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An Integrated Approach Based on ANP and Goal Programming to Determine the Best Marketing Strategy

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Abstract. This study aims to build an integrated model to choose the best marketing strategy. The proposed model uses Analytic Network Process (ANP) and Goal Programming. The selection of the best marketing strategy is the process of multiple criteria decision making which involves many criteria and alternatives. Criteria considered in this study include consistent, cost, customer loyalty, trend following, business volume, unique, customer numbers, promotion, branding, business network, outlet location, credibility, manpower and innovation. While alternative marketing strategies include cost leadership, differentiation, focus (segmentation), people and place. ANP methodology is useful to build the interrelationships among criteria and alternatives in marketing strategy selection and to determine the weight of each criterion and alternatives. Goal programming is used to choose the best marketing strategy by considering the constraints and parameters that are suitable for the conditions in SMEs. The application of this model is conducted on one of the largest Batik SMEs in Pamekasan, Madura. The results of the research show that the focus strategy was chosen as the best strategy for Batik Madura SMEs.

Keywords: marketing strategy, analytic network process (ANP), goal programming, multiple criteria decision making

1. Introduction

Batik is one of the important products for the Madura economy. Madura batik is a domestic and export commodity that can increase income and provide employment for the Madura community. Increasing the competitiveness of Madura batik products needs to be done to deal with global trade and the ASEAN economic community. Proper management steps need to be taken so that Madura batik SMEs can effectively manage business and marketing processes so that they can meet customer demands. Marketing of textile products including batik products has uncertainty and is difficult to predict [1]. Batik products have a short life cycle and a variety of product types. The price of batik products is very determined by consumers and batik is a product with high competition [2]. Managing the right marketing strategy will help SMEs survive in an unexpected business environment [3]. A good marketing strategy can help Madura batik SMEs survive and increase competitiveness in the free market.

Research on the selection of marketing strategies has been widely carried out. Marketing strategies that are often used refer to Porter's study [4] which includes differentiation, focus and cost leadership strategies. Research conducted by [5] developed a decision model to determine the best marketing

strategy of Surabaya Plaza hotel. The model developed integrates three methods, namely Decision Making Trial and Evaluation Laboratory (DEMATEL), ANP and Zero one goal programming (ZOGP). The ZOGP model is useful for optimizing selected marketing strategies. Integration of ANP and TOPSIS is also carried out by [6] for the best decision making in marketing strategies. Both of these methods are also applied by [7] to determine the right Madura batik marketing strategy.

This study will develop a marketing strategy selection model that integrates ANP and goal programming. ANP methodology [8] is useful to build the interrelationships among criteria and alternatives in marketing strategy selection and to determine the weight of each criterion and alternatives. Goal programming is used to choose the best marketing strategy by considering the constraints and parameters that are suitable for the conditions in SMEs. Criteria and alternative marketing strategies in this study were obtained from previous research [7].

2. Methodology

This research begins with the identification of criteria and alternative marketing strategies from the literature review. Then the developed criteria and alternatives formed were consulted with the owners of Batik SMEs and government officials as the experts of SMEs development in Pamekasan. The results of the interview process were used to build the network model that reflects the interrelationships among criteria and alternatives in marketing strategy selection. The pairwise comparison questionnaires were developed from this network model. The results of the process of pairwise comparisons by experts are calculated the Geometric mean. Geometric mean data are inputted into the super decision software to develop the super matrix ANP. Super matrix ANP consists of unweighted supermatrix, weighted supermatrix and limit supermatrix [8]. Alternative weights obtained from ANP are used as parameter in goal programming. The goal programming model will be solved by Lingo software

