



A multiple attribute decision model to compare the firms' occupational health and safety management perspectives



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ABSTRACT

Both the ferocious competition and judicial regulations of national or international authorities enforce organizations to implement a bundle of management systems (e.g. safety, quality, environmental, etc). Occupational Health and Safety Management System is a very important one because it provides guidance about the safety conditions for workplaces and health of the employees working within these areas. Measurement of a firm's OHSMS performance is vital because the firm's perspective about it is directly related with the workers' health. Besides, the comparison of the firms within an industry in terms of occupational health and safety can be informative for the authorities and the worker unions. In this study, we aim to build a multiple attribute decision making (MADM) model for determining and comparing the firms' OHSMS performances. The model utilizes the firms' OHSAS 18001:2007 implementation performances and compares them with respect to the standard's conditions. The ranking indicates each firm's OHSMS consciousness level against its competitors. We determine the importance of criteria (requirements of OHSAS) by Simos' procedure and VIKOR method ranks the firms in terms of the quality consultants' assessments. In this manner, this study introduces MADM as a possible firm comparison approach in terms of their OHSMS perspectives.

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1. Introduction

Occupational health and safety (OHS) management concerns the improvement in health conditions at workplace and reducing a sort of costs emanating from work accidents that could be originated by inadequate working environment, insufficient informing and low consciousness level of employees or lack of attention. Fan et al. (2014) indicated that the firms from United States of America lose \$170 billion every year because of the injuries at work and average 13 employees died while working every day in 2012. In 2014, TUISAG (Community of Occupational Health and Safety Professionals in Turkey) reported that 221,366 workers had an accident at workplace or occupational disease and 1626 workers had a fatal accident at work in Turkey (TUISAG, 2014). International Labour Organization (ILO, 2016) expressed that 6300 people died worldwide due to work-related diseases or accidents per day and 317 million accidents occur annually. These numbers demon-

strate the importance of implementing any occupational health and safety management system (OHSMS).

Zanko and Dawson (2012) reviewed the literature on OHS with a management specialist point of view and defined five main research categories. *Prescriptive OHS literature* tries to define what an OHSMS should be, rather than what it is. This part includes government prescriptions, codes of practice, national or international standards and it does not present any empirical attempts. *Systematic OHS literature* identifies sources of risk and determines countermeasures before an injury happened. Their systems are based on many national and international guidelines and contain a bundle of core elements. *Success-based OHS literature* focuses on tracing the linkage between effectiveness in managing occupational risk and a specific organizational performance. Survey-based studies dominate other methods in general. *Error and disaster-based OHS literature* examines the human-made disasters, accidents and occupational fatalities. The studies draw attention to very crucial contribution of OHSMS for handling occupational risk. *Culture, climate and high reliability literature* brings out the importance of new social aspects of management on OHS. About determination of the reasons of damages at work, a shift from technology and individual failure to social and physical work environment was occurred in

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the last decades. [Fan et al. \(2014\)](#) investigated OHS literature by utilizing a systematic citation network analysis. After reviewing 128 articles, they defined four fundamental research domains: safety climate, management system integration, voluntary OHSMS and sustainable operations.

Both of two literature review-based articles revealed that today's dynamic working environment requires proactive attempts for hindering the accidents before they occurred and employee participation because the papers discourses the important role of safety culture and willingness. OHSMS contains proactive procedures to build a safe workplace including the cooperation between employers and employees. Industry specific papers also support this argument. For example, [Sousa et al. \(2014\)](#) reviewed literature regarding the risk-based management of OHS in the construction industry and emphasized that the cultural differences and communication deficiencies are the most dominant barrier for prevention of accidents. Besides, it should not be forgotten that the employers and concerned managers' responsibility for building safety at workplace cannot be ignored and it stands in the first place when implementing and maintaining an OHSMS.

According to [Granerud and Rocha \(2011\)](#), OHSMS presents a systematic manner for relevant managers to cope with the challenges and reduce the probability of risk about health and safety at work. Today, there are many systems focusing on management of this issue and their instruments not only tend to minimize occupational risks proactively, but also support the assessment of safety management attempts permanently ([Robson et al., 2007](#)). [Abad et al. \(2013\)](#) states that OHSMSs bring out procedures published by miscellaneous national or international organizations, e.g. ILO-OHS 2001, AS/NZS 4804:2001, BS 8800, BS OHSAS 18001:2007, OSHA Act.

OHSAS 18001:2007 is an instrument for handling occupational risk in the work environment and it is one of many standards developed by British Standards Institution (BSI). ISO 9001 Quality Management, ISO 14001 Environmental Management, ISO/IEC 27001 Information Security Management, ISO/TS 16949 Automotive Quality Management, ISO 14064-1 Carbon Footprint Verification, ISO 50001 Energy Management and ISO 13485 Medical Devices could be given as examples for other management systems of BSI.

