Comparison of Artificial Neural Network and Multiple Regression on Favoured Halal Destination

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Abstract: Relationship between assumed variables has been redundantly carried out by multiple regression analysis and correlation analysis. The application of unconventional ways to learn deep into human minds to gauge the behavior and intentions will increase the weight of reasonably accurate prediction. Thus this study aims to empirically verify the prediction with the support of artificial neural network and multiple regressions. The quality of the neural network is often collated in terms of estimated error. By distinction non-linear and non-parametric procedures are not simple to implement unlike artificial neural network's applicability without manipulative assumptions. Results show that the coefficient of determination driven from multiple regression analysis is able to explain dependent variables with the support of the input variables. Despite this the error for artificial neural network is lower compared to multiple regression analysis. Thus, the predictive performance through artificial neural network is considered to be stronger approach compared to multiple regression analysis. As global tourism industry is ever more dynamic business, recognizing the needs, desires, demands and behaviors of international travelers plays a vital part in the growth of destinations. Therefore, the primary objective of this investigation is to predict the outcomes of halal destination by comparing multiple regression and artificial neural network. Outcome reflects that artificial neural network prediction is firmer compared to multiple regression analysis.

Key Words: Halal destination, intention, multiple regression, artificial neural network

1. Introduction

AftertheattacksontheWorldTradeCentreonSeptember11,2001,thenumberofWestern touristsvisitingIslamiccountriessuchasMorocco,Egypt,MalaysiaorJordansignificantly decreased (Harahap, 2019).Themajorgoalofthisresearchistopredict and improvetourismintheregionthrough developing new destinations and promoting Islamic heritage and culture, adjusting the tourismindustrytoIslamiccustomsandnorms.Providingafacilityathotelswhichoffer product or services with Islamic principles is a better step towards Halal destination named asIslamichotels,Shari'ah-complianthotelsandhalalhotels.Halaltourismconcepthasbeen implementedinnumbersofhotelswhichalreadyincreasinginbothinIslamiccountriesand Western countries (Battour and Ismail, 2016; Bogan et al., 2016; Pamukçu and Sarıısık, 2017).ThisistogivethemtheexperienceofIslamicultureandtraditioninIslamicnation.This study targets to investigate the factors that influence travel to Islamic destinations. In various scenarios, the problem is to clarify the concepts of halal tourism and Islamic tourism and to draw attention to some conceptual and practical challenges in the halal tourism industry. For our study, the type of research being conducted is descriptive, predictive as well as inferential.It will be futile if research, endeavor's under investigation, on which quarry to reach in the end or everything (Mohsin, Ramli, &Alkhulayfi, 2016; Vargas-Sánchez, & Moral-Moral, 2019). Our

main objective is to investigate the most crucial factor that influences people's behaviour, discover the association between demographics and travel factors such as problems like their intentions and factors of choosing halal destinations comparing two analytical methods. Additionally, their lifestyle, backgrounds, preferences will be integrated towards the destinations. Therefore, we could

help the tourism industry to identify what kind of tourist prefers halal destinations.

2. Literature Review

Tourism serves many purposes and provides benefits for everyone and everything involved, from the traveler to the people serving those travelers, along with the cities, states and countries that are being traveled (Al-Ansi, & Han, 2019). Tourism brings people together and opens our eyes to a variety of cultures and beliefs that we may not have had a chance to experience. Whether traveling a short distance or halfway around the world, there is something to see or learn and fun to be had.

People travel for a variety of purposes and they tend to find the halal destination because they guarantee cleanliness and safety for their good. Thus, this research is to investigate the most crucial factor in influencing among travellers, discover the association between demographics and travel factors such as problems like their intentions and factors of choosing halal destinations and to study to assess stress among tourist and its association with various academic, social and health related factors.

The issues that travellers want to find from the halal destination which they prefer and halal travel have becoming a global demand because not only muslim tend to find a halal goods but non-muslim too (Battour, & Ismail, 2016). Islamic tourist has their own factors why they're choosing the halal destination and their intentions to choose certain destination to adapt for their beliefs while traveling.

