Decision Support System on the Management of Coastal Ecotourism in Pramuka Island, Seribu Islands

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Tourism activities are generally sought to increase the country's foreign exchange, provide business opportunities, create employment opportunities and reduce unemployment. Coastal tourism is a part of the tourism activities related to the beauty of the beach panorama, sports tourism and environmental sustainability. In the industrial era 4.0, there has been a massive changes in science and technology known as the rapid disruptive movement of technology, causing many large companies to state bankruptcy and change the pattern of behavior of the current millennial generation. A lot of sectors, including tourism, which have so far been worked on by human labor, are being replaced by technology, robots or artificial intelligence. The development of tourism areas requires medium and long term of strategic studies and involves some elements including investors, transportation facilities, hotels, communication, etc. Given that the problems faced are so complex, dynamically changing at any time and faced with uncertainty (probabilistic), it needs to review whether the development of Integrated ecotourism management model in the Seribu Islands implements a system approach that is able to provide benefits and satisfaction of coastal tourism

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stakeholders. This study aimed to focus on developing the development of an integrated coastal tourism management model in the Seribu islands that was intended for ecotourism management consisting of several sub-models, namely: 1). prediction of tourist visits based on Forecasting and 2) Focus Group Discussion of coastal tourism actors based on the MAAMS method. The results of the discussion show that: 1) the tourist visits tend to increase, 2) some actors in the ecotourism are identified and 3) there is a solution for the roots of problem of coastal tourism that brings benefits to all actors.

1. INTRODUCTION

1.1 Background

Nowadays, tourism has become a leading generator of potential foreign exchange after oil and gas. The current management of the tourism sector has not shown optimal implementation. This leads to a lot of Government programs proposing the theme "The Winner Wonderful Indonesia Energy" as the spirit and strategy to achieve 20 million foreign tourist arrivals in 2019, [1]. The concrete manifestations of the Ministry of Tourism and Culture are conveyed in transparent, comprehensive and accountable information about the performance of the Ministry of Tourism (2018) with priority programs implemented in 2019. The Minister of Tourism, Arief Yahya, launched the 2019 Strategic program, i.e. the development of 10 Priority Tourism Destinations including the Seribu Islands [2].

Ecotourism has become a mainstay governmental program to increase the foreign exchange in 2019. The Minister of Tourism has been targeting tourism foreign exchange of USD 20 billion and 20 million foreign tourist visits to Indonesia. These tourism attractions have encouraged economic growth and become a multiplier effect or grown other business activities [1,2]. Indonesia's ecotourism has great potential to drive the economics from the region to the city, which in turn it becomes a more attractive tourist attraction.

On the other hand, a fundamental weakness in the development of tourism management, especially ecotourism, is awareness of the community around the ecotourism. In the Seribu Island, the tourists discard wastes causing environmental damage of mangrove forests and the ecosystem disruption of turtles, bondol eagles, stingrays and sharks.

To overcome these problems, it needs a system design that is supported by the decision support system of the Coastal Ecotourism Project to make each stage of decision making is easy to trace [3].

This research focuses more on the development of ecotourism areas that require a long-term strategic study and involves some elements including investors, transportation facilities, hotels, communications, etc. Therefore, modelling a system approach is needed. This research focuses on several problems, namely: 1). Prediction Model of tourist visit, 2) Focus Group Discussion (FGD) model based on MAAMS method, and 3) BCG Strategic Development Model for Pramuka Island.

1.2 Research Objectives

This study aimed is emphasized to get an integrated decision making process.

2. LITERATURE REVIEW

Historically, Pramuka Island used to be called Elang Island. It was because there used to be a lot of species of Bondol eagle in Pramuka Island. On the other hand, many people wandered on this Island and made camping activities and gradually changed the name of this island to Pramuka Island. This island is loved by a lot of nature lovers, unique, natural, cool, and attractive. Pramuka Island is close to the Capital City of Jakarta and only 1 hour away by ship, making it the target of recreation and a place to unwind for tourists. Tourist arrivals for 2018 were recorded at 452,434 people; while for 2017, there were 395,549 people. There was an increase of 14.4 percent compared to the previous year [3], [4]. Pramuka Island area of 16.73 ha needs to be watched as an early warning for increased waste and environmental damage, degradation of flora and fauna biota and needs to find ways to deal with environmental preservation.

