

Customer-Value Creation in Self-service Technologies (SSTs) in the Tourism Industry

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This paper explores and validates the process of customer value creation in self-service technologies (SSTs) in the context of the tourism industry. As the self-technology has been gradually advanced, its adoption in the tourism industry has brought many changes. A new trend of self-service technologies has helped service firms to save the labor costs and customers' waiting time for transactions. The purpose of this study is to confirm an applicability and a design of the original model of SSTs and explore the connection between SSTs and creation of value perception through a confirmatory factor analysis in the context of the tourism industry. Furthermore, the results of the online survey questionnaire from 234 responses in the United States and South Korea are explained in this study. The results of this study concluded that five statistically important factors are related to customers' motivations to use SSTs and enable customers to interact with SSTs as "SST location and capacity planning", "SST service quality", "motivations to use SST", "SST design", and "SST encounter". These factors may imply an important meaning to better understand about customer value during the adoption of SSTs in the tourism industry. Tourism firms may use the results of this study to effectively enhance how customers perceive value about their products and services during the usage of SSTs. This will help tourism firms' efficiencies on the adoption of SSTs for their business plans and help them remain profitable in the competitive market.

Keywords: self-service technologies (SSTs), customer value, customer satisfaction, tourism industry, confirmatory factor analysis

Introduction

SSTs are "a technological interface that enables customers to produce a service independent of direct service employee involvement" (Meuter, Ostrom, Roundtree, & Bitner, 2000, p. 50). SSTs can be used in the areas of monetary transactions, automated check-in, and companies' services over the internet. SSTs also have been adopted in many industries, such as banks, airlines, restaurants, theme parks, etc. This change has affected on how firms manage their transactions and procedures with customers. Particularly, the use of self-service technologies (SSTs) has emerged as a new trend that enables retailers to use fewer human labors, an improved efficiency of work, enhanced service quality, and attraction of new customers who prefer less in-person services (Lee & Lyu, 2016).

The use of SSTs has been adopted in the tourism industry, such as hotel check-in and airline check-in

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through kiosks or mobile applications. SSTs have been a great tool to reduce labor costs and to increase a productivity of employees as SSTs help minimize human interactions between employees and customers (Castillo-Manzano & López-Valpuesta, 2013). Also, SSTs are a time-saving process and is much convenient for customers to use without going through each of human-related procedures in customer services. While customers use SSTs, they could derive positive feelings such as empowerment, accomplishment, and pleasure as well (Reinders, Buhalis, Moital, & Gouthro, 2015). Ho and Ko (2008) discussed that when customers are aware of that they have an ability to perform the self-services without such efforts, it enhances self-esteem, which can be turned out as pleasure. Also, SSTs provide customers flexibility and freedom to make transactions on their own. This helps customers to get accomplishment to finish their works on a personal level.

Since the adoption of SSTs in the tourism industry could be an effective tool to deliver many benefits, tourism firms may need to focus on how to utilize SSTs to provide better services for customers. SSTs in the tourism industry can provide much faster services to customers through helping to reduce human transactions. Iqbal, Hassan, and Habibah (2018) mentioned that SSTs in services could allow customers to choose their convenient time to use services and reduce any unneeded delays with service providers. Therefore, it provides opportunities for customers to better perceive values in company's products and services. When customers recognize any benefits that are involved with firms' products or services, they are more likely to generate positive reviews about the firms to remain loyal to the firms (Roeffen & Scholl-Grissemann, 2016). Thus, encouraging customers to perceive value from services and products is a key role to the tourism firms to be profitable and be competitive in the market.

Many scholars have focused on identifying factors that could affect customers' intentions to use SSTs and its importance for customers and firms to adopt SSTs in terms of general application. However, there is a little attention to provide a clear picture about what factors of SST can be strongly related to creating customer value in the context of tourism industry specifically. Therefore, the purpose of this study is to confirm an applicability and a design of the original model of SSTs and explore the connection between SSTs and creation of value perception through a confirmatory factor analysis in the context of the tourism industry. This study also explores demographic characteristics of potential customers who use SSTs when they travel in terms of gender, age groups, educational backgrounds, and races. Through conducting a confirmatory factor analysis, some important factors will be grouped based on its similarities and differences.

This study can be a useful source to tourism managers to operate their businesses with SSTs with a better understanding of factors of SST design. Also, it is aimed to focus on explaining the concept of customer value creation through addressing how the usage of SSTs can help deliver better service experiences to customers in the context of the tourism industry. Furthermore, this study identifies important factors of service design in SSTs and it will fill in a gap in the previous literature review through conducting a confirmatory factor analysis to find valid factors in service design of SSTs. In the end, the result of this study will be very useful for managers in the tourism industry to better understand the adoption of SSTs in their tourism products and services to create customer value for their long-term successes.

Literature Review

The following sections focus on discovering important aspects of SSTs both in general and the tourism industry specifically by exploring previous studies on SST in terms of customer value perception, motivations of use SSTs, and service design elements of SSTs. Also, the importance of conducting a factor analysis will be

explained to strengthen the understanding of SST.

