both PU and TT on ETUI. Gender of the railway passengers does not moderate the direct impact of PU on the ETUI as well as the direct effect of TT on ETUI because it is possible that the PU of E-ticketing and TT are equally important to both male and female passengers. Meanwhile, other factors such as age, income or travel frequency may be more important in predicting ETUI than gender. That's why the impact of PU and TT on ETUI is similar for both genders.

5.2 Theoretical implication

This study contributes theoretically to the domain with the assistance of extending the original TAM.

The present study applies familiar TAM, as it was applied in the domain IT, which is characterized and extended with few predictors including PEU, PU and TT to predict railway passengers' ETUI where gender is used as a moderator.

Two most unique theoretical contributions of this study include extending the original TAM by incorporating TT as a latent variable and applying passengers' gender as a moderator to investigate its impact on the path between PEU and ETUI, PU and ETUI, and finally TT and ETUI. To the best of the authors' knowledge, no significant study was conducted earlier by incorporating TT and respondents' gender in TAM model together to extend and modify the existing original research paradigm as well as to predict railway passengers' ETUI especially in an emerging economic context.

The present study's theoretical framework uses an extended TAM model which provides a comprehensive framework for understanding the factors that influence users' intentions to adopt and use E-ticketing services. By taking into account the various factors that contribute to users' perceptions of the system, the model can provide insights into how to design and promote E-ticketing systems that are more user-friendly, trustworthy and enjoyable. This can lead to higher adoption rates and more successful implementation of E-ticketing systems in the transportation industry. Rosli, Saleh, Md. Ali, and Abu Bakar (2023) stated that the uses of an extended TAM by incorporating some sorts of individual features of the study respondents to develop theoretical framework of the study accelerate the application of a robust theory in the field of social science research.

Thus, this study has noteworthy theoretical contribution especially in the IT domain which will create opportunity for future re-extension and re-modification of originally developed TAM to ensure more rigorous study.

5.3 Managerial implication

The present study might be helpful and contributory for government and policymakers related to railway services to get actual insights into passengers' actual intention toward accepting E-ticketing system. This study explores that among all the latent variables used in the study model, passengers' TT creates the most powerful impact on their intention to accept and to use E-ticketing services. To the best of the author's understanding and searching over the existing literature, this one might be the first empirical work on IT and extended TAM model which explores that TT is regarded as the most significant predictor toward passengers' ETUL. That's why, the finding suggests Bangladesh railway and concerned authority managing the railway online ticket booking system known as Sohoz.com to consider the passengers' trust issue more seriously. This study also recommends that the authority must develop a secured payment system, convenient passengers' detail information management system; and must ensure hassle-free ticket reservation system, less effort of passengers required at the time of booking seats via online. As well as the authority should create easier and more convenient ticket reservation system for female passengers rather than male passengers.

If this happens, the ticket booking system could satisfy the railway passengers and they will go for online train seat reservation system rather than traditional counter-based ticket purchasing system. Finally, Bangladesh railway would be able to shift into E-ticketing services for its passengers completely and it accelerates the digitalization moto of Bangladesh Government. Along with this, passengers will have full trust and satisfaction in the service provided by the Bangladesh railway that will increase the annual profit of railway and will minimize the pressure over other transportations such as Bus, Lunch and Airlines to travel here from there.

5.3.1 Limitations and future research directions. Usually, academic research has some sorts of limitation. As like other empirical studies related or not related to this domain, the present study shows a few limitations which the researchers should consider for future study. Because of having limited time and no significant funding from any profit or non-profit-making organization for this study, the study area and time were limited to only northern and western parts of Bangladesh. Moreover, this empirical cross-sectional study only applies the TAM model with a little bit extension. In consideration of identified limitations of this work, future rigorous qualitative and quantitative works might be conducted by the scholars in this domain using extended TAM model along with TPB by incorporating passengers' self-efficacy, knowledge on technology, and E-word of mouth about easiness and usefulness of reserving train seats using online platforms. Future studies in this domain may consider other parts of the country as study areas and may try to manage funding to confirm the rigorousness and completeness of the study. All these future endeavors will contribute to the existing literature and assist policymakers so far.

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Appendix

Railway passengers' E-ticketing usage intention

Construct	Item	Wording	Reference
Perceived Ease of Use	PEU1	I find that using the E-ticketing is effortless	Davis (1989) and Benzine and Tiar (2022)
	PEU2	I find that the E-ticketing is clear and understandable	
	PEU3	I think it is easy to learn new technologies using the E-ticketing	
	PEU4	Using the E-ticketing is easy	
	PEU5	I find it easy to enter and modify data using the E-ticketing	
Perceived Usefulness	PU1	I would find E-ticketing useful in my ticket search	Rafique <i>et al.</i> (2018, 2020)
	PU2	Using E-ticketing would enable me to access the train ticket more quickly	
	PU3	Using E-ticketing would make it easier to search railway seat class	
	PU4	Using E-ticketing will enhance my effectiveness in searching relevant train at right time	
	PU5	Using E-ticketing would improve my IT using performance	
Technology Trust	TT1	Institutions that manage E-ticketing will be honest	Usman (2017) and Usman <i>et al.</i> (2020)
	TT2	Institutions that manage E-ticketing will keep promises and obligations	
	TT3	The facilities provided by the institutions that manage E-ticketing are reliable	
	TT4	Institutions that manage E-ticketing provide secure privacy	
	TT5	Information that I provide to E-ticketing managing institution will be used only for ticket reservation purpose	
E-ticketing Usage Intention	UI1	I intend to continue to book train tickets using E-ticketing	Benzine and Tiar (2022), Alsamydai (2014), Huang <i>et al.</i> (2019)
	UI2	I expect that using the E-ticketing will be a regular part of my job in the future to book tickets	
	UI3	I will continue to use the AIS because it is easy and useful	
	UI4	I will recommend others to use	
	UI5	I will continue to use	
	UI6	I will use in the future	

Note(s): * Dropped after the exploratory factor analysis

Source(s): Table by authors

Table A1.
Measurement items

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