The social distance theory demonstrated that individuals are all the more accommodating to other people who share a similar social and social condition which related to the culture of the local society. Andriotis (2005) proposes estimating occupants' observations and the impression of other local gatherings or the travel industry investors, as their perspectives are likewise indispensable in guaranteeing the future accomplishment of the travel industry improvement. According to Push and pull theory, this theory is to determine the factors that influences the travellers to choose a particular destination or a hotel through the environment factors (Chandra, G. R. (2014; Kovjanic, 2014). This theory is very useful in tourism sector literature. Factors such as regulations, religions, mosque and prayer facilities, presence of Azan announcements in public, halal issues dress code and displaying affecting are some of the pull factors (Boğan, &Sarıışık, 2019; Winarti, 2017).

According to Shafaei (2015), some of the related Islamic tourism factor are awareness about Islamic tourism and Halal hotels, image of Islamic destination such as Malaysia, perceived quality of Islamic/Halal Hotel and perceived value towards Islam /Halal hotels being discussed and examined under Brand Equity Theory with halal food. Chan &Chang (2008), forwarded the forth theory known as Maslow theory that cited in many travel and tourism literature such as Mill and Morrison (1998) focusing on the five needs such as physiological needs (relaxation), safety (security), belonging (love), Esteem (achievement), Self-actualization (be true to oneself). Also using Mill and Morrison (1998) model to examine the values and motives of tourists. According to Chan and Chang (2008) with the reference from Mountinho (1987, cited in Chang and Chang 2008) the Maslow model have two key variables such as personality and habits. Also Mill and Morrison (1998) said that there are several factors to determine the causes influencing tourist in choosing a particular destination such as motivations.

Grounded theory (GT) is a research technique concerned with the generation of theory, which is 'grounded' in data that has been systematically gathered and examined. It is used to uncover such things as social connections and behaviours of groups, known as social procedures. Grounded theory can be used to create a theoretical model, conceptualize the collected information and decipher the information in hospitality and tourism. (Mehmetoglua and Altinay, 2006).
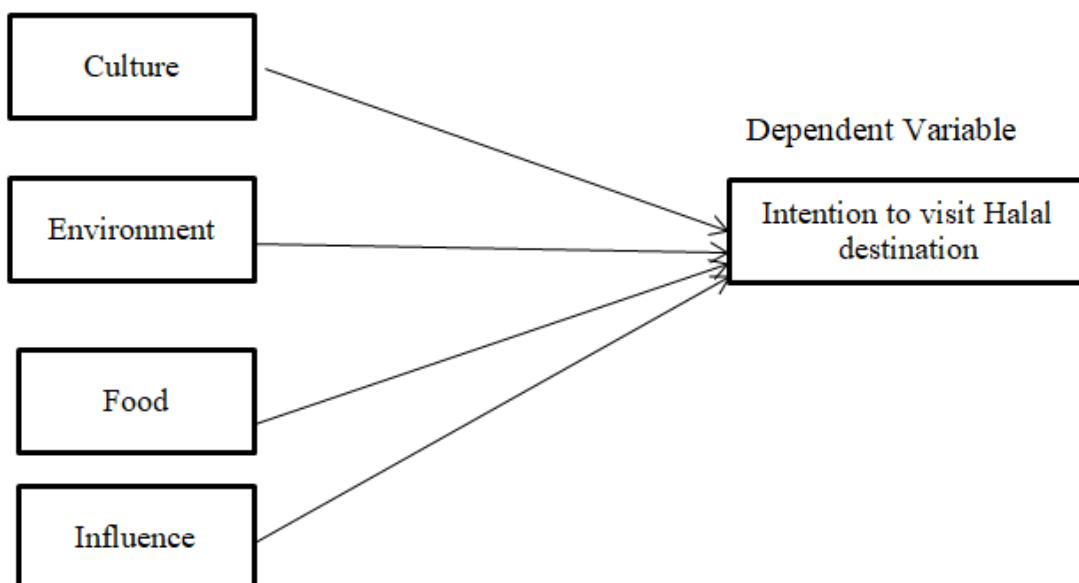
Figure 1:Conceptual framework of the study

2.1 Hypothesis to be tested

H1: There is a significant relationship between culture and intention to visit Halal Destination.

H2: There is a significant relationship between environment and intention to visit Halal Destination.

H3:ThereisasignificantrelationshipbetweenhalalfoodandintentiontovisitHalal Destination.

H4: There is a significant relationship between influence and intention to visit Halal Destination.

There are 4 components that effect the people's intention to visit halal destination. The components are culture, environment, food and influence.

