



# Quadruple Helix: The Firm-Driven Living Lab Model on Eco-Tourism Lampung

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**Abstract.** The tourism sector is one of the priority sectors for national development. Lampung province has three potential tourism sectors that can be developed for regional development. However, Lampung still focuses on ecotourism which has not been properly developed. A lot of natural/maritime tourism is developed without a clear plan, so there is a misunderstanding in developing ecotourism which is undoubtedly dangerous for nature's survival. Therefore, we need a model that could be the key to success in developing tourism potential in Lampung. The quadruple helix model can be seen as a refinement of the triple helix perspective, which focuses on practitioners from academia, government, and industry, and recognizes the increasing role played by society. Implementing the quadruple helix based on ecotourism needs to involve four parties, including academics, companies, government, and the community. Each party has its role, where academics play a role in the development of education, research, and community service in ecotourism. The company acts as an actor who develops the potential of tourism. The government plays an essential role as a regulator and facilitator in developing ecotourism. Finally, the community acts as a forum that unites the interests of business practitioners and stakeholders. Three different types of quadruple helix models can be used for collaborative innovation. The firm-driven living lab model is suitable for developing ecotourism in this research because it focuses on commercializing innovation. This model can be used to develop the commercialization of ecotourism innovations in Lampung province.

**Keywords:** E-recovery quality · e-service quality · eco-tourism · quadruple helix · satisfaction · tourist loyalty

## 1 Introduction

Ecotourism is a form of tourism that utilizes various natural areas to conserve the environment, preserve the life and welfare of residents, and show a conceptually integrated concept of a balance between enjoying natural beauty and efforts to sustain it. Based on the many advantages and benefits obtained from tourism development, a development model that could develop the tourism sector is needed. However, some of the conventional mass tourism development models that have been encountered before are still

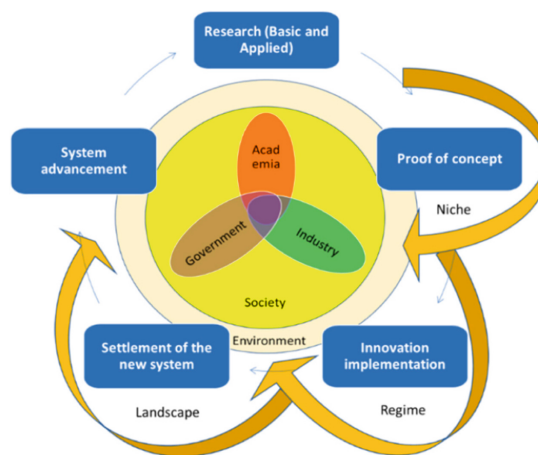
facing debate and criticism from academics and environmental advocates due to their detrimental impacts on host communities and ecosystems [1].

Moreover, the number of ecotourism development efforts oriented toward local communities is still limited. This is because the community does not have the financial ability or expertise to manage or be directly involved in ecotourism activities. The existing ecotourism potential is still not fully identified. The available objects are also still not managed optimally. In addition, the lack of participation from relevant stakeholders is also a problem that must be resolved. Related to this problem, one of the efforts to improve ecotourism is applying an innovative quadruple helix development model.

This research was specifically conducted to analyze the role of website design, e-servqual, and e-recovery servqual variables on tourist loyalty in Lampung province. Another objective is to investigate the profile of tourist visits to ecotourism areas in Lampung province from the age and employment status aspects that can be useful for policymakers, especially for management policies in executing the company's marketing strategy in dealing with high business competition. The quadruple helix concept further develops the triple helix concept that integrates civil society, innovation, and knowledge [5] (Fig. 1).

Research in the ecotourism industry is essential because it can provide ample job opportunities, expose the country's natural beauty on the international scene, and increase people's income. The success of the ecotourism industry is primarily determined by the ability of human resources, creativity, and innovation capabilities of business practitioners so that support from intellectuals, government, business, and society (quadruple helix) is needed to create a solid and resilient ecotourism industry.

The quadruple helix concept is a development of the triple helix model by integrating civil society and innovation and knowledge [2, 5]. Quadruple helix innovation theory is a collaboration between four sectors: government, business, academicians, and civil society, which play a role in encouraging the growth of innovation. Quadruple helix innovation is the first theoretical framework that integrates relevant public investment and



**Fig. 1.** Quadruple Helix Model

the importance of completeness between economic differences, expensive investments, and policies to achieve a balance of economic growth [2, 5]. Academicians, government, business, and civil society recognize that innovations made by creative citizens can support the success of the country [2, 5].

