EQS: a computer software using fuzzy logic for equipment selection in mining engineering

by A. Başçetin, O. Öztaş, and A.I. Kanli

in the *Journal* of SAIMM, vol. 106, no. 1, pp. 63–70

Comment by*: M. Yavuz* and S. Pillay

Equipment selection in mining operations is an important issue, and also difficult to solve in multiple criteria environments. The paper in question has aimed to develop computer software for solving equipment selection problems in mining.

In their paper, Başçetin *et al*. have analysed two case study problems related to openpit and underground mining method selection. By using Yager's method[1], the authors have selected 18 different criteria in the first case study and 21 criteria in the second case study. However, as emphasized by Ozdemir[2], in pairwise comparison matrices the appropriate number of criteria should be seven as the maximum, from the point view of validation, consistency and redundancy. In cases where there are more than seven criteria to be handled, it is suggested that the criteria should be clustered and then the maximum number of clusters and subcriteria of every cluster should be limited to seven[4].

Considering the arguments made above, it is possible to suggest that the pairwise comparison matrices constructed by Başçetin *et al*. is not valid. The consistency of a matrix with the dimensions of 18 x 18 or 21 x 21 can be possible only by adjusting the weights with specific/special values. Consequently, if the matrices are adjusted by assigning specific weights subjectively, the solutions arrived at for both case studies may also not be reliable.

Finally, considering the deficiencies in the application of the adopted matrix construction method by Başçetin *et al*. the present authors suggest that the total number of criteria to be handled for any pairwise comparison matrix should be limited to seven as the maximum by clustering/grouping.

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ISSN 0038–223X/3.00 + 0.00. Originally published in Jan. 2006. Comments received Dec. 2006.

Analytical hierarchy process for selection of roadheaders, by O. Acaroglu, H. Ergin, and S. Eskikaya

in the *Journal* of SAIMM, vol. 106, no. 8, pp. 569–575

Comment by*: M. Yavuz

I have read the paper in question with great interest. Equipment selection in mining operations is an important issue, and also difficult to solve in multiple criteria environment.

The paper in question has aimed to select a roadheaders by using the analytic hierarchy process (AHP) in tunnel/galleries. By using Saaty's AHP method[1], the authors have selected 14 different criteria in the case study. However, as emphasized by Ozdemir[2], in pairwise comparison matrices the appropriate number of criteria should be seven as the maximum, from the point view of validation, consistency and redundancy. In cases where there are more than seven criteria to be handled, it is suggested that the criteria should be clustered and then the maximum number of clusters and subcriteria of every cluster should be limited to seven[4].

Considering the arguments made above, it is possible to suggest that the pairwise comparison matrice constructed by Acaroglu *et al*. is not valid. The consistency of a matrix with the dimensions of 14 x 14 can be possible only by adjusting the weights with specific/special values. Consequently, if the matrices are adjusted by assigning specific weights subjectively, the solutions arrived at for both case studies may also not be reliable.

Finally, considering the deficiencies in the application of the adopted matrix construction method by Acaroglu *et. al.*, I suggest that the total number of criteria to be handled for any pairwise comparison matrix should be limited to seven as the maximum by clustering/grouping. Also, the outcome is presented as 'optimum choice' even if all alternatives come quite priority, which should call for a sensitivity analysis to see which criterion has had most influence on the results.

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