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Causal Model, Expectations and behaviors that Affect the Satisfaction of Using the Services of the National Science Museum Organization, Chiang Mai, Thailand

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Abstract

This research examined the causal model, expectations, and behaviors that affect the satisfaction with the services of the National Science Museum Organization (NSMO), Chiang Mai, Thailand and analyzed the causal factors that affect the satisfaction with the services of NSMO. The population included the onsite and online NSMO service users. Data collection used a questionnaire. Following statistical analysis, results indicated that expectations have a significant positive effect on service users' behaviors and a significant positive effect on satisfaction with service use. Moreover, the behaviors of service users do not have a significant positive effect on the satisfaction of using the services. Additionally, analysis of direct, indirect, and total effects indicated that satisfaction with service use is directly affected by expectations, and the behaviors of service users are directly affected by expectations, whereas satisfaction with the services is not directly affected by service users' behaviors nor indirectly affected by expectations.

Keywords: Expectations, Behaviors, Satisfaction, Causal model, National Science Museum Organization

Introduction

The National Science Museum Organization (NSMO) is a state-owned enterprise under Thailand's Ministry of Higher Education, Science, Research and Innovation with the mission to create understanding and inspiration for the public in science, technology and the environment by providing the services of museums, learning centers, and activities that promote learning. Currently, the Science Museum, the Museum of Natural History, the Museum of Information Technology, and the King Rama IX Museum are open to provide services. In addition, there are also learning centers under the responsibility of NMSO, which are Science Squares. Presently, this service is available at three locations: The Street Ratchada, Chiang Mai, and Nakorn Ratchasima. Thus, is is necessary to consider the expectations and satisfaction of the service users and be able to respond to their needs in line with their behaviors, which is important when providing the services of the NMSO. Having the target for the service users to return repeatedly is considered as an achievement in terms of value for money in investment and the results achieved in the marketing of the organization. Hence, in order for the organization to be competitive, they must create satisfaction for the service users that depends on many components such as product, pricing, place, marketing promotions, personnel, the service process and physical environment. These are the important elements that make visitors impressed and satisfied as well as promote the Science Squares of the NMSO as tourist attractions for recreation and learning experiences in science and technology. More importantly, they should be continually sustainable into the future.

This is in line with Fungpraserku et al. (2018), which indicated that: 1. Local museums can respond to tourism as learning resources in the local educational curriculum and make private organizations, the community, homes, temples, schools and local cultural agencies enthusiastic about establishing museums. 2. Social development of local museums conserves cultural heritage, including resources for learning and life, and is a source of income for locals. 3. Internal factors that support social development are strategic social capital management, leadership, life-long

learning, and strong community participation. External factors include government or local policies as well as the private sector, cultural tourism, the academic community, and networks. 4. The roles of museums in social development are conserving heritage, artistic culture and local traditions and to be a resource for lifelong learning and a source of income for locals.

This is in agreement with Penchan (2020), who examined the marketing mix that affects those visiting the Lanna Ancient House Museum, Chang Mai University and found that the marketing mix has an impact on tourists. Overall, the mean was at a high level. The factors that have an impact on visiting have means at a high level in every aspect, which are personnel, product, process, providing of services, presentation, physical characteristics, distribution channels, pricing and promotional marketing. Also, it is in accordance with Mudzanani (2017), who proposed a marketing mix method to help a museum achieve success by using the 4C's of marketing, namely customer value, cost, convenience and communication.

To create value for customers, museums should develop products that match the constantly changing needs of every target group. Thus, the museum should consider the principal mission to provide services for public benefit with increasing convenience for the service users through travelling exhibitions and virtual exhibits. As this research investigates the causal model, expectations, and behaviors that affect the satisfaction of using the services of the NMSO, the data obtained can be applied to respond to service users' behaviors in terms of comprehensive expectations and satisfaction with the services of the NMSO to achieve the targets and continuously improve performance.

Literature review

1. Expectations of service use

"Expectation" is a feeling and expression in the present based on needs with regard to something occurring in the future as the anticipation of the thing will impact our perception by using learning experiences as an indicator, which is an important element in the determination of individual behaviors **(**Oxford Advanced Learner's Dictionary, 2022). Expectations of tourists also play a powerful role in the proposed model, and visualization in the tourism context as presented here is connected to the formation of expectations. Visualization helps tourists understand what an experience will be like. Expectations have also been shown to impact satisfaction, similar to positive arousal and emotions or pleasure (Bordonaro, 2020; Ren-Hua Kung, 2018).

This corresponds with Penchan (2020), who investigated the marketing mix that impacts visitors to Lanna Traditional House Museum, Chang Mai University. It was found that the marketing mix affects visiting tourists. Overall, the mean was at a high level and the factors that affect visitors had the mean at a high level for every aspect as follows: personnel, product, process, providing of services, presentation, physical characterisitics, distribution channels, pricing and promotional marketing. Moreover, the marketing mix had an impact on the study group in visiting wih the overall mean at a high level. The factor that had an impact on visiting with the mean at the highest level was personnel. The product sub-factor that impacted tourists the most was the beauty of Lanna Traditional House Museum, and what impacted the study group most was the uniqueness of the museum. The pricing sub-factor that impacted tourists the most was the value of the entrance ticket price compared with the value and benefits received. Furthermore, the largest impact on the study group was the admission fee that is appropriate for the museum. The distribution channels sub-factors that impacted tourists the most were that the museum is open every day and centrally located in the urban area of Chiang Mai. The sub-factor of promotional marketing that impacted tourists the most were providing data about the museum on the website to allow access easily, and the most significant impact was opening the museum on various important days free of charge. Sub-factors of personnel that impacted tourists the most were the personality and manners of museum officials, and the most significant impact was the politeness and hospitality of the museum officials. Sub-factors of the providing of services that impacted tourists the most were the quality and standards in welcoming customers, and the greatest impact on the study group was providing the services that match the needs of the study group. Finally, the sub-factors of the physical

characteristics that impact tourists the most were the beautiful atmosphere and the organization of the area around the museum, and the strongest impact on the study group was the atmosphere within the museum.

This is also in agreement with Mihaela (2015), who stated that marketing that is currently important includes communication and creation of content regarding the reliability of products. Moreover, communication by word-of-mouth is the direct channel of communication between individuals and groups that are involved with assessment of products and services, which is accepted widely by consumers. The majority of these will likely believe word-of-mouth and use it in purchasing decisions or use of services due to the perception of higher reliability when compared with traditional media.