Culture: Culture defined as a particular set of customs, morals, codes and traditions from a specific time and place. Cultural Muslims are religiously oblivious, common or sceptical people who still relate to the Muslim culture or the religion because of family foundation, individual encounters, or thesocialandsocialconditioninwhichtheygrewup.Thus,theculturewilleffectstudents' decision making to visit halaldestination.

Environment: The environment is also the factor for the Muslim travellers visiting the destination. Some place the environment is not suitable for Muslim as the place has bars which literally sells alcohol and is against Islamic religion so it's conducive to find a destination without prohibitory culture.

Food: Finding Halal food is one of the most common problems that Muslim travellers face. If a Halal certification is shown either at the entrance or on the menu, one may be certain that eating at that establishment is permissible.On the other hand, we can become too reliant on such certifications, which may not be available in certain countries.If you see nothing suspicious about the food they serve, you can trust the establishment that it is Halal. This is particularly true if the establishment is Muslim-owned or Muslim-run. However, in many countries, such Halal certification may not be available.

Influence: Travel motivation, cognitive and affective image have the largest significant effects on the traveler's intention to visit halal destinations (Ainin, Feizollah, Anuar, & Abdullah, 2020). Contrary to expectations, the findings suggested that Muslim-friendly amenities and quality of service is also the reason they travel to Muslim-friendly destination so it will be easy for them to have a nice holiday because of Muslim-friendly service.

3. Methodology

This study adopted quantitative research design. The targeted participants for the survey study are identified as muslim people who are citizens of Malaysia. A screening question of their religion of practice is given prior to acquiring their feedback on halal destination. Further, the illegible age as determined by psychologist to produce their opinion is also considered and the respondents of 18 years and above are approached to complete the questionnaire. The questionnaire is adopted and adapted from previous related studies. However, some of the items in the questionnaires are modified retaining the original meaning.

Table 1: The variables, no. of items, alpha, scale type and source with year

Variable	No of items	Alpha	Scale type	Source with year
Culture	8	0.841	1-5 likert	Fischer, R. (2004)
Environment	8	0.721	1-5 likert	Lee, S. X., Chye, J. Y., Chin, C. Y., &Liew, W. Y. (2017)
Halal Food	8	0.787	1-5 likert	Lee, H. S. (2017)
Influence	8	0.863	1-5 likert	Lee, S. X., Chye, J. Y., Chin, C. Y., &Liew, W. Y. (2017)
Intention	4	0.715	1-5 likert	Chua, X. Z., Chia, W. S., Lau, S. T., & Lee, S. L. (2017)

The finalized questionnaire is separated into two-part demographic and measuring variables. The demographic part, discovers the characteristic of a respondents. The remaining establishes the relationship between the four independent variables and one dependent variable.

Non- probability sampling is applied to reach the respondents. A total of 300 questionnaires were distributed via online platform and face to face correspondence. Respondents belonged to different states in Malaysia. The coverage of respondents was higher as the questionnaires were delivered through online portals also.Atotal number 163 completed the questionnaire in Convenience sampling method was used for datacollection. The survey questionnaire is generally considered to be the ethical and convenient method of data collection and analysis which procures numerical results that can be granted as passage to reach the objective of the study.The data is analyzed by using SPSS version 25. The model accuracy is compared by linear regression and artificial neural network statistical test.

3.1 Analysis with linear regression

Multiple linear regression (MLR), also known simply as multiple regression, is a statistical technique that uses several explanatory variables to predict the outcome of a response variable. Multiple linear regression (MLR) aims to model the linear relationship between the explanatory (independent) variables and the response (dependent) variable.

The equation for Multiple Linear Regression Is

$$Y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \beta_3 x_{i3} + \cdots + \beta_n x_{in} + \epsilon$$

Where n = Nunmber of observations
Y_i = Dependent varaibles
x_i = Explanatory variables
β_0 = y − intercept (constant term)
β_n = slope coefficients for each explanatory variable
ϵ = the model's error term (also known as the residuals)

Upon fitting a multiple linear regression model the unknown parameter estimates will help to verify the model fit to the present observed data. The results presented in the model summary table, coefficient table and analysis of variance (ANOVA) table will be evaluated from regression analysis output. The F-statistic and p-value are reported in the ANOVA table, comparing the p-value with determined significance value (0.05) will assist to conclude the significance of the proposed model. From the various ways of assessing the goodness of the model R^2 is captured to interpretate the proportion of variation explained by the outcome variables. Including more predictors in regression analysis will always elevate the value of R^2. However, using more number of predictor is not the best way out to explain the outcome variable. Higher adjusted R^2 can suggest better fitted model. However, increasing the number of predicted variables not necessarily gives higher adjusted R^2. By norm as R^2 increases standard error (SSE) decreases. Referring to the coefficient table for p-value of the t-test for each of the predictor variables the proportion of each variables contribution to the criterion variable. Multiple regression measures each predictor variables relation to the outcome variable after controlling the remaining contributor variables.

