Giving increased value to invertebrates conservation through entotourism activity in current and planned ecotourism activity. Tourist attitudes preliminary study in Sabah, Borneo of Malaysia

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Tabin Wildlife Resort in Tabin Wildlife Reserve, Lahad Datu, Sabah is a popular tourist spot in Malaysia for being the largest wildlife reserve by mainly focusing on endangered mammals and birds. Thus, in this research, it is proposed to include invertebrates' information in the current ecotourism activities in Tabin Wildlife Reserve. Implicitly, it could increase a sustainable invertebrates' conservation. Invertebrates possess large benefits to humankind, namely waste recycling whereby, they cycle the minerals and organic minerals for plants and animals. Thus, this investigation aimed to study the tourists' perception on including invertebrates' information in current Tabin Wildlife Resort ecotourism activity. Hence, to collect data from tourists, pre-visit and post-visit questionnaire surveys were adopted as the methodological approach during preliminary entotourism activity. Two different conceptual framework sets (pre-visit and post-visit) were posited in this investigation. The collected data were analysed via Statistical Package for Social Sciences (SPSS) and Analysis of Moment Structure (AMOS) software program by adopting Structural Equation Modelling (SEM). SEM analyses revealed that both pre-visit and post-visit surveys have significant variance towards the ecotourism. This implied a good potential in including invertebrates in ecotourism activities especially in Sabah. The findings of this study are important to contribute to the literature of invertebrates' species conservation awareness in Sabah, since very limited researches are conducted specifically on entotourism field.

MANUSCRIPT

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ABSTRACT

Tabin Wildlife Resort in Tabin Wildlife Reserve, Lahad Datu, Sabah is a popular tourist spot in Malaysia for being the largest wildlife reserve by mainly focusing on endangered mammals and birds. Thus, in this research, it is proposed to include invertebrates' information in the current ecotourism activities in Tabin Wildlife Reserve. Implicitly, it could increase a sustainable invertebrates' conservation. Invertebrates possess large benefits to humankind, namely waste recycling whereby, they cycle the minerals and organic minerals for plants and animals. Thus, this investigation aimed to study the tourists' perception on including invertebrates' information in current Tabin Wildlife Resort ecotourism activity. Hence, to collect data from tourists, pre-visit and post-visit questionnaire surveys were adopted as the methodological approach during preliminary entotourism activity. Two different conceptual framework sets (pre-visit and post-visit) were posited in this investigation. The collected data were analysed via Statistical Package for Social Sciences (SPSS) and Analysis of Moment Structure (AMOS) software program by adopting Structural Equation Modelling (SEM). SEM analyses revealed that both pre-visit and post-visit surveys have significant variance towards the ecotourism. This implied a good potential in including invertebrates in ecotourism activities especially in Sabah. The findings of this study are important to contribute to the literature of invertebrates' species conservation awareness in Sabah, since very limited researches are conducted specifically on entotourism field.

***Keywords*:** Invertebrates, Entotourism, Conservation, AMOS, SEM

1. INTRODUCTION

Invertebrates are commonly known as dominant group of animals on Earth today and have enormously outnumbered compared to all other terrestrial animals globally (Triplehorn & Johnson, 2005:23). Kumar and Asija (2004:29) suggested that every species has its importance in the ecosystem, either it is a wild plant or an animal.

Invertebrates provide a bewildering array of goods and services to the people and economies of the world yet much ignored in part of our natural capital (Collen, Bohm, Kemp & Baillie, 2012:12). Wilson (1992:20) quoted that the important insects and other land-dwelling arthropods are if all were to disappear, humanity probably could not last more than a few months. Most of the amphibians, reptiles, birds and mammals would crash to extinction at the same time.

An important service afforded by the invertebrates is waste recycling. They are making the minerals and organic material available again for plants and other animals (Srivastava & Saxena, 2007:97). Many plants especially flowering plants rely on insects to pollinate their flowers in order to complete their reproductive cycle (Gallai, Salles, Settele & Vaissiere, 2008:810).

There is a long history of invertebrates being used as indicators of the health of our environment. In determining the quality of our rivers and lochs, most environmental agencies routinely use the assessments of the number and variety of aquatic invertebrates that exist alongside of the chemical analyses (Losey & Vaughan, 2006:311).

People are now becoming more interested in nature as whole. This ideology suggests that there is a potential for including invertebrates in ecotourism activities, in turn, this would contribute to invertebrates' conservation and improve tourism services as well as tourism products (Huntly, Noort & Hamer, 2005:53).

2. LITERATURE REVIEW

2.1 Invertebrates threatened

The human population has reached to an estimation of 7 billion people at the end of 2011 (UNFPA, 2011:167). Reaching this human population milestone indicates the enhancement pressure in our ecosystems as well as the species we are sharing in this planet.

There are ample indications of population declines and potential for high extinction risk in many groups of invertebrates. Pollinator decline have made the news in the previous years because of the obvious effects on ecosystem stability, crop production and food security (Potts, Biesmeijer, Kremen, Neumann, Schweiger & Kunin, 2010:345). Bumblebee has been particularly well studied and its decline has been observed throughout North America, Europe and Asia. It is most often caused by the changing of agricultural policies and land use (Williams & Osborne, 2009:367).

Freshwater groups (Darwall, Sedddon, Clausnitzer & Cumberlidge, 2012:18) are consistently at higher risk than their terrestrial counterparts (Gerlach, Hoffman, Hochkirch, Jepsen, Seddon, Spector & Williams, 2012:15). Terrestrial invertebrates are primarily threatened by agriculture and logging which both are affected by 31% of threatened species, followed by 28% of infrastructure development (Collen *et al*., 2012:51).

The impacts of climate change remain complex, though an increased understanding of species biology may provide some clues (Foden, Mace, Vie, Angulo, Butchart, DeVantier, Dublin, Gurtsche, Stuart & Turak, 2009:77). Addressing to date, the lack of invertebrate coverage on the IUCN Red List is particularly showing the ignorance in view of the ecosystem services that they are providing. Therefore, it is important that they should be assessed, inventoried, monitored, and protected (Rohr, Mahan & Kim, 2007:422).

2.2 *Invertebrate conservation*

Perhaps people questioned why should we care if a few more species of invertebrates going extinct. First and foremost, human is the main causal agent of modern extinctions and because of the intrinsic value of species, we are morally obliged to avert human mediated extinction (Sagoff, 2009:643).

Secondly, this species also have instrumental values via the use of organisms for human benefits and this often provide us with the best reason for justifying conservation actions (Justus, Colyvan, Regan & Maguire, 2009:187). The role that they play in ecosystem function may provide us with a wide range of benefits in which, if ecosystem function is compromised through the loss of species, it could incur high economic costs to human society (Losey & Vaughan, 2006:312).

2.3 *Ecotourism benefits*

It is widely known that the sustainability criterion of ecotourism includes economic and sociocultural dimensions, at the same time, it serves to minimise its ecological costs and maximise its ecological benefits (Weaver, 2008:124).

Kiss (2004:232) reported that an ecotourism project in Peru during early 2000s has yielded a mean annual household income about US$735 in the community. Similarly, 20% of the US$181,000 in commercial expenditure was generated by eco-tourists in the Apo Island Marine Sanctuary in Philippines during 1999 that went directly to local residents (Cadiz & Calumpong, 2002:22). Ecotourism revenue and employment are fostered community stability and wellbeing, especially if these are accompanied by a high degree of local control. This also provides indirect social benefits through the enjoyment experienced by local residents and other visitors (Weaver & Lawton, 2002:271).

2.4 *Conservation in ecotourism*

It is often suggested by tourism industry associations and government tourism agencies that the outdoor tourism industry should contribute to conservation merely by exposing its clients to the wonders of the natural world (Guclu & Karahan, 2004:1371). The clearest way in which tourism can contribute to conservation is through funding the establishment and operation of private conservation reserves (Buckley, 2003:54).

A number of ecotourism and cultural tourism operators are also injecting direct cash donations to particular conservation or community causes, funds, organizations or trust (Beunen, Regnerus & Jaarsma, 2008:138). Some eco-tour operators simply support NGOs that lobby for conservation by providing free transport and accommodation for conservation researchers and for conservation groups bringing politicians to inspect current or potential conservation areas (Buckley, 2006:173).

2.5 *Invertebrates in ecotourism*

Invertebrates have much interest and are able to attract people in many ways (Lemelin, 2009:235). Most of the people just want to observe the beauty and subtle features of invertebrates. These interactions can generate interest from tourist who may want to experience how invertebrates contribute to human well-being (Yi, He, Wang & Kuang, 2010:146). The recreational dimensions of insects have been described in many entomological fields (Hutchins, 2003:133). The link between insects and leisure is may at first glance appear to be dubious which deeply embedded within the socio-economic fabric of human history (Klein, 2007:12).

