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Research article

Airport passengers' adoption behaviour towards self-check-in Kiosk Services: the roles of perceived ease of use, perceived usefulness and need for human interaction

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ABSTRACT

Purpose: The purpose of this paper is to examine the factors influencing passenger adoption and behaviour of self-service technology (SST) in airports. This study adopted the Theory Acceptance Model (TAM) and extended the model by including the need for human interaction (NI) construct in the study framework.

Design/methodology/approach: The research framework is based on the theoretical concepts of SST usage from the inter-disciplinary field. Four hundred two questionnaires were collected from passengers who used the self-check-in kiosks in Kuala Lumpur International Airport (KLIA and KLIA2). The collected data were analysed using the structural equation modelling (SEM) technique.

Findings: Different factors determine passengers' willingness and adoption of SSTs. Perceived ease of use and perceived usefulness significantly affect passenger adoption and behaviour of SSTs in airports. However, the passenger was much comfortable with the SST as the moderating effect of need for human interaction shows a negative result.

Practical implications: The findings contribute to an understanding of how and why passengers use SSTs, which is critical from a customer relationship management (CRM) perspective. Better strategies can be developed to manage and coordinate SSTs delivery in the airport by understanding the passengers' experience from the self-check-in kiosks.

Originality/value: This paper goes beyond the basic SSTs usage and intentions study by highlighting the non-importance of human interaction in SSTs usage specifically by airport passengers.

1. Introduction

Advanced technologies have altered long-standing patterns of a business process, which includes productivity and employment (Brynjolfsson and McAfee, 2014; Tidd and Bessant, 2018). Business processes have been modified, and organisations are now working much more efficiently than ever. At the same time, technology has opened a new way of creating customer value (Johnson et al., 2008; Porter and Kramer, 2019), allowing businesses to communicate and collaborate with customers beyond borders (Bughin et al., 2010; Martincevic and Kozina, 2018). Self-service technology (SST) is a technological interface that enables businesses to provide the best communications to customers when interacting with their respective products and services (Lin and Chang, 2011; Meuter et al., 2000; Shin and Perdue, 2019). SST enables the business operator to produce a service independently without the involvement of a service employee (Lee and Lyu, 2019; Meuter et al., 2000). Furthermore, SST is a proven business model, generating favourable impact towards customer and service provider (Abdelaziz et al., 2010; Bloom, 1976; Drennen and Drennen, 2011; Dabholkar et al., 2003; Kamarudin, 2017; Yang and Klassen, 2008).

The airport can be a very congested and stressful environment with long queues and waiting times. In much the same way as supermarkets have started to introduce technology for customers to scan and pay for their shopping, airports are now finding that a self-service kiosk is a valuable tool in the reduction of queues (Abdelaziz et al., 2010; Seetanah et al., 2018). The SST is allowing more airports to replace flight check-in, baggage check-in and airport car parking processes with automated machines, and drastically improving the experience of air travel as a

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whole. Nearly all airlines have switched to self-service check-in kiosks (Shin and Perdue, 2019). The use of self-service kiosks allows the processing of a significant number of passengers to be decentralised from the airport itself (Protus and Govender, 2016; Seetanah et al., 2018). From the customer point of view, it can speed up the time consuming the service and offer flexibility to the customer as they can access the technology conveniently. While for the service provider, it can reduce the number of service employee and be a competitive advantage towards other organisations.

But are the self-service kiosks actually what the customer wants, and can the self-check-ins actually can ease airport woes? While the kiosk technology has been around for some time, it has still taken the industry a lot of effort in persuading the passengers to use the self-service kiosks (Drennen and Drennen, 2011; Kamarudin, 2017; Yang and Klassen, 2008). The conventional description of service encounter being "high--touch and low-tech" is shifting towards technology-based consumer relationship management (CRM). Moreover, not all customers are willing adopters, and instead, they are customers who value traditional human interaction (Bogicevic et al., 2017; Considine and Cormican, 2016). This study aims to investigate how SST's usefulness and ease of use affect customer usage behaviour based on the perspectives of technology acceptance model (TAM). This study also extends the current TAM through the inclusion of the need for human interaction (NI) as an additional moderating construct.

This paper is structured as follows. Section 2 presents and explains the issue in detail. Section 3 then describes the literature, the study framework and the research hypotheses in detail. The data collection method, analysis, and results are later explained in Sections 4 and 5, respectively. Section 6 discusses the conclusion, limitations of this study as well as future work.

2. Issue

The airport is one of the essential infrastructures, indicating the development level of a country (Fragoudaki and Giokas, 2016; Silva et al., 2017). There are several elements considered important for the development in an airport, namely flexibility, sustainability, revenue-generation opportunities, public transport connection, streamlined passenger processing, technology enhancement and a vast array of amenities (Johnson et al., 2016; Ladki and Bachir, 2018; Martín-Cejas, 2006). The growth of tourism and the benefits it brings would not have been possible without the development of air transportation services (Lohmann et al., 2009; Martín-Cejas, 2006). Moreover, with the increase in the volume in tourist arrivals, the air transportation industry is undergoing a period of rapid evolution, especially in ways to improve passengers' experiences (Johnson et al., 2016). However, various researchers claimed that the excitement of air travel had been replaced by more stressful and unpleasant experiences, resulting from crowded airports, rising passenger numbers and increased security checks (Meuter et al., 2000; Saeid and Macanovic, 2017; Wang et al., 2012). To meet the huge passenger expectation, the airport service providers need to be innovative to satisfy the passengers' needs and expectations (Bogicevic et al., 2017; Otieno and Govender, 2016; Shin and Perdue, 2019).