To get a model that can help rational decisions based on real conditions requires a systems approach, the system approach becomes the solution of problems in identifying a number of needs to make the system operation can run effectively.

To design the development of an integrated ecotourism management system model, Pramuka Island in Seribu Islands was selected with the criteria for completeness of ecotourism and the implementation of ecotourism management but has not provided benefits for all ecotourism actors. It was suitable based on tourist arrivals and carrying capacity area and suitability of the tours offered.

Previous researchers, have showed the unpreparedness of agrotourism in Southeast Sulawesi in exploring the natural potential that could be a tourist attraction [5]. The development of the ecotourism system of Gedong Songo Temple in Ungaran Regency that was able to provide benefits to all tourism actors (Regional Government, Antiquities Service, Manager of Gedong Songo Temple, Restaurants, Horse Pullers, Tourists, Tour operators, Travel agents [6].

In addition into applied Focus Group Discoussin (FGD) on solutions to the problem of strengthening coastal ecotourism which was implemented as sustainable ecotourism according to the carrying capacity of the region and the suitability of coastal tourism. The results of the Focus Group Discoussin (FGD) study found that the root problems of the problems faced by the development of ecotourism in the Pramuka Island of Seribu Islands Regency included: there were several variables that could be identified as obstacles or root problems and provided solutions through the ecotourism development program in Pramuka Island, Seribu Islands Regency [7].

The Strategy development through the Boston Consulting Group (BCG) matrix graphically based on differences between divisions in terms of relative share position and industry growth rates. The BCG matrix allows a multidivisional organization to manage its business portfolio by observing the position of the relative market share and the level of industry growth of each division relative to all other divisions within the organization [8].

In addition to applying the concept of BCG analysis method, this method uses a strategic business unit plan by classifying the organization's potential benefits [9].

To analyze the BCG Growth - Share Matrix, it is necessary to formulate a strategy based on the business units or product lines produced. In this case, it is clear which island has the most potential to be developed or prioritized for tourism development. In the fact that the BCG Matrix is suitable for creating the Seribu Islands Destination portfolio, where each island is a business unit with different characteristics [8,9]. In the BCG analysis is a method used in compiling a strategic business unit planning by classifying company profit potential. Meanwhile, the Boston Consulting Group matrix graphically shows the differences between various divisions in the position of relative market share and the level of market growth [9]. Based on the classification in 4 quadrants, it principally explains the position of an organization that is reviewed in terms of market growth and market share [8,9], including:

1. **Dog Category:** Showing the organization is in a low market share and low growth rate. Therefore, it does not contribute significantly to overall organizational development.
2. **Question Mark Category:** Showing the organization is in a relatively low market share but has high growth. In this position, organization generally requires a large enough cost/investment to develop strategies.
3. **Star Category:** Organizations are at a high growth rate, with high share. This condition illustrates the great potential for an organization to be developed at the long term.
4. **Cash Cow Category:** Organizations are in a relatively high market share however have a small growth. Therefore, a good strategy to run is endeavored to generate maximum income or the market there are 5 (five) steps taken to make the BCG matrix [8,9], namely:

Step 1: The BCG matrix can be used to analyze selected business units and products as separate units. The selected unit will have an impact on the results of the analysis. In this case, the product unit is the Island that goes into 5 development categories, namely: Resident

Island, Camping Island, Resort Island, Conservation Island, and Reclamation Island.

Step 2: Define a market that can reduce errors in the results of an analysis of the domestic and foreign tourist markets visiting the Seribu Islands' Destination.

Step 3: Calculate relative market share which is calculated based on income or market share. In this case, an approach to the amount of tourist visits to each island is used.

Step 4: Know the market growth rate of tourist growth rates.

Step 5: Draw a circle on the matrix. After doing all the steps, it must be able to map the islands according to the matrix.

Therefore, it needs to draw a circle matrix for each island. The size of the circle must be in accordance with the proportion of effort or the amount of potential for development that can be produced.

3. RESEARCH METHODS

This study used descriptive qualitative approach. This study aimed to understand comprehensively the complex condition of Pramuka Island and to formulate the design of a decision support system for Pramuka Island management.

Primary data and secondary data were collected to solve problems based on a system approach carried out through the system analysis stage, model engineering, system design implementation and system operation. The research data analysis was carried out through three stages, namely: 1) identifying tourist visits based on forecasting time series methods to predict future tourist visits, 2) Focus Group Discoussin (FGD) models based on the MAAMS method, to identify the roots of causes and problem solving solutions, 3) Focus Group Discussion (FGD) model based on MAAMS method, and 4) BCG Strategy Development Model for Pramuka Island [10].