Butterfly and insects pavilions in museums and zoos have become popular within international visitor attractions, especially in Western Europe, North America and recently in Asia (Russell, 2003:155). Observing butterflies in natural settings or as part of specimen counts are continuing to attract thousands of individual visitors every year (Pyle, 2009:15). In Japan, festivals such as the Dragonfly Citizen Summit provide dragonfly enthusiasts with the opportunity to practise and enhance their skills (Kadoya, Suda & Washitani, 2004:461).

Glow worms are an important element of tourism in both Australia and New Zealand (Baker, 2002:25). In Australia, glow worm tourism has become a multi-million dollar industry, meanwhile in New Zealand, glow worm in Waitomo Caves is attracting an average of more than 400,000 tourist visits annually and in summer visitor number is rising to approximately 2,000 people per day (Baker, 2003:14).

2.6 Research opportunities

The substantial literature which underpins this study has revealed the use of tourism industry specifically ecotourism sector as a conservation tool to increase the level of invertebrates conservation measures and to encourage the public awareness on the crucial roles that invertebrates play in ecosystem functioning. Indeed, many literatures have shown up the ignorance of invertebrates in part of the conservation program and in need of protection since population of this animal has been degraded extremely over many years known and unknowingly.

Specifically, this study aimed to determine the response of tourists to the concept of including such invertebrate's information in current and planned ecotourism activities of Tabin Wildlife Resort in Tabin Wildlife Reserve, Lahad Datu, Sabah, Malaysia.

3. RESEARCH METHOD

3.1 Research location

This research was specifically conducted in Tabin Wildlife Resort, at Tabin Wildlife Reserve, Lahad Datu Sabah. Tabin Wildlife Reserve is located in the eastern part of Sabah, Malaysia which is on the island of Borneo (see **Fig. 3.1**). This reserve area comprises of approximately 300, 000 acres in the centre of the Dent Peninsula, north-east of Lahad Datu town which is nearby to the south of lower reaching the Segama River and north of the Silabukan Forest Reserve.

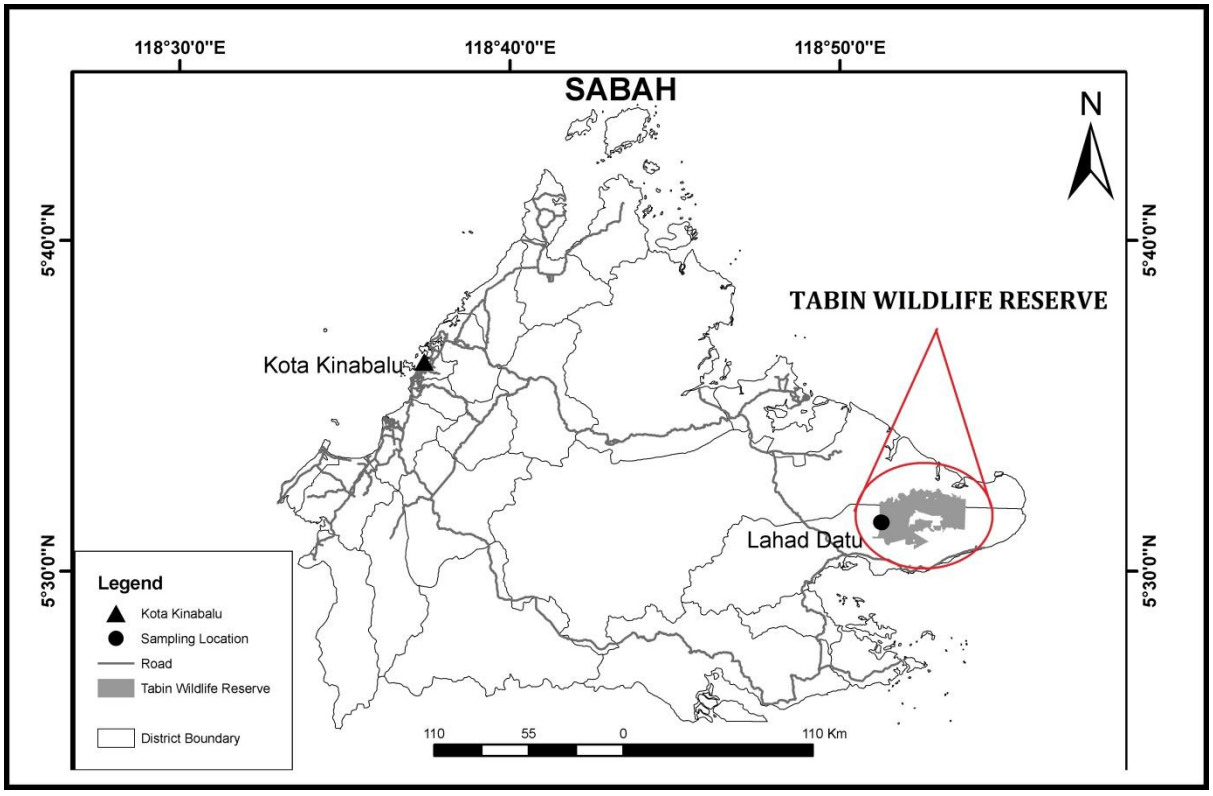

Figure 3.1: Map of Tabin Wildlife Reserve, Lahad Datu, Sabah.
Source: Biodiversity Monitoring Lab of Institute for Tropical Biology and Conservation

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3.2 Research design and approach

A quantitative research approach was adapted to examine the research objective theories by scrutinising the relationship among variables in the conceptual framework (see **Fig. 3.2** **&** **Fig. 3.3**). This approach was chosen based on the post-positivism paradigm that reflected the need to identify and assess the causes that influenced the outcomes of the research and reduced the ideas into a small distinct set. Two sets of questionnaire survey (pre-visit and post-visit) with Likert Scale were conducted.

Systematic sampling was executed in this study which mainly target the tourists who visited Tabin Wildlife Resort and has participated in the preliminary entotourism course. Sample size of this study followed the recommendation of sample size by Hair, Black, Rabin & Anderson (2010:17) in which minimum sample required is 100 samples for five or less latent constructs and each latent constructs has more than three items, in order to analyse the data in Structural Equation Modelling utilising Analysis of Moment Structure (AMOS).

Figure 3.2 shows the conceptual framework of pre-visit survey that comprised of six variables and hypothesis (H1 to H5: exogenous variables and H6: endogenous variable).

H1: *Awareness significantly affects the increased value of invertebrates*,
H2: *Interest significantly affects the increased value of invertebrates,*
H3: *Willingness significantly affects the increased value of invertebrates,*
H4: *Activity significantly affects the increased value of invertebrates,*
H5: *Support significantly affects the increased value of invertebrates*
H6: *Tourist's perception on invertebrates significantly affects the ecotourism industry*.

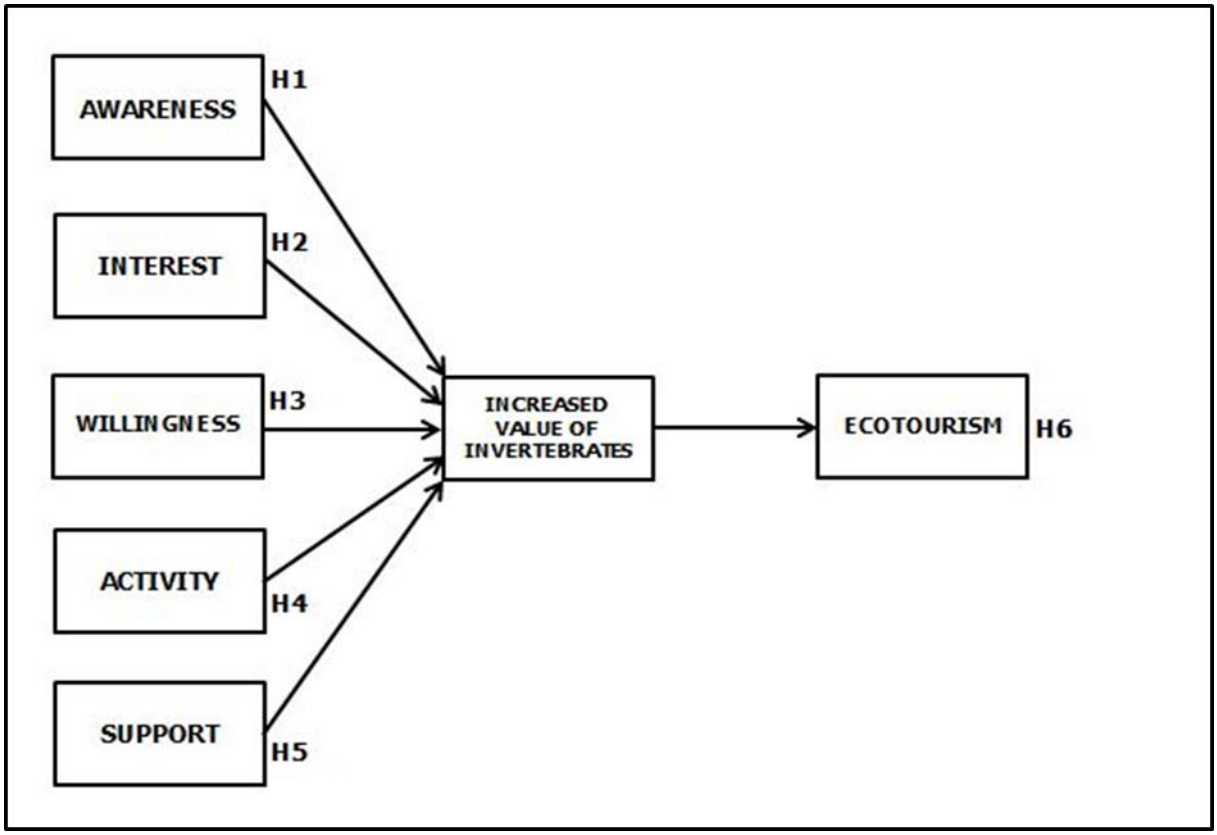

Figure 3.2: Conceptual framework of pre-visit survey

Likewise, **Figure 3.3** displays the conceptual framework of post-visit survey that comprised of five variables and hypothesis simultaneously (H7 to H10: exogenous variables and H11: endogenous variable).

