Smart Tourism (2023) Volume 4 Issue 2
doi: 10.54517/st.v4i2.2494

ORIGINAL RESEARCH ARTICLE

Integgration of the Structural Equation Model Partial Least Square (SEM-PLS) and ANFIS neuro-fuzzy approach for creating a local wisdom-based tourism development model, case study of the Prabu Siliwangi tourist attraction, West Java, Indonesia

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ABSTRACT

Tourism has become one of the most important economic sectors in Indonesia. Indonesia, with its natural wealth, culture, and historical heritage, has attracted the attention of tourists from various parts of the world. One of the provinces that has great potential for tourism development is West Java. The purpose of the research is to formulate a tourism development model based on local wisdom in the tourism location of Prabu Siliwangi. The analysis methods used in this research are Structural Equation Model Partial Least Square (SEM-PLS), and ANFIS neuro-fuzzy analysis. Composite reliability above the 0.7 GoF value of 0.725 means that the model is very good (has a high ability) at explaining empirical data. The accuracy of the model produced is 97.1%, which shows that the input data in the model can represent the real data in the field.

Keywords: strategy; development potential; tourist attraction; local wisdom; King Siliwangi

1. Introduction

Tourism has become one of the most important economic sectors in Indonesia, making a significant contribution to national economic growth[1]. Indonesia, with its rich natural, cultural, and historical heritage, has attracted the attention of tourists from all over the world. One province that has great potential for tourism development is West Java. West Java, as a province rich in cultural and natural heritage, has great potential for tourism development. However, tourism development is not only about increasing the number of tourist visits but also about preserving local wisdom and natural ecosystems in the region[2].

One important aspect of tourism development is maintaining local wisdom. This includes promoting local culture, preserving traditions, and supporting local creative industries. Involving local communities in tourism development can also ensure that cultural values and local wisdom are maintained. In the overall development of the tourism sector in West Java, collaboration between the government, private sector, and local communities is very important.

ARTICLE INFO
Received: 3 October 2023 | Accepted: 7 November 2023 | Available online: 21 November 2023

CITATION
Ismail AY, Andayani SA, Nainggolan MF. Integgration of the Structural Equation Model Partial Least Square (SEM-PLS) and ANFIS neuro-fuzzy approach for creating a local wisdom-based tourism development model, case study of the Prabu Siliwangi tourist attraction, West Java, Indonesia. *Smart Tourism* 2023; 4(2): 2494. doi: 10.54517/st.v4i2.2494

Awareness of the importance of preserving local wisdom and the natural environment must be the main basis for efforts to develop sustainable tourism. With a balanced and sustainable approach, West Java has great potential to become one of the leading tourism destinations in Indonesia and provide sustainable benefits for regional and national economic growth.

Sustainable tourism development based on local wisdom is important to maintain the sustainability of the local environment, culture, and economy[3]. One tourist attraction that has great potential for tourism development is Prabu Siliwangi in West Java, Indonesia. However, tourism development in Prabu Siliwangi requires a comprehensive and structured approach.

The approach that can be used to achieve this goal is to utilize local wisdom in tourism development. Local wisdom includes the knowledge, culture, and values of local communities, which can be integrated into tourism experiences[4]. One way to make this happen is by creating a Local Wisdom-Based Tourism Development model.

Structural Equation Model Partial Least Square (SEM-PLS) is a statistical tool that can be used to analyze the relationship between various factors in tourism development[5]. SEM-PLS allows researchers to test hypotheses, measure the impact of different variables, and formulate appropriate models to describe the influence of various factors in the context of tourism development[6].

On the other hand, the ANFIS neuro-fuzzy approach is an artificial intelligence technique that can be used to manage complex and non-linear data[7]. In the tourism context, ANFIS can be used to predict tourist behavior based on historical data and changing environmental factors.

In this case, the Structural Equation Model Partial Least Square (SEM-PLS) integration method and the neuro-fuzzy Adaptive Neuro-Fuzzy Inference System (ANFIS) approach become relevant. SEM-PLS is a multivariate statistical analysis technique that allows researchers to examine complex relationships between variables involved in the context of tourism development. Meanwhile, ANFIS is an artificial intelligence approach that combines the concept of artificial neural networks with fuzzy logic to model non-linear and complex relationships, which are often encountered in the tourism sector.

The integration of SEM-PLS and ANFIS makes it possible to explore the correlation between variables that influence tourism development in Prabu Siliwangi more accurately. This approach can help identify key factors that influence the success of local wisdom-based tourism development, including cultural, economic, environmental, and social aspects.

In addition, the use of SEM-PLS and ANFIS also allows researchers to measure and model uncertainty and complexity in tourism data, which is often non-linear and unstructured. By understanding the deeper relationships between these variables, decision-makers in the tourism sector can design more effective and sustainable development policies and strategies.

In terms of the Prabu Siliwangi tourist attraction, this research will provide a significant contribution to tourism managers, local government, and local communities. By understanding the factors that influence the development of local wisdom-based tourism, managers can design programs that respect cultural and natural heritage and empower local communities. In conclusion, the integration of SEM-PLS and the ANFIS neuro-fuzzy approach is expected to create a sustainable tourism development model based on local wisdom and provide long-term benefits for Prabu Siliwangi and the surrounding community in West Java, Indonesia.

2. Review of literature

2.1. Tourism based on local wisdom

Local wisdom-based tourism is an approach that respects and utilizes cultural heritage and local knowledge to promote sustainable tourism. This includes culture, art, traditions, culinary delights, and local knowledge, which is an attraction for tourists. The local wisdom-based tourism development model aims to preserve and develop cultural heritage assets in a sustainable manner. Local wisdom-based tourism places a strong emphasis on respecting and preserving local cultural heritage. Tourism development that promotes local cultural heritage helps maintain cultural identity and preserve heritage that can be used by future generations. One of the main principles of local wisdom-based tourism is involving local communities in the tourism development and management process. This helps in improving the welfare of local communities, creates economic opportunities, and provides a better understanding of local culture and wisdom. In many cases, local communities have an important role in guiding tourists and sharing their knowledge. Apart from preserving culture and the environment, tourism based on local wisdom can also provide economic benefits for the area. This includes job opportunities, increased income, and local economic growth. In this way, local wisdom-based tourism can become a sustainable source of income for local communities.

2.2. Structural Equation Model Partial Least Square (SEM-PLS)

SEM-PLS is a statistical method used to analyze the relationship between variables in a model. It is a useful tool for measuring and testing relationships between constructs in a research context. In the context of tourism development, SEM-PLS can be used to measure the impact of local wisdom on various aspects of tourism development.