Customer Value & Its Creation

Customer value in general can be described as customers' perceptions of benefits about purchased products and is created by providers' offerings that deliver experiences that can meet customers' expectations and needs (Lee, Verma, & Roth, 2015). Smith and Colgate (2007) explained customer value creation as the process of customers getting benefits from the purchase of certain products. It usually comes with costs and causes changes in customers' attitudes or feelings towards the product. In the tourism industry, a customer value is related to tourists' perceptions about service quality and valuable experiences (Rihova et al., 2015). Since the core elements of tourism experiences are interactions between customers and service providers, the quality of interactions plays an important role in forming customer value. According to Wahyuningish (2012), customer value is critically important for tourism firms because delivering a value for customers helps firms define their competitive advantages. Wahyuningish (2012) focused on that customer value is strongly associated with firms' marketing activities. If firms strive for delivering customer value through their marketing and products, this may help firms to construct a solid competitive advantage because customers may notice the firms' customer-oriented strategies. Thus, better values will be delivered to customers, and it may affect customers to invoke repurchase intentions, customer satisfaction, customer loyalty, and positive word-of-mouth activities.

González-Mansilla, Berenguer-Contró and Serra-Cantalops (2019) mentioned that the process of customer value creation could be a key for organizations to be more knowledgeable about customers and to be providing better services to customers. Scholars stated that the role of customers in creating value is enormous because the process of customer value creation always involves their actual interactions with companies or service providers. If employees are successful in gaining knowledge about customers through those interactions, it would be a huge advantage for them to get to know customers personally and also provide unique experiences. This personal touch would help customers to perceive values about companies. Customers might perceive higher values about the firms if they are aware of that they are treated personally while they interact with employees. Neuhofer, Buhalis, and Ladkin (2013) also mentioned that adding more personal touch on service experiences for customers may help firms to build up strong relationships with customers in the context of the hospitality industry. This supports that employees' effort on connecting with customers personally is beneficial for tourism firms to enhance customer perceptions about values.

Factors Motivating Customers to Use SSTS

There are many reasons why customers are willing to use SSTS in general. In the retail industry, customers are usually motivated to use SSTS when they perceive usefulness, ease of use, or behavioral control (Demoulin & Djelassi, 2016). Demoulin and Djelassi (2016) mentioned that customers consider reliability of the system as an important trait of perceived usefulness of SSTS. Simply, when they find the fact that the system of SSTS is reliable to use, it encourages customers to use SSTS. For the ease of use, Demoulin and Djelassi (2016) pointed out that enjoyment positively affects how to perceive ease of the SSTS. If customers feel that using SSTS involves enjoyment, such as self-scanning, it motivates customers to try again. Lastly, there are certain connections between behavioral control and a motivation of SSTS. Demoulin and Djelassi (2016) found that self-efficacy, personal responsiveness, and compatibility positively influence behavioral control of customers to use SSTS. Specifically in the context of the tourism industry, Oh, Jeong, and Baloglu (2013) found that there

are three motivational factors that customers may consider before they use self-service technologies (SSTs) for their travel experiences such as ease of use, privacy, and autonomy. Ease of use, privacy, and autonomy are positively associated with customers' perceived usefulness, and the researchers have proved that these three factors are important motivational factors for customers to use SSTs. It means that when customers perceive the feelings of easy to use, privacy, and autonomy through using SSTs, it may strengthen their intentions towards using SSTs during their trips.

Factors Affecting Customer-Value Creation During SST Interaction

In order to confirm its application of SSTs in the context of the tourism industry, five elements of service design of SSTs are selected in terms of structural and managerial elements (Fitzsimmons, Fitzsimmons, & Bordoloi, 2006, pp. 69-70). Structural service elements include facility design, location, and capacity planning. Managerial elements include service quality and service encounter. This service design has been used as a tool in many industries to assume what service employees should provide and customers should receive. These five service design elements will be used as a domain in this research paper to examine what factors could affect the process of creating customer-value during the usage of SSTs in the tourism industry.

Service quality. Service quality can refer to meet or exceed customers' expectations towards organizations. Service quality of SSTs is one of the most important factors that affect how customers perceive values about firms' products and services in many industries. In the postal service industry, the author found that SSTs play an important role in creating customers satisfaction (Isa & Kiumarsi, 2019). Service quality of SSTs can also influence customer satisfaction. Service providers can utilize SSTs to enhance customer satisfaction with the help of advanced technologies (Boonitt, 2015). The service quality of SSTs scales (SSTQUAL) is the scale which has been used a lot to measure service quality of SSTs in modern literature. SSTQUAL comprises of following dimensions such as functionality, convenience, enjoyment, security, design, customization, and assurance. This model has enabled to assess customers' perceptions toward service quality of SSTs. The usage of SSTs offers customers functionality in SSTs features such as responsiveness (Lin & Hsieh, 2011), convenience by providing flexible transaction process and saving time (Collier & Kimes, 2013), enjoyment by using advanced technology (Curran, Meuter, & Surprenant, 2003), security by providing a reliable technology system (Narteh, 2015), design features that improve interactivity between customers and the technology (Zhu, Nakata, Sivakumar, & Grewal, 2007), customization that refers to the ability to allow customers to accommodate service options, and assurance that refers to a credibility of service providers (Lin & Hsieh, 2011). Lin and Hsieh (2011) have focused on that dimensions of SSTQUAL have strong connections to how customers find values in their experiences, which include functionality, design, customization, enjoyment, assurance, convenience, and security. If SSTs provide these elements to customers, customers may perceive the quality of services through SSTs satisfaction with their needs.