Passenger's impression of the airport can be affected by their interaction with the service provider. A study by Yang et al. (2015) stated that most of the self-service technology (SST) in the airport does not meet passenger expectation. The passenger has frequently communicated disappointment with innovation or process disappointment, particularly among the individuals who could not acknowledge that they need to traverse a host of self-service activities (Meuter et al., 2000; Saeid and Macanovic, 2017; Wang et al., 2012). Human interaction between service providers and consumers is a pre-requisite for delivering quality services (Lee and Lyu, 2019; Seth et al., 2005; Martín-Cejas, 2006), which, however, was absent during SST usage (Lee, 2017). Currently, with the traveller grasping self-check-in kiosk alone, there is limited human interaction between the service provider and the passenger (Johnson et al., 2016; Lee and Lyu, 2019).

The human touch is still preferred by some market segments and for certain situations (Ku and Chen, 2013; Lee and Lyu, 2019). Airport passenger has frequently communicated disappointment with innovation or process disappointment, particularly among the individuals who could not acknowledge that they need to traverse a host of self-service activities (Demoulin and Djelassi, 2016; Lee, 2017). In the case of Zurich Airport, Wittmer (2011) stated that not all passengers would be satisfied with SST as different demographic profiles have a different level of acceptance towards technology adoption. A study by Chang and Yang (2008) proposed demographic profile of passengers may affect passenger acceptance and usage of SST in airports. Lu et al. (2009) proposes that a self-service provider should focus on the importance of human interaction while using SST, which may affect airport passenger adoption behaviour, satisfaction, and experience. Explicitly, majority of the researchers proposed that the traditional check-in counter with the interaction of service employee is still relevant for airport operation (Demoulin and Djelassi, 2016; Lee, 2017; Mäki and Kokko, 2012; Meuter et al., 2005).

The challenges with any kind of technology acceptance are not the technology itself but the usage among customer; thus, understanding what would encourage the customer to use SST is vital. The passengers are optimistic about adopting the SST because they believe it improves the airline's service delivery (Abdullah, 2012; Lee and Lyu, 2019). With the availability of mobile technologies, passengers have an extra expectation in the airport as the airport can deliver efficient operations and excellent customer service (Bogicevic et al., 2017; Kamarudin, 2017; Protus and Govender, 2016). This research is developed with the assumption that the inclusion of human interaction in the SST service process would enhance consumer usage and their overall airport experience.

3. Literature and hypotheses development

The implementation of self-service technology (SST) in an organisation gives advantages and disadvantages to the organisation and the customer itself. The benefits of using SST are less time in consuming the service and can reduce the number of service employees while the disadvantages of SST include lack human interaction and the possibility of SST machine breakdown. In the context of customer services, Oh et al., 2013 stated that customer adoption and behaviour of technology are essential aspects in determining satisfaction. To add, Kashik et al. (2015) also agree in the study that adoption behaviour is vital in SST. Positive adoption and behaviour will lead to customer satisfaction, thus can improve the service quality of any business establishments. In a study by Kaur Sahi and Gupta (2013), the customer has a positive attitude towards SST if it is convenient, easy to use and safe (privacy). However, SST can be challenging for managers (Wang et al., 2012; Lee and Lyu, 2019) as they need to understand customer preferences in accepting and using the self-service facilities.

The Theory of Acceptance Model (TAM) has been widely used to test users' acceptance and usage of technology. It is also to identify the factor that expedites the use of technology and how users react towards the adoption of technology (Lindsay et al., 2011). There are two main determinants of Theory Acceptance Model (TAM), which are perceived usefulness (PU) and perceived ease of use (PEOU). TAM has been an instrument for various empirical studies and meta-analysis and has been widely used in many studies (King and He, 2006; Lee, 2017; Lindsay et al., 2011). Similarly, researchers claimed that understanding the assumptions, strengths, and limitations of the TAM is crucial to those who are interested in researching the human interaction with technology, especially in business perspectives (Lee et al., 2003; Lee, 2017).

Perceived ease of use (PEOU) is the degree to which a person believes that using particular systems would be free from the effort (Davis et al.,

1989). As in the study by Gefen and Straub (2000), it shows a significant effect of both PEOU and PU in hypothesis three of a study in e-commerce adoption. Furthermore, Legris et al. (2003) in their study, also show the significant effect between PEOU and PU. Another study by Amin et al. (2014) claimed that perceived ease of use demonstrates a positive relationship between PEOU and customer satisfaction on the mobile website. In agreement with the past study, Chen et al. (2014) also show that PEOU is a strong determinant of PU in the adoption of technological products. Furthermore, perceived ease of use perceived usefulness and perceived behavioural control show a significant effect on the intention to use SST, thus leading to the actual use of SST (Demoulin and Djelassi, 2016; Shin and Perdue, 2019).

On the other hand, perceived usefulness (PU) assess the degree to which a person believes that using a particular system would enhance his or her job performance (Davis et al., 1989). It is another main predictor of customer behaviour of TAM. According to Patel and Patel (2018), there is a significant positive effect between PU and adoption and behaviour of internet banking services. Other than that, Alalwan et al. (2016) also claimed that adoption and behaviour in mobile banking have a significant effect on PU. In line with the previous study, Marakarkandy et al. (2017) also agree both variables (PEOU and PU) have significant impact on technology-based services. To add, results from a study by Alalwan et al. (2016) also show significant results between PEOU and PU on technology adoption and behaviour. The PEOU and PU show a significant effect on the usage of SST (Demoulin and Djelassi, 2016). Therefore, it is hypothesised that:

H_1: Perceived Ease of Use (PEOU) influence Perceived Usefulness (PU) of SST;

H_2: Perceived Ease of Use (PEOU) influence passenger adoption and behaviour of SST;

H_3: Perceived Usefulness (PU) influence passenger adoption and behaviour of SST.