3. Result and Discussion

3.1 The ANP Model for Batik Madura SMEs

The interrelationships network model has 14 criteria which obtained from literature review and consulting result with expert of Batik SMEs. Model criteria includes consistent (A/CN), cost (B/CO), trend following (C/TL), customer loyalty (D/CL), business volume (E/BV), unique (F/UQ), man power (G/MP), customer numbers (H/CN), promotion (I/PR), branding (J/BR), bussiness network (K/BN), outlet location (L/OL) , credibility (M/CR) and the inovation (IN).   While the marketing strategies in this model includes cost leadership (A), differentiation (B), focus (C), People (D) and Place (E). Figure 1 shows the ANP model for Batik Madura SMEs. Table 1, 2, 3, 4 and 5 present the pairwise comparison matrix of the geometric mean of the experts for the marketing strategy alternatives.
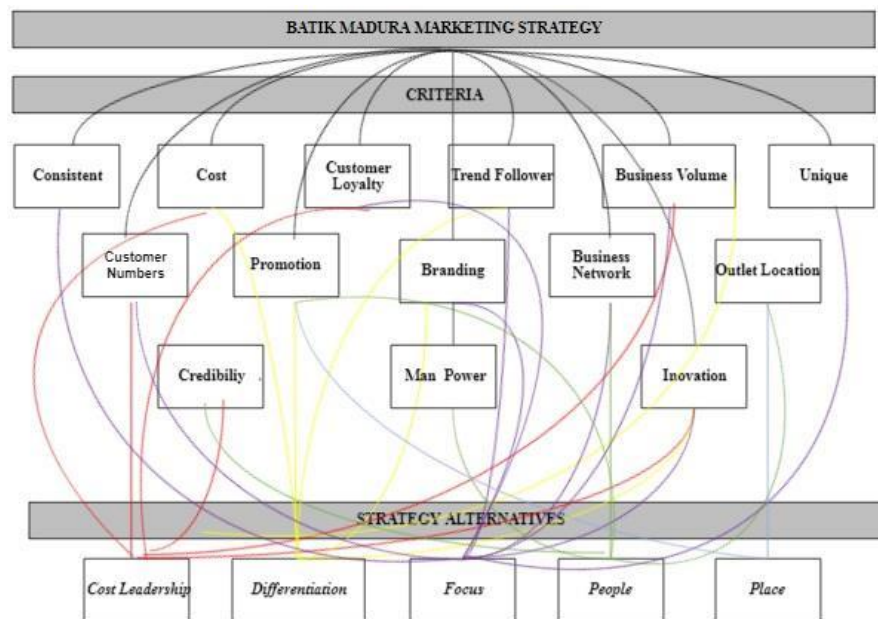
Figure1. The ANP model

Table 1. Pairwise comparison matrix of geometric mean for cost leadership alternative

Criteria	CO	CL	BV	CN	BN	CR	IN
CO	1	0.404	0.583	0.142	0.584	0.393	0.464
CL	2.458	1	1.194	0.479	0.383	0.393	0.476
BV	1.704	5.130	1	0.479	0.583	0.393	0.491
CN	7.114	2.080	2.080	1	0.518	0.425	0.476
BN	1.741	2.612	1.704	1.907	1	0.425	0.503
CR	2.530	2.53	2.53	2.327	2.327	1	0.917
IN	2.160	2.066	2.077	2.066	1.987	1.080	1

Table 2. Pairwise comparison matrix of geometric mean for focus alternative

Criteria	CO	TL	CL	BV	UQ	CN	PR	BN	IN
CO	1	0.691	0.794	0.197	0.230	0.134	0.439	0.478	0.393
TL	1.442	1	0.479	0.402	0.280	0.249	0.476	0.680	0.461
CL	1.260	2.080	1	0.280	0.263	0.172	0.476	0.518	0.425
BV	5.013	2.520	3.557	1	0.230	0.479	0.536	0.552	0.393
UQ	4.327	3.557	3.826	4.327	1	0.320	0.476	0.518	0.415
CN	7.399	3.979	5.739	2.080	3.302	1	0.503	0.583	0.425
PR	2.247	2.066	2.066	1.847	2.066	1.987	1	0.439	0.425
BN	2.073	1.455	1.907	1.811	1.907	1.704	2.247	1	0.425
IN	2.530	2.140	2.327	2.530	2.433	2.327	2.327	2.237	1

Table 3. Pairwise comparison matrix of geometric mean for differentiation alternative

Criteria	CO	TL	UQ	PR	BR	IN
CO	1	0.249	0.110	0.116	0.116	0.110
TL	3.979	1	0.230	0.507	0.280	0.281
UQ	9	4.327	1	0.383	0.331	0.243
PR	8.653	2	2.612	1	0.230	0.249
BR	8.653	3.420	2.990	4.327	1	0.331
IN	9	3.780	4.160	3.979	3	1

Table 4. Pairwise comparison matrix of geometric mean for people alternative

Criteria	MP	PR	BN	OL	CR
MP	1	0.997	0.478	0.731	0.296
PR	0.997	1	0.209	0.263	0.186
BN	2.073	1.437	1	0.691	0.249
OL	1.382	3.979	1.437	1	0.116
CR	3.420	6	3.979	8.653	1