H7: *Activity in ento-trail significantly affects the increased value of invertebrates*,

H8: *Information given in ento-trail significantly affects the increased value of invertebrates*,

H9: *Interest on ento-trail significantly affects the increased value of invertebrates*,

H10: *Willingness on ento-trail significantly affects the increased value of invertebrates*

H11: *Tourist's perception on invertebrates in ento-trail significantly affects the ecotourism industry*.

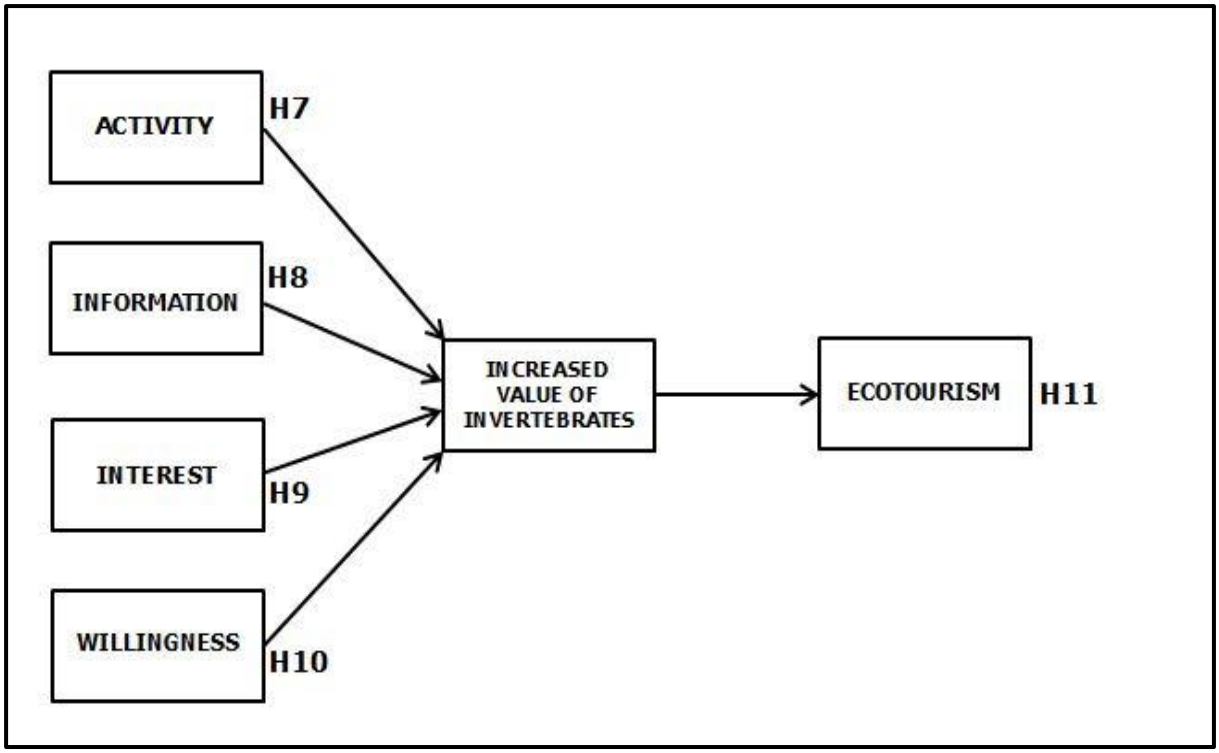

Figure 3.3: Conceptual framework of post-visit survey

3.3 Preliminary entotourism course and questionnaire survey

Structured and standardized questionnaire surveys were used to evaluate the response of tourist towards the inclusion of invertebrate tourism into current tourism activities.

Preliminary entotourism course which fully focused on invertebrate's information was conducted in the early morning from 6.00 am to 8.00 am by utilizing the Gibbon trail and river trail that run 1.0 KM in length. These trails were chosen as the preliminary course of entotourism activity due to the trails high number of invertebrates that can be easily seen and heard. Pre-visit questionnaire survey was distributed before the morning session of entotourism guided walk started, while the post-visit questionnaire survey was distributed after the session of entotourism guided walk over. A list of invertebrates was recorded along the trails before conducting the course of entotourism activity.

3.4 Data analysis

Quantitative data were collected via the questionnaire survey that were analysed utilising Statistical Package for Social Sciences (SPSS) and Analysis of Moment Structure (AMOS) computer program. Structural Equation Modelling or SEM utilise the Analysis of Moment Structure (AMOS) computer program was executed with the aims to examine the strength of the relationships between endogenous variables and exogenous variables as posited in the research hypotheses and conceptual framework.

4. RESULTS

4.1 Demographic data

Demographic data analyses for pre-visit and post-visit survey were executed via Statistical Package for Social Sciences (SPSS) computer program version 20.0 with the aim to figure out the trend of data distribution of the participated respondents. Total respondents participated in the survey were 355.

4.1.1 Pre-visit survey

There were 170 respondents in total which comprised of 60.6% of male and 39.4% of female. **Table 4.1** enumerates the percentages of each aspect in the demographic data. Among the participated respondents, there were 80.6% of tourists, 12.4% of staffs and operators, 4.1% of students, 2.4% of tour guides and 0.6% of researchers. Based on the age range of respondents, 43 and above were the highest age range (25.9%), followed by 33-37 (23.5%), 38-42 (18.2%), 28-32 (13.5%), 23-27 (12.9%) and 18-22 (5.9%) respectively. In the education background aspect, bachelor degree holders were the highest participated respondents which comprised of 52.9%, followed by diploma (18.8%), high school (12.9%) and master degree (11.2%) respectively. Vocational was the lowest respondent which only has 4.1% of participation.

Respondents' nationality of pre-visit survey was entailed from many countries as displayed in **Figure 4.1**. Malaysia ranked first in the list with 19.4%, followed by Netherland (17.6%) and China (16.5%). German and Italy shared the same percentages (9.4%) and countries that left behind were Denmark (7.1%), Canada (5.3%), France and United State America, USA (4.7%), while Japan and Singapore were the lowest which only have 3.5% and 2.4% of participation respectively.

Table 4.1: Demographic data for position, age and education background of pre-visit survey

Aspects	Frequency	Percentage (%)
Position		
Tourist	137	80.6
Staff/Operator	21	12.4
Student	7	4.1
Tour Guide	4	2.4
Researcher	1	0.6
Age		
43 and above	44	25.9
33-37	40	23.5
38-42	31	18.2
28-32	23	13.5
23-27	22	12.9
18-22	10	5.9
Education Background		
Bachelor Degree	90	52.9
Diploma	32	18.8
High school/Matriculation	22	12.9
Master Degree	19	11.2
Vocational	7	4.1