Service encounter. Service encounter that was mediated by self-service technologies has been observed in different settings, such as ATM machines, service robots, virtual fitting rooms, and point-of-sale terminals. Customers in service encounter with SSTs act as partial employees to produce services, and it should come with their efforts to get the desired results. Thus, it is considered that service encounter in SSTs is highly dependent on customers' performances in general. In other words, customers' performances to proceed transactions through SSTs play important roles to generate service encounter, and such performance will affect service encounter. In the general context of SSTs, customers are required to actively participate in service

encounter in which value can be created by using the technology (Robertson, McDonald, Leckie, & Mcquillen, 2016). High customer participation in service delivery can lead to customer positive feelings (Dong, Evans, & Zou, 2008). If customers are engaged in the service delivery with the self-control, they may perceive that they share responsibilities with service providers. Some scholars found that customers who are highly involved in creating services can contribute to their own satisfaction and service quality they are given (Bitner, Faranda, Hubbert, & Zeithaml, 1997). Customers also can be productive at implementing services by themselves during the interaction with SSTs because ease of usefulness of SSTs is an important trait of productivity (T. Kim, M. Kim, Moon, & Chang, 2014). Anitsal (2005) found that customers with better a productivity and engagement can enhance their own perceptions of the process in service delivery with positive attributes in self-service environment. Therefore, customers' active participation in the use of SSTs can affect customers' perceptions towards firms' services.

Facility design. According to Zhu et al. (2007), facility design of self-service technologies in general has been identified as a helpful component that allows customers to interact with the operational transactions effectively. They stated that the most important elements of facility design in SSTs are considered comparative information and interactivity. These two elements play key roles in effectively enhancing the operations of SSTs by allowing customers to choose their own processes. Those help customers control over the service processes. On the other hand, facility design also can affect customer experiences and satisfaction in the tourism industry because design elements are easily noticeable by customers. Among those design elements, physical facilities, technology, equipment, people, and processes are considered as important design elements in the service organizations (Goldstein, Johnston, Duffy, & Rao, 2002). In addition, customers' perceptions towards SSTs kiosks in hotels may be affected by how customized SSTs are for customers. If SSTs instructions are customized for customers in terms of providing convenient services with easy directions by saving time, customers will invoke positive perceptions towards SSTs (Beatson, Coote, & Rudd, 2006). The layout of SSTs is designed to be customer-oriented, which means that all the functions and layout of customers are focused on customers' instant needs. The authors also mentioned that when customers find that SSTs deliver values to them, it can be connected to satisfaction because SSTs help customers relieve their efforts. This means that customers may perceive that SSTs with a convenient layout would help them make less efforts, but create more benefits, which can be turned as a value (Williams & Soutar, 2000). Thus, a convenient design of SSTs and its customizing services within SSTs may enhance how customers to recognize values during travels.

Location. Location of equipment in facilities is important for effective customer experiences in the service industry. It is critical for service firms to consider operations from the customers' perspectives to enhance an efficiency of customer services. Customers may evaluate service experiences based on the amount of efforts that they put on using SST, and a physical location of SSTs can influence customers to perceive ease of use in self-service (Collier & Sherrell, 2010). Collier and Sherrell (2010) stated that the easier to access to SSTs location, the more customers perceive SSTs as valuable methods for their services. This supports that customers consider SSTs from their perspectives in terms of its easiness, accessibility, and convenience. Many customers desire for SSTs that are located in convenient areas for their service experiences. It is critical to consider how this could affect to create customer value in the tourism industry as stated above. When the location of SSTs is convenient for customers, they are more likely to consider using SSTs instead of using other mobile services or human services and it was found that it is critical to have a physical accessibility of SSTs to create value from customers' perspectives (Choi, Jo, & Ham, 2009). Scherer, Wunderlich, and Wangenheim

(2015) investigated the value of SSTs usage and its relations to customers that would remain loyal to firms and it is confirmed that the convenient location of SSTs may enhance the circulation of service processes. This means that their positive perceptions towards SSTs are highly dependent on how SSTs provide an accessibility and an opportunity to save time.

Capacity planning. Capacity planning in the context of SSTs can refer to how firms manage the ability to operate customer services efficiently with technological resources they have. SSTs are regarded as a helpful technology that can maximize firm's productivity by supplementing limited human resources of service firms. It is important for firms to manage their capacity through SSTs as it allows firms to deliver efficient and valuable services to customers based on their resources (Kokkinou & Cranage, 2013). Especially, managing waiting time is critical in the tourism industry to improve travelers' experiences. The amount of time consumed for services influences how customers perceive about services. There are also many factors that are involved in the waiting time for services, which include customers' feelings such as anxiety, their occupations in service processes, and employees' explanations about reasons of waiting (Lahap, Azlan, Bahri, Said, Abdullah, & Zain, 2018). Lahap et al. (2018) mentioned that a perceived time has to be controlled by firms to enhance customers perceptions about services based on the restaurant situations. They mentioned that the perceived waiting time could influence how customers judge about the whole service experiences because the information about the waiting time contains various information such as their occupation status, a certainty of the waiting, reasons of the waiting, etc. Most importantly, time is considered as assets for customers, which can be perceived as value. Therefore, it is significantly important for firms to provide the reasonable waiting time to customers to give them values about services or products that they provide.

