Quest for Research Excellence On Computing, Mathematics and Statistics

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Faculty of Computer and Mathematical Sciences

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Chapters in Book

The 2nd International Conference on Computing, Mathematics and Statistics (iCMS2015)

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Content

CHAPTER 32
Using Analytic Hierarchy Process to Rank Takaful Companies based on Health Takaful Product

Noor Hafizah Zainal Aznam, Shahida Farhan Zakaria, and Wan Asma'a Wan Abu Bakar

Abstract. This research is conducted to identify the main factor that influencing people to choose health takaful product and to propose the most appropriate benefits to takaful operators to be more aware the needs of participants. Using the opinions of experts in takaful field among lecturers, the researcher intends to rank the factors based on independent variables; inpatient hospitalization, emergency treatment, out-patient treatment and critical illness. All these four factors were analyzed using Analytical Hierarchy Process (AHP) to gain the weights for each by evaluating the respondents' opinion. Afterward, all the criteria were collected into one group to identify the most crucial criterion in choosing health takaful product. As a result, the position of the takaful companies was ranked based on the weights of criteria and the average obtained from pairwise comparison between takaful operators. This research will help the takaful operator in improvement and development of takaful products especially the health takaful products. Moreover, the takaful operator tends to fulfill the desires of participants in ensuring both parties could get win-win situation.

Keywords: takaful, AHP; takaful products; takaful companies; ranking

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1 Introduction

In all studies on the performance of takaful companies, the performance of the com-panies is measured using the mainstream approach used to measure conventional financial institutions. The approach is a measure of efficiency based mostly on cost or profit. To use this approach to assess takaful companies miss the essence of what the companies aim to achieve. These companies have to meet certain social objectives and priorities as required by Shariah. To overcome this shortcoming we propose a new set of approach to evaluate the performance of takaful companies. An alternative is to account for the interests of the institutions, depositors, shareholders, clients and the society at large. However, due to the large work involved, we started work on measuring the performance of takaful companies by ranking the companies based on their takaful medical products.

One of the objectives of Shariah is to secure benefits for and rid evils from the so-ciety at large. In business transactions like transactions in Islamic banks and takaful, Shariah forbids exploitation which might jeopardise fair dealing. (Kamali, 2008).

Takaful is an Islamic insurance based on the concept of shared protection where risk is shared jointly by participants of the takaful fund. The main concept is to spread the risk of damage or loss among the members of the fund. On the other hand, in conventional insurance, risk is undertaken by or transferred to the insurer (Abdul Rahim Abdul Wahab et al., 2007; Kwon, 2007). The essence of introducing an Islamic insurance company is not only it must satisfy lawful aspect of Shariah but also protect the interests of the companies, participants and the shareholders.

2 Methodology

This paper investigates preferable health takaful products based on four criteria by using Analysis Hierarchy Process (AHP). AHP is a widely known method for its ca-pability to switch the qualitative factor into quantitative value. The hassle of a qualitative problem can be arranged systematically into a hierarchy and the hierarchy can be determined by the ranking process. The solution to get the ranking must be based on the calculation of weights for criteria and the scores for each alternative (Figure 1) (Fu et. al, 2009). AHP introduced the concept of pairwise comparison by using Saaty's scale. The nine-scale of Saaty's (Table 1) has been developed by considering the importance between two different elements. The comparison will be used to calculate the relative weights of criteria and then will be utilized to develop the overall ranking of alternatives (Sbeity et. al, 2014).

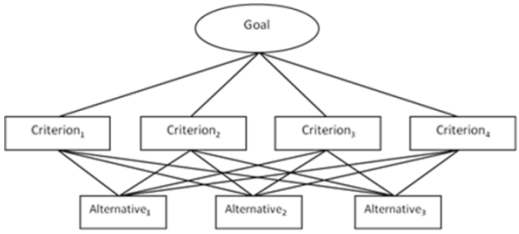

Fig. 1. General Hierarchy Model for Ranking Health Takaful Products

Table 1: Saaty's Scale

Numerical Values	Definition
1	Equally important or preferred
3	Moderately more important or preferred
5	Strongly more important or preferred
7	Very strongly more important or preferred
9	Extremely more important or preferred
2,4,6,8	Intermediate values

(Agarwal et. al, 2014)

The ranking is derived from values and preferences of decision makers according to the consideration of several criteria. Prioritizing takaful products is essential as it will help participants choosing the product that suits their affordabilities as well as to meet their needs. Most health takaful products offer four main benefits in providing services to customers which are in-patient hospitalization, emergency treatment, out-patient treatment and critical illness. In this study, three health takaful products are being considered which each one represents each takaful company.