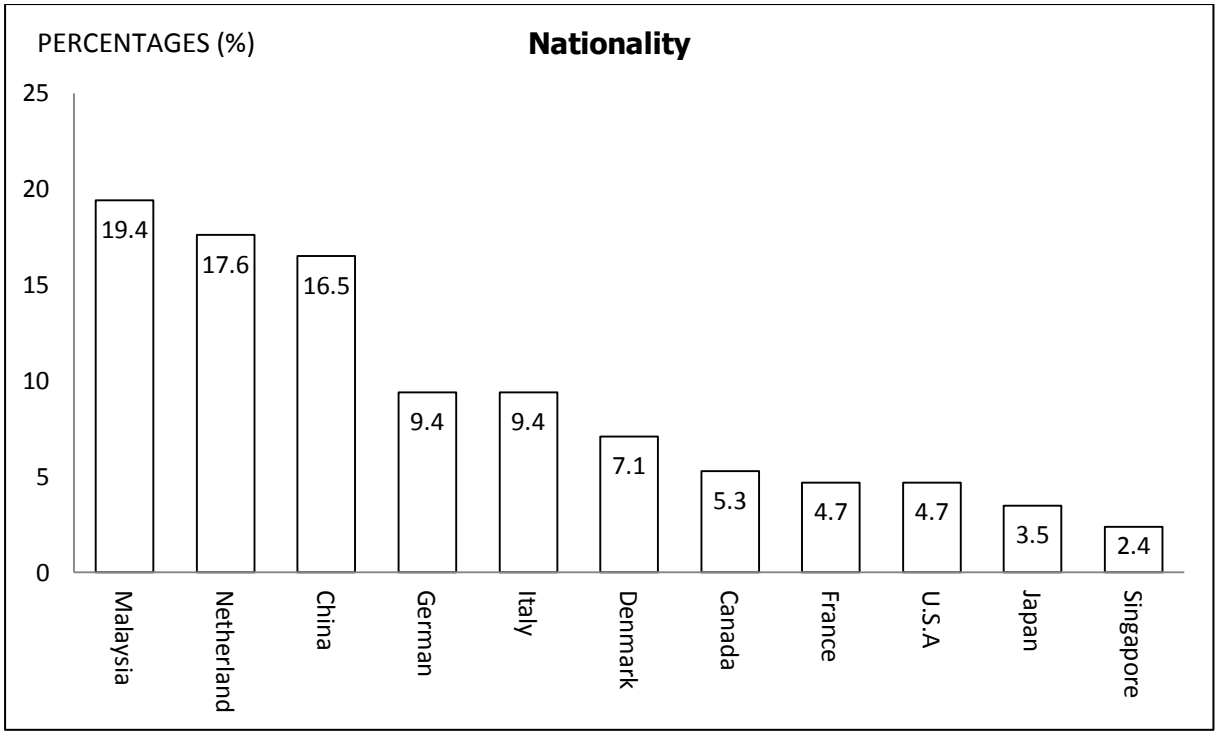

Figure 4.1: Bar chart of pre-visit respondents' percentages based on their nationality.

4.1.2 Post-visit survey

The total participants were 185 respondents which dominated by female (51.4%) and followed by male (48.6%), whereby 100% participation was from tourists. **Table 4.2** enumerates the percentages of age range and education background. Based on the age range, 33-37 years old were the highest age range of participated respondents which comprised of 33.5% followed by 38-42 (20.5%), 23-27 (19.5%) and 43 and above (11.9%). While 28-32 and 18-22 were the lowest percentages of age range which each has 9.7% and 4.9% participation respectively. Meanwhile, 62.7% of respondents were graduated with bachelor degree, 20.5% with master degree and 13.5% were from high school. Doctoral degree was the lowest group with only 3.2% participation.

Respondents' nationality of post-visit survey was also entailed from many countries as displayed in **Figure 4.2**. Japan is the highest country participated with 22.7% followed by German 22.2% and Netherland 13.0%. Malaysia and France shared the same percentages (9.7%), while 6.5% participation from China, Italy and United Kingdom. United State America, USA was the lowest rate with only 3.2%.

Table 4.2: Demographic data for age range and education background of post-visit survey

Aspects	Frequency	Percentage (%)
Age		
33-37	62	33.5
38-42	38	20.5
23-27	36	19.5
43 and above	22	11.9
28-32	18	9.7
18-22	9	4.9
Education Background		
Bachelor Degree	116	62.7
Master Degree	38	20.5
High school/Matriculation	25	13.5
Doctoral Degree	6	3.2

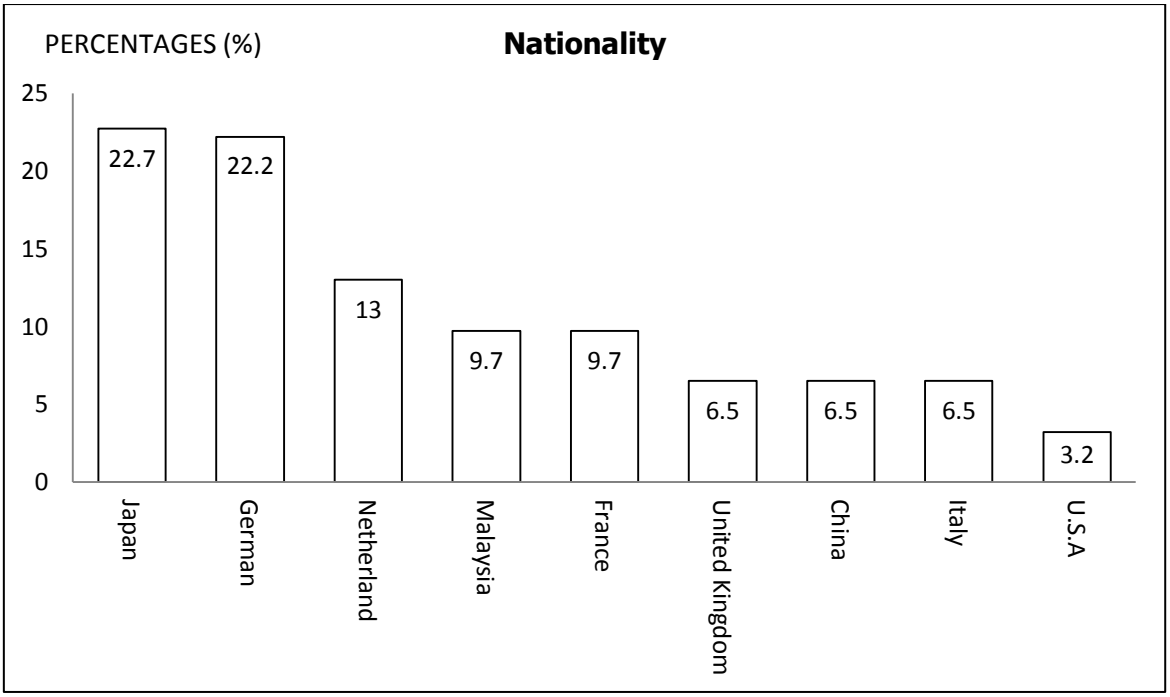

Figure 4.2: Bar chart of post-visit respondent's percentages based on the nationality.

4.2 Structural Equation Modelling (SEM)

Structural Equation Modelling (SEM) technique utilised Analysis of Moment Structure (AMOS) computer program version 21.0 was carried out with the aims to examine the strength of the relationships between latent variables and observe variable as posited in the research hypotheses and the conceptual framework for simultaneous test that chains multiple regressions with confirmatory factor analysis to estimate simultaneously a series of interrelated dependence relationships. The SEM analysis was performed through two phases: measurement model and structural model.

4.2.1 Measurement model

Measurement model comprised of two components, namely, Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). Exploratory Factor Analysis (EFA) was executed via Statistical Package for Social Sciences (SPSS) computer program version 20.0 with the aim of data reduction of items that was below the recommended value of 0.50 to well represent its expected factor for further analysis.

A. Exploratory Factor Analysis (EFA) pre-visit survey

Results as presented in **Table 4.3** details the items loadings and the Cronbach's Alpha values for all factors (*Awareness, Interest, Willingness, Activity, Support*, and *Ecotourism*). It is noted that the loading items are greater than 0.50, and Cronbach's Alpha value exceeded 0.70 had considered the items load heavily to its respective factors and reliable for subsequent level of analysis (Hair *et al*., 2010:27). The entire investigated factors in this study were designed in five question items. During the EFA, all items were reliable to measure its respective factors as it fulfilled the requirement of having loadings above 0.50 with no cross-loadings.

However two factors, *Awareness* and *Interest* were required to eliminate one item for having loadings below 0.50. Indeed, all constructs have Cronbach's Alpha values beyond 0.70, *Support* (0.873), followed by *Ecotourism* (0.860), *Interest* (0.845), *Willingness* (0.845), and *Activity* (0.815), respectively. *Awareness* was the lowest value of Cronbach's Alpha with 0.783. Thus, all factors had high internal consistency.

Table 4.3: Exploratory Factor Analysis (EFA) items loading of pre-visit survey

Construct	Items	Standardised Loading	Cronbach's Alpha
Awareness	A2	0.806	0.783
	A3	0.734	
	A4	0.759	
	A5	0.790	
Interest	B1	0.760	0.845
	B2	0.805	
	B3	0.830	
	B5	0.613	
Willingness	C1	0.811	0.845
	C2	0.772	
	C3	0.830	
	C4	0.764	
	C5	0.785	
Activity	D1	0.798	0.815
	D2	0.813	
	D3	0.819	
	D4	0.781	
	D5	0.645	
Support	Es1	0.864	0.873
	Es2	0.794	
	Es3	0.905	
	Es4	0.777	
	Es5	0.724	
Ecotourism	F1	0.794	0.860
	F2	0.855	
	F3	0.788	
	F4	0.845	
	F5	0.748	

B. Exploratory Factor Analysis (EFA) post-visit survey

Results as presented in **Table 4.4** details the items loadings and Cronbach's Alpha values for all factors (*Activity, Information, Interest, Willingness* and *Ecotourism*). It is acclaimed that the loading items are greater than 0.50 and Cronbach's Alpha value exceeded 0.70 to acknowledge the items load heavily to its respective factors and reliable for subsequent level of analysis (Hair *et al*., 2010:27). Likewise, all factors scrutinized in post-visit survey were designed in five question items.

