



Reply

Reply to “Comment on using a modified grey relation method for improving airline service quality”

A B S T R A C T

Keywords:
TOPSIS
Grey relation
VIKOR
Service quality

This is a reply to the comments on the previously published paper entitled “Using a modified grey relation method for improving airline service quality”. The commentators question that the paper does not offer any improvement over [Chen and Tzeng's \(2004\)](#) work and uses the same data as in [Liou, Tsai, Lin, and Tzeng's \(2011b\)](#) paper. However, the modified grey relation described therein actually does improve on [Chen and Tzeng's \(2004\)](#) work in two ways. First, the ideal and negative ideal referential sequences are replaced by the aspired to and tolerable levels. Second, the similarity used in the grey relation model is transformed into a weighted gap, “the smaller the better”. The same survey data is used in both papers, but the targets and purposes differ. One is focused on economy class passengers, while the other targets all passengers. Therefore, we argue that the comments indicate misunderstanding of the modifications.

© 2011 Elsevier Ltd. All rights reserved.

1. Background

Two major points in our study regarding airline service quality, entitled “Using a modified grey relation method for improving airline service quality” ([Liou, Hsu, Yeh, & Lin, 2011a](#); [Liou, Tsai, Lin, & Tzeng, 2011b](#)) have been questioned. The commentators declare that the methodology is the same as that described in [Chen and Tzeng's \(2004\)](#) work using the grey relation method focused on ranking alternatives. Furthermore, the paper is criticized as using the same data as in [Liou et al.'s](#) publication entitled “A modified VIKOR multi-criteria decision method for improving domestic service quality” that appears in the *Journal of Air Transport Management*, 17(2), 57–61, 2011. Actually, the study of the modified grey relation method is a continuation of the work of the VIKOR paper, but in the latter work, the focus is on economy class passengers and how to improve the performance gaps for each dimension/criterion. In this way, airlines can develop more precise strategies for improving and customizing their services. The grey relation method described in our study may appear to be the same as that described in [Chen and Tzeng's \(2004\)](#) work on ranking alternatives, but we use a different definition for the referential sequence. We also transform the “similarity” into “weighted gaps” that better enable airline managers to measure and realize their gaps to the aspired levels and set priorities for improvement. The rest of this response is structured as follows. In Section 2, we first clarify the survey data. The differences between our study and [Chen and Tzeng's \(2004\)](#) work are illustrated in Section 3. We conclude our argument in Section 4.

2. Clarification about the use of the survey data

After finishing the paper “A modified VIKOR multi-criteria decision method for improving domestic service quality”, two issues

were brought to our attention. First, the collected data represent the largest survey about service quality of domestic airlines within the last 10 years commissioned by the Civil Aviation Administration of Taiwan. The question is do the results provided offer an objective appraisal? Although the modified VIKOR is a good tool to investigate gaps in service quality for a carrier, the question arises are there other ways to explore these gaps? Second, different class passengers may have different expectations and service quality needs. It does not seem reasonable to neglect these differences as in the VIKOR paper. Based on the above, we carried out another study using a modified grey relation to look at economy class passengers only. The VIKOR data is based on all passengers but the grey relation method only considers economy class passengers who have different aspiration levels and needs. Therefore, the data used, derived results and management implications of both articles are different. Furthermore, the introduction and literature review in the two articles addressed various view points. We place more emphasize on the PZB model and IPA discussion in the JTMA paper. To sum up, the data used in the two articles are different.

3. Differences from Chen and Tzeng's work

The discrepancy between the VIKOR and the grey relation method is obvious. The VIKOR method is based on the idea of “distance,” while the grey relation method considers the idea of “similarity.” The grey relation model basically compares the alternative to find the aspired to alternative or the worst alternative using the “degree of similarity.” The value obtained from the VIKOR is the smaller the better, however, for the grey relation results, the larger the better. Undoubtedly, the distance and similarity create two completely different approach methods.

There are two differences between our proposed grey relation method and Chen and Tzeng's (2004) work. Chen and Tzeng used the referential sequence a^* and a^- obtained from the existing set A. Its performance at criterion j is decided by the best value of criterion j within existing alternatives for a_i , as indicated in Equations (1) and (2)

$$a^*(j) = \max_i a_i(j), \quad (1)$$

$$a^-(j) = \min_i a_i(j). \quad (2)$$

However, in our study, a^* and a^- are replaced using the expectation level of the decision-makers for each criterion for each alternative, as shown in Equations (3) and (4)

$$a^*(j) = \text{aspired}_a(j), \quad \text{for setting aspired levels}, \quad (3)$$

$$a^-(j) = \text{tolerable}_a(j), \quad \text{for setting the worst values}. \quad (4)$$

We can use a metaphor to illustrate this difference. In the original/traditional method (focused on ranking alternatives or selecting the relatively best only), we pick one apple to be as the benchmark from a basket of inferior apples. The benchmark is still an existing inferior apple. However, with our new method, the decision maker sets an aspired to level as the benchmark, an alternative which might not exist in the current basket of apples, but would be more suitable in today's competitive environment. The aspired to levels in each dimension/criterion are pursued by setting improvement strategies. As a consequence, the old model can only tell the company what the gaps between their and their leading competitors are. Our model, on the other hand, cannot only help companies realize the gaps between current service and the customers' aspired to levels, but also gives them a chance to surpass their leading competitors.