SEM-PLS makes it possible to measure complex constructs in the context of tourism development. A construct such as “local wisdom” can be measured empirically by identifying appropriate indicators, such as local traditions, cultural knowledge, and local community participation.

PLS helps in modeling and measuring variables. The use of SEM-PLS in tourism development can also help in risk management and decision-making. SEM-PLS analysis can help stakeholders, such as the government and tourism business owners, plan more effective development strategies by understanding the impact of local wisdom on various critical variables.

2.3. Adaptive Neuro-Fuzzy Inference System (ANFIS)

ANFIS is an inference system based on artificial neural networks and fuzzy logic. This approach allows combining artificial intelligence (neuro) and fuzzy logic to create models that can adapt to data. In tourism development, ANFIS can be used to understand tourist behavior patterns, predict tourism demand, and optimize responses to various factors. ANFIS is an inference system based on artificial neural networks and fuzzy logic. Artificial neural networks are used to understand non-linear relationships in data, while fuzzy logic is used to deal with uncertainty and ambiguity. ANFIS has a layered structure that allows learning from data as well as adaptation to changes in the environment. In the context of tourism development, ANFIS has proven to be a useful tool for analyzing and forecasting tourist behavior. ANFIS can be used to understand tourist behavior patterns by taking historical data such as tourist preferences, weather, and ticket prices as input. With the ANFIS model, we can identify complex relationships between these variables and predict tourist behavior, such as time of visit, places visited, and spending levels. This helps with more effective destination planning and tourism marketing. ANFIS can also be used to predict tourism demand. By incorporating historical data on visitation, economic trends, and special events, ANFIS models can produce accurate forecasts of future tourism demand. This helps authorities and tourism companies organize resources and

promotions more efficiently. ANFIS can be used to optimize responses to various factors that influence tourism. For example, ANFIS can be used to set ticket prices and promotions based on real-time data such as weather, local events, or traffic conditions. With this model, authorities can respond quickly to environmental changes and maximize the tourist experience.

2.4. Integration of SEM-PLS and ANFIS

The integration of SEM-PLS and ANFIS can provide advantages in developing tourism development models. SEM-PLS can be used to analyze the relationship between relevant variables, such as local wisdom, tourists, infrastructure, and the local economy. Meanwhile, ANFIS can be used to model tourist behavior patterns and optimize tourism strategies based on the data obtained. The integration of these two methods allows for the development of tourism strategies that are more tailored to tourists' preferences and behaviors. This can increase the attractiveness of a tourism destination and improve the tourist experience.

3. Methodology

3.1. Research design

The method used in this research is a mixed method with a descriptive approach. The mix method is a research approach that combines or combines qualitative and quantitative forms. Quantitative research is systematic, planned, and clearly structured. According to Sugiyono[8] mixed-method research is a combination of quantitative and qualitative research methods. Combining or combining methods together in one study to obtain more comprehensive, valid, reliable, and objective data.

Quantitative research methods can be interpreted as research methods that are based on the philosophy of positivism, used to research certain populations or samples, sampling techniques are generally carried out randomly, data collection uses research instruments, data analysis is quantitative or statistical in nature with the aim of testing the hypothesis. Meanwhile, the qualitative research method is called a new method based on the philosophy of postpositivism. This method is also called an artistic method, because the research process is more artistic (less patterned), and is also called an interpretive method because the research data is more concerned with the interpretation of data found in the field.

The map of the research location is shown in **Figure 1** below. This research was carried out in the religious tourism area of Prabu Siliwangi's petilasaan grave, which is in Pajajar village, Rajagaluh sub-district, Majalengka district. The determination of the research location was carried out deliberately (Purposive Sampling). The following is a map of research locations.

Figure 1. Research location map.

3.2. Data sources and data collection techniques

The data sources used in this research are primary data and secondary data. Primary data was obtained through direct observation and interviews with farmers using prepared questionnaires. Interviews were conducted with parties involved and concerned with the research objectives. Secondary data was obtained through literature searches on research results, literature studies, reports, and documents from various agencies related to the research field.

The interview process was carried out directly with visitors to the Prabu Siliwangi tourism location who were concerned with aspects that were part of the development of the Prabu Siliwangi tourism location. The process of collecting data from the questionnaire used contains questions regarding the objectives of the research carried out. The nature of the questionnaire is that it is a closed questionnaire with several open questions prepared so as to increase the researcher's insight.

3.3. Population and sample of research respondents

Basically, the population is a generalized area consisting of objects/subjects that have certain qualities and characteristics determined by researchers to be studied and then conclusions drawn[8]. The population in each study is usually selected to be closely related to the problem to be studied. The population in this study was all visitors who came to the Prabu Siliwangi tourism location, totaling 320 people.

Based on logical considerations such as practicality, limited costs, time, and energy, not all members of the population were sampled in this research, instead, a number of samples were taken to represent the entire population[9]. The sampling technique used in this research is the cluster random sampling technique so that all members of the population have the same opportunity to be selected as a sample. Several steps were taken to apply the cluster sampling technique, namely: the first stage, determining the sampling point, namely around the Prabu Siliwangi tourism area. Next, a number of visitors are selected who meet the required criteria. The diversity of respondents selected is adjusted to the needs of the analysis in order to find answers to the problem identification question that was raised at the beginning.

3.4. Data analysis plan

To answer the objectives of this research, descriptive analysis was used by applying descriptive statistics. Descriptive statistics is a technique for collecting, processing, and then presenting observational data so that the characteristics of the objects in the data can be seen[8].

Building a development model requires many variables as performance measurements, which can be defined as the efficiency and effectiveness of previous actions. A performance measure can be defined as a parameter used to quantify the efficiency or effectiveness of past actions, thereby creating a performance matrix that includes the content and component parts of a broad-based performance measure[10].

Performance measurement is carried out in two stages, namely the preparation stage and the measurement stage. The preparation stage involves determining the part to be measured, determining the criteria used to measure performance, and measuring actual performance. Meanwhile, the measurement stage consists of comparing actual performance with predetermined targets and desired performance[11–13].

The preparation stage for performance measurement starts with determining indicators. Each indicator determined must be supported by criteria to determine whether the resulting performance is good or not, such as determining the farmer scale, namely using the continuum line criterion, which divides farmer responses into 5 categories (very good, good, fair, poor, and not good). After determining the criteria, 5 performance measurement criteria were obtained, these criteria were analyzed using the analytical tools used by the researcher, in this research using SEM-PLS and ANFIS integration. This is done to facilitate the development

of a tourism model based on sustainable local wisdom.