Methodology

The Sample, Data Collection, and Measurements

Data collection for this research paper was based on the self-administrated online survey questionnaires in South Korea and the United States. Convenience sampling is used in this research. It is one of nonprobability or nonrandom samplings, which involves easy accessibility to the population and a higher willingness to participate (Etikan, Musa, & Alkassim, 2016). For the online survey software, a Qualtrics survey was used in this research. The online survey link was distributed through social media webpages, emails, and text messages. The responses were recorded automatically in Qualtrics software and were transmitted to the SPSS analytical software program for further analysis. The pilot testing was not conducted due to time limits. A total of 234 responses were collected in this survey from November 29th, 2019 to January 31st, 2020. However, there are some missing values in some variables across all of responses. Nevertheless, there are no variables with 5% or more missing values. According to missing value analyses, those missing values did not create any concern that might cause response bias. Thus, there is no concern on validity of those survey results in this study. The questionnaire was created based on the literature review. A total 29 questions were included in the survey in the areas of collecting general information, measuring motivations to use SSTs, service quality, service encounter, facility design, location, and capacity planning during the usage of SSTs. A seven-point-Likert scale ranging from not important at all to very important was used to identify the findings in the previous literature review of this study. "1" stands for not important at all and "7" means very important.

The first part of questionnaire focused on demographic information, the second part of questionnaire goes into details about respondents' motivations to use SSTs in terms of three factors that include easiness to use,

privacy, and autonomy. The third part of questionnaire asks about service quality during SST experiences. A total of seven factors were measured in the third part in areas of functionality, enjoyment, security, assurance, design, convenience, and customization while they use SSTs. These factors were constructed based on the SSTQUAL model that is created through qualitative and quantitative studies (Lin & Hsieh, 2011). The fourth part of questionnaire consists of measuring service encountering during SST experience. In this regard, service encounter was explained as employee engagement during SST experience to help participants understand on the context of a question. Three questions were built based on the study by Lariviere et al. (2017) to measure the extent of service encounter towards evoking customer satisfaction. The fifth part of questionnaire is intended to measure facility design and its relation to satisfaction. In this part, facility design is defined as interface design in which SST interface is a design feature that responds to users' requests and allows them to control information flow. Three factors were chosen based on Zhu and others' research (2007) on self-service technology effectiveness regarding design features and individual traits. Three factors for facility design during SST experience include whether SST provides comparative information for customers, whether SST has an interactive design, and whether SST allows customers to perform two tasks simultaneously. The sixth part of questionnaire is to measure how location can affect customer satisfaction during SST experiences. Based on Collier, R. S. Moore, Horky, and M. L. Moore (2015), three factors were included in this part. A same concept of the fifth part was applied in this part as examples are helpful to understand the context of questions for readers. Convenience of location of SST, location that could save transaction time, and location that helps solely focus on a transaction without caring the surrounding environment, were selected to measure the relationship between location and customers' perceived satisfaction. Lastly, three questions were included to measure capacity planning during SST experiences. Also, examples for readers were inserted in order to help respondents picture the actual situations. A brief definition about capacity planning was given in this part to avoid any misunderstanding of the meaning. Capacity planning was explained as how firms manage technological resources to operate customer services efficiently. Three factors were measured in this part, which includes SSTs to save time, to help operate service process smoothly, and to stimulate willingness to use firm's products that provide SST.

Data Analysis

This study is aimed to confirm what valid factors can be used in SSTs model in the tourism industry. In order to achieve the objectives of this study, a confirmatory factor analysis was chosen. A confirmatory factor analysis (CFA) is defined as a tool that is used for examining the relationships between observed measures and latent variables. In this case, a factor is relatively small number of unobservable variables that is correlated with more than one observed measure (Brown & Moore, 2012). By conducting a confirmatory factor analysis, this study could provide a clearer overview of service design elements of SSTs specifically in terms of the tourism industry. For the data analysis, IBM Statistical Package for Social Science (SPSS) 25 was used in this research paper. Furthermore, a descriptive analysis and a factor analysis were chosen to analyze the data set in order to identify relationships between variables in this research. First, a descriptive analysis was used to analyze data summary about the sample including mean, variance, and standard deviation. Descriptive statistics summarize the observations from the sampling populations, and it is a useful tool to show the descriptive data about variables that are related to SST experiences in the tourism industry. Second, a factor analysis was conducted in this research to measure variability among variables, especially a lower number of unobserved variables. The main purpose of adopting a factor analysis is to summarize the information on how original variables could turn

into a smaller set of new variables (MacCallum, Widaman, Zhang, & Hong, 1999). In this research, a factor analysis is used to verify the validities of variables regarding five main variables during SSTs interaction, which are service quality, service encounter, facility design, location, and capacity planning in terms of the tourism industry. This will be useful to present statistical information of these variables and consider relationships between some demographic information and different factors.