The second difference is that we transform the "similarity" of the grey relation into the weighted gaps by using Equation (5) as follows:

$$g_i(j) = w_i(j) \times [1 - \gamma(a^*(j), a_i(j))], \quad j = 1, 2, \dots, n. \quad (5)$$

This is possible because the purpose of our study is to help companies understand the gaps between their current service and the aspired to level. This objective cannot be reached with original grey relation which is based on similarity (the larger the better). We therefore apply the Equation (5) to investigate the weighted gaps (the smaller the better). This is also a convenient way to observe poor service items and prioritize improvement strategies. Another benefit is that we can compare the grey relation results with the VIKOR results from the same basis (as shown in Table 5 of both articles). However we did not make such a comparison for two reasons. Since the two studies are based on different passenger backgrounds, there is no need to make this kind of comparison. The other reason is that when we were preparing the grey relation paper, the VIKOR paper was still under review.

In order to observe the relative competitiveness of service quality, we further derive a ranking index. The ideas of TOPSIS and compromise are combined solutions to consider both positive and negative ideal solutions. The procedure is similar but slightly different to that described in Chen and Tzeng's (2004) work. The definitions of a^* and a^- are different which will cause difference

in the calculated values. Although the procedures are the same, the meaning of the referential sequence is different. Furthermore, our main objective is to provide the airline with strategies or directions for improvement, but not to rank them. Omitting the citation of Chen and Tzeng's (2004) work might have been a mistake, but we can derive the same method from Chen and Hwang (1992), Yu (1973) and Zeleny (1982).

4. Conclusion

The paper using modified grey relation is a continuation of the work in the VIKOR paper. Both papers use the same survey data but a different data base. The VIKOR data covers all passengers but the grey relation targets economy class passengers only. Although the calculation procedures are similar in the two papers, the definitions for a^* and a^- are different. Furthermore, we transform the similarity into the weighted gaps, which were not used in Chen and Tzeng's (2004) work. To sum up, we wish to express our disagreement of the comments made on our study of JTMA.

References

- Chen, M. F., & Tzeng, G. H. (2004). Combining grey relation and TOPSIS concepts for selecting an expatriate host country. *Mathematical and Computer Modeling*, 40(13), 1473–1490.
- Chen, S. J., & Hwang, C. L. (1992). *Fuzzy multiple attribute decision making: Methods and applications*. Berlin: Springer-Verlag.
- Liou, J. J. H., Hsu, C. C., Yeh, W. C., & Lin, R. H. (2011a). Using a modified grey relation method for improving airline service quality. *Tourism Management*, 32(6), 1381–1388.
- Liou, J. J. H., Tsai, C. Y., Lin, R. H., & Tzeng, G. H. (2011b). A modified VIKOR multi-criteria decision method for improving domestic airline service quality. *Journal of Air Transport Management*, 17(2), 57–61.
- Yu, P. L. (1973). A class of solutions for group decision problems. *Management Science*, 19(8), 936–946.
- Zeleny, M. (1982). *Multiple criteria decision making*. New York: McGraw-Hill.

James J.H. Liou*

Department of Industrial Engineering and Management,
National Taipei University of Technology, No. 1, Section 3,
Chung-Hsiao East Road, Taipei, Taiwan

Gwo-Hshiung Tzeng

Graduate Institute of Project Management, Kainan University,
No. 1 Kainan Road, Luchu, Taoyuan County 338, Taiwan

Institute of Management of Technology,
National Chiao Tung University, 1001 Ta-Hsueh Road,
Hsinchu 300, Taiwan

Chao-Che Hsu

Department of Transportation Management, Tamkang University,
151 Ying-Chuan Road, Tamsui, Taipei 251, Taiwan

Wen-Chien Yeh

Department of Air Transportation, Kainan University,
No. 1 Kainan Road, Luchu, Taoyuan County 338, Taiwan

* Corresponding author. Tel.: +886 2 27712171x2332;
fax: +886 2 27317168.

E-mail address: jamesjliou@gmail.com (J.J.H. Liou)

13 July 2011