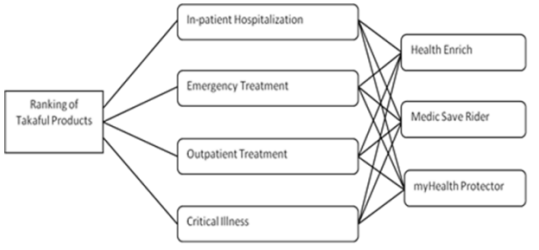

Fig. 2. Scenario of Ranking Health Takaful Products

Using the guidelines in AHP, an AHP framework was developed to ease this study. Therefore, the suggested steps are as follow:

Step 1: Define the objective of the study

The objective of this study is to evaluate and rank the health takaful products based on four criteria of the three observed takaful companies.

Step 2: Identify the benefits of health takaful products as criteria

In this study, the three takaful companies focusing on four health benefits in offering services to prospective policyholders. The four health benefits were chosen as the criteria in this study as those four balance the needs of policyholders. In-patient hospitalization, emergency treatment, out-patient treatment and critical illness are four elements that have been used for each health takaful products.

Step 3: Determine the health takaful companies as alternatives

The three takaful companies chosen are Prudential Malaysia, Etiqa Takaful and Takaful Malaysia.

Step 4: Construct a hierarchy framework for analysis

The criteria were structured into a hierarchy starting from the goal descending to cri-teria at the second level and finally to the third level which is alternatives (Simoes, et. al, 2010). The top level of the hierarchy represents the defined objective, while the second level of the hierarchy consists of four main health benefits of criteria. Finally, the bottom level of the hierarchy represents the alternatives of takaful companies.

Step 5: Collect empirical information and data

Data used was gathered from the experts in takaful field among lecturers of UiTM Kedah.

Step 6: Perform pair-wise comparisons for each criterion

All lecturers were given the instruction on how to answer the questionnaires. Lecturers were requested to compare the four criteria by assigning relative scales by mean of comparing two criteria at the same time. The decision matrix is formed to obtain the level of importance of each criterion. These information were then combined using the geometric mean approach to obtain the priority vector for each criterion. A Saaty's scale of real numbers from 1 to 9 used in ranking is presented in Table 1. The purpose of this scale is to determine how many times more important or dominant one element is over another element with respect to the criterion with respect to which they are compared (Maletic et. al, 2014)

Step 7: Perform the consistency test and remove the inconsistency

For each decision, the consistency ratio (CR) is calculated to ensure inconsistency is removed from the calculation. Usually, the consistency ratio (CR) is used to check whether a criterion can be used for decision-making. The consistency ratio (CR) should be below 10 percent. CI is obtained by the following equation: $CI = (\lambda max - n)/(n - 1)$, where 'n' is the number of criteria or and λmax is the largest eigenvector in the matrix. Consistency ratio is obtained by dividing the CI with random index (Yin, 2013). In this study,

the random index of 0.9 was selected as it involves 4 criteria. From the calculation, the CR is less than 10% which indicate the judgment of pair-wise comparison is coherence. A few of data were removed because of the inconsistency gained from the calculation. Only the consistent data were furthered to the next evaluation.