3.5. Structural equation model (SEM) analysis

SEM-PLS can be used to measure the impact of local wisdom on various aspects of tourism development. According to Solimun, SEM is used to analyze the structural influence between variables, both directly and indirectly. To make it easier to process and analyze data, a hypothetical structural equation model is first prepared, which refers to a framework of thought. This hypothetical structural equation model shows in **Figure 2** the flow of influence between exogenous latent variables ($X1$, $X2$, $X3$, $X4$) and endogenous latent variables (Y), as well as latent variables (exogenous and endogenous) and their indicators. Path diagram construction is usually done with visualization so that it can be easily understood by researchers and readers. Path diagrams are very useful for seeing causal relationships between exogenous and endogenous variables. The model of this research is as follows:

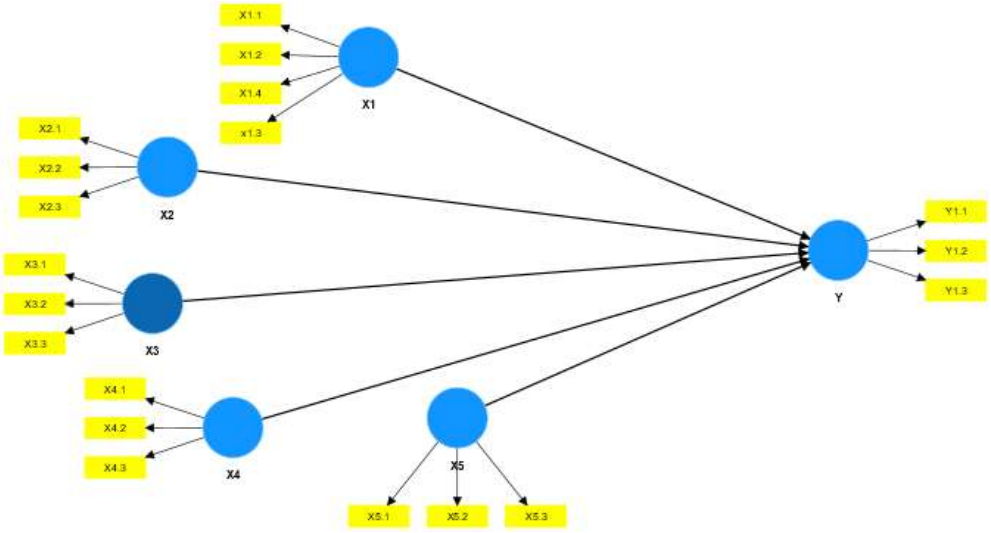


Figure 2. Structural Equation Model (SEM) Analysis construct.

3.6. Sistem Adaptive Neuro Fuzzy Inference System (ANFIS)

The Adaptive Neuro Fuzzy Inference System (ANFIS) is an adaptive neural network based on a fuzzy inference system. The reasons for using the Adaptive Neuro Fuzzy Inference System (ANFIS) in this research are that it is easy to understand, very flexible, tolerates data that is considered inappropriate, is able to model nonlinear data, and can build on and apply the experience of experts directly. The ANFIS method has the advantage of modeling the qualitative side of human knowledge and the mechanism of the decision-making process through constructed commands. Artificial neural networks also have the advantage of recognizing certain patterns, learning new things, and solving problems without the need to apply mathematical modeling. This is based on historical data entered into it, and it can predict future events based on this data.

Jang states that the Fuzzy Inference System (FIS) Sugeno model of first order, which is inserted into an adaptive network framework, will be used to facilitate the learning and adaptation process, as shown in **Figure 3** below.

Figure 3 shows that there are 2 types of nodes, namely adaptive nodes with a square symbol and nodes with a circle symbol. The output of each layer is denoted by Oj, where i is the number of rules and i is the number of layers.

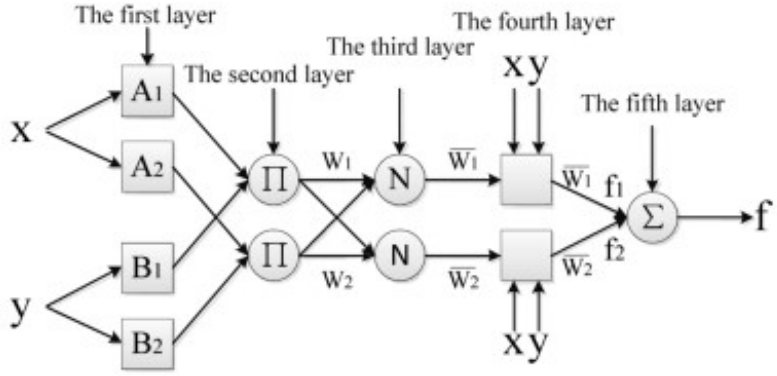


Figure 3. ANFIS structure algorithm.

4. Results

4.1. Implementation of the SEM-PLS model in Prabu Siliwangi tourism development

In developing the results of the analysis using SEM-PLS into an implementation model that will build a tourism development model based on local wisdom at the Prabu Siliwangi tourism location, a suitability test for the entire model and indicator factor testing for the development of Prabu Siliwangi tourism will first be carried out.

First, the formulation of the sustainability model is carried out by evaluating the SEM measurement model and data processing in the context of hypothesis testing, which includes convergent validity and discriminant validity. Convergent validity is the degree to which a measure correlates positively with alternative measures of the same construct. By using a domain sampling model, reflective construct indicators are treated as different (alternative) approaches to measuring the same construct. Convergent validity consists of three tests, namely composite item reliability, and average variance extracted (AVE). Convergent validity is used to measure how well existing indicators can explain dimensions. This means that the greater the convergent validity, the greater the dimension's ability to apply the latent variable.

4.2. Reliability item

Reliability items, or what we usually call indicator validity. Testing of item reliability (indicator validity) can be seen from the loading factor value (standardized loading). This loading factor value is the magnitude of the correlation between each indicator and its construct. A loading factor value above 0.7 can be said to be ideal.

Based on **Figure 4**, the results of the loading factor calculation for each latent variable have a value above 0.5 on average, many even exceed 0.7. Loading factor results with a value of more than 0.5 do not need to be set aside. Thus, each indicator is valid to explain each latent variable, namely the agribusiness subsystem and the sustainability of organic rice agribusiness. Apart from showing the validity of each indicator, factor loading also shows the magnitude of the contribution of each indicator to the factor.