Need for human interaction is personalised relationship between customer and service employee that provides direct services, which may enhance the customer experience. In term of the need for human interactions during customer's engagement with SST, past literature shows both direct and indirect influences of the need for human interaction on passenger intention towards SST adoption (Lee and Lyu, 2019; Lin and Chang, 2011; Martín-Cejas, 2006; Meuter et al., 2005). Also, Kaushik and Rahman (2017) proposed that there is the significance of the need for human interaction towards SSTs while other researchers suggested significant effects of NI on task uncertainty and perceived efforts in using SSTs (Alalwan et al., 2016; Lee, 2017; Lee and Lyu, 2019). Mäki and Kokko (2012), on the other hand, proposed that personal service will enhance customer adoption and behaviour of SSTs. As supported by a study by Demoulin and Djelassi (2016), without the need for human interaction, there will be a decrease in self-service behavioural intention. Based on the above arguments, three hypotheses were developed:

H_4: Need for human interaction (NOI) affect passenger adoption and behaviour of SST.

H_{5a}: Need for human interaction (NOI) moderates the relationship between Perceived Ease of Use (PEOU) and passenger adoption and behaviour of SST.

H_{5b}: Need for human interaction (NOI) moderates the relationship between Perceived Usefulness (PU) and passenger adoption and behaviour of SST.

This paper proposes and tests a research framework of technology acceptance and usage of SST based on the modified TAM with the inclusion of the need for human interaction as moderator. The proposed research framework is illustrated in Figure 1 based on the justification of the hypothesised relationships considering the previous findings from the literature as per discussed above.

Sources: Davis et al. (1989); Demoulin and Djelassi (2016); Dabholkar (1996).

The research framework extends the TAM through the inclusion of the need for human interaction as an additional predictor in the relationship between PEOU and PU and adoption and behaviour of SST. The measurements of TAM were adopted from Davis et al. (1989) and Demoulin and Djelassi (2016). Meanwhile, the measurement for the need for human interaction (NOI) was adopted from Dabholkar (1996) and Lee (2017).

4. Methodology

The research goal of this study was to investigate how perceived ease of use (PEOU), perceived usefulness (PU), and the need for human interaction (NOI) affect the usage intention and subsequent behaviour in the SSTs. The study objectives and the nature of the study were being brought all together in identifying the best method possible before the field study. This study is conducted in a non-contrived setting with minimal interferences of the researcher. A quantitative approach is suitable for data collection method as the researcher conducted the analysis based on actual respondent opinion.

This paper looks at the passenger perception of using the self-check-in kiosk in Kuala Lumpur International Airport (KLIA) and Kuala Lumpur International Airport 2 (KLIA2). Both are the two main airports in Malaysia. As this is a cross-sectional study, the constructs and their relationships used within the research framework were developed and validated based on the TAM theories by Davis et al. (1989), Demoulin and Djelassi (2016), and Dabholkar (1996). The population for this study is air passengers who travel inbound and outbound via the KLIA and KLIA2, and specifically check-in through the self-service kiosk. The sampling technique used in this study is purposive sampling. Thus, only

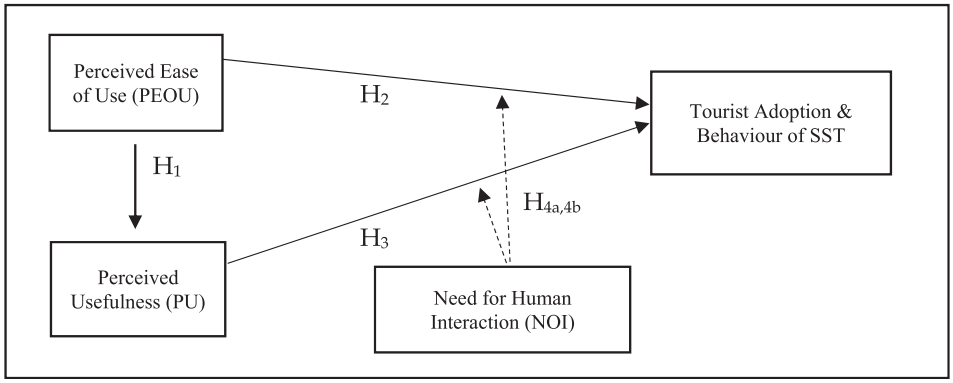

Figure 1. Research framework. Sources: Davis et al. (1989); Demoulin and Djelassi (2016); Dabholkar (1996)

passengers who use the SST system during check-in were selected and approached. As KLIA and KLIA2 handle millions of passengers every year, the required minimum sample size, according to Krecjie and Morgan (1970) is 384 respondents.

Ethics approval was not required for this study as per applicable institutional guidelines and Personal Data Protection Act 2010 of Malaysia. Brief information regarding the study was provided to the respondents prior to data collection, including a description of question characteristics and time required to complete the questionnaire. The respondents need to accept this statement and was treated as a receipt of consent.

4.1. Instruments

The questionnaire is divided into four sections. For section A, the respondents need to answer a specific screening question: Did you used the self-service kiosk? If the respondent answers yes, he or she would proceed with answering the rest of the questionnaire. The purpose of the screening question is to make sure the researcher acquires a suitable respondent to answer the survey. For section B, passengers were asked about their perception of SST services offered in KLIA and KLIA2. The measurements of TAM were adopted from Davis et al. (1989) and Demoulin and Djelassi (2016). Meanwhile, the measurement for the need for human interaction (NOI) was adopted from Dabholkar (1996) and Lee (2017). For section C, the passengers were asked about the attitude and behaviour regarding SST. In the last section, the passengers were queried about their demographic profile (gender, age, occupation and income level).