2. Behavior of service users

Cohen et al. (2014) mentioned that tourist behaviors are actions or expressions involved with the process of purchasing decisions regarding tourism products starting from pre-travel searching using data from technology in order to make the decision, which leads to Purchasing and the period of time during tourism is known as Using, and after traveling is Evaluating and Disposing. By considering these factors, tourist locations and other services will be able to respond to vistors' needs in accordance with research of Numee (2019), which stated that the decision to choose to travel or buy goods and tourism services in response to needs is based on both individual or internal factors, namely sex, age, income, occupation, education, knowledge about a tourist attraction, experience in tourism, category of tourism, attitude and perception, and the social or external factors, namely politics, the economy, society and culture, and receiving information from reference groups, including friends and relatives who discuss personal experiences from travel and tourism. Chi et al. (2008) stated that when doing business, in addition to the product sales of the organization, entrepreneurs must also consider the services, which is an important element in the creation of customer satisfaction, especially creation of long-term relationships with customers. During the decade 1970-1980, creation of the highest satisfaction was the ultimate target of marketing strategy, but currently behavioral intention is considered to be a better predictor of behaviors than satisfaction. Thus, businesses must build their understanding of customers in order to be able to offer goods and services directly based on the needs and expectations of customers. Thus, numerous academic and market research studies have created interest about consumer behavior and the factors that affect purchasing decisions, repeat purchasing, and word-of-mouth of customers.

3. Service user satisfaction

Regarding service user satisfaction, Kim and Lee (2011) mentioned that when customers are satisfied with the services or products of particular companies, opportunities for loyalty with those companies will be at a high level due to the positive feeling that they want to reoccur, and this makes new customers interested in using the services. Therefore, word-of-mouth communication is the principal indicator of success in a company's future as the intention to buy has a strong effect from the satisfaction of customers, which leads to a willingness to buy again in the future. In summary, providing good service makes customers satisfied and increases current and future sales. This is in line with Heung and Tianming (2012), who conducted research on the effects of radio in restaurants on the satisfaction and repeat purchasing with satisfaction as a interstitial variable. The research results indicated that satisfaction has a positive effect on repeat purchasing.

Furthermore, Zeithaml and Bitner (2009) summarized the important concept that the satisfaction of customers comprises five factors: quality of services, quality of goods, price, situational factors, and individual factors, such as mood, bias, etc. These factors have a major impact on consumers' perception regarding the benefit that they actually gain from organizations (perceived performance), and when compared with expectations, the result is the level of satisfaction or dissatisfaction with the outcome. Nevertheless, the majority of customers are not able to decide about goods and the price accurately and objectively but will decide through their perception of the value of the goods and services (Kotler & Armstrong, 2010).

Soonthonsmai's (2019) research on the causal model of service satisfaction on the quality of health tourism services of elderly Scandinavian tourists defined the variables as follows: 1) Service Satisfaction (Sersat) (Lovelock & Wirtz, 2011) comprising eight observable variables: Product, Price, Place, Promotion, People, Process, Physical evidence, and Productivity and Quality, 2) Service Quality (SerQual) (Parasuraman et al., 1988) comprising five observable variables: Tangibility, Reliability, Responsiveness, Assurance and Empathy. The results indicated that tourists have service satisfaction in terms of the services, the cost of distribution and distribution channels, and promotional marketing at the highest level with the quality of the total services and all five aspects at the highest level. Results of the hypothesis testing indicated that the model that was developed agrees with the empircal data by the latent variable of service satisfaction having a direct positive effect on the quality of the services and explained the variability of the quality of the services at 69%. It was recommended that future research should study the gap in services with other principal international tourist groups and the potential of entrepreneurs in the Pattaya City area to provide the other health tourism services for elderly international tourists.

Moreover, Liu et al. (2017) stated the relationship between the image of a tourist attraction and satisfaction and behavioral intention is important for the tourism industry. Repeat tourism or referrals occur due to various factors, namely the image of a tourist attraction, quality of providing the services, perception of value, and satisfaction.

4. Relationships among expectations, behaviors, and service user satisfaction

The expectation confirmation theory (ECT), also known as the expectation–disconfirmation theory (EDT), is often used in explaining the relationship between the expectations and behaviors of service users and the relationship between expectations and service satisfaction. Based on the literature review on marketing to create understanding of service user satisfaction and post-purchase behaviors of customers (Zhu et al., 2021; Malik & Rao, 2019), there are five principal constructs in ECT: expectations, perceived performance, confirmation of expectations, satisfaction, and behavioral intentions of service users. ECT suggests that service users develop expectations regarding goods or services before consumption. After consuming goods or services, they then perceive the actual performance of products or services. Based on this, consumers will compare the perceived performance with their expectations and determine the extent to which these expectations are confirmed, which determines the level of satisfaction (Zhu et al., 2021; Kima & Baker, 2020). Consumers who are satisfied show positive behaviors, whereas consumers who are not satisfied spread negative word-of-mouth and turn to other companies (Zhu et al., 2021; Hossain & Quaddus, 2012), as seen in Figure 1.

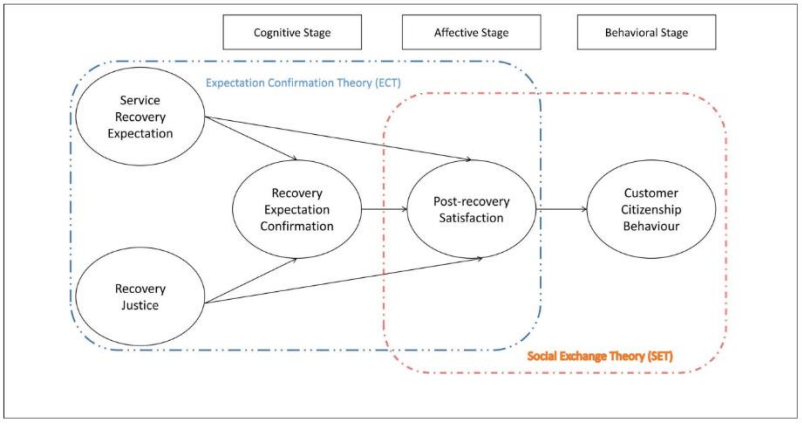

Figure 1 Relationships among expectations, behaviors, and satisfaction of service users
Source: Zhu et al., 2021

Conceptual Framework

This research work therefore studied the causal model, expectations, and behaviors that affect the service satisfaction of the National Science Museum Organization, Chiang Mai.