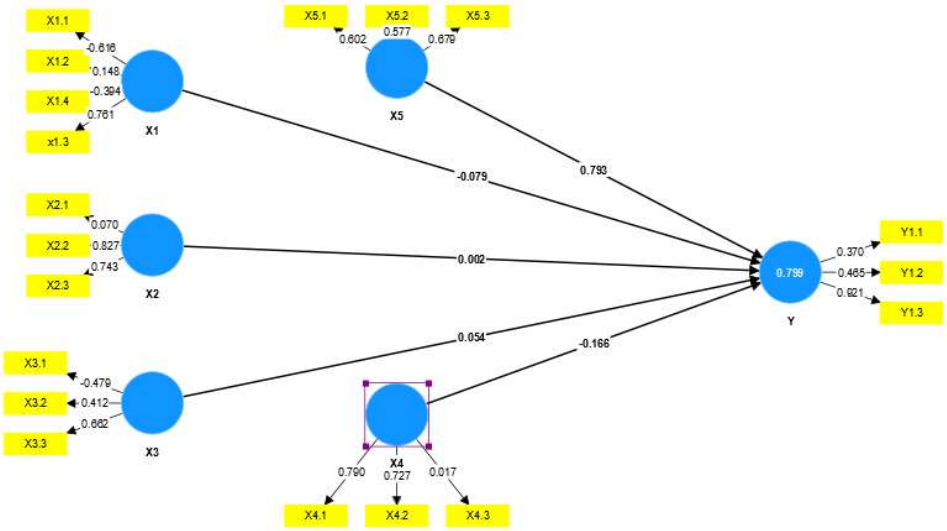


Figure 4. Standardized loading factor inner and outer model.

For input subsystem factors, the indicator that has the largest loading factor is X5, which is a tourism attractiveness variable that has 3 indicators, namely X5.1 Uniqueness, X5.2 Beauty, and X5.3 Social Community. Meanwhile, the variable that has the lowest value is X2, which is the Prabu Siliwangi tourism marketing variable, which has 3 indicators that are part of this variable, namely.

This shows that the Prabu Siliwangi tourism location has the advantage of being a tourist attraction, which is quite interesting for visitors, whereas, in the development process, there has been no effort to maximize this potential because the general public's knowledge of the tourism location is still small because marketing socialization has not utilized all resources such as online media, direct promotion, and offline mass media.

4.3. Composite reliability

In processing, using the SEM statistical application used in composite reliability, or Cronbach's alpha and D.G rho (PCA). The Cronbach's alpha and D.G rho (PCA) values are greater than 0.7, indicating that the construct has high reliability as a measuring tool. A limit value of 0.7 and above means acceptable, and above 0.8 and 0.9 means very satisfactory.

Table 1 shows that the composite reliability value for the agribusiness subsystem, changes in production, and sustainability of organic rice farmers' agribusiness has a composite reliability value above 0.7, so it can be said that the reliability of these three variables is good as a measuring tool.

Table 1. Composite reliability table for each Prabu Siliwangi tourism variable.

Variables	Composite reliability
X_1	0.829
X_2	0.865
X_3	0.916
X_4	0.934
X_5	0.751
Y	0.512

4.4. Average variance extracted (AVE)

Average variance extracted (AVE) describes the amount of variance that can be explained by items compared to the variance caused by measurement error. The standard is that if the AVE value is above 0.5, it

can be said that the construct has good convergent validity.

Based on **Table 2**, the AVE (average variance extracted) value for the agribusiness (*X*), production (*Y*1), and agribusiness sustainability of organic rice farmers (*Y*2) subsystems has an AVE above 0.5 as the lowest limit, so that all variables have convergent validity, which is good where the latent variable can explain on average more than half of the variance of the indicators.

Table 2. The average variance extracted for each Prabu Siliwangi tourism variable.

Variables	AVE	Composite reliability
X_1	0.668	0.829
X_2	0.623	0.865
X_3	0.759	0.916
X_4	0.850	0.934
X_5	0.451	0.751
Y	0.522	0.512

4.5. Validity of the confirmatory factor analysis (CFA) measurement model and structural model

Discriminant validity is the extent to which a construct is truly different from other constructs by empirical standards. Establishing discriminant validity implies that a construct is unique and captures a phenomenon not represented by other constructs in the model. The initial estimation results using SEM-PLS software obtained the standardized loading factors (SLF) values for each exogenous and endogenous indicator/variable as presented in **Table 3** below.

Table 3. Standardized loading factors (SLF) values for each exogenous and endogenous indicator/variable.

	X_1	X_2	X_3	X_4	X_5	Y
$X_{1.1}$	0.689	0.668	0.709	0.702	0.678	0.464
$X_{1.2}$	0.676	0.701	0.747	0.755	0.733	0.472
$X_{1.3}$	0.885	0.832	0.858	0.860	0.796	0.598
$X_{1.4}$	0.780	0.871	0.865	0.885	0.841	0.739
$X_{2.1}$	0.908	0.894	0.936	0.921	0.915	0.612
$X_{2.2}$	0.395	0.519	0.346	0.400	0.496	0.359
$X_{2.3}$	0.811	0.819	0.782	0.816	0.720	0.587
$X_{3.1}$	0.950	0.900	0.581	0.944	0.899	0.620
$X_{3.2}$	0.753	0.691	0.518	0.747	0.664	0.401
$X_{3.3}$	0.838	0.784	0.753	0.828	0.793	0.567
$X_{4.1}$	0.319	0.307	0.296	0.219	0.290	0.230
$X_{4.2}$	0.347	0.323	0.327	0.363	0.337	0.633
$X_{4.3}$	0.355	0.305	0.354	0.267	0.332	0.617
$X_{5.1}$	0.233	0.215	0.231	0.236	0.148	0.606
$X_{5.2}$	0.701	0.663	0.691	0.703	0.740	0.451
$X_{5.3}$	0.591	0.573	0.537	0.539	0.733	0.432
Y	0.371	0.923	0.796	0.363	0.903	0.934

The examination of the discriminant validity of the reflective measurement model is assessed based on

cross-loading and comparing the AVE value with the square of the correlation between variables. The cross-loading measure compares the correlation of indicators with their variables and variables from other blocks. Good discriminant validity will be able to explain the indicator variable at a higher rate than explaining the variance of other indicator variables.

Based on the table above, the AVE value marked in bold is the highest correlation value of the indicator with the variable, thus showing that each indicator represents the variable being studied.