This study employs a 7-point Likert scale for the survey instruments. Respondents were required to respond to indicate a degree of agreement or disagreement with each of the series of statements about the stimulus objects. Each number represents an agreement, which is 1- strongly disagree, 2- disagree, 3- somewhat disagree, 4- neutral, 5- somewhat agree, 6- agree and 7 – strongly agree. Also, the demographics were measured on a nominal and ordinal scale. The instrument was administered in English. Prior to actual data collection, this study applied face validity to a group of experts to appraise the appropriateness of the survey instrument. The validity test is used to ascertain whether the items in the questionnaire were clear and acceptable as well as to refine the procedures pertaining to instrument administration. Based on their feedback, no items were eliminated as the survey instruments are understandable and accordingly with the research objectives.

4.2. Data collection

The survey questionnaires were self-distributed and collected by the researchers at KLIA and KLIA2. Participation was voluntary. A total of 500 self-administered questionnaires were distributed at KLIA and KLIA2, and the number of returned and completed questionnaires was 402, indicating a healthy 80.4% response rate. The descriptive statistic which looking at the mean score and standard deviation as explanatory of each item in the dimension will then be applied. Next, this study adopted the covariance based-structural equation modelling (SEM) technique to test the hypotheses via the Social Science Software (SPSS) AMOS versions 22.

5. Results

5.1. Descriptive analysis

A total of 402 participants took part in the study. The results are based on the quantitative information obtained through questionnaire surveyed with the KLIA and KLIA2 passengers. Table 1 presents the demographic characteristics of the respondents.

Table 1 presents the overall respondents' profiles. Majority of the respondents are females (n = 231; 57.5%) with only 171 male respondents was surveyed (n = 171; 42.5%). Meanwhile, the descriptive statistics also showed that most of the respondents are young, with age between 25-34 years old (n = 247; 61.4%). However, no response was obtained from the mature respondent (age above 60 years old), which was as per expected. This may happen because older adults are not ready to use the SST, and they much preferred to interact with people. The young travellers somewhat preferred self-check-in kiosks, and the older age groups were quite uninterested about self-check-in kiosks. Next, most of the respondents are employed (n = 294; 73.1) while the unemployed records the fewest response (n = 2; 0.5). Lastly, most respondents have an income level between RM1001 to RM3000 (n = 132; 32.8), justified with the young age group surveyed in this study. Table 2 reports the descriptive report (mean score) for PEOU, PU, NOI and passenger adoption and behaviour.

Table 1. Demographic profiles.

Demographic characteristics		Frequency	Percentage
Gender	Male	171	42.5
	Female	231	57.5
Age	18–24 years old	80	19.9
	25–34 years old	247	61.4
	35–44 years old	54	13.4
	45–60 years old	21	5.2
Occupation	Student	106	26.4
	Employed	294	73.1
	Unemployed	2	.5
Income	Less than RM1000	111	27.6
	RM1001-RM3000	132	32.8
	RM3001-RM5000	105	26.1
	More than RM5000	54	13.4

N = 402.

Based on the table above, the study sample showed a high passenger perception towards the PEOU (M = 5.56) and PU of the SST (M = 5.36). Majority of the respondents agree that it is easy to use the self-check-in kiosk and highly perceived the usefulness of the SST in their travelling experience. Also, the respondents were found to be inclined towards the need for human interaction (M = 5.32), which then affect their SST adoption and behaviour (M = 5.45). Most of the respondents believe that the human interaction between service employee and passengers is important to facilitate the service delivery of self-check-in kiosk in KLIA and KLIA2. The respondents also were satisfied with their experience with the self-check-in kiosk and will favour adopting similar services in their future travel plan.

The next step of the data analysis is to examine the hypothesised model. The authors opt for CB-SEM as it is an appropriate method as it possessed the ability to show how well a theoretical model fits the observed data (Hair et al., 2010). First, the measurement model evaluation will be discussed, followed by the structural model evaluation. Issues related to unidimensionality, reliability and validity for all the constructs used were also discussed.

Table 2. Mean score for perceived ease of use and perceived usefulness.

Construct	N	No. of items	Mean	Cronbach Alpha
Perceived Ease of Use (PEOU)	402	4	5.56	.941
Perceived Usefulness (PU)	402	3	5.36	.941
Need for Human Interaction (NOI)	402	4	5.32	.907
Passenger Adoption and Behaviour (BTA)	402	3	5.45	.914

Note: Likert Scale (1: strongly disagree, 2: disagree, 3: somewhat disagree, 4: neutral, 5: somewhat agree, 6: agree and 7: strongly agree).

5.2. Measurement model evaluation

This section explains the measurement model evaluation procedures to provide a confirmatory test of the measurement scale using the goodness of fit measures. In confirming that the data fits a specified model structure, the measurement models were evaluated by testing the overall model fit which include Chi-Square test of "Goodness-of-Fit" (GOF), Chi-Square/df ratio, Root Mean Square Error Approximation Index (RMSEA), Adjusted Goodness of Fit Index (AGFI) and Comparative Fit Index (CFI). In addition to the GOF, the convergent validity and reliability of the survey instruments were also assessed. The construct's scale was examined to ensure that all factor loading is high where the loadings should be at least 0.6 and ideally at 0.7. Finally, the Average Variance Extracted (AVE) was also calculated to check on whether convergent validity existed. A rule of thumb was used to suggest adequate convergence where AVE should be higher than 0.50 (Hair et al., 2010). Worth noting here that both composite reliability and AVE were calculated manually based on the output from SPSS AMOS since the software itself did not provide the values directly. Figure 2 depicts the output of the measurement model.

