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Validity and Reliability of Research Instruments on Ecotourism Development and Poverty Alleviation in Doguwa Local Government Kano, Nigeria

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Abstract **Original Research Article**

Kano state, specifically Doguwa local government possess enormous ecotourism attractions where stakeholders make effort to develop ecotourism in the area, through the provision of necessary facilities, infrastructure and marketing, nonetheless, destination's contribution in poverty alleviation and improving the lives of the host communities is low due to low tourist patronage. This study therefore followed a positivist epistemology and objective ontology together with interpretive epistemology and subjective ontology, to establish if there is any significant relationship between ecotourism development and welfare of host community. Therefore, this paper intended to show how the research instruments used in this study were validated for the purpose of coming up with the simple structure, and appropriateness of the data for the conduct of paramretric statistics. Being qualitative and quantitative study, using exploratory factor analysis, the findings from reliability tests using Cronbach alpha arrived at Cronbach alpha coefficient above 0.7, and validity tests using content validity index with CVIs above 0.7, KMO above 0.7, Batlets test sig less than 0.05, determinants greater than 0.000, communalities above 0.5 and rotated component matrices discriminated and loading highly on distinct factors. Using convergent and discriminant validity, the findings confirm the attainment of optimum simple structure.

Keywords: Exploratory factor analysis, validity, reliability and rotated component matrices.

1.0 Introduction

Researchers may amass a mountain of data, however, unless the research process is scientific: systematic, rational, logically sequenced, and the data valid, the conclusion may be useless. Thus, for the research findings to be acceptable by the research community, and also to serve its intended purposes, "the research instruments need to satisfy two very specific criteria of validity and reliability" (Ndiyo, 2015, P. 293). This means that after designing a questionnaire or an interview guide, the researchers have to test for its validity and reliability to ascertain its appropriateness, accuracy and consistency of research findings. This paper intends to show how the questionnaire and interview guide used were validated, and to determine the reliability of the findings using Cronbach alpha, for determining

simple structure, and suitability of data for the conduct of parametric statistics of correlation and regression

2.0 Literature Review

Validity

Kothari (2004) defines validity as "the degree to which an instrument measures what it is designed to be measured" (P.73). Similarly, to Sedlack and Stanley (1992), Validity refers to a measuring instrument's ability to accurately measure what it claims to measure by producing findings that are in agreement with theoretical or conceptual values. Thus, validity demonstrates the extent to which a test instruments measure the qualities and capabilities of information it is designed to measure. Considering the nature of this study which is triangulation, face, content and construct validity were used.

Face validity: Face validity is established when an individual researcher, who is an expert on the research subject reviewing the questionnaire (instrument) concludes logically that it measures the characteristic of interest Amin, 2005). Therefore, face validity involves the expert looking at the items on the questionnaire and agreeing on the face of it, merely establishes that the tool seems an appropriate way to find out what is being measured (Zikmund & Babin, 2000).

Content validity: Content validity refers "to the extent to which the content of the instruments adequately covered the variables and the entire study" (Asika, 2010, P.71). It focuses upon the extent to which the content of an instrument corresponds to the content of theoretical concept it is designed to measure (Kothari, 2004). Thus, the researcher is expected to come up with content validity index (CVI) of which according to Field (2009), it must be equal to, or greater than 0.70 as the evidence of good validity.

Construct validity: Construct validity refers to "an attempt to measure how adequately an instrument measures the actual meaning of a construct or concept" (Ndiyo, 2015,P. 299). To (Asika (2010.), construct validity "is the extent to which an instrument accurately appraises a theoretical or hypothetical construct" (P.72). Thus, construct Validity focusses on the assessment of whether a particular measure relates to measures consistent with theoretically derived hypotheses concerning the relationships among the variables (Kothari, 2004). In this study, construct validity was tested using convergent and discriminant validity, using exploratory factor analysis.

Exploratory Factor Analysis: According to George and Mallery (1999), exploratory factor analysis "is a statistical procedure designed to take a large number of constructs and reduce them to a smaller number of factors" (P. 342). Similarly, to Zikmund and Babin(2000), factor analysis is "a statistical technique that is used as a data reduction technique to identify a relatively small number of factors (constructs) from a set of many and interrelated variables" (P. 236). Moreover, as opined by Aaker, Kumar and Day (2005), the broad purpose of factor analysis "is to identify underline constructs in the data and to reduce the number of variable to a more manageable set" (P.554). Moreover, factor analysis is normally used to regroup variables into a limited set of clusters based on shared variance and isolating constructs and concepts so that relationships and patterns can be easily interpreted and understood (Amin, 2005). Thus, how many factors will exist among a large number of variables will be determined by the eigenvalues of equal or greater than one (George & Mallery, 1999, P.284).