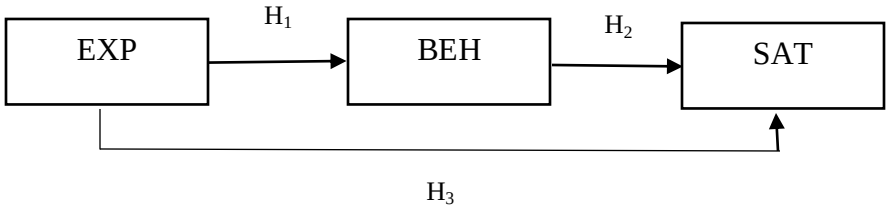

Figure 2 Conceptual framework

H_1 Expectations have a positive effect on the behaviors of service users of the National Science Museum Organization, Chiang Mai, both directly and indirectly.

H_2 Expectations have a positive effect on the service satisfaction of the National Science Museum Organization, Chiang Mai, both directly and indirectly.

H_3 Service users' behaviors have a positive effect on the service satisfaction of the National Science Museum Organization, Chiang Mai, both directly and indirectly.

Research methodology

Quantitative research was conducted using a questionnaire as follows: 1) The population in this study includes the group of users of the services of the National Science Museum Organization (NSMO), Chiang Mai, both onsite and online. The sample group size was calculated from the proportion of the total of observable variables and latent variables, giving a total of 80 parameters; therefore, a sample size five times the total was used (Hair et al., 2010). Thus, the sample group size was 400 using multi-stage sampling. Stage 1 used systematic random sampling and selection of specific locations in the collection of the sample group data. Stage 2 compared the proportion of the sample group sizes for all five locations to obtain the sample group size of the service users of the NMSO.

2) Creation of the questionnaire as the research tool was divided into four parts:

Part 1 - Questions related to demographic information, namely sex and age.

Part 2 - Opinions about expectations of NMSO Chiang Mai (EXP), namely 2.1 Safety measures that are effective regarding COVID-19 (EXP 2.1), 2.2 Knowledge that is modern in accordance with present needs (EXP2.2), 2.3 Fun and enjoyable activities (EXP2.3), 2.4 Easy accessibility to visit often (EXP2.4), 2.5 Numerous learning materials (EXP2.5), 2.6 Good service with courteous manners (EXP2.6), and 2.7 Participation in activities with NSMO provides the highest benefit for using free time (EXP2.7). The design of the questionnaire is a 5-point rating scale.

Part 3 - NMSO service users' behaviors (BEH), namely 3.1 You use the services in order to relax during holidays (BEH3.1), 3.2 You to use the services to find learning resources outside the classroom (BEH3.2), 3.3 You use the services to enhance scientific development (BEH3.3), 3.4 You use the services to improve life skills (BEH3.4), 3.5 You use the services to find new tourist destanations (BEH3.5), and 3.6 You use the services to take photos (BEH3.6). The design of the questionnaire is a 5-point rating scale.

Part 4 - Service satisfaction with NMSO (SAT), namely 4.1 The channels allow you to be familiar with the museum and learning resources of NSMO offering interesting information (SAT4.1), 4.2 The data on the NSMO website are sufficient for the decision to visit, such as maps, opening days and times, activities, up-to-date data and channels for when you need information, etc. (SAT4.2), 4.3 The search for data of the museum is easy and convenient (SAT4.3), 4.4 The signage is clear, indicating the correct directions with clear lettering (SAT4.4), 4.5 The route to access the museum is convenient, for example the location on Google maps is accurate (SAT4.5), 4.6 The parking services are convenient and safe (SAT4.6), 4.7 The design of exhibitions is beautiful and exciting (SAT4.7), 4.8 The exhibitions meet international standards (SAT4.8), 4.9 The content and technology of the exhibition are modern (SAT4.9), 4.10 The exhibitions provide comprehensive and valuable knowledge (SAT4.10), 4.11 The learning materials in

exhibitions are complete and effective (SAT4.11), 4.12 Activities encouraging learning, for example walk rallies, workshops, IT labs, etc., result in further learning (SAT4.12), 4.13 The size of the parking lot is sufficient (SAT4.13), 4.14 The route to walk through the museum is easy and convenient (SAT4.14), 4.15 The ticket distribution service is convenient (SAT4.15), 4.16 The system to enter is easy to understand and convenient (SAT4.16), 4.17 The locations for seating to wait between activities are sufficient (SAT4.17), 4.18 The number of food and beverages shops is satisfactory (SAT4.18), 4.19 The quality of food and beverage shops is suitable (SAT4.19), 4.20 The restrooms in the museum are clean and hygienic (SAT4.20), 4.21 The number of souvenir shops is appropriate (SAT4.21), 4.22 The souvenirs that are available in the museum are interesting and have satisfactory quality (SAT4.22), 4.23 The equipment and facilities of the museum are sufficient (SAT4.23), 4.24 The price paid in attendance of activities (SAT4.24), 4.25 The price of souvenirs (SAT4.25), 4.26 The price of food and beverages (SAT4.26), and 4.27 Promotions that influence the decision to use the services, such as discounts, a member system and free passes (SAT4.27). The design of the questionnaire is a 5-point rating scale.

3) Tool quality testing includes the questions related to the causal model, expectations and behaviors that affect the service satisfaction of the NMSO, Chiang Mai, which were applied to create the questionnaire and submitted to three experts to consider the appropriateness and accuracy of the language usage and the overall content of the research work, followed by consideration of the content validity by finding the Index of Objective Congruence (IOC) between each question, which resulted in the IOC between 0.60 - 1.00. Adjustments based on additional suggestions were made, and the questionnaire was tested with a population that was not the sampled group totalling 30 people in the municipal district of Chiang Mai province using simple random sampling employing Cronbach's alpha coefficient (Cronbach, 1990). Overall, the questionnaire had a confidence value of 0.914, which was higher than the threshold of 0.70 (Cronbach, 1990). The expectation variable's confidence value was 0.933, for the service user behavior variable, the confidence value was 0.959, and for the service satisfaction variable, the confidence value was 0.954, in which all variables have confidence higher than the specified criteria, showing that this questionnaire can be used further.

4) The data collection was as follows: 1. Primary Information; 1.1 Checking of the survey and the questionnaire between the data collection and the data collection in the field from 1 June to 1 November 2022, 1.2 Compiling of data and testing of accuracy to prepare the survey and the questionnaire to code them with the various categories, and 1.3 Data analysis conducted by statistical methods with computer software package, 2. The secondary data was compiled from the theoretical concepts and the results of related research and data from related agencies, namely representatives of the NMSO, Chiang Mai, etc.