In addition, Table 3 reports the results of the measurement model. The table reports that all standardised loadings in the measurement model are higher than 0.7 that indicate the confirmation for unidimensionality and convergent validity (Anderson and Gerbing, 1988; Hair et al., 2010). Also, the overall value of composite reliability (>.70) and AVE (>.50) are satisfactorily high hence further validating that the existence of convergent validity (Hair et al., 2010). Table 3 shows the result of the measurement model assessment (see Table 4).

The GOF (Table 3) measure based on the fit indices' threshold as per Hair et al. (2010) suggests that most of the indexes were acceptable (x^2 = 225.852, x^2/df = 3.181, RMR = .046, CFI = .970, RMSEA = 0.073). The unidimensionality of each factor is evident where all the measured items' factor loadings were greater than 0.70, except for PU4, which was removed from the model. These factor loadings indicate that the convergent validity was obtained. The instruments were reliable based on their composite reliability score, which is significantly higher than the minimum acceptable level of 0.60, as suggested by Bagozzi and Yi (1988). The AVE outcome will conclude this section, and the AVE of 0.50 or higher is a good rule of thumb to suggest adequate convergence (Hair et al., 2010), thus sum up that convergent validity existed. As a conclusion, the measurement model exhibits strong indication of unidimensionality, convergent validity and reliability; thus, it can proceed to the structural model evaluation.

Table 3. Measurement model Goodness-of-Fit.

Overall Goodness-of-Fit Indices	Measurement model
x^2	225.852
Degree of Freedom	71
p	.000
$x^{2/}$df	3.181
RMR	.046
GFI	.924
AGFI	.888
IFI	.971
CFI	.970
RMSEA	.073

5.3. Structural model analysis

The relationships between constructs were tested after the validity and reliability of the measurement model had been established. To meet the purpose of the structural model evaluation, the hypothesised study

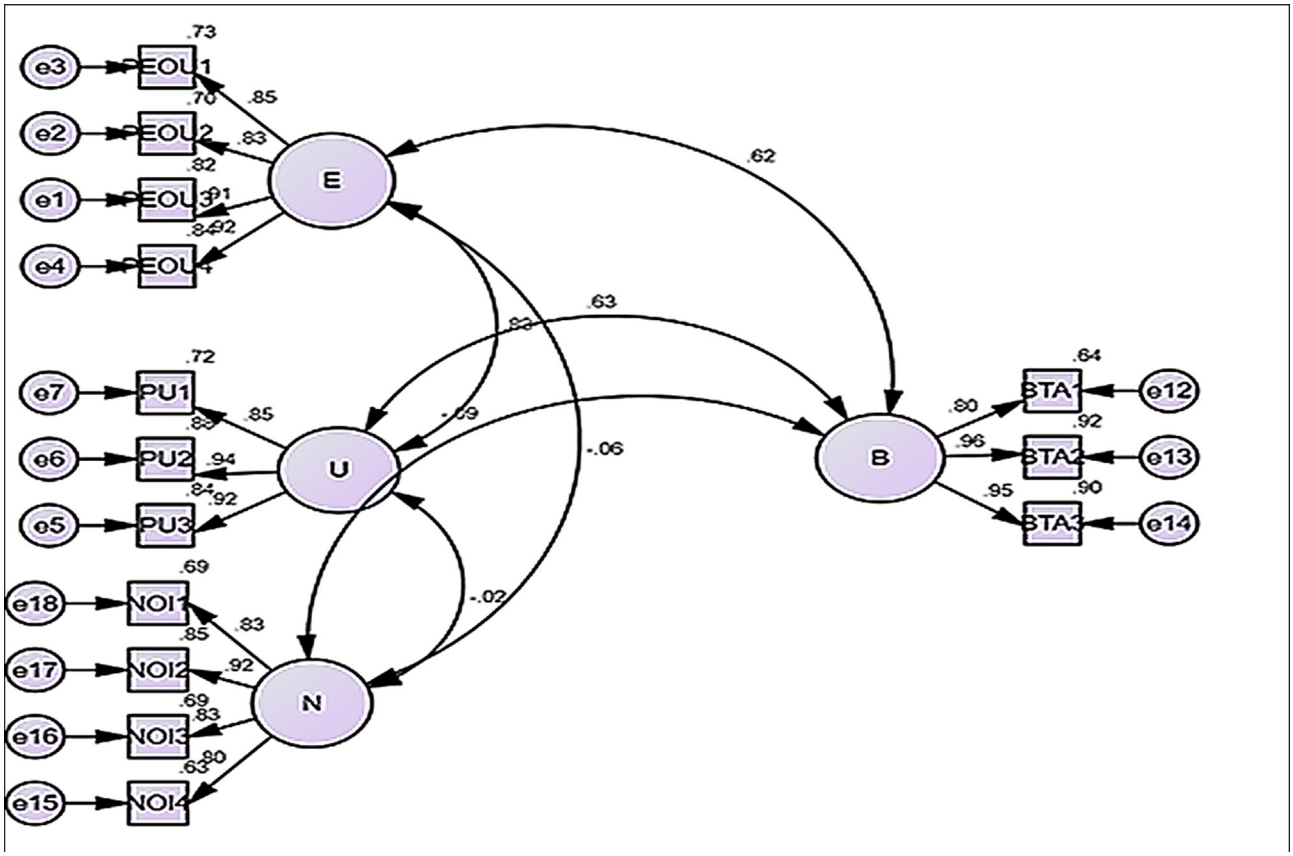

Figure 2. Measurement model.