The two types of factor analysis techniques are Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) (Aaker, Kumar and Day (2005). CFA attempts to confirm hypotheses and uses path analysis diagrams to represent variables and factors, whereas EFA tries to uncover complex patterns by exploring the dataset and testing predictions (Kothari, 2004) of which construct validity relates to the later.

Convergent and Discriminant Validity

Convergent: Testing the relationship between scores on a new test with other theoretically

related measures is one of the important stages in conducting a construct validation, using convergent validity, where the relationships among different measures of the same construct are identified and interpreted (Field, 2009). According to George and Mallery (1999), Convergent validity refers to the capability of the instruments to display measures which are related and allied together (P. 341).

Discriminant validity: Discriminant validity" represents how unique or distinct is a measure" (Zikmund & Babin, 2000, P. 337). Assessing discriminant validity (also known as divergent validity) is another way of expressing internal consistency by demonstrating that a measure of a construct is unrelated to indicators of theoretically irrelevant constructs in the same domain (Zikmund & Babin, 2000. P 337).

Correlation matrix: Correlation matrix is the standard form of reporting correlation coefficients for more than two variables (Aaker, Kumar and Day, 2005). According to Panneerselvam (2014), "correlation matrix is the matrix of correlation coefficients of the original observations between different pairs of input variables, where the researcher will report how each item in the study is related.

Communality: According to Aarker, Kumar and Day (2005), communality" is a percentage of a variable's variance that contributes to the correlation with other variables" (P.561). Similarly, to Panneerselvam (2014), communality is the sum squares of the factor loadings on all factors. Therefore, the communality shows the extent to which how questions are related, and whether they measure study variables. A relatively high Communality indicates that a variable has much in common with the other variables (Zikmund & Babin, 2000).

Determinant: According to (George &Mallery (1999), determinant refers to "a coefficient used in computing values for test of multivariate normality" (P. 342.). Below the table of communality you will see determinant, of which according to Field (2005), it must be greater than 0.0000

Kayser Mayer Olkin and Baartlett tset: KMO is the measure of sampling adequacy. "It establishes whether the distribution of value is adequate for conducting factor analysis" George & Mallery, 1999 P.342). For components to be good for factor analysis, the KMO should be equal or above 0.70, and significant value should be less than 0.05 which demonstrates that the sample is adequate (George & Mallery, 1999. P. 292).

Rotated Component Matrix: Factors are rotated continuously for better interpretation and attaining optimal simple structure where the number of factors extracted is determined so that that eigen value must be equal or greater than one, and cumulative percentage of variance equal to, or greater than 50% (George & Malley, 1999).

Eigen value: According to Zikmund and Babin (2000, P. 628), eigen values "are a measure of how much variance is explained by each factor" (P. 283). One criterion that can be used to determine the number of factors to retain is Kaiser's criterion of retaining all factors that are above the eigenvalue of one (Zikmund & Babin, 2000, P. 628).

Reliability:

According to Ndiyo (2015), reliability refers to" the consistency between independent measurements of the same phenomenon" P. (303). Similarly, to Asika (2010), "a researcher will ensure that the instrument gives similar, close or the same result if the instrument to which the study is applied is replicated" (P.72). Moreover, considering the nature of this study which is triangulation in nature, Cronbach alpha was used. Thus, Cronbach alpha is designed as a measure of internal consistency of ascertaining whether all items within the instrument measure the same thing, and it ranges between 0 and 1 (George and Mallery, 1999. P.271.)

3.0 Methodology:

The study employed cross sectional, descriptive and correlation designs, using both qualitative and quantitative approaches. This was necessitated due to the nature of the

measurement and quantifiable nature of study variables, study objectives, study hypotheses, qualitative and quantitative nature of the research approaches, and nature of poverty alleviation which can be quantified, measured, predicted and also perceived. Therefore, based on the aforementioned, the data were collected using both questionnaires and interviews. Similarly, in considering the appropriateness of the instruments, the study subjected the data to validity and reliability tests, specifically, face, content and construct validity and Cronbach alpha respectively. Moreover, the data were collected using non standardized instruments, with a target sample size 0f 410. Using convergent and discriminant, the study carried out a reliability test using Cronbach alpha and arrived at Cronbach alpha coefficient above 0.7, and validity test using content validity index with CVIs above 0.7, KMO above 0.7, Batletts test sig less than 0.05, determinant greater than 0.000, communalities above 0.5 and rotated component matrices discriminated and loading highly on distinct factors. The data were analysed at univariate, bivariate and multivariate levels using frequency, percentage, mean correlation and regression.