4.6. Goodness of fit

The goodness of fit test or model feasibility test is used to measure the accuracy of the sample regression function in estimating actual values. Statistically, it can be obtained from the average communality index multiplied by the R^2 value. Statistical calculations are said to be statistically significant if the statistical test value is in the critical area (the area where Ho is rejected). On the other hand, statistical calculations are said to be insignificant if the statistical test value is in the area where Ho is accepted[14]. To validate the model as a whole, goodness of fit (GoF) is used. The GoF index is a single measure used to validate the combined performance of the measurement model and the structural model. The following are the results of calculating the goodness of fit model.

Based on **Table 4**, the average communality result is 0.642. This value is then multiplied by R^2 and rooted. The calculation results show that the GoF value is 0.725, which is more than 0.36, so it is categorized as a large GoF, meaning that the model is very good (has high ability) at explaining empirical data.

Table 4. Goodness of fit Prabu Siliwangi tourism variable.

	AVE	R square
X1	0.668	-
X2	0.623	-
X3	0.759	-
X4	0.850	-
X5	0.451	-
Y1	0.522	0.671
Rata-rata	0.642	0.671
GoF	0.725	

4.7. Implementation of Neuro Fuzzy-ANFIS in Prabu Siliwangi tourism development

In this research, the design was built using primary data from the results of collective data from the results of filling out questionnaires by respondents consisting of 5 input data variables for tourism development, namely: facilities, tourism marketing, supporting factors, human resources, and tourism attractiveness. In **Figure 5**, this is the input data model for ANFIS programming. By inputting testing data in the form of variables supporting tourism development into ANFIS, ANFIS automatically builds a data input model that forms rules as a reference for making predictions.

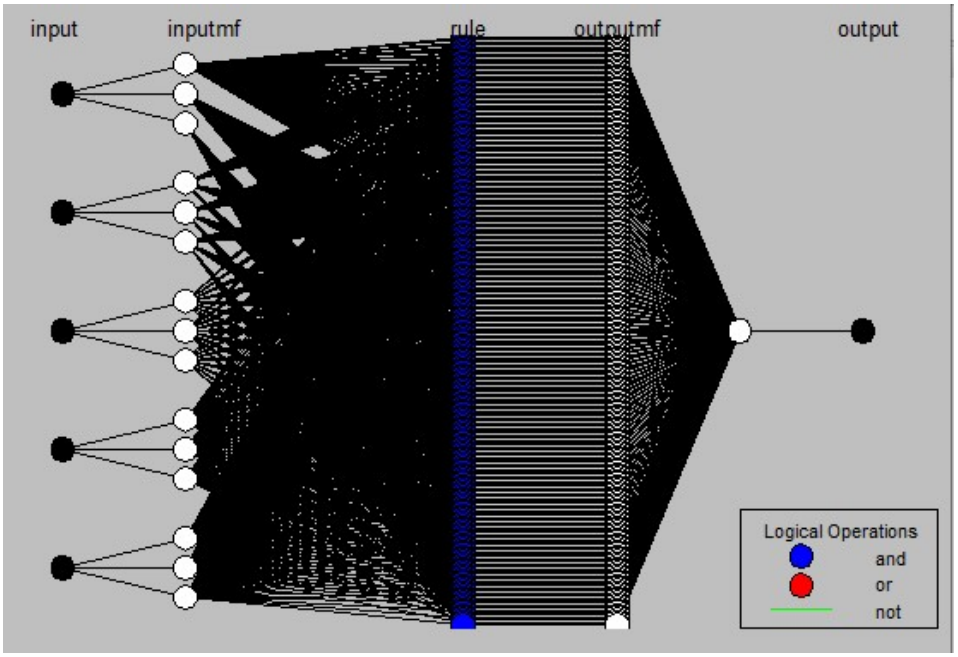
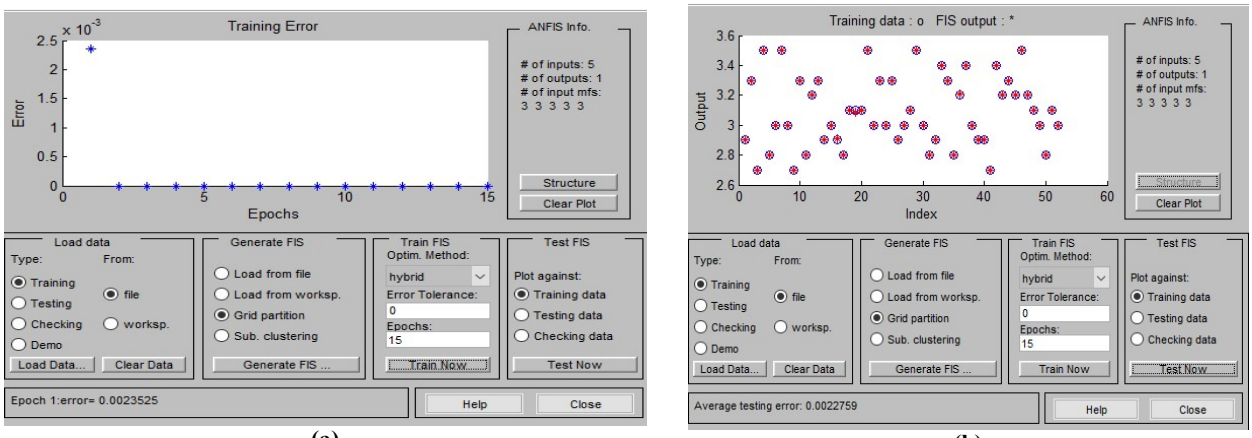


Figure 5. ANFIS model architecture for predicting Prabu Siliwangi tourism development.

Input data entered into the ANFIS application must be tested by determining training errors in ANFIS. The error tolerance value was chosen as 0. In this study, the number of epochs used was 15. After determining the error tolerance value of 0 and the epoch value of 15, ANFIS will start the training process until it reaches the specified number of epochs. If the training process for each epoch has been completed, the error obtained in the main graph can be seen, as shown in **Figure 6**. This shows that the input data will later be read accurately by the ANFIS program.



(a) **(b)**

Figure 6. (a) Trend of errors of the trained fuzzy system; **(b)** training data and FIS output with four inputs and one output.

ANFIS will display the accuracy of ANFIS in training data on the ANFIS Editor graph, with training data symbolized by a blue circle and ANFIS training results symbolized by a red star as in the picture... The more precisely the red star is in the blue circle, the more precisely ANFIS trains the training data, the smaller the average training error, the closer to the error tolerance, and the better the quality of the designed system in terms of accuracy in producing data output. On the other hand, if the position of the red star is further away from the position of the blue star, the worse the ANFIS performance will be in testing the test data. The new system can be declared successful and ready to be applied if the test results are good, with the average test error approaching the desired error tolerance, namely 0.