Table 4. Measurement model assessment.

Code	Items	Loading	Composite Reliability	AVE
Perceived Ease of Use				
PEOU3	I would find it easy to get the information I need from the self-check-in kiosk.	.875	.931	.772
PEOU4	The self-check-in kiosk instructions are clear and understandable	.868		
PEOU1	It is easy to understand how the self-check-in kiosk works	.818		
PEOU2	Interacting with the self-check-in kiosk does not require a lot of my mental effort	.797		
Perceived Usefulness				
PU2	The self-check-in kiosk enhances my effectiveness in completing the check-in process.	.840	.929	.814
PU3	The self-check-in kiosk speed up my check-in	.827		
PU1	The self-check-in kiosk allows me to easily check-in at the airport	.776		
PU4	*The self-check-in kiosk enhance my trip efficiency (removed)*	*.566*		
Need for Human Interaction				
NOI2	I like interacting with a real person that provides the service	.917	.909	.715
NOI3	Personalise attention by the service employee is important to me	.879		
NOI1	Having human contact in providing services makes the process enjoyable for the customer	.876		
NOI4	My self-check-in kiosk experience will be much better with the help from a real person.	.858		
Passenger Adoption and Behaviour				
BTA2	I plan to use the self-check-in kiosk in the future	.896	.933	.823
BTA3	The likelihood that I would recommend the self-check-in kiosk to a friend is high	.874		
BTA1	I usually use the self-check-in kiosk	.792		

model with its structural paths were evaluated as illustrated in Figure 3. In this evaluation, the model fit and the significance of the hypothesised paths in the directional model were reported.

The model fit summary for the final measurement, and structural model (Table 5) reported that most of the indexes were acceptable (x^2 = 225.852, x^2/df = 3.181, RMR = .046, CFI = .970, RMSEA = 0.073) and based accordingly with the fit indices' threshold as per Hair et al. (2010). The structural model would only be supported when it shows a good fit and all the hypothesised paths are significant or supported. The significance of the hypothesized paths was presented in Table 5 below (see Table 6).

Based on the table above, the path analysis confirms: i) perceived ease of use (PEOU) significantly influence perceived usefulness (PU) of SST (β = .775***); ii) perceived ease of use (PEOU) significantly influence passenger adoption and behaviour of SST (β = .347***) and; iii) perceived usefulness (PU) significantly influence passenger adoption and behaviour of SST (β = .490***). This result is in line with previous studies findings. The SST services, especially the self-check-in kiosk and bag drop kiosk, helps passenger free from extra effort during the check-in and bag drop process, and it enhances their trip experience (Amin et al., 2014; Liu, 2014; Nasser Al-Suqri, 2014; Chen et al., 2014). To add, Kashik et al. (2015) and Otieno and Govender (2016) also agree that passenger adoption behaviour of SST depends on the complexion and the usefulness of the system. This suggests that the ease of use of the self-check-in kiosk experience and the degree in which the passengers are satisfied with the usefulness of the self-check-in kiosk are imperative in predicting the passenger adoption and behaviour of SST (Wang, 2012; Izuagbe and Popoola, 2017).

However, this study found that the need for human interaction does not significantly affect passenger adoption and behaviour (β = -.083). The result contradicts with past research, in which the need for human interaction shows positive and significant impact towards passenger behaviour (Kaushik and Rahman, 2017; Lee, 2017; Lee and Lyu, 2019; Mäki and Kokko, 2012; Demoulin and Djelassi, 2016). The young age distribution of this study may be the main reason of such result as they prefer to use technology independently with limited human interaction (Lee, 2017). Meanwhile, those in favours with the need for human interaction could be the grey passengers (those aged 45 and over), in which they would prefer interpersonal interactions with airport employees.

The final hypotheses are to investigate i) the moderating effect of the need for human interaction (NOI) on the relationship between PEOU and passenger adoption and behaviour of SST, and ii) the moderating effect of the need for human interaction (NOI) on the relationship between PU and passenger adoption and behaviour of SST. In this analysis, the predictors are PEOU and PU as the independent variable and NOI as a mediator, while the dependent variable is passenger adoption and behaviour (BTA) of SST. Moderated regression analysis, as the recommended method for testing interaction effects were used as per proposed by Cohen et al. (2013). The results of the hierarchical analysis using multiple regression analysis were exhibited in Table 7.

The moderating effects were calculated using multiple hierarchical linear regressions whereby main effects are presented in the first step and interactions in the second step. Looking at Model 1 (H_{5a}), PEOU can explain 35.8 per cent (R^2 = .358; F-change = 223.33***; p < .001) of the variation in the passenger adoption and behaviour of SST dimension. The beta value (β = .599***; p < .000) demonstrated that PEOU possessed a significant impact on passenger adoption and behaviour of SST. Similarly, Model 1 (H_{5b}) proved that PU could explain 35.4 per cent (R^2 = .354; F-change = 219.37***; p < .001) of the variation in the passenger adoption and behaviour of SST dimension. The beta value (β = .595***; p < .000) demonstrated that PU possessed a significant impact on passenger adoption and behaviour of SST.