3.2 Analysis with Artificial neural network

Artificial neural network is a predictive application, such as the multilayer perceptron (MLP) and radial basis function (RBF) networks, are supervised in the way that the estimated model outcomes can be compared with the known values of the criterion variables. The word "neural network" refers to a closely connected family of models derived from studies of brain function and characterised by a broad parameter space and versatile structure. While much of the associated terminology reflects the family's origins, much of the new models were developed for non-biological applications as the network expanded. Since the connections in the network flow forward from the input layer to the output layer without any feedback loops, this arrangement is known as a feed forward architecture. In this figure:

- The input layer contains the predictors.
- The hidden layer contains unobservable nodes, or units. The value of each hidden unit is some function of the predictors; the exact form of the function depends in part upon the network type and in part upon user-controllable specifications.
- The output layer contains the responses. Since the history of default is a categorical variable with two categories, it is recoded as two indicator variables. Each output unit is some function of the hidden units. Again, the exact form of the function depends in part on the network type and in part on user-controllable specifications.

Neurons are computational unit that takes the input(s), after calculations the outcome is produced. The types of activation function that produces the output within a range are:

Sigmoid- $y_s = \frac{1}{1+e^{-x_s}}$ range from 0 to 1
Tanh- $y_s = \tanh(x_s)$ range from -1 to 1
Rectified Linear Units (ReLu)-$y_s = \max(0, x_s)$, range from 0 to $+\alpha$
However, there is more activation function to derive the output. The aggregation of the activation function is:
$f(b + \sum_{i=1}^{n} x_i w_i)$
Where,   b= bias,
        x=input neuron,
        w= weights,
        n= number of inputs from the incoming layer,
        i= a counter from 0 to n.

4. Result andDiscussion

Thischapterfocusesonthefindingofthedatathathavebeencollected.Thedatahavebeen analyzed based on 3 sections.

The first section described the results ofdemographic data of respondents which consist of age, gender, race, marital status, education level and employment status. The second part focuses on descriptive analysis performed in order to identify student's intention to visit halal destination. The third section is focused on the correlation analysis between variables that are used in this research. This finding and discussion is made to understand thevariables. Analysis commenced with reliability test, descriptive analysis, multiple regression and artificial neural network using IBM SPSS (Statistical Package for Social Science) version 25.

Demographic Profile

Table 2: Frequency and Percentages of Participants' Age

Age	Frequency	Percent	Valid Percent	Cumulative Percent
18 - 22	59	29.5	29.5	29.5
23 - 27	70	55	55	84.5
27 - 31	18	9	9	93.5
32-36	9	3	3	96.5
37-41	3	1.5	1.5	98
42-46	1	0.5	0.5	98.5
47-51	1	0.5	0.5	99
52-56	1	0.5	0.5	99.5
57-above	1	0.5	0.5	100
Total	163	100	100	

Table 3: Frequency and Percentages of Participants' Age

Gender	Frequency	Percent
Male	79	48.5
Female	84	51.5
Total	163	100

Table 4: Frequency and Percentages of Participants' Race

Race	Frequency	Percent
Malay	151	92.6
Chinese	3	1.8
Indian	4	2.5
Other	5	3.1
Total	163	100

Table 5: Frequency and Percentages of Participants' marital status

Marital Status	Frequency	Percent
Married	140	85.9
Single	21	12.9
Divorced	2	1.2
Total	163	100

Table 6: Frequency and Percentages of Participants' Employment Status

Employment Status	Frequency	Percent
Unemployed	98	60.1
Employee	55	33.7
Self-employed	10	6.1
Total	163	100

Table 7: Frequency and Percentages of Participants' Employment Status

Variables	No. of items	Reliability
Culture	8	0.841
Environment	8	0.721
Halal Food	8	0.787
Motivation	8	0.863
Students' intention	4	0.715