4. RESULTS AND DISCUSSION

The results of the system design are supported by a computer-based Decision Support System, called Bangmola Coastal Ecotourism which can be done by activating a database of management system, a model base

management system and directly interacting in a dialogue system [10].

Decision Making for Bangmola Coastal Ecotourism.

The process of developing decision support system for Bangmola Coastal Ecotourism includes:

4.1 The Tourist Visit Prediction Model can be Seen in Fig. 1

Based on the assessment, data collection and information, as well as future analysis and prediction as a reference for the sustainability of the Seribu Islands ecotourism management, the result of forecasting from Central Bureau of Statistics data of the Seribu Islands can be seen in Table 1.

Prediction results of tourist visits indicate an increasing trend, this condition in addition to bringing prosperity and regional economic growth also leads to an increase in the amount of waste that causes environmental damage.

4.2 Focus Group Discussion Model Based on MAAMS Method

The Focus Group Discoussin (FGD) model is expected to be able to prevent / minimize environmental degradation so it is necessary to find the best solution to solve environmental damage.

Efforts to solicit all opinions of the ecotourism actors including the community around the ecotourism location, so that a number of opinions which are elements of affinity are obtained, then affinity elements are carried out grouping similarities of opinions and the next stage is a cause-and-effect analysis carried out to get the root problems in the development of ecotourism.

Therefore, the solutions can be given in the form of decisions/recommendations for the development of ecotourism in the Seribu Islands Regency.

Pramuka Island concession is able to attract tourists; however, the garbage and low tourist awareness make the island full of rubbish, damages to coral environment, mangroves, and disturbance of hawksbill habitat. In fact, Pramuka Island is like a beautiful princess that lacks charm. For this reason, ecotourism development
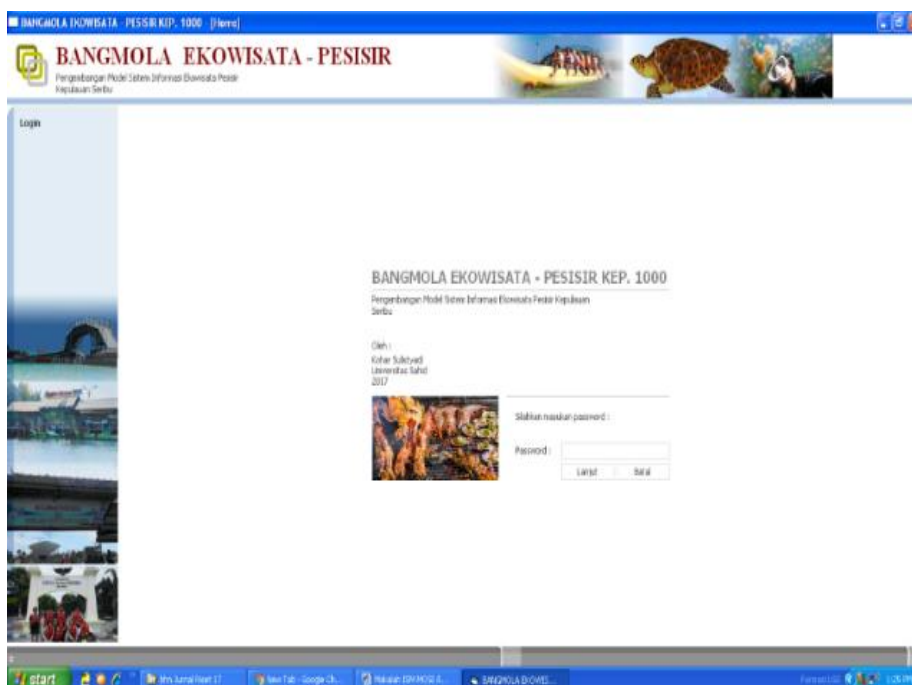
Fig. 1. Decision support system program for Bangmola coastal ecotourism

Table 1. Seribu Islands tourist visits

Year	Number of tourists in Seribu Island
2008	132,743
2009	141,227
2010	231,020
2011	558,998
2012	659,998
2013	1,138,900
2014	1,785,280
2015	986,300
2016	1,110,000
2017	1,186,647
2018	1,234,112

The forecasting results with linear regression of the lowest error rate of MAD = 205,041.2 and MSE = 8,750,032 with the Pramuka Island area of 16.73 ha

Year	Predicted number of visitors in Seribu Islands
2019	1,613,494
2020	1,743,543
2021	1,873,592
2022	2,003,641
2023	2,133,689
2024	2,263,738
2025	2,393,787
2026	2,523,835
2027	2,653,884
2028	2,783,933

with an environmental perspective requires a comprehensive revitalization/application with a design that accommodates the interests of various stakeholders.

