EVALUATION OF THE IMPACTS OF CHALLENGING FACTORS ON UNDERGROUND COLLIERY OCCUPATIONAL HAZARDS IN IRAN USING FUZZY CAUSE AND EFFECT INTERACTION

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Abstract:
The occupational and health hazards associated with working in coal mines are known as the main concerns despite the high importance of coal production in the economic development of countries. Irreparable damages to personal and financial losses can be avoided if the effective factors resulting in the occupational risks of underground coal mines are identified. In this research, these factors were initially identified in the case of underground coal mines in Iran. Then, the direct and interaction effects of the identified factors were evaluated and determined using fuzzy cognitive map approach that is based on the analysis of the cause and effect interaction between the identified effective factors. Results indicated that dust concentration, individual negligence and mistakes, inappropriate and inadequate ventilation, errors in design, planning and execution, and the volume and concentration of methane gas are respectively important factors posing occupational hazards in the underground coal mines of Iran. The statistical study of the accidents occurred in Iran underground coal mines, especially recent events, confirmed the results of this research.

Keywords:
Occupational hazards, fuzzy cognitive map, cause and effect interaction, underground coal mines.

INTRODUCTION
The occupational hazards in underground coal mines are posed because of working space limits, pollutants at workplace, fire and explosion potentials, strata control difficulties, the instability of excavated spaces, and the problems caused by utilizing machinery in limited spaces. In this case, a particular attention is required to assess all factors affecting workplace safety. Researchers have mostly assessed the accident risks of underground coal mines by use of statistical analysis and prioritizing the accidents based on their occurrence, and less attention has been paid to the importance of factors affecting occupational hazards. In this research, factors affecting occupational hazards in Iran underground coal mines are evaluated on the basis of their importance and interactive role in the hazards occurrence utilizing fuzzy cognitive map.

METHODOLOGY AND APPROACHES
The most important factors affecting the occupational hazards of underground coal mines mostly in Iran mines are initially identified by considering experts' opinions and related following studies. Fuzzy cognitive map is employed to evaluate the interaction between challenging factors and their impacts on the occupational hazards of the coal mines (Papageorgiou & Salmeron, 2014). A conceptual cognitive map is designed according to the problem of the study. Based on the fuzzy cognitive map, a primary matrix is created, indicating the impacts of challenging factors on the main goal. Adjacent matrix is also created that represents the impacts of the challenging factors on each other. Experts' opinions have been employed to create both initial and adjacent matrices by use of fuzzy numbers. After updating the values of the initial matrix, the final matrix is resulted, representing the importance of challenging factors.

RESULTS AND CONCLUSIONS

Dust concentration, individual negligence and mistakes, and inadequate ventilation are respectively determined as the most challenging factors causing occupational hazards in underground coal mines of Iran. The recent accidents occurred in Iran underground coal mines can approve the results obtained in this research.

REFERENCES

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