Table 5. Pairwise comparison matrix of geometric mean for place alternative

Criteria	PR	OL
PR	1	0.2
OL	5	1

The above geometric mean matrix are inputted into the super decision software to calculate the ANP supermatrix. the weight obtained from the results of the super decision is used to create an unweighted supermatrix. The weight in unweighted supermatrix will be multiplied by the corresponding cluster weight so that each column in the weighted supermatrix has a sum weight of 1. Then, the weighted supermatrix weight will be increased by multiplying the superamatrix with itself repeatedly until the weights in each column have the same value. When the weight value is the same then the multiplication process is stopped and the matrix has stabilized and forms a limiting supermatrix. Supermarix limiting is the end of the ANP weighting process. From this matrix we can obtain the weight for alternative marketing strategies.

Table 6. The overall weight for the alternative marketing strategies

Alternatives	Weight
Cost leadership	0.1496
Differentiation	0.1169
Focus	0.4017
People	0.2511
Place	0.0807
Total	1.000

The results in table 6 show that the focus strategy has the highest weight with a value of 0.4017 followed by the people strategy with a weight of 0.2511.

3.2 Goal Programming

Goal programming is used to determine the best marketing strategy by considering the weight of the results of the ANP method. The goal programming model has an objective function to minimize positive deviations from the constraints and the weight of each alternative marketing strategy. To carry out the alternative strategies, support for costs, human resources and working hours is needed. Table 7 shows data relating to costs, human resources and work time based on interviews with owners of Madura Batik SMEs. The data will become parameters for the developed goal programming model.

Table 7. Parameters of goal programming

Marketing strategies	Cost (x Rp.1,000)	Human Resources (person)	Working hours (hr)
Cost leadership	1,300	18	225
Differentiation	2,200	22	360
Focus	2,500	17	279
People	5,850	18	300
Place	5,200	20	250
Maximum limit	6,000	25	480

The goal programming model that is formed is as follows:

Minimize

$$Z = d_1^+ + d_2^+ + d_3^+ + 0.1496\,d_4^- + 0.1169\,d_5^- + 0.4017\,d_6^- + 1.2511\,d_7^- + 0.0807\,d_8^- \tag{1}$$

Subject to :

$$1{,}300X_1 + 2{,}200X_2 + 2{,}500X_3 + 5{,}850X_4 + 5{,}200X_5 + d_1^- - d_1^+ = 6{,}000 \quad (2)$$
$$18X_1 + 22X_2 + 17X_3 + 18X_4 + 20X_5 + d_2^- - d_2^+ = 25 \qquad\qquad (3)$$
$$225X_1 + 360X_2 + 279X_3 + 90X_4 + 100X_5 + d_3^- - d_3^+ = 480 \qquad (4)$$
$$X_1 + d_4^- = 1 \qquad\qquad (5)$$
$$X_2 + d_5^- = 1 \qquad\qquad (6)$$
$$X_3 + d_6^- = 1 \qquad\qquad (7)$$
$$X_4 + d_7^- = 1 \qquad\qquad (8)$$
$$X_5 + d_8^- = 1 \qquad\qquad (9)$$
$$X_1 + X_2 + X_3 + X_4 + X_5 = 1 \qquad (10)$$
$$X_j = 1 \ or \ 0, \qquad j = 1,2,3,4,5 \qquad (11)$$

Equation (1) is the objective function of goal programing that minimizes positive deviations from the constraints and the weight of each alternative marketing strategy. Constraint (2) shows the cost limit, constraint (3) shows the limitations of human resources and constraints (4) is the limit of employee working hours. Constraint (5) - (9) shows a negative deviation from an unselected alternative. Constraint (10) shows that there is only one marketing strategy that will be selected. Constraint (11) shows that variable values can only be 1 or 0 and there are 5 variables in the goal programming model. The result of running the goal programming model with Lingo software shows that the model has a global optimum solution with the value of the objective function Z is 0.5983 and the chosen marketing strategy is the focus strategy.

4. Conclusion

The objective of this study is to build an integrated model to choose the best marketing strategy. The model developed which is an integration of ANP and goal programming is able to choose the best marketing strategy efficiently and effectively. The model application is carried out on one of the Batik UKM in Pamekasan and the selected strategy based on the constraints and resource data of the UKM is a focus strategy.

Referemce

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