To accommodate the interests of various parties, it is necessary to design a Focus Group Discussion (FGD) which is an in-depth interview with experts and ecotourism actors who may have different interests.

a) For the Focus Group Discussion, Pramuka Island refers to the suggestions/recollections of the community and stakeholders of Pramuka Island ecotourism. They are then grouped based on the similarities. The root problems of the problem of inequality in Pramuka Island management, Seribu Islands Regency are looked for and shown in Table 2.

The next stage is the solution and priority ecotourism development of Pramuka Island, Seribu Islands as shown in Table 3.

4.3 Marketing Strategy Development

The BCG Growth-Share Matrix approach will be used by authors as a tool in this study. To generate the BCG Growth-Share Matrix, 5 steps were conducted:

Step 1: Analyzing the selected business unit, the product as a separate unit.

In this case, which became a product unit is an island included in the 5 development categories grouped by cluster, namely: 11 inhabitants island; 10 resort islands; 30 conservation islands and 1 reclamation island, 5 camping islands.

Step 2: Deciding the Markets.

The role of the market in the study is data of the tourist archipelago (N) and the foreign tourists (M) who visited the islands.

Step 3: Calculating relative market share.

Table 2. Variables of root problems

No.	Root problems
V.1	Arrival at location – Marina Ancol
V.2	Arrival at location – Kali Adem
V.3	Map of Seribu Islands near Jakarta
V.4	Ecotourism promotion in Pramuka Island
V.5	A lot of hotels/homestays around Pramuka Island
V.6	Participating in various tourism events
V.7	Lack of hygienic culinary and marine flavors
V.8	Unique souvenir of Seribu Islands Regency
V.9	Special tour for cultivation and coral grafting
V.10	Educational tour for students and researchers (mangrove)
V.11	Educational tour for students and researchers (turtle)
V.12	Educational tour of shark and stingray breeding
V.13	Developing the creativity of the craftsmen souvenirs
V.14	Giving tourists awareness to environmental sustainability
V.15	Encouraging community welfare improvement
V.16	Preserving and preserving historical relics
V.17	Creating/revitalizing Local cultural attractions
V.18	Prohibiting travelers from throwing garbage
V.19	Many tourists come and make the garbage grow
V.20	Many tourists come to scribe doodles
V.21	The rise of local cultural figures
V.22	Presenting a cultural art party
V.23	Holding art performance exhibitions/Betawi culture
V.24	The cultural attractions of fishing communities

Table 3. Problem-based search FGD and root problems solutions

Root problem	Problem grouping	Program development
Arrival at location – Marina Ancol	Travel waiting time from Jakarta to Seribu Islands	Socialization of ferry safety
Arrival at location – Kali Adem		Socialization of speed boat safety
Map of Seribu Islands near Jakarta		Socialization of transportation safety for tourists
Ecotourism promotion in Pramuka Island	Ecotourism Promotion	Promotion of beautiful and environmentally sound Pramuka Island
A lot of hotels/homestays around Pramuka Island		Strengthening the administration and friendliness of the Pramuka Island citizen
Participating in various tourism events		Jetski, diving, fishing, banana boat, etc.
Lack of hygienic culinary and marine flavors		Cooking training, maintaining cleanliness of restaurants
Unique souvenir of Seribu Islands Regency		Craft training. Home-based food industry.
Special tour for cultivation and coral grafting	Strengthening the Ecotourism in Pramuka Island	Scuba Diving and coral grafting training
Educational tour for students and researchers (mangrove)		Mangrove Forest Planting Program
Educational tour for students and researchers (turtle)		Scale turtle/hatchlings breeding Program
Educational tour of shark and stingray breeding		Shark and sting fish breeding Program
Developing the creativity of the craftsmen souvenirs		Creative SME training from local raw shells, mangrove fruit
Giving tourists awareness to environmental sustainability		Socialization of sustainability and environmental hygiene
Encouraging community welfare improvement	Environmental awareness	Local community Empowerment Training
Preserving and preserving historical relics		Training of community participation in ecotourism
Creating/revitalizing Local cultural attractions		Revitalizing Betawi Arts
Prohibiting travelers from throwing garbage		Socialization of protecting the environment, garbage, providing disposal
Many tourists come and make the garbage grow		Creating information banning garbage disposal
Many tourists come to scribe doodles		Training to increase tourist visits
The rise of local cultural figures	Cultural preservation	Socialization of coastal cultures
Presenting a cultural art party		Making Betawi Cultural attractions
Holding art performance exhibitions/Betawi culture		Socialization of cultural attractions
The cultural attractions of fishing communities		Art performance

