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Status of ISO 45001:2018 implementation in seaports: A case study

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Seaports are global players in the maritime industry with the responsibility of promoting the well-being of employees and customers in the workplace. However, over the past years safety performance of seaports operating within the West African sub-region has become a major concern due to the lack of enforcement of national occupational health and safety regulations. This has compelled some seaports to adopt the occupational health and safety management system (OHSMS) ISO 45001:2018 standard. The aim of this study is therefore to assess the progress seaports have made in the implementation of ISO 45001:2018 standard and discuss the challenges that need to be overcome when implementing ISO 45001:2018 standard in seaports. Through the use of questionnaire, observations and review of institutional document, data was gathered from workers and senior managers of export, container depot and the stevedoring sections of seaports operating in Ghana. The findings of this study revealed that seaports within Ghana have made some progress with regards to workers' awareness of occupational health and safety issues, usage of personal protective equipment (PPEs) and safe working procedures. However, it was also established that a lot more needs to be done to improve the current levels of communication, safety training and resources in relation to health and safety management. The findings of this research are useful to maritime institutions wishing to migrate from OHSAS 18001:2007 certification to ISO 45001:2018 certification or seeking to improve on already existing system.

Keywords: Maritime; Safety culture; Seaports; Accident; Safety management.

1. Introduction

Based on the successes resulting from the implementation of the quality management system (ISO 9001) and the environmental management system (ISO 14001), there was the need for an international certification system capable of supporting and promoting good practices in the area of occupational health and safety (Vinodkumar and Bhasi 2011). One of such international standards was the OHSAS (Occupational Health and Safety Assessment Series) 18001 standard which was formulated in 1998 and came into force in 1999. OHSAS 18001 was a British standard for occupational health and safety management and was recognized as the rapidly used global standard for occupational health and safety management (British Standard Institution (BSI) OHSAS 18001 2007). Due to its worldwide acceptance, the standard was revised and published in July 2007 as OHSAS 18001:2007 to replace OHSAS

18001:1999. In March 2018 the process of transitioning from OHSAS 18001:2007 to ISO 45001:2018 began, to improve the occupational health and safety performance of seaports in Ghana. Seaports in Ghana are improving infrastructure and services to increase efficiency in order to meet international standards. In order to improve efficiency while meeting international standards, seaports must demonstrate enough commitment by instituting measures to ensure that employees and other users of the ports are protected by eliminating work place related accidents. However, it appears seaports in Ghana are more vulnerable to work place related accidents due to the lack of enforcement of local occupational health and safety regulations as well as inaccessible historic information on occupational health and safety related issues. Due to these vulnerabilities, some seaports in Ghana adopted the OHSAS 18001:2007 standard and have now transitioned

to the ISO 45001:2018 standard to improve work place safety while enhancing productivity.

Although ISO 45001 is designed based on some aspects of OHSAS 18001, there are differences between both standards, thus making ISO 45001 a new and unique standard. Key among these differences are that ISO 45001 standard focuses on productivity and performance improvements, its views occupational health and safety management from a risk based perspective, hence making it dynamic and the structure is modeled along the framework of other ISO standards for uniformity and easy usage.

Due to the worldwide importance and acceptance of OHSAS 18001, now ISO 45001 standard (Ghahramani and Salminen 2019), reasonable amount of research in relation to its implementation has received considerable attention in literature. In what follows some recent publications on the implementation of OHSAS 18001:2007 and ISO 45001:2018 standards are briefly reviewed.

Focusing on OHSAS 18001, Dejanović and Heleta (2016) reviewed occupational health and safety regulations in Serbia and the requirements airports should satisfy from OHSAS 18001 perspective. Ghahramani (2016a) employed safety climate questionnaire to evaluate three OHSAS 18001-certified manufacturing companies and three non-certified manufacturing companies in Iran. In Ghahramani (2016b), eleven potential areas of improvement in implementing OHSAS 18001 was identified based on the experience and perception of managers who worked in OHSAS 18001 certified companies in Iran. Ghahramani and Summala (2017) investigated the effect of OHSAS 18001 on occupational injury rate in Iran. Palačić (2017) assessed the impact of OHSAS 18001:2007 standard requirements in reducing number of injuries at work places as well as its financial implications to certified business organizations in Croatia. Lafuente and Abad (2018) applied OHSAS 18001 standard to measure the safety, financial and operational performance of manufacturing, construction and service companies in Spain. Ghahramani and Salminen (2019) explored the effectiveness of OHSAS 18001 standard in the manufacturing sector of Iran. Bayram (2020) examined the

factors influencing employee safety productivity in OHSAS 18001:2007 certified organizations.

Focusing on ISO 45001, Lee et al. (2020) investigated the changes in awareness and strength demands for OHSMS in South Korea. Findings of the study showed that social demands and corporate social responsibility were the drivers for introducing OHSMS. The findings were also used to develop a plan for introducing ISO 45001:2018 standard. Morgado, Silva, and Fonseca (2019) examine the perception of Portuguese companies on the transition from OHSAS 18001 certification to the new ISO 45001 certification. Karanikas et al. (2022) evaluated the degree to which system thinking from literature were incorporated into ISO 45001:2018 standard.

In reviewing literature, it was revealed that there was worldwide adoption of OHSAS 18001 standard for managing occupational health and safety in the construction, manufacturing, printing, business service provision and the aviation industries to improve health and safety performance while ISO 45001 standard is currently gaining attention.