5) Data analysis with the statistical software package, in which the scoring criteria and interpretation of the results were as follows: a mean of 4.51–5.00 indicates the highest level of agreement, 3.51–4.50 indicates a strong level of agreement, 2.51–3.50 indicates a moderate level of agreement, 1.51–2.50 indicates a low level of agreement, and 1.00–1.50 indicates disagreement.

6) The statistics used in this research were percentage, means, standard deviation, Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM).

Results

1. Data validation results

1.1 Response to the questionnaire

From sending out a total of 400 questionnaires, the response was 400 sets received. Therefore, the response rate was 100%.

1.2 Bias in Response

By conducting a comparison between the questionnaires that were initially collected and those afterwards by dividing into the first 75% of the questionnaires and the remaining 25%, the t-test results on the differences of sex and age indicated that the questionnaire in the groups that were collected at first and afterwards did not have

statistically significant differences of data at the level of 0.05, which shows there is no bias in the response to the questionnaire (Hair et al., 2010).

1.3 Missing data

It was found that the queestionnaire did not have missing data exceeding 5%, which indicates that the questionnaire is complete and can be analyzed in the next step.

2. Results of basic statistical analysis for general data

Analysis of basic statistics for the general data of the questionnaire respondents was as follows.

Demographic characteristics		Number	Percent
Sex	Male	167	41.8
	Female	233	58.3
	Total	400	100.0
Age	Lower than 20 years	121	30.3
	21-40 years	218	54.5
	41-60 years	60	15.0
	60 years and above	1	0.30
	Total	400	100.0

Table 1 Demographic characteristics of questionnaire respondents

In Table 1, the demographic characteristics of the questionnaire respondents indicate that the majority were female and aged between 21-40 years.

3. Data validation results before analysis of SEM

3.1 Fundamental Statistical Analysis of Variables

The fundamental statistical analysis of variables is the analysis of the level of opinions of the expectations, service users' behaviors and service satisfaction variables by analysis of the results using descriptive statistics, namely mean and standard deviation.

Latent Variable	Min	Max	Mean	Standard Deviation	Interpretation
Expectations	2.000	5.000	4.453	0.554	High
Service users' behaviors	1.000	5.000	4.426	0.872	Very often
Service satisfaction	2.000	5.000	3.932	0.184	Very satisfied

Table 2 Basic statistical values of variables

Table 2 shows that the three variables have the mean around the level of 4 in a range from 3.932 to 4.453 with the variable having the highest mean being the expectations variable (mean = 4.453, s.d. = 0.554), followed by service users' behaviors (mean = 4.426, s.d. = 0.872) and the service satisfaction (mean = 3.932, s.d. = 0.184).

3.2 Analysis of distribution of indicator data

For this analysis, the Box-Cox Transformation method with program R was used by considering from the Lambda estimates, then inserting such estimates into the formula (xlambda) -1/(lambda) (Box & Cox, 1964), so that the data of the indicator is close to normal distribution.

3.3 Analysis of correlation coefficients of variables

The analysis of the correlation coefficients of the variables revealed that the three variables are correlated in the same direction, which is positive, and the correlation coefficient of each pair is lower than 0.80. Therefore, the problem of multicollinearity was not found, as seen in Table 3.

Latent Variables	Expectations	Service users' behaviors	Service satisfaction
Expectations	1.000		
Service users' behaviors	0.152	1.000	
Service satisfaction	0.350	0.100	1.000

Table 3 Results of analysis of correlation coefficient of variables

Futhermore, analysis to test the Variance Inflation Factor (VIF) and Tolerance indicated that the three variables have few correlations as the VIF was less than 5.00 and Tolerance was greater than 0.20 (Hair et al., 2010). Therefore, the problem of multicollinearity was not found, as shown in Table 4.

Variables	Tolerance	VIF
Expectations	0.977	1.024
Service users' behaviors	0.977	1.024

Table 4 Results analysis of VIF and Tolerance

3.4 Analysis of the indicator factor loading

Based on analysis of the indicator factor loading, it was found that the indicators have factor loading from 0.530 to 0.988, in which every indicator has factor loading greater than 0.50 (Hair et al., 2010). Therefore, it is within acceptable criteria and can be applied to analysis in the next step, as shown in Table 5.

3.5 Results of Confirmatory Factor Analysis (CFA)

3.5.1 Analysis of construct validity

This comprised measurement of convergent validity and measurement of discriminant validity.

1) Testing of convergent validity

Measurement of convergent validity is considered from Composite Reliability (CR), which showed that the indicators are able to be combined to measure the latent variables and Average Variance Extract (AVE). This indicates that it is the average variance of the latent variables that can be explained with the indicators from testing showing CR = 0.888 to 0.949, greater than 0.70 (Bagozzi & Yi, 1988), within the acceptable criteria and AVE = 0.421 to 0.671, greater than 0.50 (Hair et al., 2010), within the acceptable criteria, as seen in Table 5.

Components/Indicators	Factor loading	CR	AVE
Expectations (EXP)		0.934	0.671
EXP1	0.733		
EXP2	0.816		
EXP3	0.832		
EXP4	0.814		
EXP5	0.853		
EXP6	0.814		
EXP7	0.866		
Service users' behaviors (BEH)		0.888	0.613
BEH1	0.975		

Components/Indicators	Factor loading	CR	AVE
BEH2	0.988		
BEH3	0.976		
BEH4	0.983		
BEH5	0.983		
BEH6	0.978		
Service satisfaction (SAT)		0.949	0.421
SAT1	0.576		
SAT2	0.675		
SAT3	0.716		
SAT4	0.547		
SAT5	0.641		
SAT6	0.695		
SAT7	0.675		
SAT8	0.726		
SAT9	0.627		
SAT10	0.752		
SAT11	0.672		
SAT12	0.663		
SAT13	0.716		
SAT14	0.652		
SAT15	0.688		
SAT16	0.652		
SAT17	0.607		
SAT18	0.636		
SAT19	0.641		
SAT20	0.599		
SAT21	0.675		
SAT22	0.578		
SAT23	0.667		
SAT24	0.642		
SAT25	0.559		
SAT26	0.530		

Table 5 Convergent validity

2) Testing of discriminant validity

Discriminant validity is considered from AVE, and the correlation between latent variables should have a value lower than the square root of AVE, as seen in Table 6.