On the other hand, the quadruple helix is defined by its relationship to government, research and development facilities, university laboratories, and civil society as the primary sources of innovation and knowledge [3, 6]. The quadruple helix model carried out by civil society, the business community, and the supply chain can create innovation [4]. In this case, the innovation in question is related to developing the ecotourism sector that can bring out the potential for the nation's development. The ability to innovate is essential so that the country's ecotourism sector can compete and survive in an era of increasingly fierce competition (Fig. 2).

To be successful in business, a company can use information technology facilities (the internet) to sell its products or services. Companies can create websites that provide all information about their products or services. There are many factors that marketers must consider when selling products or services through the internet. Shopping convenience, site design, product or service information, transaction security, and ease of communication support the company's success in marketing its products or services. One form of success can be measured by the level of satisfaction on a company's website. The study of the importance of website design is in line with Rahadi's [5] study that revealed clear evidence that good website characteristics will contribute to customer satisfaction on a website. Therefore, the first hypothesis in this research is:

H1: Website design has a significant effect on tourist satisfaction

E-service quality is a form of electronic-based service that is carried out to meet and facilitate customer needs. In addition, e-service quality can also measure customer satisfaction. Customer satisfaction results from a company's success with a product or service. Customer satisfaction can be achieved by providing excellent and satisfying service quality. Therefore, the following hypotheses are as follows:

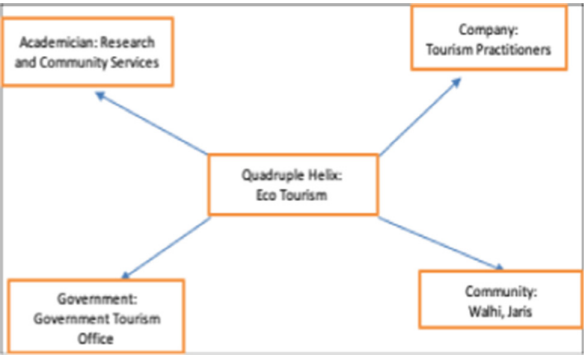


Fig. 2. Quadruple Helix: Ecotourism based

H2: E-Service quality has a significant effect on tourist satisfaction

Quality of service to customers is not always able to satisfy customers. Many service failures cause dissatisfaction. Therefore, the company should restore the service. Internet-based service recovery is one of the significant determinants of customer satisfaction, loyalty, and retention. According to Matos et al. (2007), service recovery has a positive effect on customer satisfaction; therefore, the researcher formulates the following hypothesis:

H3: E-Recovery Quality has a significant effect on tourist satisfaction

Customer loyalty is closely related to customer satisfaction. Customers who are satisfied with their desires will make these customers repurchase the product and become loyal consumers of the seller's product; therefore, the researcher formulates the following hypothesis:

H4: Consumer satisfaction has a significant effect on tourist loyalty.

## 2 Research Methods

This research used quantitative research to test the quadruple helix model, which focuses on developing the commercialization of tourist loyalty behaviour innovations in ecotourism areas in Lampung. Model testing was carried out using research work procedures through several stages: starting with the literature study stage to ensure the measurement of consumer behaviour is appropriate and in accordance with the theory and results of previous research, which then ends with the preparation of reports and published articles.

This study refers to the quadruple helix model, which focuses on developing the commercialization of tourist loyalty behavior innovations in ecotourism in Lampung. Researchers collected data from respondents in several ecotourism districts. The data set consists of 203 respondents, with the number of males being 74 (36.45%) and females being 29 (63.55%). Most respondents were aged 17–22 or 22 people (60.10%). Regarding education level, 101 respondents (49.47%) had high school/equivalent level. Furthermore, the highest frequency of tourists originating from Lampung was 178 (87.68%), and most of the visiting frequency was once a month, with a result of 148 (72.91%).

## 3 Results and Discussions

The results of the SEM assumptions, validity, reliability, and exogenous and endogenous confirmatory analyses can illustrate that the indicators and variables or constructs in this study can be used to define latent constructs and test hypotheses. This means that these results indicate that the analysis can be continued with the entire model (full model) that has been designed in the empirical model. The empirical model consists of 4 hypotheses, each referenced from various theoretical and empirical studies. Regression Weights: (Group number 1 - Default model) (Figs. 3 and 4).