Relative market share was calculated based on the number of tourist visit shares in each island using 2017 data.

The growth rate of tourist arrivals from the domestic and foreign tourists in Seribu Islands Destinations in 2017.

Step 4: Determining the level of market growth.
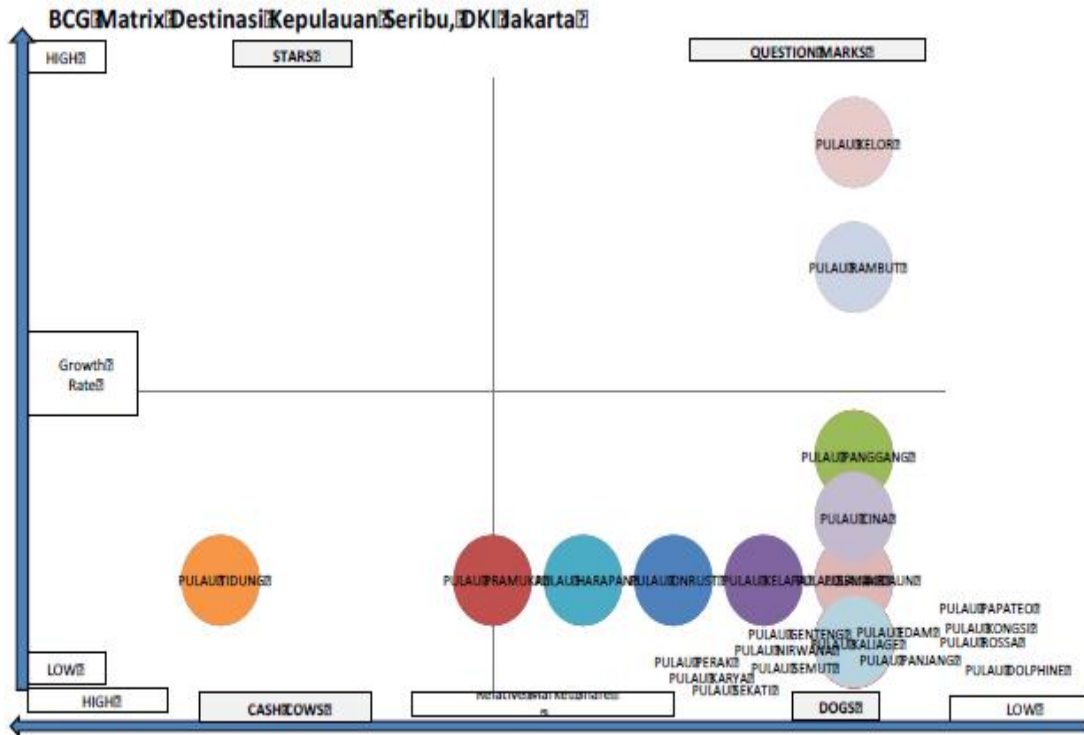
Step 5: Drawing a circle on the matrix.

Fig. 2. BCG growth-share matrix destinations of the Seribu Islands

After doing all the next steps, map the islands on the matrix and draw circles for each island. The size of the circle must match the proportion of businesses or the number of the potential for development that can be produced. The results obtained from the BCG Matrix analysis with 40 island data are presented in an adjusted diagram, where the X-axis will be a relative market share, and the Y axis will be Growth as shown in Fig. 2.