Regression analysis result
Table 8: Table of Regression Analysis

Model	Sum of Squares	df	Mean Square error	F	Sig
Regression	36.886	4	9.222	58.796	.000[b]
Residual	24.781	158	0.157		
Total	61.667	162			
a. Dependent Variable: Intentions					
b. Predictors: (Constant), motivation, culture, halal, environment					

Table 9: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.073[a]	0.0058	0.0088	0.79603
a. Predictors: (Constant), motivation, culture, halal, environment				

Table 10: Table of Coefficients scores for the independent variables

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-0.009	0.287		-0.032	0.974
Culture	0.32	0.048	0.371	6.661	0
Environment	0.128	0.084	0.106	1.524	0.13
Food	0.246	0.074	0.224	3.317	0.001
Infleunce	0.339	0.067	0.313	5.037	0
a. Dependent Variable: Intentions					

Results of Hypothesis Testing

H1: There is a significant relationship between culture and students' intention to visit halal destination. Based on the table, the significant value is 0.000 ($p < 0.05$). Hence, we accept the null hypothesis. Thus, this concludes that there is a significant relationship between culture and students' intention to visit halal destination.

H2: There is a significant relationship between environment and students' intention to visit halal destination. Based on the table, the significant value is 0.130 ($p > 0.05$). Hence, we reject the null hypothesis and accept the alternatives hypotheses. Thus, this concludes that thereisnosignificantrelationshipbetweenenvironmentandstudents'intentiontovisithalal destination.

H3: There is a significant relationship between halal food students' intention to visit halal destination. Based on the table, the significant value is 0.001 ($p < 0.05$). Hence, we accept thenullhypothesis.Thus,thisconcludesthatthereisasignificantrelationshipbetweenhalal food and students' intention to visit halaldestination.

H4: There is a significant relationship between motivation and students' intention to visit halal destination. Based on the table, the significant value is 0.000 ($p < 0.05$). Hence, we accept the null hypothesis. Thus, this concludes that there is a significant relationship between motivation and students' intention to visit halal destination.

From all the independent variables, we only reject the null of the H2 independent variable (environment) because the p-value or significant value on the coefficients table is greater than 0.05. Hence, we are accepting the null of H1 independent variable (culture), H3 independent variable (halal food) and H4 independent variable (motivation) because the p- value or significant value on coefficient table is smaller than 0.05. This shows that the independent variable of H2 doesn't have any connection or relationship with thedependent variable which is students' intention to visit halaldestination.
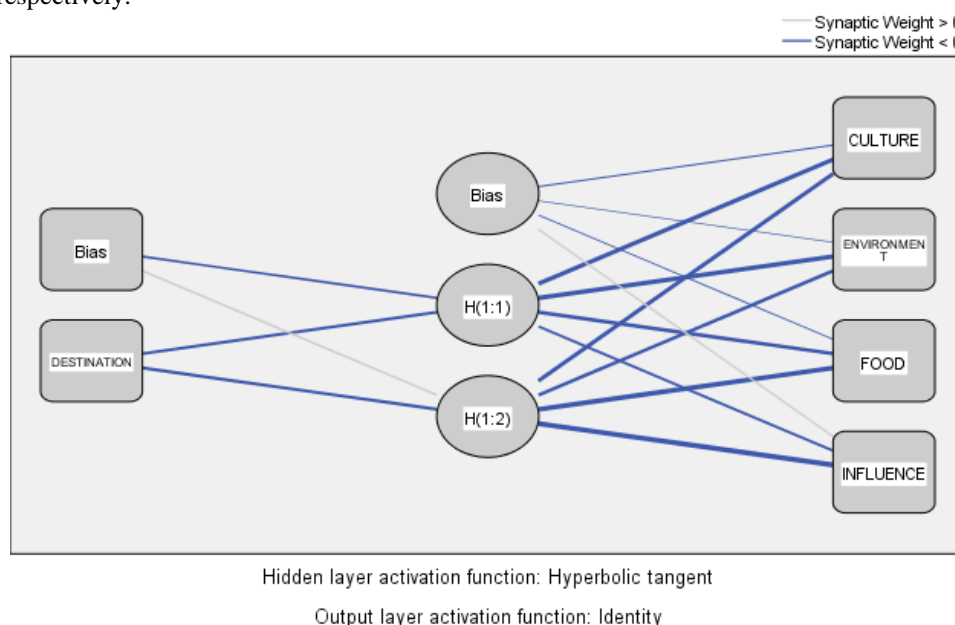
Artificial Neural network result

Table 11: Table presenting the summary of the cases

	Case	N	Percent
Sample	Training	110	67.50%
	Testing	53	32.50%
	Valid	163	100.00%
	Excluded	0	
Total		163	

Table 11 presents the partition of the values into training and testing sets. By default the training and testing cases are divided into 70% and 30 % respectively. In case of our data 67.5% and 32.5% are concluded as training and testing sets respectively.