Table 2: Random Index Values

Number of Criteria	2	3	4	5	6	7	8	9	10
Random Index	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.51

Table 3: The Consistency Ratio

	Geometric Mean (Random Index=0.9)
Lambda Max	4.134
Consistency Index	0.045
Consistency Ratio	0.049

Step 8: Compute the weights of each criterion and calculate the average for each alternative

After the consistency was checked, the next step is getting the weights for each crite-rion. The pair-wise comparison was normalized and the priority vector is generated for each criterion. Other than that, the average for each alternative according to each criterion was computed. As shown in Table 5, critical illness has the highest weightage which is 0.434, followed by inpatient hospitalization with 0.261 weightage. The third-ranked is emergency treatment and the fourth-ranked is out-patient treatment. The weights gained were used to determine the rank later by combining them with the average of each alternative.

Table 4: The Matrix of Eigen Vectors for Health Takaful Products

Criteria	EnrichHealth	Medic Save Care	myHealth Protector	Priority Vector
Inpatient Hospitalization	0.371	0.148	0.482	0.261
Emergency Treatment	0.670	0.200	0.130	0.181
Out-patient Treatment	0.319	0.420	0.261	0.125
Critical Illness	0.355	0.164	0.481	0.434

Step 9: Synthesize the results

In order to obtain the final results, all of the alternatives are multiplied by the weight of the criteria. The results are summarized in Table 5.

Table 5: The Evaluation of Criteria with Alternatives

	Average
EnrichHealth	0.412
Medic Save Care	0.199
myHealth Protector	0.390

Step 10: Final ranking of alternatives studied
The final ranking is determined by calculating the average for three alternatives.

Table 6: Final Ranking of the Alternatives

Rank	Takaful Products	Takaful Companies
1	EnrichHealth	Prudential Malaysia
2	myHealth Protector	Takaful Malaysia
3	Medic Save Care	Etiqa Takaful

3 Result and Discussion

As can be seen from the Table 4, the priority vector gained from the analysis indicates critical illness is the main criterion when it comes to choose a medical policy. The inpatient hospitalization is in second rank while emergency treatment takes place in third. The fourth one is outpatient treatment with a weightage of 0.125. Based on the criteria offered by the three takaful companies, cancer treatment and kidney dialysis are the benefits promoted to attract customers in buying their products. Sudden diagnosis with these types of diseases would make one needs urgent money because the treatment is expensive. This leads the result to the priority vector of 0.434. Inpatient hospitalization mainly involves the assurance of hospital daily room, intensive care unit, the surgical fees, pre- and post-treatment as well as daily allowance per day. The benefits offered are enough to put it in second place with 0.261. Accidental dental treatment and the treatment for accidental injury, both under the emergency treatment category, offer little benefit but when compared to outpatient treatment, the sum insured is higher than outpatient treatment slightly which makes emergency treatment ranked third.

After evaluating the integration of the criteria with alternatives, EnrichHealth by Prudential Malaysia is the most attractive based on the criteria studied in this re-search. Out of four criteria, EnrichHealth is so prominent in two criteria which are critical illness and emergency treatment while Takaful Malaysia is not far behind with a difference of 0.022. As in the

analysis, Takaful Malaysia dominates another criterion which is inpatient hospitalization and Medic Save Care by Etiqa Takaful dominates the outpatient treatment. It clearly shows the ranking is able to play two important roles involving two parties, which are the potential buyer and the takaful company. Prospective policyholders can choose takaful policy that is affordable and can meet their needs based on their financial capability while takaful companies can investigate to improve and enhance services to gain the trust of customers.

4 Conclusion and Recommendation

This study ranked the benefits of three health takaful products offered by three takaful companies in Malaysia. Those three were evaluated using AHP focusing on four main criteria in determining the hierarchy. AHP provides an approach to assist a decision which could be made by changing a complex problem into a simplified re-sult. The consistency ratio helps to determine the rank of criteria as it eliminates in-consistency. From the evaluation, the findings suggest that the benefits offered in critical illness as the most important element in buying health takaful product. The ranking gained from the calculation show that EnrichHealth as the best policy that met the needs of lecturers. For further studies, premium, co-takaful and profit sharing between policyholder and takaful company need to be implemented so that it will enhance the results. Furthermore, development of visual application can be a new tool to ease takaful companies to ensure their products always meet the customers' needs.

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