



Constructing a Bayesian network model for improving safety behavior of employees at workplaces



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ABSTRACT

Introduction: Unsafe behavior increases the risk of accident at workplaces and needs to be managed properly. The aim of the present study was to provide a model for managing and improving safety behavior of employees using the Bayesian networks approach.

Methods: The study was conducted in several power plant construction projects in Iran. The data were collected using a questionnaire composed of nine factors, including management commitment, supporting environment, safety management system, employees' participation, safety knowledge, safety attitude, motivation, resource allocation, and work pressure. In order for measuring the score of each factor assigned by a responder, a measurement model was constructed for each of them. The Bayesian network was constructed using experts' opinions and Dempster-Shafer theory. Using belief updating, the best intervention strategies for improving safety behavior also were selected.

Results: The result of the present study demonstrated that the majority of employees do not tend to consider safety rules, regulation, procedures and norms in their behavior at the workplace. Safety attitude, safety knowledge, and supporting environment were the best predictor of safety behavior. Moreover, it was determined that instantaneous improvement of supporting environment and employee participation is the best strategy to reach a high proportion of safety behavior at the workplace.

Conclusion: The lack of a comprehensive model that can be used for explaining safety behavior was one of the most problematic issues of the study. Furthermore, it can be concluded that belief updating is a unique feature of Bayesian networks that is very useful in comparing various intervention strategies and selecting the best one form them.

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1. Introduction

1.1. Unsafe behavior

Unsafe behavior is defined as any behavior engaged in by an employee without considering safety rules, standards, procedures, instructions, and specified criteria in the system that can negatively influence the system safety or endanger the employee himself or his colleagues (Fam et al., 2012). According to this definition, unsafe behavior has a prominent place in occupational accidents, which has been stressed by many studies. (Heinrich and Granniss, 1959)

attributed 85% of all accidents to unsafe acts. (Blackmon and Gramopadhye, 1995) explained unsafe behavior as a cause of 98% of accidents. Unsafe behavior was introduced by (Abdelhamid and Everett, 2000) as one the main causes of accidents have occurred at constructions sites. (Fleming and Lardner, 2002) stated that 80–90% of occupational accidents are attributable to unsafe behaviors. (Haslam et al., 2005) explained that workers or work teams are a key factor in as many as 70% of construction accidents.

Although still an unsafe behavior by itself is regarded as the main cause of accidents in many organizations, particularly in developing countries, a wide range of factors can be enumerated that have a direct or an indirect influence on the behavior of individuals within the organization and thereby they have an indirect effect on accidents. In the other words, unsafe behavior is just a factor mediating the effects of some organizational, cultural, and

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