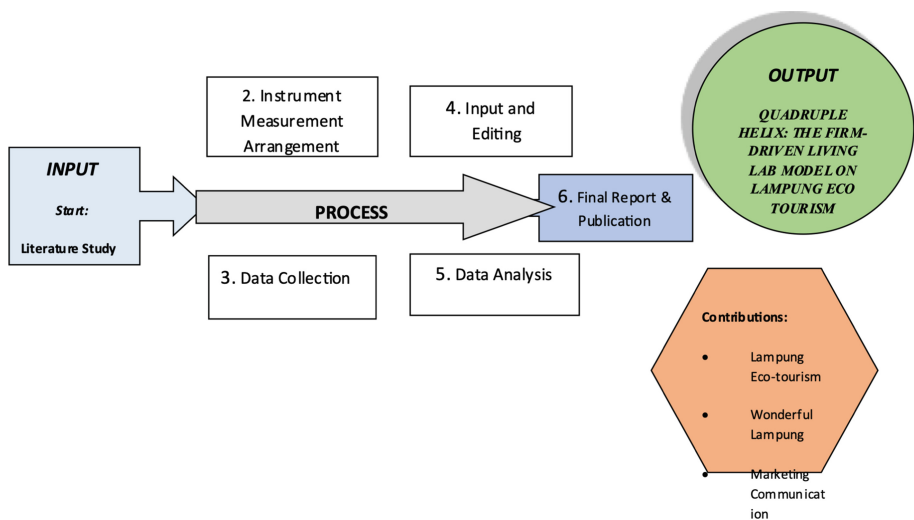


Fig. 3. Research Procedures



Fig. 4. Research Model

In the relationship between the influence of the X variable on Y, it can be concluded that it has a significant positive effect if the P-value < 0.05 and the CR value is above 1.96, and the estimated value is positive. This shows that X has a positive and significant effect on Y.

The results of the first hypothesis testing shown in Table 1 revealed that the estimated parameter value is 0.677, the standard error value is 0.082, and the critical ratio (CR) value is 8.275 with a probability of 0.01. By using the error rate ( $\alpha$ ) = 0.05, it can be said that the first hypothesis, which states that website design has a significant effect on tourist satisfaction, is proven.

The results of the second hypothesis testing shown in Table 1 revealed that the estimated parameter value is 0.135, the standard error value is 0.061, and the critical ratio (CR) value is 2.222, with a probability of 0.01. By using the error rate ( $\alpha$ ) = 0.05,

**Table 1.** The Results of Hypothesis testing

	Estimate	S.E.	C.R.	P	Label
Tourist_Visit Satisfaction $\leftarrow$ Desain Website	,677	,082	8,275	***	par_13
Tourist_Visit Satisfaction $\leftarrow$ e_Servqual	,135	,061	2,222	,026	par_14
Tourist_Visit Satisfaction $\leftarrow$ e_Recovery_Servqual	,480	,124	3,884	***	par_21
Tourist_Visit Satisfaction $\leftarrow$ Touris_Visit_Satisfaction	,841	,054	15,474	***	par_15

it can be said that the second hypothesis, which states that E-service quality has a significant effect on tourist satisfaction, is proven.

The results of the third hypothesis testing shown in Table 1 revealed that the estimated parameter value is 0.480, the standard error value is 0.124, and the critical ratio (CR) value is 3.884, with a probability of 0.01. By using the error rate ( $\alpha$ ) = 0.05, it can be said that the third hypothesis, which states that e-recovery quality has a significant effect on tourist satisfaction, is proven.

The results of the fourth hypothesis testing shown in Table 1 revealed that the estimated parameter value is 0.841, the standard error value is 0.054, and the critical ratio (CR) value is 15.474, with a probability of 0.01. By using the error rate ( $\alpha$ ) = 0.05, it can be said that the fourth hypothesis, which states that consumer satisfaction has a significant effect on tourist loyalty, is proven.

## 4 Conclusion

This study's findings show that website design has a significant effect on tourist satisfaction. E-service quality has a significant effect on tourist satisfaction. Recovery quality has a significant effect on tourist satisfaction. Visitor satisfaction has a significant effect on tourist loyalty.

The analysis results through the SEM analysis model show that the interaction results support all hypotheses. The effect of the satisfaction variable as a moderator strengthens the loyalty of ecotourism visitors. The results show that the firm-driven living lab quadruple helix model influences ecotourism in Lampung province. The model is expected to develop tourism potential in Lampung province.

This study uses an integrated approach by considering many related factors such as website design, e-service quality, and e-recovery servqual. This study reveals that these factors positively and significantly influence tourist loyalty. The current study states that website quality is positively significant to loyalty. Website design and quality must consider the characteristics of the navigation structure, product information, and user interface so that buyers can find suitable products according to their needs. These characteristics present a usability logic that buyers can understand concerning the efficiency and effectiveness of their online buying process.

This study also resulted in e-recovery quality having a significant effect on tourist satisfaction. To maintain a good relationship with its customers, tourist place managers

must ensure the restoration of outstanding electronic services. The system must communicate to the customer the recovery process and the period within which recovery can be achieved. Furthermore, these findings are supported by [6] that stated effective service recovery helps reconcile customer problems and strengthen relationships, thereby preventing switching intentions. The customer experience provided during e-recovery, such as timely and fast recovery actions and fairness in transactions, will significantly assist in maintaining loyal customers.

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