4.0 Findings:

The study analyses the data and presents the findings based on the objectives of the study presented as follows:

In considering the acceptability of the instruments, the study conducts: face validity and content validity for both questionnaire and interview guide and arrives at coefficients of content validity index of 0.85, 0.83, 0.86, 0.83, 0.86 and 0.86 per constructs and per experts respectively, manifesting on table 4.1, 4.2 and 4.3 respectively, authenticating that the contents of an instrument corresponds to the content of the theoretical concept it is intended to measure, which coincides with Zikmund and Babin(2000) and Aaker, Kumar and Day (2005) as follows:

Table 4.1: Expert's Content Validity Index Table

Experts	**Content Validity Index (CVI)**
Experts 1	0.90
Experts 2	0.90
Experts 3	0.80
Experts 4	0.80
Experts 5	0.80
Average	**0.85**

Source: Primary Data, 2025.

Table 4.2: Expert's Content Validity Index per Construct

Accommodation	0.80
Transportation	0.80
Infrastructure	0.90

Marketing	0.80
Income	0.80
Employment	0.90
Average	**0.83**

Source: Primary Data, 2025

Table 4.3: Content Validity Index (For Interview Guide)

Questions	**Expert 1**	**Expert 2**	**Expert 3**	**Expert 4**	**Expert 5**
How would you assess the contribution of accommodation on poverty alleviation?	0.8	0.8	0.8	0.9	0.8
How would you assess the contribution of accommodation on poverty alleviation?	0.9	0.9	0.8	0.9	0.9
How would you assess the contribution of infrastructure on poverty alleviation?	.9	0.8	0.8	0.8	0.9
How would you assess the contribution of marketing on poverty alleviation?	0.9	0.9	0.8	0.9	0.9
How would you assess the contribution of ecotourism on poverty alleviation?	1.0	0.9	0.9	0.9	0.8
Total CVI	**0.86**	**0.83**	**0.86**	**0.86**	**0.86**

Source: Primary Data, 2026.

Similarly, in ascertaining the construct validity, the study conducts exploratory factor analysis through convergent and discriminant validity, using principal component analysis (PCA) with varimax method. The findings are manifesting on table 4.4, and 4.5 respectively.

Table 4.4: Communality Table (Ecotourism Development)

Items	Initial	Extraction
Doguwa possess sufficient hotel accommodation	1.000	.718
Road travels are in good conditions	1.000	.813
Host community facilitates local transportation	1.000	.816
Functional health care facilities are available	1.000	.737
Host community privides local transportation	1.000	.797
Financial institutions facilitate travel experience	1.000	.784
People are trained as local tour guides.	1.000	.820
Hotels in Doguwa are sufficient	1.000	.536
Destinations deliver effective service	1.000	.860

Source: Primary Data, 2025.

Determinant=0.012

Table 4.5: Communalities (poverty alleviation)

Similarly, the result from communality table on table 4.5 for poverty alleviation shows the convergence, where all the items on the questionnaire are correlated with each other as

Manifesting in the communality table, having the loadings of greater than 0.5, ranging from

0.802 to 0.892 and determinant of 0.002 which is greater than 0.000, which coincides with Field (2009). That shows that items on the communality are allied and highly correlated to each other.

Table 4.5: Communalities (Poverty Alleviation)

Determinant =0.012

Items	Initial	Extraction
There is availability of employment in the local people	1.000	.881
Villagers are employed as guides and interpreters	1.000	.892
Villagers have become self-reliant	1.000	.849
The industry has invested in the provision of educational opportunities to host community	1.000	.814
The economic activities empower the local people	1.000	.802
The location of the industry has improved government revenue	1.000	.861

Moreover, the result from communality tables of ecotourism development and poverty alleviation show the convergence and linearity relationship, and items are correlated. As a result, all the variables with very low and insignificant correlation with each other were eliminated, reflecting having the loadings above 0.5, ranging from 0.536 to 0.860, and the determinant of 0.012 which is greater than 0.000. That coincides with Kothari (2004) and George and Mallery (1999).

Similarly, the exploratory factor analysis was run, and the results from discriminate validity confirms that the rotated component matrix of the study variables were summarized into reduced set of variables, where all the unrelated items were detached and loaded separately from each other as manifesting on table 4.6. and 4.7 as follows:

Table 4.6: Rotated Component Matrix (Ecotourism Development)

Items	Component			
	1	2	3	4
Most hotels in Doguwa are easily accessible	.837			
Doguwa possesses sufficient hotel accommodations	.826			
Hotels in Doguwa offer wide range of accommodations	.770			
Costs of travel are relatively expensive	.649			
Managers at destinations attend to customer's demand promptly	.618			
Destinations deliver effective service	.571			
There is an effective sewage and drainage system		.841		
Transportation is effective		.800		
There is constant supply of electricity and water		.791		
Doguwa destination delivers effective service		.719		
Local transportation is convenient and reliable			.868	
Local transportation is affordable			.863	
The Prolong military has affected the destinations				.811
The Destination suffers from internal insecurity				.793
Eigen Value	3.326	2.608	1.627	1.590
% of Variance	23.758	18.629	11.622	11.358
Cumulative % of Variance	23.758	42.387	54.009	65.366

Source: Primary Data, 2025.