In the EFA, all items were reliable to measure its respective factor as it fulfilled the requirements of having loadings above 0.50 with no cross-loadings. However, *Information* eliminated two items, meanwhile *Ecotourism* and *Interest* eliminated one item for having loadings below 0.50. Indeed, all constructs have Cronbach's Alpha values beyond or approaching to 0.70 with *Activity* (0.754) followed by *Ecotourism* (0.730), *Willingness* (0.693) and *Interest* (0.674) respectively. *Information* was the lowest value of Cronbach's Alpha (0.660). Henceforth, all factors had high internal consistency.

Table 4.4: Exploratory Factor Analysis (EFA) Items loading of post-visit survey

Construct	Items	Standardized Loading	Cronbach's Alpha
Activity	ACT1	0.720	0.754
	ACT2	0.697	
	ACT3	0.682	
	ACT4	0.719	
	ACT5	0.754	
Information	INFO2	0.715	0.660
	INFO3	0.663	
	INFO5	0.799	
Interest	INT1	0.659	0.674
	INT2	0.714	
	INT4	0.672	
	INT5	0.723	
Willingness	WILL1	0.557	0.693
	WILL2	0.718	
	WILL3	0.674	
	WILL4	0.780	
	WILL5	0.609	
Ecotourism	ECO1	0.808	0.730
	ECO2	0.795	
	ECO3	0.704	
	ECO4	0.679	

C. Confirmatory Factor Analysis (CFA) pre-visit survey

After each items loaded heavily to its respective factors in the Exploratory Factor Analysis stage, Confirmatory Factor Analysis (CFA) utilising Structural Equation Modeling (SEM) technique via Analysis of Moment Structure (AMOS) computer program version 21.0 was performed to test the measurement model of the conceptual framework whether it has a satisfactory level of validity and reliability of each factor before testing for a significant relationship in the structural model that included the standardised item loadings, Composite Reliability (CR) and Average Variance Extracted (AVE). It is a requirement (loading >0.70) which any item that did not fit the measurement model due to low standardised item loadings were needed to be removed from further analysis (Fornell & Larcker, 1981:35; Ifinedo, 2006:16).

Furthermore, the Composite Reliability (CR) value for each factor must exceed 0.70 and Average Variance Extracted (AVE) must surpass 0.50 to have acceptable results (Hair *et al*., 2010:27). **Table 4.5** depicts the reliabilities and validities for each factors included standardised loadings for each item, Composite Reliability (CR) and Average Variance Extracted (AVE).

Table 4.5 details the standardised loadings for each items, Composite Reliability (CR) and Average Variance Extracted (AVE), fulfilled the minimum requirements as stated above. An item was discarded from *Willingness* and *Support*, while two items were eliminated from *Interest* and *Activity* to improve the model fit.

Table 4.5 Items reliability and validity of pre-visit survey

Construct	Items	Standardised Loading	Cronbach's Alpha	Composite Reliability[a]	Average Variance Extracted[b]
Awareness	A2	0.681	0.783	0.806	0.510
	A3	0.747			
	A4	0.650			
	A5	0.772			
Interest	B1	0.698	0.769	0.754	0.506
	B2	0.726			
	B3	0.709			
Willingness	C1	0.761	0.814	0.855	0.596
	C2	0.730			
	C3	0.825			
	C4	0.769			
Activity	D1	0.584	0.807	0.871	0.701
	D2	0.915			
	D3	0.926			
Support	Es1	0.875	0.870	0.873	0.636
	Es2	0.692			
	Es3	0.919			
	Es4	0.674			
Ecotourism	F1	0.749	0.860	0.849	0.534
	F2	0.763			
	F3	0.779			
	F4	0.799			
	F5	0.529			

[a] Composite Reliability = (square of the summation of the factor loadings)/ {(square of the summation of the factor loadings) + (square of the summation of the error variances)}.
[b] Average Variance Extracted = (summation of the square of the factor loadings)/ {(summation of the square of the factor loadings) + (summation of the error variances)}

Next, the Cronbach's Alpha value for this model showed that *Support* has the highest Cronbach's Alpha value (0.870), followed by *Ecotourism* (0.860), *Willingness* (0.814), *Activity* (0.807), *Awareness* (0.783) and *Interest* (0.769), respectively. For Composite Reliability (CR), *Support* has the highest value (0.873), followed by *Activity* (0.871), *Willingness* (0.855), *Ecotourism* (0.849), *Awareness* (0.806) and *Interest* (0.754).

Next, the Average Variance Extracted (AVE) revealed that *Activity* demonstrate the highest AVE value (0.701), followed by *Support* (0.636), *Willingness* (0.596), *Ecotourism* (0.534), *Awareness* (0.510) and *Interest* (0.506). All variables showed high value than the threshold, hence indicating good convergent validity.

D. Confirmatory Factor Analysis (CFA) post-visit survey

Table 4.6 arrays the Standardised Item Loadings, Composite Reliability (CR) and Average Variance Extracted (AVE) for each factor. Factors such as *Information*, *Interest* and *Willingness* were needed to eliminate two items resulting in three items left for each.

Further, an item was eliminated in *Activity* and *Ecotourism* to fit the model. Next, Cronbach's Alpha was checked to test internal consistency of the factor items where the results revealed that Cronbach's Alpha values of this study are acceptable which bellow the recommended value of 0.70 (Hair *et al*., 2010:27). Among the five factors, *Willingness* had the highest Cronbach's Alpha value (0.797), followed by *Information* (0.760), *Ecotourism* (0.730), *Activity* (0.713) and *Interest* (0.641), respectively. For Composite Reliability (CR), *Ecotourism* had the highest value (0.905), followed by *Willingness* (0.845), *Activity* (0.821), *Interest* (0.815) and *Information* (0.786) respectively. Thus, internal consistency was well handled.

Table 4.6 Items reliability and validity of post-visit survey

Construct	Items	Standardised Loading	Cronbach's Alpha	Composite Reliability[a]	Average Variance Extracted[b]
Activity	ACT1	0.719	0.713	0.822	0.536
	ACT2	0.756			
	ACT4	0.702			
	ACT5	0.748			
Information	INFO2	0.706	0.760	0.786	0.551
	INFO3	0.733			
	INFO5	0.786			
Interest	INT1	0.727	0.641	0.815	0.595
	INT2	0.811			
	INT5	0.773			
Willingness	WILL1	0.855	0.797	0.845	0.645
	WILL2	0.762			
	WILL3	0.790			
Ecotourism	ECO1	1.072	0.730	0.905	0.711
	ECO2	0.724			
	ECO3	0.768			
	ECO4	0.762			

[a] Composite Reliability = (square of the summation of the factor loadings)/ {(square of the summation of the factor loadings) + (square of the summation of the error variances)}.
[b] Average Variance Extracted = (summation of the square of the factor loadings)/ {(summation of the square of the factor loadings) + (summation of the error variances)}.

Next, convergent validity was evaluated based on the Average Variance Extracted (AVE) of each factor, whereby the value must surpass 0.50 to be considered as satisfactory. Results discovered that *Ecotourism* had the highest AVE values (0.711), followed by *Willingness* (0.645), *Interest* (0.595), *Information* (0.551) and *Activity* (0.535). All variables showed higher value than the threshold value, indicating measurement model has a good convergent validity.

E. Correlation analysis of pre-visit survey

Discriminant Validity examined the extent to which a construct was truly distinct from other constructs tested (Hair *et al*., 2010:27), by comparing the value of Average Variance Extracted (AVE) value with correlation squared (Fornell & Larcker, 1981:35). **Table 4.7** specified the correlation matrix for constructs where there was a significant positive correlation between all variables at 0.01 level. For instance, *Support* highly correlated with *Ecotourism* ($r=0.574$, $p<0.01$), followed by *Willingness* ($r=0.514$, $p<0.01$), and *Activity* ($r=0.432$, $p<0.01$). Indeed, *Awareness* ($r=0.385$, $p<0.01$) and *Interest* ($r=0.284$, $p<0.01$) also significantly correlated with *Ecotourism*. Hence, there is no multi-collinearity problem in this research.

For the skewness, it ranged between -0.870 to -0.204, which was below ±2.0, while Kurtosis ranged between -0.745 to 1.090, lower than ± 10. Both results lead the model to be in a normal distribution or Bell-shaped curve. Next, means for all factors ranged between 3.950 to 4.324 on a scale of 1=strongly disagree to 5=strongly agree, inferring respondents mostly had positive attitude toward ecotourism.