In the second step of hierarchical multiple regression (Model 2), the need for human interaction (noi) construct was entered the moderating variable to influence the passenger adoption and behaviour of SST. Based on the Model 2 (H_{5a}), PEOU and NOI can explain 36.3 per cent (R^2 = .363; F-change = 113.487***; p < .001) of the variation in the passenger adoption and behaviour of SST dimension. The beta value for NOI (β = -0.066; p > .000) demonstrated that the need for human interaction possessed an insignificant impact on passenger adoption and behavioural intention towards SST. Moreover, the inclusion of the need for human interaction did not enhance the variance explained between PEOU and the behavioural intention (R^2 Change = 0.5%). Meanwhile, Model 2 (H_{5b}) confirms that PU and NOI can explain 35.3 per cent (R^2 = .353; F-change = 113.883***; p < .001) of the variation in the passenger adoption and behaviour of SST dimension. The beta value for NOI (β = -0.096; p > .000) demonstrated that the need for human interaction possessed an insignificant impact on passenger adoption and behavioural intention towards SST. Moreover, the inclusion of NOI did not enhance the variance explained between PU and the behavioural intention (R^2 Change = -0.1%). Hence, H_{5a} and H_{5b} are rejected.

To be more specific, the need for human interaction with airport employees did not affect passenger adoption and behaviour of SST when passengers prefer the self-check-in kiosk highly because of their ease of use and practicality. This result might depend on the age of travellers, and it could be hypothesised that older travellers are more reluctant to use, and place less trust in, new technologies (Wittmer, 2011). Similarly, Castillo-Manzano and López-Valpuesta (2013) postulated that older travellers are more reluctant to use and place less trust in new technologies. Thus, if airports continue to employ self-check-in kiosks or intend to employ more SSTs, they should ensure the self-check-in kiosk provide prompt service in an error-free manner. Nonetheless, airports should deploy their employees (with minimal supervision) to the self-check-in kiosk lanes so that any time delays could be handled by them immediately.

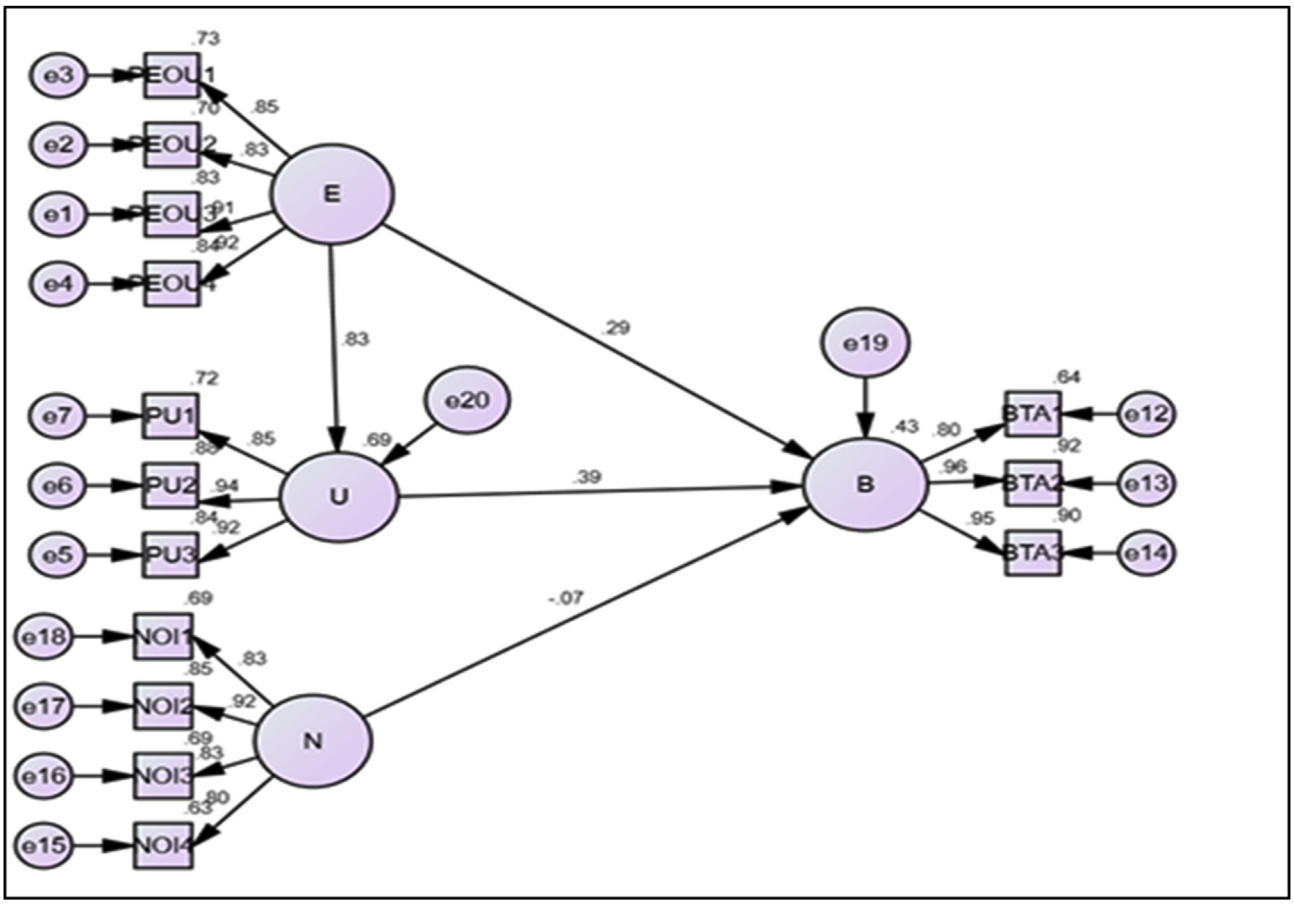

Figure 3. Structural model.

Table 5. Model fit summary for the final measurement and structural model.