Result and Discussion

Descriptive Statistics

The total number of responses for this survey was 234. Among 234 respondents, the majority of the responded were female (61.8%). In this study, generation Y was recorded with the highest number accounting 44.5% of the total respondents. More than 40% of respondents have bachelor's degree, and more than 30% of respondents have high school diploma or equivalent degree. Before conducting a data analysis, the statistical test on checking assumptions of variables is conducted in the areas of sample size, normality, *r*-square, autocorrelation, multicollinearity, and internal correlations among all the variables. In terms of sample size, it is appropriate since the ratio of sample size to variable is about 7.8:1, namely, 30 variables were measured by 234 respondents. Normality of variables was also considered in this study. After reviewing histograms and skewness of variables, it is shown that all the variables are distributed normally. *R*-square was measured in order to check the goodness of the fit of the regression model. *R*-square is used to evaluate the strength of the proposed relationships between the dependent and independent variables, and in this case three variables of facility design are considered as dependent variables. First, *r*-square of informed choice in SST resulted in 0.7, which means that 70 percent of the variability of dependent variables is explained by the independent variables. Simply, the model is roughly 70% accurate. Second, *r*-square of interactive design of SST indicates 68.2% of accuracy. Lastly, *r*-square of performance of simultaneous two tasks are relatively low in accuracy with 48.2%. In terms of measuring autocorrelation, Durbin-Watson statistic is used for each model of dependent variables. All the three variables of facility design indicate that autocorrelation does not exist in the models because Durbin-Watson statistic of every variable falls within the acceptable range of 1.5 to 2.5, showing 1.884, 2.036, and 2.018 in regular sequences. In terms of multicollinearity issues, Pearson correlation statistics was conducted for three variables of facility design. All the values that are correlated with three variables of facility design do not exceed 0.90. If the value is greater than 0.90, this means that multicollinearity does exist in the model. However, this model does not have any issues with this as all the values are less than 0.90. Thus, all the three variables show that multicollinearity does not exist in the model.

Factor Analysis

The descriptive analysis of variables was conducted to see the statistical information of variables. As following, a factor analysis is used in this study to simplify the variables into a fewer number of dimensions. In order to understand the differences and similarities among a total of 24 variables, the factor analysis was chosen to analyze. First off, the Kaiser-Meyer-Olkin (KOM) method is conducted to check the sampling adequacy of each variable in the model. KMO statistic varies between 0 and 1, a value of 0 indicates that the sum of partial correlations is large relative to the sum of correlations and causes diffusion in the patterns of correlations. Tastan and Yilmaz (2008) mentioned that KMO criterion rate must be above 0.50. Higher number shows better adoption for the factor analysis. As shown in Table 9, it shows that the data set is factorable since the KMO

measure of sampling adequacy is 0.896. Hence, a factor analysis is likely to be feasible. Also, the Bartlett's test explains that a significant p value is listed, which is almost closer to 0, less than 0.001. This supports that the sample size in the data set is appropriate.

As a communality explains how much an item correlates with all other items, higher values in the communalities fit better. It is considered that if communalities for a certain variable are between 0.0-0.4, this may hinder to load on any factor. All the values for extraction are above 0.4, and these do not fall between the range of 0.0-0.4. This indicates that there are no issues to load certain factors among all the variables. For the first round of analysis, five components are identified in this round of a factor analysis. The total variance of five factors are 64.66%, and each item has loading factors higher than 0.4. As the higher value fits better for the factor loading, this may identify good correlations between items. However, one item "EOS1: Easy to use 1" should be removed for the second analysis due to the reason that the communality is below 0.5. As a result, 23 items are retained for the second round of factor analysis. The result of a factor analysis in the second round is displayed. The total variance is presented with 66.09%. Every item has a factor loading value greater than 0.5. This implies good correlations between 23 variables. As a result, a total of five factor components are demonstrated, and each component possesses notable loading factors. After conducting a factor analysis for 24 variables, it was indicated that 23 variables are sorted out within five factor components. Those components can be identified as "SST location and capacity planning", "SST service quality", "Motivation to use SST", "SST design", and "SST encounter". It is important to note that the factor of "SST location and capacity planning" is indicated as the biggest concept among five factors that include location of SST, capacity planning of SST, design of SST, SST service quality, and SST encounter. It is clear that the factor "SST location and capacity planning" explains a total variance of 22.085% whereas subsequent factors explain only small amount of variance, which means that it is not remarkable as factor 1.

***T*-Test of Motivations to Use SSTS and SSTS Interaction Variables**

In this part, independent samples t -test is conducted to compare the mean numbers of selected variables from the previous factor analysis. A total of 23 variables were identified into five factors, thus mean numbers of 23 variables among different demographic groups will be presented in this section. In order to compare mean numbers of different demographic groups, the two most statistically significant groups were chosen to be compared for each demographic group, which include gender, age groups, educational backgrounds, and races. Though comparing mean numbers and conducting t -test, it will show the significances of these factors in terms of the four kinds of different demographic information.

In general, there are not many differences between mean numbers of each factor in terms of female and male. However, if the 10% level of significance is used to analyze the data, the differences between female and male in "customization" factor and "privacy" factor are statistically important. It also shows that male respondents perceive that "customization" factor is more important than female respondents while they use SSTS. And, female respondents put more importance on "privacy" factor than male respondents do. Next, the independent samples t -test is conducted to calculate the mean numbers of each variable in terms of age groups. Two most significant groups were chosen in terms of sampling sizes. Generation Y and Generation Z were used to compare mean numbers of each factor. These results may imply that generally generation Y respondents who are born between 1980 and 1994 consider "security" and "SEcounter2" as important factors than generation Z respondents do. Generation Z respondents put more importance on "capacityP2—SST helps operate service

process smoothly” factor.