From **Figure 6**, it can be seen that the red star is in the blue circle as a whole, which indicates that the input data has an error value that is close to 0, so it can be concluded that the input data in the form of tourism variables can represent the tourism development prediction model that will be issued by the ANFIS program.

Based on the input data into the ANFIS program, the ANFIS program automatically builds its own rules from the data. From the input data of 5 variables for the development of Prabu Silinwangi tourism, a total of 243 rules were formed by ANFIS (**Figure 7**). If the parameters in the rule viewer are moved manually, changes will be immediately visible in the Prabu Silinwangi tourism development model built by ANFIS in the early stages. The best results, namely at {3, 3, 3, 4, 4}, show that the maximum value in this research is for facilities 3 (medium), marketing 3 (medium), supporting factors 3 (medium), HR 4 (good), and attractiveness tourism 4 (good).

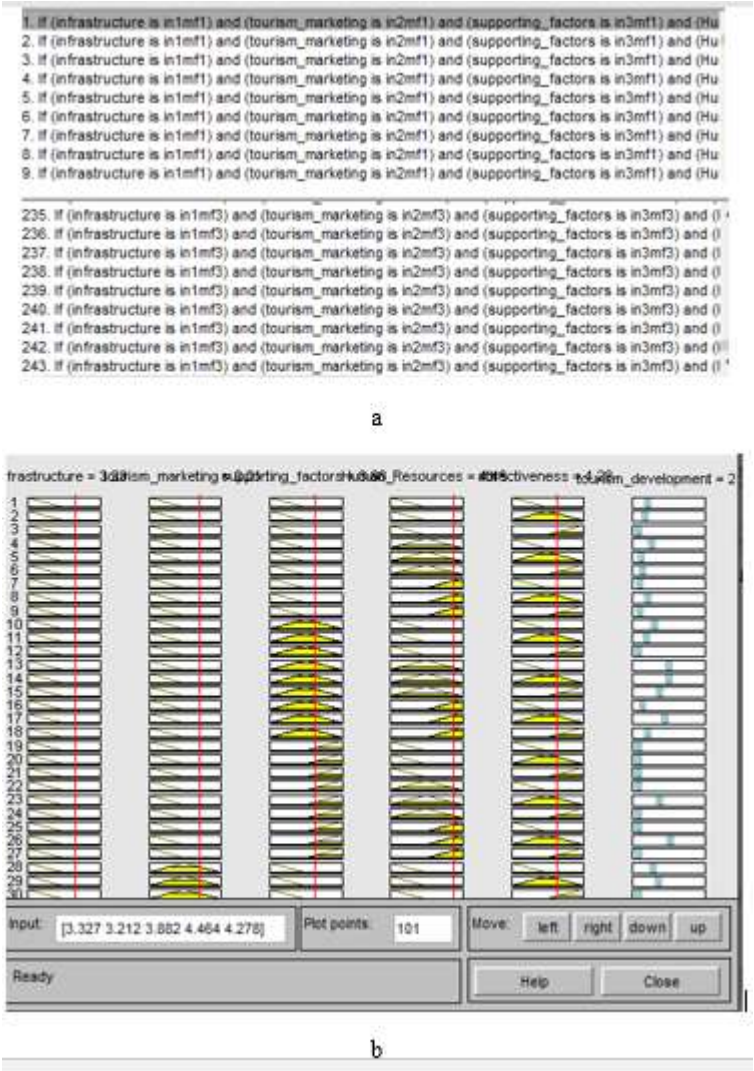
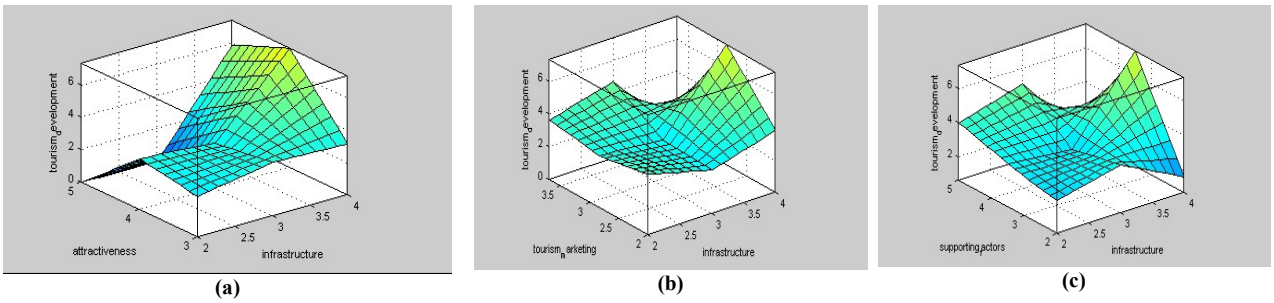


Figure 7. Rule for predicting the development of Prabu Siliwangi tourism formed by ANFIS.

Facilities are a very influential factor in the development of tourism locations. In the development of Prabu Siliwangi tourism, facility variables were also observed. From the results of the analysis using ANFIS programming, it can be seen that the suggestions are also closely related to other variables, as shown in **Figure 8** below. To obtain optimal tourism development value, of course, good facilities are not enough to be supported by tourism attractions. In this case, Prabu Siliwangi tourism will be able to be optimally developed when better facilities are improved because the attractiveness of Prabu Siliwangi tourism is considered good.

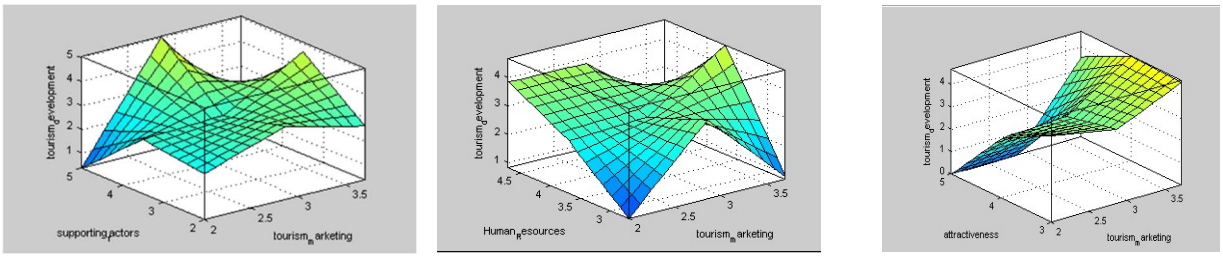
Apart from that, the facilities will also be related to tourism marketing and tourism supporting factors. From **Figure 8b,c**, it can be seen that the better the two variables, the better the tourism development model.