Table 4.7: Correlation analysis pre-visit survey

	Awareness	Interest	Willingness	Activity	Support	Ecotourism
Awareness	**0.714**					
Interest	0.763**	**0.711**				
Willingness	0.718**	0.625**	**0.772**			
Activity	0.567**	0.524**	0.615**	**0.837**		
Support	0.427**	0.352**	0.609**	0.402**	**0.797**	
Ecotourism	0.385**	0.284**	0.514**	0.432**	0.574**	**0.731**
Mean	4.216	4.324	4.196	4.121	3.950	4.262
Std Deviation	0.619	0.566	0.598	0.621	0.730	0.583
Skewness	-0.664	-0.0870	-0.267	-0.204	-0.345	-0.861
Kurtosis	-0.077	0.723	-0.413	-0.734	-0.745	1.090

** Correlation is significant at the 0.01 level (2-tailed).
Diagonal elements shown in bold are the square root of the Average Variance Extracted (AVE).

F. Correlation analysis of post-visit survey

The shared variances between factors as shown in **Table 4.8** were beneath the square root of the AVE of the individual factors, endorsing discriminant validity. Further assessment in the correlation matrix of the constructs resulted significant positive correlations between all variables at 0.01 levels.

For instance, *Interest* highly correlated with *Ecotourism* (r=0.560, p<0.01), followed by *Information* (r=0.532, p<0.01), and *Willingness* (r=0.456, p<0.01). Indeed, *Activity* (r=0.443, p<0.01) also significantly correlated with *Ecotourism*. Hence, there is no multi-collinearity problem in this research. The Skewness was ranged between -0.616 to 0.033, which below ±2.0, while Kurtosis ranged between -0.939 to 1.066, lower than ± 10. Both results edged the model to be in a normal distribution or Bell-shaped curve. Next, means for all factors ranged between 3.941 to 4.118 on a scale of 1=strongly disagree to 5=strongly agree, inferring respondents mostly had positive attitude towards ecotourism.

Table 4.8: Correlation analysis post-visit survey

	Activity	Information	Interest	Willingness	Ecotourism
Activity	**0.731**				
Information	0.528**	**0.742**			
Interest	0.589**	0.628**	**0.771**		
Willingness	0.764**	0.571**	0.585**	**0.803**	
Ecotourism	0.443**	0.532**	0.560**	0.456**	**0.843**
Mean	3.953	4.076	4.180	3.941	4.118
Std Deviation	0.514	0.499	0.452	0.541	0.445
Skewness	-0.068	-0.129	0.033	-0.616	-0.198
Kurtosis	-0.939	-0.187	-0.267	1.066	0.499

** Correlation is significant at the 0.01 level (2-tailed).
Diagonal elements shown in bold are the square root of the Average Variance Extracted (AVE).

4.2.2 Structural model

The structural model in SEM was evaluated by examining (1) several fit indices and (2) the strength of the relationships between independent variables and dependent variables simultaneously.

A. Goodness-of-fit indices for structural model of pre-visit survey

Table 4.9 presents the results of the overall Goodness-of-Fit Indices of pre-visit survey for the structural model. To have best fit value, fit indices value for CFI, GFI and NFI must be above 0.90 and RMSEA below 0.80 (Bentler, 1990:23; Byrne, 2001:11).

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Results specified that the χ2 of the model was 218.909 with 105 degrees of freedom. The fit indices value of χ2/df=2.085 and Root Mean Square of Error Approximation (RMSEA) was 0.080. Values of Parsimony Normed Fit Index (PNFI) and Parsimony Comparative Fit Index (PCFI) were 0.613 and 0.645 respectively, which exceeded 0.50. In addition, the fit indices value for Comparative Fit Index (CFI) = 0.940 (>0.90), Goodness of Fit Index (GFI) = 0.885 (>0.90) and Normed Fit Index (NFI) = 0.894 (>0.90), specifying that all indices surpassed the respective common acceptance levels that suggested by previous researchers (Bentler, 1990:23; Byrne, 2001:12). Hence, the structural model had a satisfactory model fit.

Table 4.9: Goodness-of-fit indices for structural model of pre-visit survey

	X^2	df	X^2/df	CFI	GFI	NFI	RMSEA	PNFI	PCFI
Recommended Value	N/A	N/A	<3.0	>0.9	>0.9	>0.9	<0.08	>0.5	>0.5
Model Values	218.909	105	2.085	0.940	0.885	0.894	0.080	0.613	0.645

B. Goodness-of-fit indices for structural model of post-visit survey

Table 4.10 itemised the results of the overall Goodness-of-Fit Indices of post-visit survey for the structural model. In this study, the χ2 of the model was 66.691 with 42 degrees of freedom. The fit indices value of χ2/df=1.588 and Root Mean Square of Error Approximation (RMSEA) was 0.057. Values of Parsimony Normed Fit Index (PNFI) and Parsimony Comparative Fit Index (PCFI) were 0.508 and 0.526 respectively, which exceeded 0.50. In addition, the fit indices value for Comparative Fit Index (CFI) = 0.978 (>0.90), and GFI = 0.953 (>0.90), evident that all indices surpassed the respective common acceptance levels. Hence, the structural model had a satisfactory model fit.

Table 4.10: Goodness-of-fit indices for structural model of post-visit survey

	X^2	df	X^2/df	CFI	GFI	NFI	RMSEA	PNFI	PCFI
Recommended Value	N/A	N/A	<3.0	>0.9	>0.9	>0.9	<0.08	>0.5	>0.5
Model Values	66.691	42	1.588	0.978	0.953	0.944	0.057	0.508	0.526

C. Conceptual framework for structural model of pre-visit survey

Figure 4.3 displays the framework of structural model which examined the relationships between independent variables (*Awareness, Interest, Willingness*, *Activity*, and *Support*) on the dependent variable (*Ecotourism*). Specifically, the Structural Equation Modelling (SEM) analysis revealed that 51% variance of *Ecotourism* was well explained by all the five independent variables.

Table 4.11 exemplifies that H1 (*Awareness*) was insignificant (β1 = 0.081, p= 0.682, p>0.05), implying the H1 was not supported. Correspondingly, the next factor, *Interest* also not able to affect *Ecotourism* as p>0.50 (β2 = -0.164, p=0.538). Thus, H2 was not maintained.

The ensuing hypothesis, H3 proposed that *Activity* has significant positive relationship with *Ecotourism*. The results presented in **Table 4.11** indicating that H3 was maintained as *Activity* significantly and positively affect *Ecotourism* (β3=0.270, p=0.009, p<0.05). Likewise, *Ecotourism* was also influenced by *Support* (β4=0.422, p=0.000, p<0.05). Structural Equation Modelling confirmed that this factor has highest standardized beta coefficients, implying that it was the most imperative factor influencing *Ecotourism*. Henceforth, H4 was sustained. However, H5 (*Willingness*) revealed insignificant relationship with *Ecotourism* (β5=0.208, p=0.264, p>0.05), inferring H5 was rejected.