Third, the interdependent samples *t*-test was conducted to compare two groups in terms of educational levels. There were such differences between respondents who possess high school diploma or equivalent degree and respondents who have bachelor’s degree. Two positive mean differences state that respondents with high school diploma or equivalent degree consider “privacy” and “SEcounter3—employees will ask any feedback from me after using SST” as more important than respondents with bachelor’s degrees. Two negative mean differences show that “facilitydesign2—if SST has an interactive design, which allows me to choose my own priorities and strategies of information processing” and “convenience” are more important factors to respondents with bachelor’s degrees. Lastly, the independent samples *t*-test is executed to figure out the differences of mean numbers of 23 variables between different ethnic groups. This part could imply different cultural perspectives on using SSTs between Western and Eastern contexts since Caucasian and Asian were chosen as two significant groups in races. The results show that the mean differences are statistically significant in 23 variables between Caucasian and Asian. Interestingly, there were many mean differences between these two ethnic groups. Three positive mean differences for 23 variables state that Caucasian respondents consider “functionality”, “assurance”, and “location3—SST is located in a convenient area helps me solely focus on a transaction without caring the surrounding environment” as more important than Asian respondents. A negative mean difference for 23 variables implies that Asian respondents perceive more the factor of “SEcounter3—employees will ask any feedback from me after using SST” when they use SST than Caucasian respondents. It is important to note that there are huge differences on mean numbers between these two racial groups. The mean differences were averaged at 0.58, which was significantly high. It may suggest that there is a significant gap between Caucasian and Asian groups on how to perceive variables when they experience SSTs.

Discussions

This study investigated the variables of motivations to use SSTs and SSTs interaction through explaining with its mean values and standard deviations. In terms of the higher mean values in the statistics, the higher mean value implies that most of survey respondents agree more on the statement of the survey or they assume that it is a more important factor when they use the SSTs. The highest mean value was identified as “Employees are available to help me when I run into difficulties to use SST”. This means that most of survey respondents are most likely to agree with this statement. This implies that employees’ availabilities to help customers when they get into troubles are an important element contributing to motivate the usage of SSTs. The second highest mean value was indicated that “If the location of SSTs is convenient for me to access. (ex. the kiosks at the airport are located right in front of main entrance of a terminal)”. Survey respondents also considered that a convenient location of SSTs is an important motivational factor to use SSTs. Third place was listed as “It is easy and convenient to access the firm’s SST. (convenience)”. This implies that the accessibility of SSTs and convenience are important factors to consider when customers use SSTs. To sum up those important factors that are associated with customers’ motivations to use SSTs, these results may imply that tourism operations should consider how to educate employees to efficiently deal with technical issues of SSTs requested from customers and how to allocate SSTs machines in the most convenient locations that are easier for customers to access to SSTs.

Among the 24 variables, the least agreed variable was identified as “Employees will ask any feedback

from me after using SST". This implies that this statement regarding employees' inference on the usage of SSTs does not influence travelers' motivations to use SSTs. Also, "a clear privacy policy is stated when I use the firm's SST" and "SST stimulates my willingness to use the firm's products rather than using other companies that do not offer SST services" were considered less important than other factors among the 24 variables as follows. This means that these two factors do not strongly influence customers' motivations to use SSTs as other factors influence to customers. Regarding the results of *t*-test and factor analyses, this study focused on finding statistical difference of 24 variables across different groups by conducting a factor analysis and *t*-test. First of all, a factor analysis was chosen to simplify the variables into a fewer number of dimensions. The Kaiser-Meyer-Olkin (KMO) method was used to check the adequacy of each variable in the model. Based on the result from this method, the data set was considered factorable as the KMO measure of sampling adequacy came out as 0.896, which is closer to 1. This implies that the data set is suitable to conduct the factor analysis. Regarding the sample size, it was appeared that the sample size of the data set of the study is acceptable based on the result of Bartlett's test. The value from Bartlett's test was indicated as 0.00001, which is almost closer to 0 and less than 0.001. These two methods imply that the data set of the study to confirm the differences and similarities among the chosen variables is appropriate.

In terms of age groups, generation Y respondents give more attentions to "security" and "Employees will pay attention to check whether I need help or not when I use SST" while generation Z respondents consider "SST helps operate service process smoothly" more important to them when they use SSTs. This may imply an important meaning to tourism managers in a way that the business strategy of adopting SSTs should be considered based on their target markets' ages as well. A younger generation considers "SST helps operate service process smoothly" more important than other factors. This means that if the tourism firms aim to target a younger age group, such as generation Z, the extent to which how smooth the service can be operated is important. If the tourism firms aim to target generation Y customers, "security" and "Employees will pay attentions to check whether I need help or not when I use SSTs" have to be the top priorities in the installation of SSTs in their properties. In terms of educational levels among respondents, respondents with high school diploma or equivalent degree consider "privacy" and "Employees will ask any feedback from me after using SST" more important while respondents with bachelor's degrees perceive "If SST has an interactive design, which allows me to choose my own priorities and strategies of information processing" and "convenience" to be more important than other factors. This means that the way how customers perceive value in the usage of SSTs may appear different depending on different educational levels. Customers with high school diploma may put more focus on privacy of SSTs and employees' performances in checking upon on customers regarding the usage of SSTs would be the most important factor to use SSTs. Also, customers with bachelor's degrees may perceive the convenience of SSTs and SSTs' functions on providing an interactive design most importantly. Thus, tourism firms should consider how the educational levels of customers may affect their perceptions on difference values of the SSTs.