Using discriminant validity on ecotourism development and poverty alleviation generate rotated component matrix, which shows that values are highly loaded ranging from: 0.649 to 0.868. Similarly, eigen values of 3.326, 2.608, 1.627 and 1.590 were also generated which shows that they are greater than one. Moreover, all the unrelated factors were detached, and, the cumulative percentage of variance of 65.366 was generated. The result coincides with Field (2009) and Aaker, Kumar and Day (2005).

Table 4.7: Rotated Component Matrix (poverty alleviation)

Items	Component	
	1	2
Members of host community are employed as managers	.803	
Local people are involved in decision making	.816	
The industry has invested in the provision of educational opportunities to host community		.674
Host community are provided with alternative means of diversification		.640
The industry has provided the availability of goods and services to local people		.748
The industry has strengthened linkages with other economic sectors.		.729
Local people are benefiting from facility available		.791
The patronage of guest has created multiplier effect to host community		.738
The location improves economic condition of Host community		.769
The industry has contributed in the earning of foreign exchange for the country		.784
The availability of infrastructure benefits the host community		.796
The impact of the industry has brought a change to economic activities of host community		.784
The economic activities empower the local people		.799
The industry has stimulated domestic consumption to local people		.776
The location of the industry has improved government revenue		.760
Eigen Value	7.417	1.740
% of Variance	49.450	11.600
Cumulative % of Variance	49.450	61.050

Moreover, the result on table 4.7 also shows that the values are discriminated and loading highly on distinct factors, with Eigen values of: 7.417 and 1.740 respectively, which coincides with Ellis (1994), that Eigen value should be greater than or equal to one; and cumulative percentage of variance above 60 %.

Furthermore, in ascertaining sampling adequacy and internal consistency, using the exploratory

factor analysis the study generates the Kayser Mayer Olkin (KMO) of 0.80 and Bartlet's test statistics of sig= 0.000. That coincides with Field (2009) of having KMO and Bartlett test of 0.70 and less than 0.05 respectively as the evidence of sampling adequacy, and distribution of value adequate for the conduct of factor analysis, manifesting on table 4.8.

Table 4.8: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0.80
Bartlett's Test of Sphericity	
Sig.	.000

Source: Primary Data, 2025.

In furtherance to the above, the result from reliability shows consistent result manifesting on table 4.9 and 4.10, with Cronbach alpha coefficients of 0.868 and 0.911 respectively.

Table 4.9: Constructs Reliability Index

Variables	**Cronbach alpha**	**No of Items**
Accommodation	0.789	10
Transportation	0.737	10
Infrastructure	0.742	10
Marketing	0.716	8
Ecotourism Development	**0.868**	**38**
Employment	0.739	10
Income	0.920	12
Welfare	**0.911**	**22**

Table 4.10: Reliability Statistics (Ecotourism Development and poverty alleviation).

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.751	.800	2

Source: Primary Data, 2026.

This was supported by conducting reliability test using the entire study variables and arrives at Cronbach alpha coefficients of 0.800 as manifesting on table 4.10and Bartlet's test coefficients of <0.01 respectively on table 4.8 as an evidence of good reliability. That result also coincides with Kothari (2004)

5.0: Conclusion

The research instruments used in this study were validated appropriately, using face, content and construct validity. The results demonstrated high factor loadings as an evidence of good simple structure for both study variables. Similarly, the suitability of data for the conduct of parametric statistics was also ascertained manifesting on the findings for the results generated from content and construct validity indexes of above 0.70. Moreover, using convergent and discriminant analysis, the reliability result reveals Cronbach alpha coefficient above 0.700 and Bartlet's test coefficients of <0.05 respectively. Moreover, the result from the rotated component matrix shows that values discriminated and loading highly on distinct factors, with eigen values greater than or equal to one; and cumulative percentage of variance above 6o percent as an evidence of good simple structure which coincides with George and Malley (1999). Finally, the findings from exploratory factor analysis using discriminant validity confirms that the ecotourism development is multi-dimensional with four constructs, consisting accommodation, transportation, marketing and infrastructure. While poverty alleviation of host community is independently loaded on two columns, consisting employment and income.

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