Figure 2:Scehmatic model of artificial neural network

According to the schematic output in figure 2 shows four nodes in the one hidden layer. All the lines from the input layer to hidden layer and then to the output reveal the estimated relationship. The darker or thicker the colour of line shows stronger relationship. Apart from the output node both the input and hidden layer paths witness some amount of bias or error. In our case the error from the input to hidden layer shows darker lines predicting weak descriptors. However, the bias path to output node can be interpreted as not strong and have insignificant effect.

Table 12: The unknown parameter estimates of the independent variables

		Predicted				
		Hidden Layer 1				**Outer Layer**
Predictor		H(1:1)	H(1:2)	H(1:3)	H(1:4)	Destination
Input Layer	(Bias)					
	Destination					
Hidden Layer 1	(Bias)					
	H(1:1)					
	H(1:2)					
	(Bias)	0.775	-0.432	-0.084	-0.364	
	Culture	-0.262	0.808	0.143	0.143	
	Environment	0.151	-0.009	0.39	-0.39	
	Food	0.355	0.401	-0.455	-0.455	
	H(1:1)					0.135
	H(1:2)					1.126
	H(1:3)					-0.067
	H(1:4)					0.439

The parameter estimates table 12 presents the calculated value for each of the path relationship presented in figure 2. The upper left values are from the input to hidden layer and the bottom right values represent the estimates from the hidden layer to output node.

Table 13: Model summary results for artificial neural network

Training	Sum of Squares Error		156.867
	Average Overall Relative Error		0.713
	Relative Error for Scale Dependents	Culture	0.732
		Environment	0.715
		Food	0.719
		Influence	0.686
Testing	Sum of Squares Error		69.714
	Average Overall Relative Error		0.739
	Relative Error for Scale Dependents	Culture	0.673
		Environment	0.891
		Food	0.712
		Influence	0.694
a. Error computations are based on the testing sample.			

The quality of the model can be predicted with the relative error values for both training and testing segments. The error values are relatively small and therefore the performance of the model is considered to be good to do a

suitable prognosis. The details of the wrong location of the data which might occur can be detected from the classification details.

Table 14: Importance of independent variable

Variables	Importance	Normalized Importance
Culture	0.54	100.00%
Environment	0.157	29.00%
Food	0.303	56.10%
Influence	0.186	31.20%

Lastly table14 highlights which of the three dependent or input variables are the most important to describe the output variables. The importance of each predictor in comparison with the linear regression coefficient is shown by the scores in table 15.The scores divulge that culture is the most important contributor for finalizing a halal destination furthermore food come the next important factor for the selection criteria. Environment feature shows least score contributing towards choosing a halal destination.

The distribution of the outcome is unknown as such no specific test is applied. The focus of prediction revolves around the strength of the relationship between the projected paths and the prevalence of degree of error.

5.   Conclusion

Through the services and surrounding environment that provided at halal destination, this couldhelpmuslimstolearnandadaptwiththesituationandsurroundingsuchasdresscode for female and male. Besides, the tourist could help to suggest and recommend to their close friends and family a better stay for their vacation as the experience living in halal destination changes their perception and decision making which would attract the listeners to visit the halal destination. Besides gaining knowledge on the cultural heritage at the destination, touristcouldhaveanexperiencetogoindepthonIslamandculturewhich haveabroadexploration.Furthermore,throughthisresearch,wecouldhelpthecountries to improve the destinations to attract the visitors and backpackers to visit the halal destination.

As the amount of error in the model is small highlighting a good fit, however the coefficient estimates have not sufficiently contributed and such the R^2 value remains unexplained by 40%. Therefore, the probability of unidentified factors exists. Practical contribution, states can open a center along the pathway and create awarenesstothetravellersaboutmaking decision whiletravellingwhichwill provide them option for halal destination. Then, the authorities can provide the information through their social media such as Instagram or Facebook. This is the initiative for the authorities to implement in order to motivate tourist and make them aware on the existing halaldestination.

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