Lastly, the information was gathered between two major ethnic groups of the survey population, which are Caucasian and Asian. It was appeared that Caucasian respondents consider "functionality", "assurance", and "SST is located in a convenient area helps me solely focus on a transaction without caring the surrounding environment" more important than Asian respondents. Asian respondents consider "Employees will ask any feedback from me after using SST" the most important. This is important to see the different cultural perspectives on the usage of SSTs between Western and Eastern contexts. It might be useful to distinguish

different perspectives on the usage of SSTs from two ethnic groups because the results from these two ethnic groups may present the different viewpoints of Western and Asian cultures on the usage SSTs. Generally speaking, Western and Asian cultures are tremendously different in terms of lifestyles, social norms, traditions, and religions. Those could influence how they perceive value from using the SSTs, and it is helpful to identify possible similarities or differences on the usage of SSTs. As explained earlier, Asian respondents focus on whether employees will ask their feedback or not. This means that the role of employees in SSTs services is more important than Western customers. Asian culture is usually based on a collectivism in which people care each other's thoughts and opinions collectively. This nature of the culture may influence how customers expect a certain role from employees because collectivism stresses personal relationships between one and another. Asian customers may focus more on how others such as employees care about their thoughts on any services or products. On the other hand, Western customers focus on various elements of SSTs in which it is more focused on functions and physical accessibility of SSTs. As opposed to Asian culture, Western culture is mostly based on an individualism that advocates on individuals' interests than social goals. Western customers may pay more attentions to their own needs and conveniences when it comes to using any products or services. This could influence how they perceive SSTs from the point of view that emphasizes its usefulness and functionality. When tourism firms consider adopting SSTs for their businesses, it is tremendously important where they will set up the business. If tourism firms emphasize on Western countries, it would be meaningful to consider values that are related to functionality and location convenience. If the tourism firms focus on Eastern markets, considering employees' roles in customers services could be a priority of their business plans. Based on these findings, it can be suggested that tourism operations have to understand about differences between several demographic groups. It is important to note that companies' business plans on adopting of SSTs could be significantly different whether what target markets they focus on or which gender they aim for. When companies set the plans for SSTs, this demographic information should be at least considered.

As SSTs have been widely adopted in many organizations in the tourism industry such as hotels and airlines, it is critical for firms to focus on maximizing benefits for customers and minimizing disadvantages in the use of SSTs on products and services. This research paper contains such information about service design elements of SSTs that would be related to customers' perceptions about value during their travels. Managers in the tourism industry should consider identifying important factors of service design of SSTs to help customers to perceive values easily. The identified factors of service design of SSTs will give an idea to tourism firms to focus on different perspectives and how to improve service delivery through SSTs. This study also suggests a few of theoretical contributions to the academia. First, this study achieved to identify some of important elements of services design in SSTs in the context of the tourism industry. This study adopted a factor analysis as a methodology to classify a total of 24 variables of SSTs interactions and motivations to use SSTs into five main factors. These five factors were indicated as "SST location and capacity planning", "SST service quality", "motivation to use SST", "SST design", and "SST encounter". This finding has an important meaning to the academia since previous researches that have conducted a factor analysis on SSTs in the tourism industry have mostly focused on customers' intentions to adopt SSTs (Oh et al., 2013; Kaushik, Agrawal, & Rahman, 2015) or the relationships between elements of SSTs and customer satisfaction (Hong & Slevitch, 2017; Dzia-Uddin, Hashim, & Isa, 2018). However, this study has aimed to focus on the service design elements of SSTs as well as demographic variables in terms of different age groups, gender, ethnicities, and educational backgrounds. Also, this study considered the possible differences between Western and Eastern contexts on the subjects

through conducting an online survey in two different countries, which are the U.S. and South Korea. This study is one of only a few of studies that have focused on cultural perspectives and demographic information together on the service design elements of SSTS that are related to the process of customer value in the tourism industry. The findings of this study are also helpful for tourism operations and scholars to understand how customers perceive values when they use SSTS during their travels. This would expand the insights about the effective ways of adopting SSTS in products and services in the tourism industry.

Conclusion and Limitation

In conclusion, this research paper explains the critical service design factors of SSTS that could relate with customer perceptions about value in the context of the tourism industry. This research investigated on specific service design factors that can be related to customer value in the usage of SSTS based on a substantial literature review and the results of a *t*-test and a factor analysis. The online survey was adopted as a methodology to examine the possible factors identified in the literature review. Also, SPSS program was used to explain statistical information about the survey. Particularly, a descriptive analysis, a factor analysis, and *t*-test were used to analyze the data with different demographic information. Based on the results from the total of 234 respondents of the online survey, the results have significant meanings to the tourism industry. It was discovered that a majority of sampling population (76.8 %) has experienced SSTS before. In terms of the mean values, it was indicated that most of survey respondents are more likely to agree with the statement, which is “Employees are available to help me when I run into difficulties to use SSTS”. This implies that it is important to note the role of employees in helping customers during the SSTS interaction is still important. As follows, the survey respondents considered the statement about “If the location of SSTS is convenient for me to access. (ex. the kiosks at the airport are located right in front of main entrance of a terminal)” important secondly. This also implies that location convenience plays an important role to help customers perceive value through the usage of the SSTS. On other side, it was identified that the least agreed variable out of the total 24 variables was “Employees will ask any feedback from me after using SSTS”. This means that customers may relatively consider employees’ role in getting the feedback from customers after the usage of SSTS. These indicated variables are useful for tourism firms to consider how to prioritize service design elements of SSTS to enhance customer perceptions about values in their products.