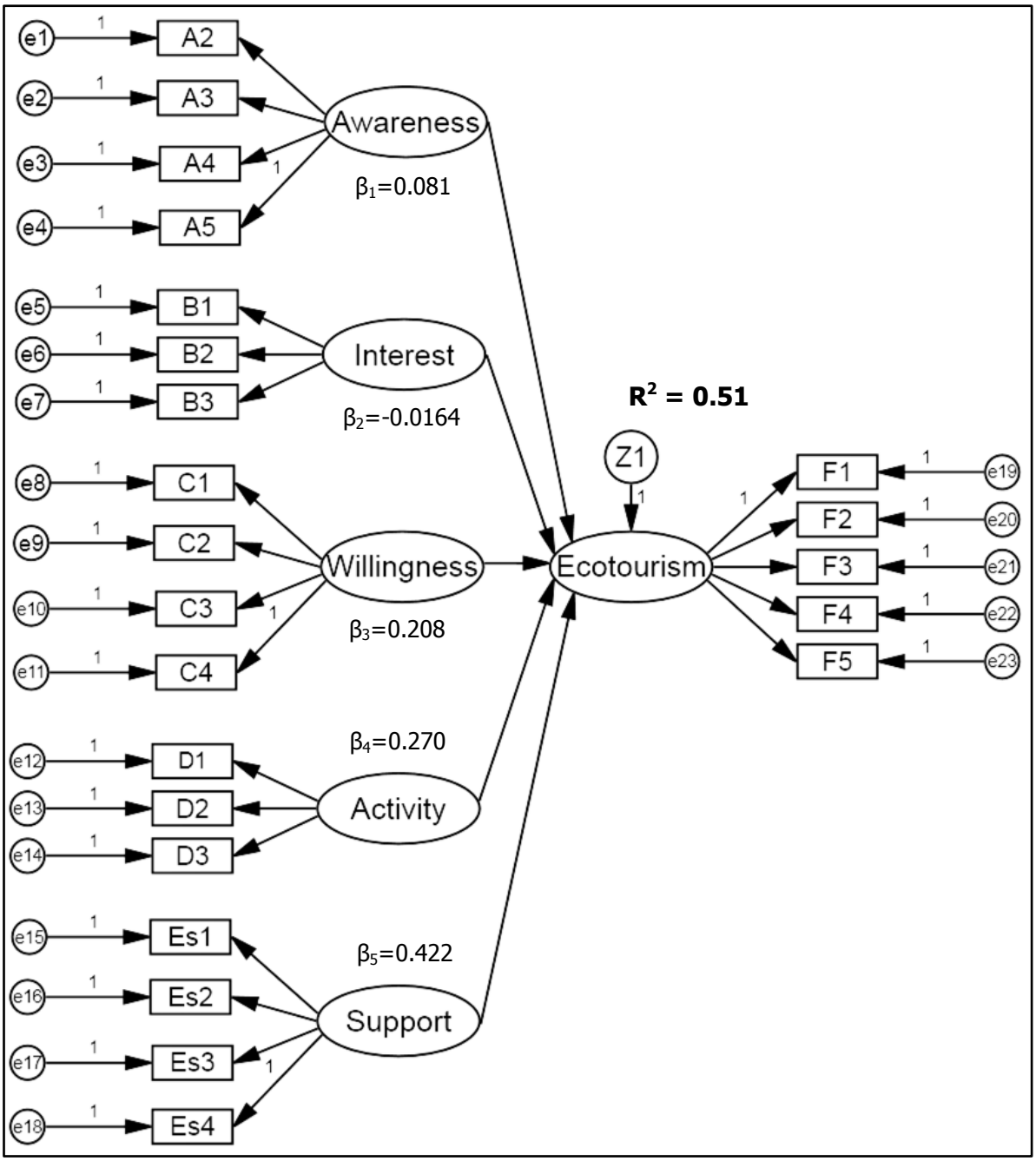

Figure 4.3: Structural Model Framework of Pre-visit Survey

Table 4.11: Relationships on ecotourism of pre-visit survey

Paths			Estimate	S.E	C.R	*P*
HI	Awareness	--- > Ecotourism	0.081	0.113	0.410	0.682
H2	Interest	--- > Ecotourism	-0.164	0.211	-0.616	0.538
H3	Activity	--- > Ecotourism	0.270	0.090	2.595	0.009*
H4	Support	--- > Ecotourism	0.422	0.061	4.152	0.000*
H5	Willingness	--- > Ecotourism	0.208	0.138	1.117	0.264

*$p<0.05$

D. Conceptual framework for structural model of post-visit survey

Figure 4.4 displays the framework of structural model for post-visit survey which appraised the relationships between exogenous variables (*Activity, Information, Interest*, and *Willingness*) on the endogenous variable (*Ecotourism*). Specifically, the Structural Equation Modelling analysis divulged that 65% variance of *Ecotourism* was well expounded by all the four exogenous variables.

Table 4.12 enumerates the relationship of exogenous variables (*Activity, Information, Interest* and *Willingness*) towards endogenous variables (*Ecotourism*). *Activity* had significant relationship with *Ecotourism* with β7=-0.258, p=0.005 (p<0.05), signifying H7 was sustained. Instead, *Information* displayed insignificant effect on *Ecotourism* with β8=0.575, p=0.062 (p>0.05). Thus, H8 was rejected. Same phenomenon appeared in *Interest* (β9=0.498, p=0.173, p>0.05). Likewise, H9 also not maintained. The final factor, *Willingness*, also have irrelevant relationship with *Ecotourism* (β10=-0.172), exemplifying that H10 also disqualified with insignificant p-value (p=0.126, p>0.05).

Table 4.12: Relationship on ecotourism of post-visit survey

Paths			Estimate	S.E	C.R	*P*
H7	Activity	--- > Ecotourism	-0.258	0.083	-2.837	0.005*
H8	Information	--- > Ecotourism	0.575	0.351	1.864	0.062
H9	Interest	--- > Ecotourism	0.498	0.090	2.595	0.173
H10	Willingness	--- > Ecotourism	-0.172	0.061	4.152	0.126

*p<0.05

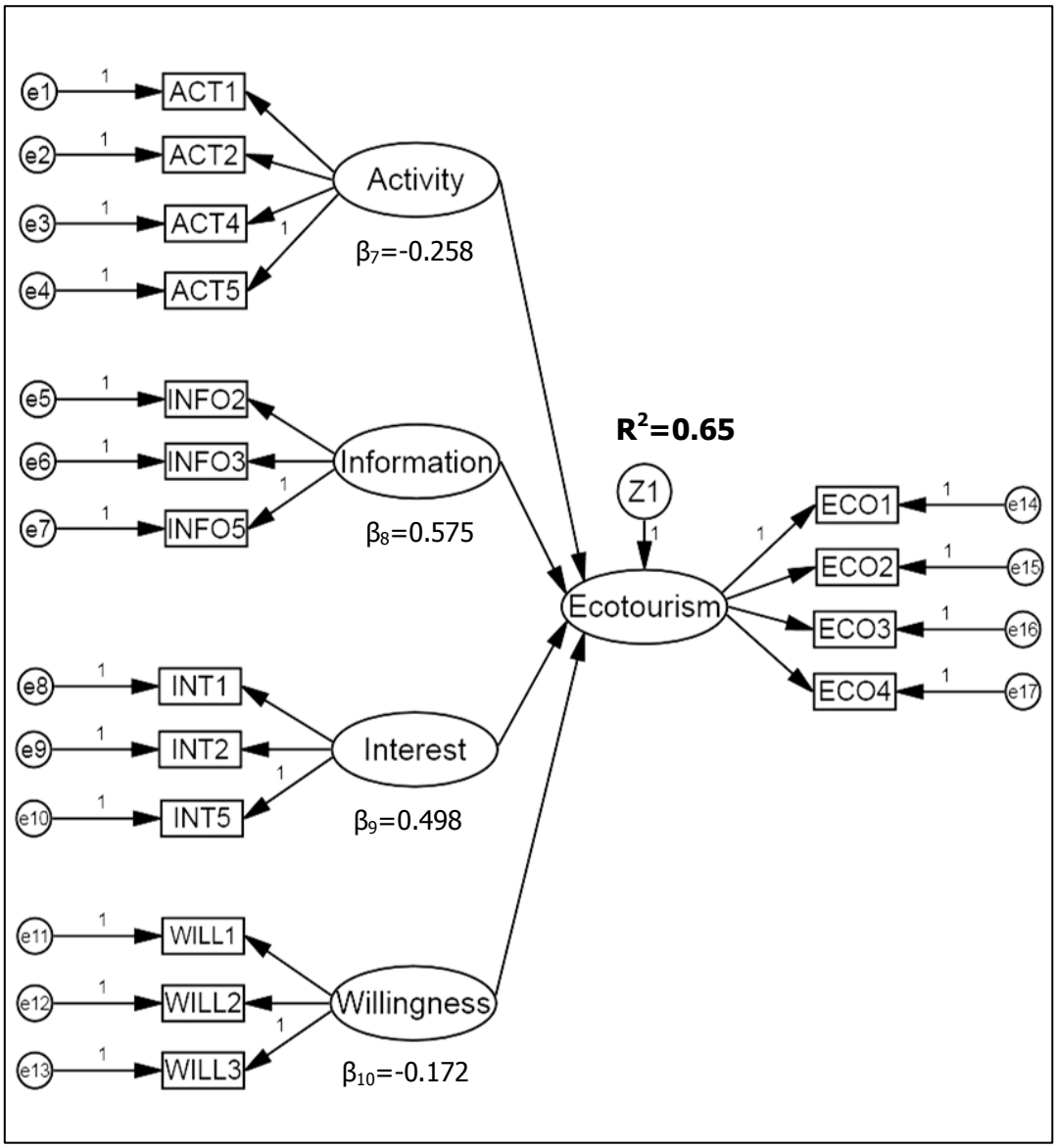

Figure 4.4: Structural model framework of post-visit survey

4. DISCUSSION

The pre-visit survey was constructed with six variables which five variables are exogenous variables (*Awareness, Interest, Willingness, Activity*, and *Support*) and one endogenous variable (*Ecotourism*). Meanwhile, post-visit survey was executed with five variables which four variables (*Activity, Information, Interest*, and *Willingness*) were exogenous variables and one variable (*Ecotourism*) was endogenous variable.

4.1 Awareness

Awareness in pre-visit survey was prevailed insignificant value influencing the *Ecotourism*. This proves that people are still not aware of the invertebrates' roles in the function of ecosystems and their needs for conservation. This finding lends a strong support for the findings of Martin-Lopez, Montes & Benayas (2007:67) mentioned that without such awareness, people are tend to disregard invertebrates as important for ecosystem functioning or as in need of protection.

Indeed, some people view invertebrates as a potential of pest and health threat to human being. There is also a general perception that merely because there are appeared to be so many invertebrates, they cannot be possibly in need of conservation (Horwitz, Recher & Majer, 1999:8).

4.2 Interest

Interest also showed insignificant value influencing the *Ecotourism* variable in both pre-visit and post-visit survey. This trend implied that tourists did not show strong interest intention towards invertebrates instead most the tourists were concerning to big mammals in Tabin Wildlife Reserve such as Pygmy elephants, Orang Utans and some sort of birds watching.