(a) **(b)** **(c)**

Figure 8. Visualization of the 3D surface plots of the rule base system adapted to the data for different mf types; **(a)** visualization of the influence of the variable tourism infrastructure and attractiveness; **(b)** visualization of the influence of the variable tourism infrastructure and tourism marketing; **(c)** visualization of the influence of the tourism infrastructure and supporting factors.

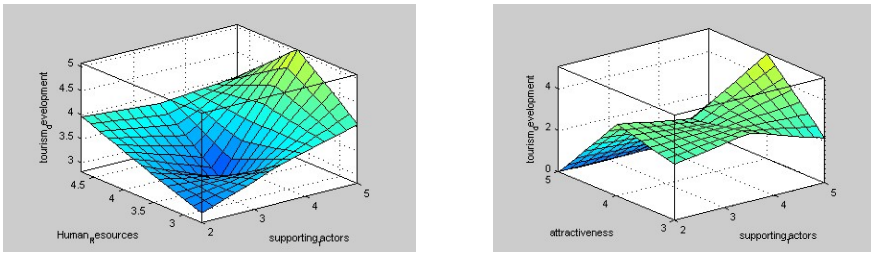
In tourism development, of course, you also have to pay attention to tourism marketing so that it is better known by tourists globally. The results of the ANFIS analysis on the development of Prabu Siliwangi tourism show in **Figure 9** that tourism marketing can achieve maximum value in tourism development when it is linked and supported by 3 variable aspects, namely supporting factors, human resources, and tourism attractiveness. In the development of Prabu Siliwangi tourism, it can be seen that (a) tourism marketing and supporting factors have not been able to achieve optimal value in tourism development. This is shown by the dominant value, namely 3 (medium) in tourism marketing and 3 (medium) also in the supporting system, in this case namely the manager, government, and private sector, so basically there is still a need for development in this field. In (b), the marketing and human resource values are still seen to be in the 2–3 range, which shows that human resources and tourism marketing in this location are not yet optimal. It is necessary to upgrade human resources so that tourism development can be better. (c) it can be seen that the attractiveness of Prabu Siliwangiu tourism is very good (3–5), but marketing is still rated moderate (3–3.5), so optimization is needed in this field for the development of Prabu Siliwangi tourism.



(a) **(b)** **(c)**

Figure 9. Visualization of the 3D surface plots of the rule base system adapted for the data for different mf types; **(a)** visualization of the influence of the tourism marketing variables and supporting factors; **(b)** visualization of the influence of the marketing variables and human resources; **(c)** visualization of the influence of the tourism marketing and attractiveness.

For the development of Prabu Siliwangi tourism shown in **Figure 10**, one of the important values is the supporting factors, which in this case are tourism managers, the government, and the private sector. In this research, supporting factors must also be interrelated with other variables so that they can optimize tourism development. In the research, it can be seen that the supporting factors have not yet reached a good value because, in the graph, the values in the range 2–4 are still visible, namely, the supporting factor values are spread from poor to moderate. This is also followed by HR, which is still low, namely in the 2–4 range.



(a) **(b)**

Figure 10. Visualization of the 3D surface plots of the rule base system adapted for the data for different mf types; **(a)** visualization of the influence of the variable human resources and supporting factors, **(b)** visualization of the influence of the variable uniqueness of tourism and supporting factors.

From **Figure 11** below, it can be seen that the attractiveness variable value is very good, namely in the 3–5 range, but this is not followed by the HR value, which is still in the 2–4 range. So it is still visible that the 3-man chart is at a low development point. On the other hand, from the 3-dimensional graph, it can also be seen that the tourism development value will be higher when human resources and attractiveness are at a value of 4. This is a prediction of the ANFIS output, which will be a guideline in the development of Prabu Siliwangi tourism.

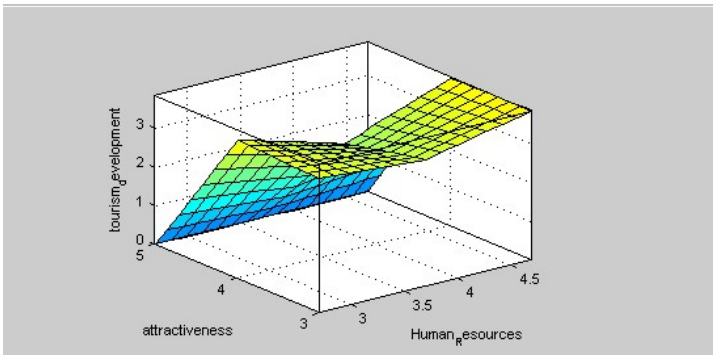


Figure 11. Visualization of the 3D surface plots of the rule base system adapted for the data for different mf types of attractiveness and human resources.

Overall ANFIS prediction shown in **Figure 12**, the prediction model built by ANFIS can be assessed from the accuracy of the resulting model. Which comes from comparing input training data to observational data or actual data. In this research, an accuracy of 97.1% was obtained, which shows that the input data in the model can represent real data in the field. So when making decisions in developing tourism, Prabu Siliwangi can refer to the rules established by ANFIS.

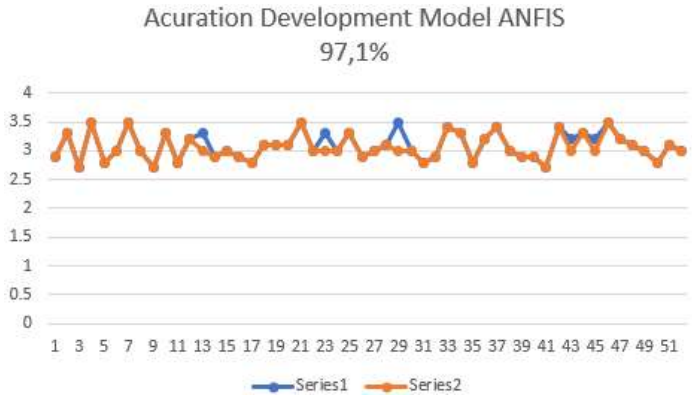


Figure 12. ANFIS prediction accuracy.