OHSAS 18001 is the dominant OHSMS in industry and it is implemented by a large number of firms of various sizes and sectors. It aims to promote a systematic and structured management understanding in order to provide safety of workers' health sustainably ([Muniz et al., 2012](#)). [Rajaprasad and Chalapathi \(2015\)](#) implied that OHSAS 18001 enounces the requirements for implementing an OHSMS in order to establish a safety policy including objectives and processes for complying with the obligations of the policy and take the necessary actions to improve system performance in the long run. The essence of OHSAS embraces hierarchy by expectations, strategies, and the organizational structure to maintain an OHS policy.

[Granerud and Rocha \(2011\)](#) emphasized that this standard compels the firm to accord to legal requirements, formulate targets for protecting health and providing safety and appropriate work environment conditions, and devise management systems to improve performance and reduce risk. OHSAS standards necessitate staying up to date. When the goals are succeeded, new goals and new plans should be formulated for continuous improvement in order to provide a sustainable OHS management comprehension. Consequently, implementing OHSAS 18001 involves a certification process and it yields an OHSAS 18001:2007 certificate when the firm adopts the standards successfully. Certification is based on the establishment of reporting and feedback systems to be used in combination with plans and strategies for improvement. This systematic approach for health and safety conditions should advance

employee capability to contribute to the system, so the worker participation into the OHSAS implementation is central idea. Thus, OHSAS certification process can be accepted as involving a continuous improvement comprehension.

[Muniz et al. \(2012\)](#) also stated that OHSAS 18001 certification have strategic and competitive implications. Certification could be seen as a strategic tool for firms that reach a good position in competitive market. Adopting the standard enhances the working conditions and reduces risks about possible injuries and material damages; hence it protects both human capital and the corporate reputation. Certification may also improve the firm's relations with its stakeholders like shareholders, creditors, customers, suppliers, labour unions, and the public authorities because OHSAS implemented firm may guarantee that it has a sufficient OHSMS to control occupational risks.

The OHSAS literature is fertile regarding the relationship between safety management and any kind of performance measures. [Abad et al. \(2013\)](#) investigated the connection between OHSAS 18001 certification process and safety performance and labour productivity. Safety performance indicators were selected as rate of accidents at work, proportion of fatal accidents and average number of lost work days (all of them should be at minimum for any firm); labour productivity was represented by sales per employee for a year. They found that safety performance measures are lower in OHSAS 18001 implemented firms, and also sales level is in a good position for them. So, it is evident that OHSAS 18001 implementation contributes to the firm's safety and labour performance. [Lo et al. \(2014\)](#) found that OHSAS 18001 certification leads to significant increases in abnormal performance on safety, sales growth, labour productivity, and profitability. The positive relationship between certification and performance is not only valid for OHSAS. [Vries et al. \(2012\)](#) examined the business and environmental impact of ISO 14001 Environmental Management System; [Bellesi et al. \(2005\)](#) investigated the possible impact of the same system on exports; [Lafuente et al. \(2009\)](#) studied the relationship between ISO 9000 certification and ownership structure and its effect upon firm performance; [Kaynak \(2003\)](#) examined the connection between total quality management practices on firm performance.

The certification process is performed by auditing bureaus. The most blind side of the auditing is that OHSAS 18001 does not include any performance metrics. So, the auditing process is conducted by a subjective manner. There is no protocol for safety auditing and each safety auditing firm utilizes its own methodology. In literature, there are few articles attempting to analyze firms quantitatively. [Saracino et al. \(2015\)](#) developed a model called M.I. M.O.S.A. (*Methodology for the Implementation and Monitoring of Occupational Safety*) with the aim of quantifying the OHS level of a company. The model has 6 key elements: leadership; orientation to risk reduction; involvement, learning and development of individual culture; continuous improvement; formal and general compliance; social responsibility. The measurement is based on the assessment of experts. The opinions and beliefs about any indicator are collected by either of direct interview or indirect interview to group membership. [Teo and Ling \(2006\)](#) developed a model for measuring the performance of safety management systems of construction sites and the required assessment data were again obtained from OHS experts by conveying surveys, interviews or workshops. The Analytical Hierarchy Process (AHP) were used to identify the most critical attributes affecting safety and Multi-Attribute Value Model were used to determine the final scores of each sites. Both of two articles did not contain OHSAS implication for assessing safety performance. Therewithal they failed to notice the importance of OHSAS 18001 standard's distinctive features which may be operationalized by means of the decision model proposed by the current study.

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