Overall Goodness-of-Fit Indices	Measurement model	Structural model	Recommended value by Hair et al. (2010)
x^2	225.852	227.915	P < .05
Degree of Freedom	71	73	
p	.000	.000	P < .05
$x^{2/}$df	3.181	3.122	<5
RMR	.046	.053	<.10
GFI	.924	.923	>.90
AGFI	.888	.890	>.80
IFI	.971	.971	>.90
CFI	.970	.970	>.90
RMSEA	.073	.072	<.08

6. Conclusion

The contributions of this study to SSTs research are threefold. First, the study findings show that perceived usefulness and ease of use are both positively associated with attitude toward SST use. The results present conclusive evidence that perceived ease of use (PEOU) significantly affect consumers' perception towards SSTs' perceived usefulness. In addition, this study implies that during SSTs adoption, airport users rely more upon SSTs' perceived usefulness rather than perceived ease-of-use. Based on the findings, airport management should offer a much simple, useful and easy to use SSTs to the airport passengers as these will lead towards a much favourable attitude in using the SSTs.

Table 6. Path analysis results.

	Hypothesis	Effect type	Estimate	C.R.	P	Result
H_1	Perceived Ease of Use (PEOU) influence Perceived Usefulness (PU) of SST	Direct effect	.775	17.438	***	Significant
H_2	Perceived Ease of Use (PEOU) influence passenger adoption and behaviour of SST	Direct effect	.347	3.470	***	Significant
H_3	Perceived Usefulness (PU) influence passenger adoption and behaviour of SST	Direct effect	.490	4.514	***	Significant
H_4	Need for human interaction (NOI) affect passenger adoption and behaviour of SST	Direct effect	-.083	-1.600	.110	Not Significant

Note: *p < .05, **p < .01, ***p < .001.

Table 7. Results of hierarchical analysis.

Variables	H_{5a} PEOU– > NOI– > BTA		H_{5b} PU– > NOI– > BTA	
Dependent Variable: passenger adoption and behaviour of SST	Model 1 Std. β	Model 2 Std. β	Model 1 Std. β	Model 2 Std. β
Step 1: Independent Variable (IV)	.599***		.595***	
Step 2: Need for Human Interaction (MV) Independent Variable (IV)		592*** -.066		.591*** -.096
R^2	.358	.363	.354	.353
Adj. R^2	.357	.359	.353	.360
R^2 Change	-	.005	-	-.001
F-Change	223.33***	113.48***	219.37***	113.88***

Note: *p < .05, **p < .01, ***p < .001.

Second, this study highlighted that previous researcher had proposed future studies to include need for human interaction construct in TAM model without taking into consideration the case of generational differences in technology adoption and usage. This study argues on how generational (X, Y, Z, Millenials) differences may influence the acceptance and usage of innovative technologies. From the theoretical perspective, the findings from this study can help any academic institutions, specifically in hotel and tourism industry field to see through better views on the adoption of SST by passengers in airports and the passenger preferences in terms of service experience, either via SST or through the service employee.

Third, this paper provides new information with a more precise, current perspectives, especially on the exclusion of need for human interaction in SST adoption. This study expands the Theory Acceptance Model (TAM) by adding a moderating variable, the need for human interaction. Specifically, this study integrated the role of need for human interaction construct into the TAM, more comprehensively exploring whether having human interaction at the self-service kiosk would enhance the traveller's airport experience and satisfaction. This study verified and tested its impact and discover that need for human interaction is not important in traveller's airport experience and satisfaction. However, airport management should ensure their employees should monitor the self-check-in kiosk lanes so that any delays or issues could be handled by them immediately.

From the practical perspective, the findings from this study help the related organisation focus on the tourism industry to better understand the current passenger trends and to make them feel satisfied using provided SST. This study may also create awareness of the potential benefits of the SST, particularly in the airport. With the advancement of technology, service is shifting from people to machines. Thus, the service provider needs to understand the needs and wants of passengers for them have the intention to use the SST and feel satisfied using them. The researchers hope that this study proposed framework and findings will catalyze researchers to better understand and be prepared for the technology-infused frontline experience in the future.

This study is far not from certain limitation. The first limitation of the study is biased regarding age distribution. The majority of the respondents' is quite young (between 18-34 years old) as it covers 81.3% of the total respondents. Acceptance of new technologies varies between age groups, and younger generations adapt more quickly to modern technological methods than older generations. Non-User behaviour is the key to determine whether need for human interaction is still needed when dealing with SST. The observed trends toward encouraging customer adoption of SST in airports around the world merit understanding non-user perceptions, as these customers may exhibit differences in the expectation that would inform recovery strategy upon their expected future adoption of the self-check-in kiosk.

Another limitation of this study is the setting of the research, which only takes place in the departure area of KLIA and KLIA2. The passengers who used the self-service kiosk, might in a hurry to catch their flight. The reluctance of passengers to complete the questionnaire, especially international passengers, can be one of the reasons the results from the survey are biased and show current experience and situation of using SST. Thus, the future researcher should expand the scope of and employ mix methods to understand passengers behaviour better.

Successful customer service is about knowing what customers expect from the interaction. If the SST service transaction is well managed, it can be as successful as human-based service if not better. Implementing SST can also minimise the occurrence of service failure. The traditional method of service delivery in an airport is absolute; as it can lead to unsolicited employee action and long queues. However, if customers are forced to use SSTs without other options available, it can result in negative impacts. The researchers believe that an ideal service encounter is when the customer can decide whether to adopt self-service or interpersonal service.

Declarations

Author contribution statement

Nursyuhada Taufik: Conceived and designed the experiments; Performed the experiments; Wrote the paper.

Mohd Hafiz Hanafiah: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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