Using AHP and VIKOR to evaluate the hotel industry of eight European countries

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ABSTRACT

The purpose of this work is to provide a ranking of eight European countries concerning their hotel industry. We have drawn data from TripAdvisor with various features, like the location of each hotel, the cleanliness, the number of the rooms, the price of each hotel and other similar criteria. The analysis was conducted by using two multicriteria analysis methods, namely AHP and VIKOR. Specifically, the well known AHP method will help us to calculate the weights of the criteria and the ranking of the alternatives is provided by VIKOR. The obtained results provide vital information, more specifically which country has the more attractive hotel industry, compared with the other countries. Based on the obtained results in this research, we can see that there are two countries with the best hotel services and the ranking has a particular interest, as all eight countries are famous for their tourist services.

Keywords: Analytic Hierarchy Process, VIKOR, hotel industry, tourism, multiple criteria decision making

INTRODUCTION

In the contemporary business highly competitive environment, hotels try every day to gain their customers. Today, the facilities in hospitality are getting better through technology; cheap choices are easy to be found and potential customers are very demanding. Internet tools and websites with tourist interest have made their appearance over the last decade. In our days, they have the ability to shape and define the image and reputation of a hotel or a restaurant.

In this study, we are going to focus to the hotel industry in eight European countries: Croatia, France, Greece, Italy, Malta, Portugal, Spain and Turkey, which are well known to enjoy a very high tourist interest. The choice of these countries aims at comparing different situations, which cover the Balkans, the Mediterranean and Central Europe. In this way, we can have an overview of entrepreneurship on tourism with multiple site features. We study the available hotels of these
countries through some criteria, using the data from TripAdvisor, a quite widespread American travel website, which is providing reviews of travel-related content.

LITERATURE REVIEW

Despite the fact that the tourism industry is highly developed in many countries, the scientific community does not seem to have performed adequate research using multiple criteria methods. Most of the publications are for a single country or for other tourist facilities with different criteria. The most representative example is the one publication (Fu, Chu, Chao, Lee & Liao, 2011) about AHP and VIKOR for benchmarking analysis in the hotel industry, but it is a comparison through 26 hotels in Taiwan with criteria of mainly economical interest. There are other recent publications which are related to a certain extent (Đorđević, Zecevic & Hristov, 2016; Akincilar & Dagdeviren, 2014; Lee & Lee, 2015; Mardani, Jusoh, Bagheri & Kazemilari, 2015; Shirouyehzad, Arabzad & Reza, 2013), however they are using AHP or VIKOR for research on other factors or they focus on one country. Therefore there seems to be a gap in the comparison of hotels between different countries, but with similar tourism characteristics. This paper is trying to find which country has the best hotels, with the most frequent criteria that tourists are interested in.

METHODOLOGY

Multicriteria Analysis method AHP

The multicriteria analysis method AHP was developed by T. Saaty in 1980 as a mathematical technique for solving complex and unstructured decision problems. The objective of AHP is the comparative evaluation and hierarchical ranking of the alternative solutions, with regard to a group of compound (can be decomposed to sub-criteria) criteria (Saaty, 1996; Doumpos & Zopounidis, 2001). In our study we will use AHP only for the computation of the weights of the criteria that we are going to use with the VIKOR method. The mathematical approach used by AHP is based on the pairwise comparison technique through a numerical scale from 1 to 9 (Saaty, 1996; Vaidya & Kuman, 2006). Those scalar values express the subjective opinion of the decision maker about how many times more important is one criterion in comparison to another. Table 1 exhibits the entire spectrum of the pairwise comparison scalar values and their linguistic equivalents (Saaty, 2008).

| Scalar Value | Reciprocal scalar value | Definition (criterion a in comparison to b) |
|--------------|-------------------------|------------------------------------------|
| 1            | 1                       | Equally important                         |
| 2            | 1/2                     | Weakly or slightly more important         |
| 3            | 1/3                     | Moderately more important                 |
| 4            | 1/4                     | Moderately plus more important            |
| 5            | 1/5                     | Strongly more important                   |
| 6            | 1/6                     | Strongly plus more important              |
| 7            | 1/7                     | Very strongly more important              |
| 8            | 1/8                     | Very, very strongly more important        |
| 9            | 1/9                     | Extremely more important                  |