However, the *Interest* of tourists slightly increased in post-visit survey after they had participated the course of guided walk that focusing on inclusion of invertebrate's information or preliminary entotourism activity. This might be caused by the tourists' realisation on attractiveness of invertebrates and its importance to include such invertebrates' information in ecotourism activities. Lemelin (2009:235) stated that invertebrates have much interest and this group of invertebrates also able to attract people in many ways.

Even though *Interest* did not significantly influence the *Ecotourism*, it still showed a little potential of increases after the course of preliminary entotourism activity. This perhaps needs some of improvement of the course of invertebrates' activities in the current study in order to enhance the tourists' interest towards invertebrates in the future.

4.3 Willingness

Willingness was another factor that did not support the *Ecotourism* which displayed insignificant value. During the pre-visit survey, most respondents showed their lack of willingness to participate the course of preliminary ento-tourism activities. This could be caused by the thinking that it is not worthy joining such activities.

Afterward, the *Willingness* slightly increased in post-visit survey after the tourists had participated the course of preliminary entotourism activity, yet it did not strong enough to support the *Ecotourism*. As mentioned by Yi *et al*., (2010:146), many people are just willing to observe the beauty and subtle features of invertebrates.

4.4 Information

In post-visit survey, *Information* displayed insignificant value in influencing the *Ecotourism*. This may be due to the lack of information contents given during the course of invertebrate inclusion activities due to fewer discoveries about the existence of invertebrates around the Tabin trails.

There were only few invertebrates information had been studied in Tabin Wildlife Reserve and most invertebrates that had been highlighted during the course of preliminary entotourism activities were considered as the common information and no inclusion of indigenous information of invertebrates given due to the lack of documentation about the invertebrates indigenous information.

Moreover, there were only few invertebrates had been known generally and scientifically in Tabin Wildlife Reserve especially in Tabin trails. There are abundance of invertebrates yet not been documented and studied. This dilemma will waste the richness of invertebrate's diversity in Tabin that if the information be carried out very well, it can be used for ecotourism activities, education as well as for conservation purposes in the future.

This phenomenon is not only occurred in Tabin but in most places over the world. Till now, most invertebrate species are still in progress to be described (Erwin, Pimienta, Murillo & Aschero, 2004:72) and this problem is prevalent in invertebrates in which researchers still far from agreeing on the possible number of species for invertebrates (Wilson, 2000:3). Without a large scaling up of taxonomic efforts in most of these cases, the species will disappear without even knowing that they are existed (Mackinney, 1999:1273).

4.5 Support

Support was the highest factor that showed significant value influencing the *Ecotourism* which implies that *Support* was the most imperative factor to influence *Ecotourism* in terms of inclusion of invertebrate information in ecotourism activities.

Even though most tourist were not aware and willing to participate in the course of invertebrate activities in the pre-visit survey since these two factors were closed to *Support*, yet they were still support such kind of invertebrate activities in terms of their conservation need and their important roles to our environment and benefits to human being.

This might because tourist who visited Tabin Wildlife Reserve were readily mind focused on Tabin iconic attractions mammals instead to know about the invertebrates. But, this support trend from respondents becomes the prior potential towards the inclusion of invertebrate information in ecotourism activities of Tabin Wildlife Reserve. Certainly, many people are indeed concerned about conservation and some devote time, money and effort to conservation causes and organizations (Guclu & Karahan, 2004:1371).

Maybe people questioned why should we care whether a few or more species of invertebrates are in the midst of extinction. First and foremost, human as the main causal agent of modern extinctions and because of the intrinsic value of invertebrate's species, we morally support to avert human mediated extinction (Sagoff, 2009:643). This support is often provides us with the best reason for justifying conservation actions (Justus *et al*., 2009:187).

4.6 Activity

Activity showed a good significant value towards *Ecotourism* in both pre-visit and post-visit survey. This indicates the strong potential of the inclusion of invertebrate information in ecotourism activities of Tabin Wildlife Reserve.

This potential has capability to broaden the scope of ecotourism activities by including the invertebrates focused activities rather just narrowing to focus only on mammals or already endangered animals. It is also able to reduce the redundancy in giving the information to the tourists by varying the focus of guided activity.

Moreover, it would also able to attract more attention and interest of tourists especially invertebrate's enthusiasts, ento-lovers or entomologist to visit Tabin Wildlife Reserve. Besides that, the operator has more choices or options on activity packages to provide to the tourists or visitors. The suggestion had made in which just by a simply seeing of some beautiful scenery or rare species and this should lead the commercial tour clients to lobby to protect them (Guclu & Karahan, 2004:1371).

The recreational dimension of insects or entotourism is described in many entomological fields (Hutchins, 2003:133). Large concentrations of invertebrates might attract nature lovers for viewing and photography. Indeed, rare invertebrates mostly attract many scientists and specialists who want to gain knowledge or observe new species. Yi *et al*., (2010:146) described that these interactions can generate interest to tourist who may want to experience how invertebrates contribute to human well-being.

4.7 Ecotourism

Structural Equation Modelling analysis revealed that 51% variance of *Ecotourism* in pre-visit survey was well explained by all the independent variables stated above and the variance percentages increased by 65% in the post-visit survey. This indicates that all those independent variables were influencing the *Ecotourism*, indeed indicates the potential to increase the conservation of invertebrates through ecotourism.

This percentage showed that ecotourism is one of the tools that enhance and support the conservation of invertebrates. Tourism has emerged in many countries as a means of providing the financial resources needed to conserve biodiversity (Goodwin, Kent, Parker & Walpole, 1998:49). Since ecotourism sector is the fastest growing subsector, its growth rate being three times that of tourism overall (Burns & Holden, 1995:17), it perhaps can help to boost the effort of invertebrates conservation.

The potential of inclusion of invertebrates information in ecotourism activities of Tabin Wildlife Reserve was high and it is not just can be extended and broaden the activities but also helps the conservation of invertebrates that been ignored by many peoples. The inclusion of invertebrate's information in ecotourism activities has been practiced over the world and it seems to contribute to conservation as well as economic benefits. Ecotourism is mainly contributing to the economic, social and cultural wellbeing of communities that living close to ecotourism venues and other legitimate stakeholder. Indeed, it serves to minimise the ecological costs and maximise the ecological benefits (Weaver, 2008:124).

5. CONCLUSION AND IMPLICATIONS

5.1 Conclusion

This research is conducted in order to encourage the conservation of invertebrates that been disregarded globally due to many negative perceptions about invertebrates. The popularity of ecotourism perhaps can be used as a tool to boost the conservation of many animals including the invertebrates. The inclusion of invertebrates in ecotourism activities is rare globally but it still becomes good potential for preserving the biodiversity.

This research was conducted in Tabin Wildlife Reserve, Lahad Datu, Sabah has triumphed good results which Structural Equation Modelling analysis revealed that pre-visit and post-visit survey have significant variance towards the ecotourism. This implies a good potential of the inclusion of invertebrates in ecotourism activities especially in Sabah and at the same time, it will support the invertebrate's conservation through ecotourism.

5.2 Implications

The findings of this research are useful in contributing to the literature and information about the invertebrate conservation awareness specifically documentation on the invertebrates tourism or entotourism information in Sabah. There is very little research has been done globally that focuses on entotourism to promote the species conservation.

Moreover, most tourism management in protected areas in Sabah are concerning the large mammals and endangered wildlife species causing most of those species becoming the attraction icons for Sabah tourism. Instead of encouraging the invertebrate conservation activities, entotourism also able to broaden the scope of ecotourism activities that would help to minimize the negative impacts of tourism that stressing more on the already endangered species.

5.3 *Recommendation of invertebrates inclusion activities*

The findings of this research indicated that practically it was quite feasible to include information regarding invertebrates into ordinary drives or walks in ecotourism activities. In addition, it has been established that there was positive response from both tourists and ecotourism service providers towards inclusion of information regarding invertebrates into activities. According to this, the following recommendations are listed for implementation:

a. Rapid biodiversity assessments on invertebrates need to be undertaken at suitable ecotourism sites in Tabin Wildlife Reserve in order to identify the presence of species or orders that suitable for inclusion in ecotourism activities.
b. The emphasis of the rapid invertebrate's biodiversity assessments in Tabin Wildlife Reserve should be highlighting the presence of easily seen, endemic, new, charismatic or iconic orders or species.
c. Vernacular names should be used in listing the invertebrate species as this approach has been identified as one of the effective ways of increasing public awareness (Samways, 2002:39).

5.4 *Recommendations for training of guides*

Some initiatives suggested to improve the training of tour guide relating to the invertebrate inclusion activities to make it more effective and successful in delivering that invertebrate information to the tourists. Followings are the recommendation approaches that can be considered.

a. For future inclusion of invertebrate related information into ecotourism activities, it is recommended that information regarding invertebrates should be included in eco-tour guide training courses.
b. Trainers of ecotourism guides should be taught about the importance of invertebrates and provided with course materials on invertebrates.
c. Course materials regarding invertebrates should be developed and presented in accessible ways, both for the guides training and the subsequent presentation to tourists.

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