Based on the diagram above, it can be concluded that:

a) There are no islands in Seribu Islands that are included in the Stars category.
b) There are 2 islands that are categorized as Cash Cows, namely: Tidung Island and Pramuka Island.
c) There are 2 islands that are categorized as Question Mark, namely: Kelor Island and Rambut Island.
d) There are 36 islands that are categorized as Dogs, namely: Panggang Island, Coconut Island, Harapan Island, Pari Island, Lancang Island, Untung Jawa Island, Payung Island, Sebira Island, Ayer Island, Bidadari Island, Kotok Tengah Island, Putri Island, Pelangi Island, Sepa Island, Pantara Island, Macan Island, Tengah Island, Bira Island, Bintang Island, Kaliage Island, Genteng Island, Semak Daun Island, Karya Island, Kongsi Island, Dolphine Island, Sekati Island, Papateo Island, Perak Island, Rossa Island, Nirwana Island, Semut Island, Air Island, Panjang Island, Cina Island, Edam Island, and Onrust Island.

So as a whole the discussion of the Seribu islands can be represented from Tidung Island, Pramuka Island and Untung Jawa Island.

Then the DSS model can be integratedly stated that to be able to focus on the development of tourist prediction models that tend to increase with the prediction of potentially disposing of waste and increasing environmental damage, to describe the many problems FGD needs to do in order to get the best solution that can benefit all stakeholders and efforts to develop management the Seribu Islands ecotourism development needs to be done developing appropriate BCG matrix strategies in evaluating the growth and relative market share of each island in the Seribu Islands.

5. CONCLUSIONS

Based on the results and discussion, it can be concluded that to obtain an integrated decision making process, so that each stage of decision making is easy to trace.

1. Prediction of tourist visits with the lowest error rate is linear regression which tends to continue to increase. Meanwhile, Pramuka Island area remains 16.73 ha; thus, it needs to be aware of the suitability of tourist visits and the carrying capacity of the area and the allotment of coastal tourism.
2. FGD provides recommendations for root problem variables with problem solving solutions and programs that should be run.
3. The results of the development of strategies based on the BCG approach show that:

   a. There are no islands in Seribu Islands that are categorized as Stars.
   b. There are 2 islands that are categorized as Cash Cows, namely: Tidung Island and Pramuka Island.
   c. There are 2 islands that are categorized as Question Mark, namely: Kelor Island and Rambut Island.
   d. There are 36 islands that are categorized as Dogs.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Yahya A. Spirit dan strategi menjadi pemenang, Magazine G. Priority, Indonesia; 2018.
2. Kemenpar. Promosi Pariwisata di 10 Destinasi Pariwisata Prioritas Prioritas (DPP) dan satu Kawasan Ekonomi Khusus (KEK) Likupang, Sulawesi Utara, Indonesia; 2019.
3. Sulistyadi K, Sukamdani NB. Pemodelan sistem pengelolaan wisata Pesisir Pantai, P Pramuka, Kepulauan Seribu, Seminar Nasional Sains and Enterpreneurship VI, UPGRIS, Semarang, Jawa Tengah, Indonesia; 2019.
4. Susanty SL, Sulistyadi K, dan Soecahyadi. Penerapan strategi pemasaran agrowisata taman Wisata Mekarsari, *Jurnal IImu Pariwisata Trisakti Jakarta*. STP Trisakti, Indonesia. 2019;14(3).
5. Baka LR, dan Sulistyadi K. Kajian sistem pengembangan agrowisata perkebunan berdasarkan metoda interpretative structural modellling, Seminar Nasional Perencanaan Industri, SNIITB-2000, Bandung, Indonesia; 2000.
6. Sulistyadi K. Pengembangan Sistem ekowisata candi gedong songo di kabupaten semarang, Jurnal Ekonomi Bisnis dan Kewirausahaan, Indonesia. 2014;3(2).
7. Sulistyadi K, Sukamdani NB, Pardede N. Pengembangan focus group discussion P. Pramuka, Kabupaten Kepulauan Seribu Dalam Rangka Penguatan Ekowisata Berkelanjutan. Jurnal Ekonomi Bisnis dan Kewirausahaan, Indonesia. 2017;6(2).
8. David RF. Strategic management concepts and cases. Ed. 9, New Jersey: Prentice Hall; 2003.
9. Addin M, Sukamdani NB, dan Sulistyadi K. Strategi Pengembangan Destinasi Kepulauan Seribu Berdasarkan Pendekatan Boston Consulting Group (BCG). Jurnal Gaung Informatika, Universitas Sahid Surakarta, Indonesia. 2018;11(2).
10. Turban. Decision Support System Managerial Perspective Mc Millan, New York; 1995.