Variables	Expectations	Service users' behaviors	Service satisfaction
Expectations	*0.819*		
Service users' behaviors	0.152	*0.981*	
Service satisfaction	0.350	0.100	*0.649*

Table 6 Discriminant validity

Based on the testing, it was indicated that correlation between variables is accurate because it has a value less than the square root of AVE (Hair et al., 2010). This shows that the latent variables have differences in measurement.

3.5.2 Analysis of the measurement model

Confirmatory factor analysis of the model to obtain the goodness-of-fit of the model indicated that χ^2 = 3267.895, df = 699, χ^2/df = 4.675, p-value = 0.000, CFI = 0.829, TLI = 0.819, NFI = 0.793, RMSEA = 0.096, SRMR = 0.063, GFI = 0.697. Thus, the model was not within the criteria. Hence, it was necessary to modify the model by consideration of the Modification Indices, in which Hair et al. (2010) recommended that the number of variables eliminated must not exceed 20% of the indicators because if the number of remaining variables is lower than this, it will impact the accuracy of the model. Thus, the index value in the goodness-of-fit testing of the model with the empircal data after modification was χ^2 = 833.514, df = 554. χ^2/df = 1.504, p-value = 0.000, CFI = 0.981, TLI = 0.975, NFI = 0.947, RMSEA = 0.036, SRMR = 0.044, GFI = 0.906, which indicates that the criteria for the index used to verify the consistency of the model have been met. Therefore, the model is accurate, as seen in Table 7.

Consistency indices	Criteria	Before modification		After modification	
		Index value measure	Results	Index value measure	Results
χ^2/df	< 3 (Hair et al., 2010)	4.675	Not within criteria	1.504	Within criteria
CFI	> 0.90 (Hair et al., 2010)	0.829	Not within criteria	0.981	Within criteria
TLI	> 0.90 (Hair et al., 2010)	0.819	Not within criteria	0.975	Within criteria
NFI	> 0.90 (Hair et al., 2010)	0.793	Not within criteria	0.947	Within criteria
SRMR	< 0.05 (Kline, 2011)	0.063	Not within criteria	0.044	Within criteria
RMSEA	< 0.05 (Kline, 2011)	0.096	Not within criteria	0.036	Within criteria
GFI	> 0.90 (Hair et al., 2010)	0.697	Not within criteria	0.906	Within criteria

Table 7 Index values in testing of the goodness-of-fit of the model with the empircal data

In addition, the weighted value of the estimation of standard score coefficients in the confirmatory factor analysis indicated that:

1. Expectations (EXP) measured from the indicators (7 items), by which EXP3 has the most importance with standardized weighting coefficient = 1.170, followed by EXP5, EXP4, EXP7, EXP2 and EXP1 with standardized weighting coefficients = 1.164, 1.127, 1.087, 1.067 and 1.000, respectively.
2. Service users' behaviors (BEH) measured from the indicators (6 items), by which BEH6 has the most importance with a standardized weighting coefficient = 1.035, followed by BEH2, BEH4, BEH1, BEH3 and BEH5 with standardized weighting coefficient = 1.026, 1.002, 1.000, 0.977 and 0.976, respectively.
3. The service satisfaction (SAT) measure obtained the indicators (26 items), by which SAT6 have the most importance with standardized weighting coefficient = 1.846, followed by SAT23, SAT21, SAT7, SAT17, SAT3, SAT2, SAT24, SAT20, SAT25, SAT19, SAT18, SAT9, SAT10, SAT13, SAT11, SAT5, SAT8, SAT12, SAT26, SAT22, SAT14, SAT4, SAT16, SAT1 and SAT15 with standardized weighting coefficient = 1.653, 1.649, 1.552,

1.512, 1.436, 1.401, 1.388, 1.378, 1.361, 1.357, 1.340, 1.333, 1.299, 1.255, 1.241, 1.232, 1.210, 1.183, 1.151, 1.149, 1.072, 1.057, 1.035, 1.000 and 0.937, respectively.

Therefore, the weighted values of the calculated estimation of standard score coefficients have statistical significance at the level of 0.05 for all questions. Thus, the questions used to measure the variables based on the research framework were extracted into variables effectively and have the level of statistical significance for all questionnaire items.

3.6 Results analysis of the Structural Equation Model

3.6.1 Analysis of Structural Equation Model

Analysis of the structural equation model involving the testing of the suitability and accuracy of the model with consideration of index value used in testing the goodness-of-fit of the model with the empircal data indicated χ^2 = 833.514, df = 554, χ^2/df = 1.504, p-value = 0.000, CFI = 0.981, TLI = 0.975, NFI = 0.947, RMSEA = 0.036, SRMR = 0.044, GFI = 0.906. This shows that index value used in testing the goodness-of-fit of the model was acceptable, as seen in Figure 3.