The results of *t*-test and a factor analysis from this study also deliver significant meanings to the tourism industry. As indicated earlier, the sampling adequacy of the data set of this study is 0.896, which is considered to be suitable for a factor analysis. Also, the sample size of the data set of this study was acceptable based on the result of Bartlett’s test. In terms of the communality of the data set, it turns out that the data set also has the good fitness of correlations among variables. This study also conducted total two rounds of rotated components matrix to explain the total variance and loading actors of each variable in the data set. At the first round, one item, “Using SSTS is easy to use (ex. a clear instruction is given for users)”, in the data set was removed to increase the goodness of correlations between items. As a result, the total variance of the second round was increased from 64.66% to 66.09%. Some notable information from the statistics of *t*-test in this study is all based on the four different demographic variables, which include gender, races, educational levels, and age groups. It was indicated that male respondents perceive “customization” to be more important while female respondents perceive “privacy” to be more important. It shows that customers may perceive important service design elements of SSTS differently by gender. In terms of age groups, generation Y and generation Z were

chosen to be compared with each other. Generation Y respondents consider “security” and “Employees will pay attention to check whether I need help or not when I use SST” while generation Z respondents consider “SST helps operate service process smoothly” more important. This also implies that customers might give a useful insight for tourism firms to consider their target markets when adopting the SSTs. If the tourism firms aim for younger customers, considering the way how SST helps operate service process smoothly would be a key to a successful business. Education levels among respondents play significant role when deciding which service design elements of SSTs are important to customers. It was indicated that respondents with high school diploma or equivalent degree put more attentions to “privacy” and “Employees will ask nay feedback from me after using SSTs”. However, respondents with bachelor’s degrees perceive “If SSTs has an interactive design, which allows me to choose my own priorities and strategies of information processing” and “convenience” to be more important than other factors. Lastly, the results from the *t*-test of this study show that there is a difference between two different ethnic groups of the survey respondents, which include Caucasian and Asian groups. Caucasian respondents more agreed on “functionality”, “assurance”, and “SST is located in a convenient area helps me solely focus on a transaction without caring the surrounding environment”. Asian respondents consider “Employees will ask any feedback from me after using SST” as the most important factor out of the total 24 variables. These results indicate that customers have different perspectives on how to perceive important values during the usage of SSTs depending on their own ethnicities. This will also provide helpful advice to the tourism firms to consider different factors that might be associated with service design of SSTs. Their focus on the adoption of SSTs should be considered with cultural backgrounds of the markets as well. As results of these analyses through SPSS program, five factors for motivations to use SSTs and SSTs interaction have been identified in this study. Those important factors are consisting of “SST location and capacity planning”, “SST service quality”, “motivations to use SST”, “SST design”, and “SST encounter”. These discovered factors may imply an important meaning to better understanding of customer value factors during the usage of SSTs in the tourism industry. In addition, the study of customer-value creation in self-service technologies in the tourism industry has furthered the understanding of the importance of self-service technologies into the tourism section with different demographic variables. Lastly, this study has initially attempted to consider the concept of customers’ perceptions about value in SSTs by conducting a confirmatory factor analysis.

This study has some limitations. Future studies might consider expanding this study as a baseline. First, the survey was performed in Hawaii, the U.S. and South Korea. These can imply that the findings of the study may not represent the whole population of the U.S. and South Korea. Also, most of respondents who answered this survey had identified themselves as Asian accounting 92.7%, thus the variety of racial groups could limit the representatives of the sample population. As a result, the generalization of the findings of this study may be concerned. Future study should consider this issue by diversifying the sampling population from different states in the U.S. or different countries, not only specifically in Asia. This may help expand the validity of the concept of this study. Second, this study only focuses on a few variables regarding SSTs interaction, which include service quality, service encounter, facility design, location, and capacity planning. Other important variables could be involved with SSTs interaction or could be considered as mediating variables. Also, this study only focuses on customer satisfaction as a result of customer value creation. Future researches should be able to combine with other factors that can be related to the process of customer value creation in SSTs to further

identify the relationship between customer value in SSTs and customer satisfaction or loyalty.

Lastly, a sample size of the study is not significantly enough since there are only 234 responses and missing values. In order to intensify the statistical information of the study, the sample size has to be expanded to gather more responses from the population in the future studies. A larger sample size for the study would enhance a validity of results on this subject, and the results from a larger sample size will be more reliable to the academia. By doing so, future researchers may consider conducting a survey ahead of time to get more responses from the sampling population, which means that it requires time commitments for longer periods. The accurate calculation of a sample size is necessary to gather useful insights from the population as well.

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