Multicriteria analysis method VIKOR

Multicriteria optimization can be defined as a complex and dynamic procedure, for the determination of the best solution for a decision problem with regard to certain criteria. It generally consists of two discrete function levels. The administrative level analyses the problem, defines the
goals and chooses or rejects the optimal alternative solution proposed by the engineering level, which in turn defines the alternatives and the evaluation criteria, determines the importance of each criterion to the decision process, evaluates the alternative solutions for each criterion and finally applies an optimization methodology to get a ranking of the alternatives (Duckstein & Opricovic, 1980). However, in some cases the heterogeneity of criteria might make it impossible to produce a solution that satisfies them all simultaneously. In order to confront such situations first Yu (1973) and almost a decade later Zeleny (1982) introduced the notion of ‘compromise solution’ which is defined as the feasible solution “closest” to the “ideal” one and compromise means an established agreement by mutual concessions (Opricovic & Tzeng, 2004). The VIKOR method is an implementation of the notion of compromise solution.

The method (Visekriterijumska Optimizacija i Kompromisno Resenje in Serbian) was developed by S. Opricovic in 1990 as a multicriteria optimization method to solve complex decision problems, which have several possible solutions. VIKOR aims to rank the set of alternatives with regard to a set of conflicting evaluation criteria and suggest the solution that is “closest” to the “ideal” solution. (Yazdani & Graeml, 2014).

**CASE STUDY**

**Data Description**

The source of the data is TripAdvisor. Our data base includes 274,663 ratings, for the period from 2010 to 2014 and we used the averages of them. The alternative solutions are eight countries: Croatia, France, Greece, Italy, Malta, Portugal, Spain and Turkey. The choice of these countries is due to the fact that they have a highly developed tourist industry and the tourist product that they deliver is quite similar. A comparison between very different countries might not have a great deal of interest as incomparability issues may arise.

The criteria are ten and by using them all we are able to describe the general quality of a hotel. Specifically, the criteria are: the location, the cleanliness, the numbers of the rooms, the service of the hotel, the quality of sleep, the value, the stars of the hotel, the price of the room, the distance of the city center and all of them in overall. We consider that they cover most of the points that a potential client will take into account in order to choose a hotel.

**Criteria Weights Using AHP**

![Figure 1. Criteria weights using AHP](image-url)
Figure 1 shows the values of the criteria and the weights. As we can see above, we have used the pairwise comparison technique of AHP with the integer numerical scale from 1 to 9 in combination with fractional values, like there are shown in Table 1.

On the right side we can see a column, which is showing the weights that have been calculated based on the adjacent criteria using AHP. According to the results, the most important criteria are the cleanliness of the hotel, the prices, the services and the value. All the criteria may be important for the client, but the most powerful ones are those that will shape the final choice.

**Ranking Alternatives Using VIKOR**

The final stage is the ranking of the alternatives, which are shown in the Figure 2. In the beginning of the image we can see the weights and if we want to maximize or to minimize them. We have also a helpful window on the right side with the criteria. So, these are the results of each country in each criterion. We can notice in detail for each country in which criteria prevail.

For example, Malta and Croatia have the best ranking in almost every criterion.

**CONCLUSIONS**

The purpose of this study is to reach to a conclusion, which will help us to find the country with the best quality of tourist hospitality. As we can see in the results in Figure 3 and Figure 4, there are two countries with similar results, Malta and Croatia. There are some different results across the rankings. In figure 4 we can see clearly how the alternate solutions are formulated in each ranking. The results of Croatia and Malta are the same in R ranking and Q ranking, with where Malta is first, but in S ranking Croatia takes the first place. But the important point is the Q ranking, so the compromise solutions are Malta and Croatia.

Due to the fact that the selected countries have similar hotel hospitality, the comparison of them is very interesting. We think that any country that would be first among the selected would be a sensible result. Although, Malta and Croatia are two Mediterranean countries with a high quality in their hotels and in recent years they have been increasing their impact on tourism more and more.
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