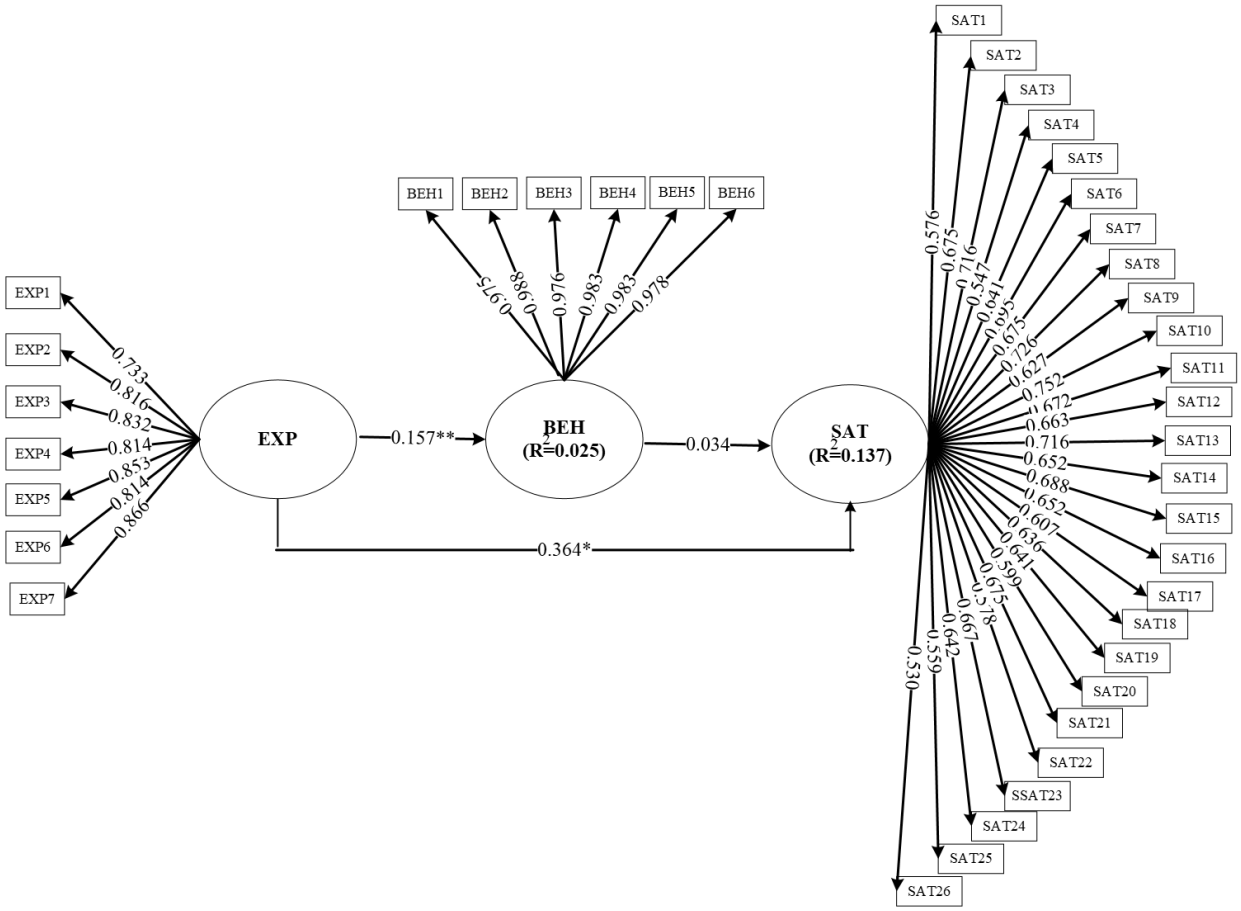

Figure 3 Structural Equation Model

Note *p < 0.001 **p < 0.01, variables: expectations (EXP) Service users' behaviors (BEH) and the service satisfaction (SAT).

Testing of the research hypotheses

Hypothesis 1 Expectations (EXP) has a positive effect on service users' behaviors (BEH). The results indicate that expectations have a significant positive effect on service users' behaviors ($\beta = 0.157$, $p < 0.01$). Therefore, the hypothesis is supported.

Hypothesis 2 Expectations (EXP) have a positive effect on the service satisfaction (SAT). The results indicate that expectations have a significant positive effect on the service satisfaction ($\beta = 0.364$, $p < 0.001$). Therefore, the hypothesis is supported.

Hypothesis 3 Service users' behaviors (BEH) have a positive effect on the service satisfaction (SAT). The results indicate that service users' behaviors do not have a significant positive effect on the service satisfaction ($\beta = 0.034$, $p > 0.05$). Therefore, the hypothesis is not supported.

Research hypotheses	Correlation of research hypotheses	p-value	Results
H1	Expectations have a positive effect on service users' behaviors.	0.002	Supported
H2	Expectations have a positive effect on the service satisfaction.	0.000	Supported
H3	Service users' behaviors have a positive effect on the service satisfaction.	0.487	Not supported

Table 8 Research hypotheses testing

3.6.2 Analysis of causal effects

Analysis of the causal effects of the service satisfaction with direct effect (DE), indirect effect (IE) and total effect (TE) is presented as follows.

Factors	Service users' behaviors			Service satisfaction		
	DE	IE	TE	DE	IE	TE
Expectations	0.157**	-	0.157**	0.364*	0.005^{ns}	0.369^{ns}
Service users' behaviors	-	-	-	0.034^{ns}	-	0.034^{ns}
R^2	0.025			0.137		

Note: *$p < 0.001$ **$p < 0.01$; ns = not significant.

Table 9 Analysis of causal effects

The analysis of causal effects indicated that the service satisfaction is directly affected by expectations ($\beta = 0.364$, $p < 0.001$) and service users' behaviors are directly affected by expectations ($\beta = 0.157$, $p < 0.01$). Moreover, service satisfaction is not directly affected by service users' behaviors ($\beta = 0.034$, $p > 0.05$) nor indirectly affected by expectations ($\beta = 0.005$, $p > 0.05$).

The predictive coefficient (R^2) of the service users' behaviors variable = 0.025. This shows that the variables in the model can explain the variance of 2.50%, and the forecast coefficient (R^2) of the service satisfaction variable is equal to 0.137, indicating that the variables in the model can explain the variance of 13.70%.

Summary

The research was divided into preliminary data analysis, descriptive statistics and confirmatory factors, and objective study results.

1) Analysis of data in preliminary descriptive statistics and confirmatory factors

This research received the questionnaire response of 100%. The preliminary testing results indicated there is no bias in the response, the questionnaire does not have missing data exceeding 5%, and the questionnaire respondents are mostly female (58.3%) and aged between between 21-40 years (54.5%).

Results from tourists about expectations, service users' behaviors and service satisfaction indicated that expectations is at a high level (mean = 4.453), service users' behaviors is within the level of very often (mean = 4.426), and service satisfaction is within the level of very satisfied (mean = 3.932).

Results of the correlation coefficient of the variables, Variance Inflation Factor (VIF) and Tolerance did not reveal the problem of multicollinearity.

Moreover, the factor loading of the indicators and the Composite Reliability (CR) and Average Variance Extract (AVE) are within the acceptable criteria, which shows that the convergent validity and a value correlation between variables have discriminant validity.

2) Research results based on objectives

This study has two objectives, namely 1) to study the causal model expectations and behaviors that affect the service satisfaction of the National Science Museum Organization, Chiang Mai and 2) to analyze the causal factors that affect the service satisfaction of the NMSO, Chiang Mai.

Objective 1

Based on the testing of a hypothesis-based causal model, the results led to improving the fitness of the model through model modification. The goodness-of-fit of the model with the empircal data indicated $\chi^2 = 833.514$, df = 554. $\chi^2/df = 1.504$, p-value = 0.000, CFI = 0.981, TLI = 0.975, NFI = 0.947, RMSEA = 0.036, SRMR = 0.044, GFI = 0.906.