5. Discussion

5.1. General conditions of tourism locations

Petilasan Prabu Siliwangi is located in Pajajar Village, Pajajar Village, Rajagaluh District. Astronomically located at coordinates 6°49′38″ LS and 108°20′30″ BT. Prabu Siliwangi Patilasan Protected Forest is located in Pajajar Village, Rajagaluh District, with an area of +3 ha, which was built in 2000/2001. The distance from the center of Majalengka City to the location of tourist attractions is +21 km. Patilasan Prabu Siliwangi in ancient times was a resting place for Prabu Siliwangi and it is said that according to the surrounding community, it is the place where Prabu Siliwangi disappeared. In this tourist area, there are two talagas (Talaga Emas and Talaga Pancuran) whose water is considered holy by the surrounding community and visitors, so before performing rituals in the partisan visitors are required to take a clean bath in the two talagas. In addition to Prabu Siliwangi's lake and patilasan, in this tourist area, there are also bamboo trees left by Soekarno, which from year to year amount to 5 trees (1 grows, 1 dies), and there is a bathing pool for visitors.

5.2. Facility development

The influence of facilities on the development of Prabu Siliwangi Tourism in the SEM analysis shows a CR value of 0.83, which shows that infrastructure directly has a positive and significant effect on the development of Prabu Siliwangi Tourism. To confirm the condition of the infrastructure in the tourism location, it was tested with ANFIS analysis, which shows that the surface results are still dominant in the range of 2–4. This shows that the infrastructure is still in the bad-moderate range, so based on that, there is still a need to improve the facilities in the Prabu Siliwangi tourism location. A good infrastructure will provide comfort while traveling and be a determinant of the arrival of tourists[15].

Findings in the field indicate that infrastructure in tourist locations, including roads, electricity, clean water, telecommunications, signposts, tourist information boards, and tourist traffic signs, is not enough. Road access to Prabu Siliwangi's tourism location is still narrow and broken, telephone and internet are still often interrupted; and there are even blank spots. The problem of accessibility should receive attention because it has a great influence on tourists[16]. The better the accessibility, the more tourists can visit, and vice versa, if the accessibility is bad, tourists will experience obstacles in visiting tourist attractions[17]. Communication problems should also be handled as soon as possible because they play an important role in driving the community's economy and the development of tourism[18]. In addition to access to tourism, other facilities and infrastructure, such as parking spaces, public toilets, and shopping areas, should be well laid out[19].

5.3. Tourism marketing

Tourism marketing has a role in the development of a tourist location[20]. Based on SEM analysis, there is a CR value of 0.86 for the 0.86 for the tourism marketing variable, which shows that tourism marketing has a direct influence on the development of tourism locations in Prabu Siliwangi. As confirmation of the variable, testing was done with ANFIS, and the results show that the surface value is in the value range of 2–3.5. This shows that the reality of Prabu Siliwangi's tourism development is at a poor-moderate value. Marketing indicators in tourism are important in increasing tourists[21]. For the development of Prabu Siliwangi's tourism, tourism marketing needs to be developed online-based[22]. Publicity, promotion, and product marketing in this process are all international in nature. So it is necessary to coordinate with internal and external travel bureaus[23–25]. The increased exposure of tourist locations in the media will influence the interest of tourists[26].

5.4. Tourism supporting board factors

The development of tourism in an area, especially the tourism of Prabu Siliwangi, requires the

contribution and cooperation of tourism stakeholders[27]. There are three tourism stakeholders that play a major role in the development of a tourist object, including marine tourism, namely the government, the private sector, and the community[28]. The results of the SEM analysis show a CR value of 0.93, which indicates that in the development of Prabu Siliwangi tourism, the role of supporting institutions is very significant. In order to test the reality of the relationship of the variable in the field, testing was carried out with ANFIS, and the results showed that the surface value was in the value range of 2–4, which shows that the reality value of the Board's support in the development of tourism in Prabu Siliwangi is still poor-moderate. Government support is needed in developing tourism locations[29]. Increasing government policies through promotion, improving the quality of resources and providing adequate infrastructure can increase the development of tourism [30]. The arrival of tourists has an impact on the increase in the income of the people who work in tourism and also has an impact on the increase in tourism development[30,31].

5.5. Human resources

Human resources is one of the factors that play an important role in developing the tourism sector. The importance of HR in the tourism sector is that people are a very important resource in most organizations. Especially in service-based organizations, HR plays a key role in creating performance success[29,30]. The result of the analysis of this research, the human resource variable using SEM got a CR value of 0.94, which indicates that in the development of Prabu Siliwangi's tourism, the HR factor is one of the most influential variables. To test the reality of the relationship of the variables in the field, testing was carried out with ANFIS, and the results showed that the surface value was in the value range of 2–4, which shows that the real value of human resources in the tourism development of Prabu Siliwangi is still poor-moderate. Based on the results, there is still a great need for development in the field of human resources for the development of Prabu Siliwangi tourism. The development of human resources aims to produce a framework that is logically and comprehensively linked to develop an environment where employees are encouraged to learn and grow[30,31]. According to Halifatullah[31], the role of human resources greatly supports the success of the development of cultural tourism in Prabu Siliwangi with its potential, so that the existing cultural tourism objects are more attractive and have uniqueness that is rich in historical and cultural value. The role of tourism human resources is very beneficial for the success of tourism development so that it can increase regional income, in addition to the role of tourism facilities and infrastructure[32].

5.6. Tourism attraction

The Prabu Siliwangi Tourism location got a very good score, based on the SEM analysis of a CR value of 0.75, which shows that the attractiveness of tourism is an important variable in considering the development of a tourist location. In the ANFIS analysis, as a confirmation of the situation in Prabu Siliwangi's tourism location, the attractiveness variable value is in the range of 3–5, which means good—very good, this shows that the uniqueness of this tourism is very original and special. The sustainability of tourism is seen in the attractiveness of tourism in tourist locations in terms of the availability of tourist attractions[33]. Prabu Siliwangi's tourist location is an attraction in terms of the religion, culture, and history of Prabu Siliwangi.

6. Conclusion

In the development of Prabu Siliwangi tourism, support is needed from various aspects, such as infrastructure, human resources, board support, and tourism marketing. Prabu Siliwangi's tourism attraction is categorized as very good for development. Prabu Siliwangi's tourism development has not been optimal because supporting variables such as infrastructure, human resources, tourism marketing, and the support of the Board are still not optimal.

Author contributions

Conceptualization, AYI and MFN; methodology, SAA; software, MFN; validation, AYI and SAA; formal analysis, MFN; investigation, SAA; resources, MFN; data curation, MFN; writing—original draft preparation, AYI, MFN, SAA; writing—review and editing, AYI; visualization, MFN; supervision, AYI and MFN; project administration, AYI and MFN; funding acquisition, AYI and SAA. All authors have read and agreed to the published version of the manuscript.

Acknowledgments

The authors would like to thank the government of Majalengka Regency and Kuningan University for the support given to the entire writing team.

Conflict of interest

The authors declare no conflict of interest.

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