For Hypothesis 1, it was found that expectation has a significant positive influence on consumer behavior ($\beta = 0.157$, $p < 0.01$), thus supporting the hypothesis. For Hypothesis 2, it was found that expectations have a significant positive influence on service satisfaction ($\beta = 0.364$, $p < 0.001$), thus supporting the hypothesis. For Hypothesis 3, it was found that the behaviors of service users had no significant positive influence on service satisfaction ($\beta = 0.034$, $p > 0.05$), thus the hypothesis is not supported.

Objective 2

Results of the analysis of direct, indirect, and total effects indicated that the service satisfaction is directly affected by expectations ($\beta = 0.364$, $p < 0.001$) and service users' behaviors are also directly affected by expectations ($\beta = 0.157$, $p < 0.01$). Regarding service satisfaction, there is no direct effect from service users' behaviors ($\beta = 0.034$, $p > 0.05$) and no indirect effect from expectations ($\beta = 0.005$, $p > 0.05$). Additionally, the coefficient of determination (R^2) is able to explain the variability of service users' behaviors at 2.50% and the variability of the service satisfaction variable at 13.70%.

Discussion and conclusions

Testing of the objectives confirmed that expectations have a significant positive effect on service users' behaviors (H1), expectations have a significant positive effect on the service satisfaction (H2), and service users' behaviors do not have a significant positive effect on the service satisfaction (H3). In addition, expectations directly influemce service users' behaviors and the service satisfaction. Service users' behaviors do not have a direct effect on the service satisfaction and the service satisfaction is not directly affected by expectations.

Expectations have a significant positive effect on service users' behaviors. Therefore, Hypothesis 1 is supported and expectations have a direct effect on service users' behaviors because they have expectations that the organization will provide modern knowledge, numerous enjoyable learning materials, and services that can be accssed frequently, which match their behaviors to relax on holidays, find learning resources outside the classroom, enhance scientific development, improve life skills, find new tourist destinations, etc. These results agree with Sirilor and Chantuk (2016), which indicated that customer expectations affect purchasing behaviors, similar to Numee (2019), who

explained that the factors that affect behaviors regarding decisions to travel/choose to buy goods and services are attitude and perception as expectations is an attitude that individuals have regarding things that are both concrete and abstract, which allow individuals to express reactions toward these things in terms of acception or rejection (Jie Hu, 2016). The expectations of service users have a greatly important role in the providing of services. Hence, service providers should notice and create understanding of customer behaviors in using the services and because of that, the service providers contribute to both mood and behaviors that respond to the expectations of the service users. This causes service users to respond with behaviors that are positive (Jeong et al., 2019).

Expectations have a significant positive effect on the service satisfaction; therefore, Hypothesis 2 is supported, and expectations have a direct effect on the service satisfaction due to the service users expect that the museum will have effective measures to supervise safety related to COVID-19, services providing modern knowledge with numerous enjoyable learning materials, frequent access to services, and courteous staff. Also, when accessing the services they feel satisfied regarding the quality of the shows/exhibitions and modern content and technology that are able to provide comprehensive knowledge and numerous effective learning materials and activities, the ability to access the museum easily, sufficient facilities for using the services, and reasonably priced fees.

The results of this research are in line with Chi et al. (2008), who stated that organizations, in addition to producing goods to sell, must consider providing services because it is an important element in creating the satisfaction for customers as well as necessary to create understanding of customers in order be able to offer goods and services directly based on their needs and expectations, This is in accordance with Park et al. (2018), who explained the research hypothesis that expectations have a direct and positive effect on the satisfaction of customers. Moreover, there are numerous research studies that confirm clearly that the satisfaction of individuals will occur when the results of accessing the services meet or exceed expectations (Fu et al., 2018; Nam et al., 2020; Zhu et al., 2021) as well as the theory of expectation confirmation (ECT), which explains that consumers will have expectations regarding goods or services before consumption and after consuming goods or services, which is followed by perceived performance of the actual products or services. Consequently, consumers will compare their perception with their expectations, which will be the determinant of the level of their satisfaction (Kima & Baker, 2020).

Service users' behaviors do not have a significant positive effect on the service satisfaction. Therefore, Hypothesis 3 is not supported. These results contrast with the research of Muangkong (2009). which indicated that there is a relationship between behaviors of using services and customer satisfaction. This is similar to Dokputsorn and Makkaew (2022), which indicated that tourism behaviors impact satisfaction with tourism logistics. Additionally, it agrees with Green and Yıldırım (2022), who conducted a study on protective behaviors during the COVID-19 situation regarding the satisfaction with life and found that human behaviors will affect the level of satisfaction, because if we have the level of caution regarding COVID-19 that increases, people will protect themselves increasingly and cause the level of the satisfaction with life to increase accordingly. Therefore, based on the results of Hypothesis 3, the service satisfaction is not indirectly affected by expectations. This is because of the possibility that the service users have varied travel targets. Therefore, they do not feel that this factor will affect or contribute to their satisfaction with the source of information and the easy accessibility of the services, the quality of the shows/exhibitions with modern content and technology that is able to provide knowledge comprehensively, learning materials that are complete and effective, the conducting of numerous learning activities, the sufficient facilities, and the collection of reasonable fees. Additionally, expectations may be deeply related with motivation, interest, and commitment and determination to travel (Mortazavi, 2021), thus resulting in expectations not having an indirect effect on the service satisfaction with the transfer variable being the behaviors of the service users.

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References

1. Bagozzi, R. P., & Yi, Y. 1988. On the Structural Equations Models, ***Academy Of Marketing Science***, 16(1), 74-94.
2. Bordonaro, L. 2020. Expectations of tourism: hope, disappointment and tourism development in Vila Real (Douro, Portugal*). **Etnográfica*** 24(2):289-314.
3. Box, G. & D. Cox. 1964. Analysis of transformation. ***Journal of the Royal Statistical Society Series B*** 26 (2): 211-252.
4. Chi, C. G. & Qu, H. (2008) Examing the structural relationships of destination image, tourist satisfaction and destination loyalty: An integrated approach. ***Tourism Management***, 29(4):624-636.
5. Cohen, S. A.., Prayag, G., & Moital, M. (2014) Consumer behaviour in tourism: Concepts, effects and opportunities. ***Current issues in Tourism***, 17(10):872-909.
6. Comrey, A. L. & Lee, H. B. (2009) A First course in factor analysis (2nd ed.) New York: Lawrence Eribaum Associates.
7. Cronbach, L. J. (1990) Essentials of Psychological Testing. (5th ed.) New York : Harper Collins Publishers. pp.202-204.
8. Dokputsorn, K. & Makkaew, C. 2022. A Study of Behavior and Satisfaction in Historical Tourism Logistics: A Case Study of Phra Nakhon Si Ayutthaya Province. ***Journal of Digital Business and Social Sciences***, 8(2), 1-12.
9. Fu, X. M., Zhang, J. H., & Chan, F. T. 2018. Determinants of loyalty to public transit: A model integrating Satisfaction-Loyalty Theory and Expectation-Confirmation Theory. ***Transportation Research Part A: Policy and Practice***, *113*, 476-490.
10. Fungpraserku. S., Suwanmongkol, P., Katekao, V., and Chiring, P. 2018. Role of Local Museum in Social Development: Case Study of Local Museum Established by Temples, Communities and Private Sector in Nakhon Pathom. ***EAU HERITAGE JOURNAL Social Science and Humanity***, 9(2): 163-174.
11. Green, Z. A., & Yıldırım, M. 2022. Personal growth initiative moderates the mediating effect of COVID-19 preventive behaviors between fear of COVID-19 and satisfaction with life. ***Heliyon***, *8*(6), e09729.
12. Hair, J.F., Black, W.C., Babin, B.J. & Anderson, R.E. 2010. Multivariate Data Analysis. (7th ed.). Pearson: New York.
13. Heung, V. C. S., & Tianming, G. U. 2012. Effect of restaurant atmospherics on patron satisfaction and behavioral intentions. **International Journal of Hospitality Management**, 31(4), 1167-1177.
14. Hossain, M. A., & Quaddus, M. 2012. Expectation-confirmation theory in information systems research: A review and analysis. ***Inform. Syst. Theor***. 28, 441–469. doi: 10.1007/978-1-4419-6108-2_21
15. Jeong, J. Y., Park, J., & Hyun, H. (2019). The role of emotional service expectation toward perceived quality and satisfaction: Moderating effects of deep acting and surface acting. ***Frontiers in Psychology***, *10*, 321.
16. Jie Hu. 2016. Expectations, Satisfaction, and Behaviors of Kunming Tourists Driving to Chiang Mai Province Using Route R3A. Master of Arts Thesis. Department of Hospitality and Tourism Industry Management, Bangkok University
17. Kim, Y. K., & Lee, H. R. (2011) Customer satisfaction using low cost carriers. ***Tourism Management***, 32, 235-243.
18. Kima, K., & Baker, M. A. (2020). Paying it forward: The effect of other customer service recovery on future co-creation. ***Journal of Business Research***, *121*, 604-615.
19. Kotler, P., & Armstrong, G. (2010) Principle of Marketing (13th ed.). New Jersey: Prentice-Hall.
20. Lewis, T. F. (2017). Evidence regarding the internal structure: Confirmatory factor analysis. ***Measurement and Evaluation in Counseling and Development***, 50(4), 239–247.
21. Liu, X., Li, J. & Kim, W. G. (2017) The role of travel experience in the structural relationships among tourists' perceived image, satisfaction, and behavivioral intentions. ***Tourism and Hospitality Research***, 17(2):135-146.
22. Lovelock, C., & Wirtz, J. (2011) Service marketing: People, technology, strategy. New Jersey: Prentice-Hall.

23. Malik, G., & Rao, A. S. 2019. Extended expectation-confrmation model to predict continued usage of ODR/ride hailing apps: role of perceived value and self-efcacy. Inform. Technol. ***Tourism*** 21, 461–482. doi: 10.1007/s40558-019- 00152-3
24. Mihaela, O. O. E. (2015) The effect of the integrated marketing communication on the consumer buying behaviour, ***Procedia Economics and Finance***, 23:1446-1450.
25. Mortazavi, R. (2021). The relationship between visitor satisfaction, expectation and spending in a sport event. ***European Research on Management and Business Economics***, *27*(1), 100132.
26. Muangkong, A. 2009. Factors influencing service use behavior. and overall satisfaction Of customers who come to use the floating restaurant, Riverside Boat. Master's Degree Program Thesis Marketing Program, Graduate School Srinakharinwirot University.
27. Mudzanani, T. E. (2017) The four 'C's of museum marketing: proposing marketing mix guidelines for museums. ***African Journal of Hospitality, Tourism and Leisure***, 6(2):1-12.
28. Nam, K., Baker, J., Ahmad, N., & Goo, J. (2020). Determinants of writing positive and negative electronic word-of-mouth: Empirical evidence for two types of expectation confirmation. ***Decision Support Systems***, *129*, 113168.
29. Numee S. (2019) Foreign Torists' behavior towards creative tourism : a case study of Koh Samui district, Suratthani Province. Bangkok : National Institute of Development Administration
30. Oxford Advanced Learner's Dictionary. 2022. Expectation meaning. Retrieved on 14 December 2022. Available at https://www.oxfordlearnersdictionaries.com/definition/english/expectation?q=expectation
31. Parasuraman, A., Zeithaml, V. A., & Berry, L. L. 1988. SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. **Journal of Retailing**, 64(1): 12-40.
32. Park, S., Hahn, S., Lee, T., & Jun, M. 2018. Two factor model of consumer satisfaction: International tourism research. ***Tourism Management***, *67*, 82-88.
33. Penchan, S. 2020. Marketing Mix Affecting Customers Towards Visiting Lanna Traditional House Museum, Chiang Mai University. Master of Business Administration. Chiang Mai : Chiang Mai University
34. Ren-Hua Kung, 2018. A Study of the Tourists Expectation, Satisfaction and Revisiting Intention in the Neiwan, Hsinchu. ***International Journal of new developments in Engineering and Society***. 2(1):43-49.
35. Sirilor T. & Chantuk T. 2016. Expectation Factors Affecting Behavior of Electronic Baby Department Shopping on Website. Veridian E-Journal, Silpakorn University (Humanities, Social Sciences and arts), 9(2), 2115-2130
36. Soonthonsmai, V. 2019. A Causal Model of Satisfaction on Service Quality of Health Tourism in Scandinavian Aging Tourists. ***Journal of Humanities and Social Sciences, Burapha University***, 28(1):244-268.
37. Zeithaml, V.A., & Bitner, M.J., Gremler, D.D. 2009. Service Marketing: Integrating Cu.
38. Zhu, T., Liu, B., Song, M., & Wu, J. 2021. Effects of service recovery expectation and recovery justice on customer citizenship behavior in the E-retailing context. ***Frontiers in Psychology***, *12*, 658153.