Furthermore, studies conducted on application of OHSAS 18001:2007 and ISO 45001:2018 in countries located in Asia, Europe and North America have been reported in literature. However, seaports in Ghana faces wide range of potential risks and this is because there are interactions between complex equipment and users (i.e., employees and customers) but none of the reviewed literature focused on application of OHSAS 18001:2007 and ISO 45001:2018 standards for seaports. It must also be indicated that studies on the implementation of OHSAS 18001:2007 and ISO 45001:2018 standards in African countries have not been covered. The aim of this study is to assess the progress, and discuss the challenges hampering the implementation of ISO 45001:2018 in seaports using Ghana as a case study.

To determine the progress and barriers, the study focused on seaports within Ghana, which are ISO 45001:2018 certified. Questionnaire, observations and documentation review approaches were employed to achieve the objective of the study. The results of this study contribute to occupational health and safety research by identifying the progress and barriers toward the implementation of ISO 45001:2018

standard in seaports. In addition, this research could enhance the management of occupational health and safety in other seaports by helping reduce work place related injuries and fatalities.

2. Research methodology

This research uses primary data collected through administering of questionnaire and observations, and secondary data obtained through the review of internal company documents.

2.1 Questionnaire development

Questionnaire was developed to solicit information from senior managers and the general workforce. The questionnaire took the form of both open and close ended questions. The use of questionnaire was helpful as it allowed respondents enough time to think about the questions in order to provide accurate answers. The questionnaire was serially numbered in order to track the number distributed and the number returned.

The questionnaire was developed based on extensive review of existing literature on OHSAS 18001:2007 and ISO 45001:2018, which is line with the questionnaires developed in previous studies (Ghahramani 2016a, Ghahramani and Salminen 2019, and; Bayram 2020). In order to refine the questionnaire and eliminate undesirable items, the first draft of the questionnaire was piloted among graduate students of the port and shipping department of the Regional Maritime University (RMU) who had fair idea of port operations and safety. The piloting resulted in a number of changes made to the initial questionnaire to reflect the objective of the study. After the piloting, the authors further consulted a safety professional with vast knowledge and experience in maritime safety to audit the questionnaire. Further modifications were made to the questionnaire after the auditing. The authors finally pre-tested the questionnaire with two staff members of RMU with experience in occupational health and safety management in order to validate the suitability of the questionnaire for application in seaports. Tables 1 and 2 shows samples of questions used to evaluate progress and challenges in the implementation of ISO 45001 standard in Ghanaian seaports in the Likert scale.

Table 1. Samples of questions for evaluating progress of ISO 45001 implementation in seaport

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1. What do you understand by occupational health and safety?
 2. Does your department have a written occupational health and safety policy?
 3. How do you assess the health and safety performance at your department since the introduction of ISO 45001?
 4. Does the department has a written procedure of work that ensures work is done safely?
 5. How do you assess communication of health and safety issues within your department?
 6. How often do you use your Personal Protective Equipment?
 7. How will you rate the effectiveness of the emergency response system?
 8. Do you feel safe working within the port?
 9. How often do you report incidents?
 10. Are there supervisors to ensure Personal Protective Equipment usage compliance?
 11. How often are safety issues discussed in the department?
 12. How will you rate the availability of safety signs and cautions at the work place?
 13. Can you list some of hazards in your work that you know?
 14. How are you protected from these hazards?
 15. Do you feel that accident cases are properly investigated to its logical conclusion?
 16. Do you think the introduction of ISO 45001:2018 has been improved general safety in your department?
 17. Do you think the implementation of ISO 45001:2018 has negative implications on productivity?
-

Table 2. Samples of questions for evaluating challenges of ISO 45001 implementation in seaport

-
1. How do you assess the attitude towards occupational health and safety?
 2. How will you rate the availability of resource for health and safety implementation?
 3. How will you rate the level of health and safety supervision?
 4. How will you assess the level of health and safety communication?
 5. How will you assess the level of health and safety training you have received?
 6. How will you assess the level of Leadership commitment on health and safety in the department?
-

2.2 Questionnaire administration

Staff from export, container depot, and stevedoring sections were chosen as respondents because they are exposed to different kinds of risk in their routine operations and are considered to have better understanding of the implementation of the ISO 45001:2018 at the

departmental level. Hence, they were considered very qualified to address issues concerning the status of implementation of ISO 45001:2018 standard in seaports. Due to the nature of the data required for the study, both senior managers and junior staffs of the three departments were requested to participate in the survey. A total of 105 questionnaires were sent out and 46, representing 43.8%, were received as responses. However, six of the responses were incomplete and the authors decided to discard them, leaving the authors with the final 40 responses, which is approximately 38% of the 105 questionnaires original sent out. Out of the 40 respondents, 20 were received from the stevedoring section and 10 each from export and container depot sections, respectively. However, due to inability to deliver the questionnaire to some of the respondents through email or face-to-face, the authors reached those respondents on phone for interview.

2.3 Observations

In addition to the questionnaires, observations of the environment and how workers go about their duties were also utilized in obtaining primary data. Observations offered the authors the opportunity to assess the working conditions and whether safety rules are being followed or otherwise by the workers as they go about their routine duties.

2.4 Documentation review

The questionnaire and observation were supplemented by documentation review. Secondary data was obtained from internal company documents which included Hazard Identification and Risk Assessment (HIRA) records, real accident records as well as corporate safety policy documents. The HIRA is an important source of secondary information as it lists all identified hazards in the department and prescribes ways of mitigating their effects. The accident records also give information of the various accidents and their nature which occurred at various departments.

3. Results

The data for this study was obtained through the use of questionnaire, observations, and review of internal company documents.

Data from each of the methods were analyzed. The results of the analysis were then categorized into progress achieved since the adoption of ISO 45001:2018 standard and the challenges during its implementation using the Likert scale. Figure 1 shows the percentage distribution of various parameters used to evaluate the progress and challenges confronting the implementation of ISO 45001:2018 standard in seaports in Ghana.

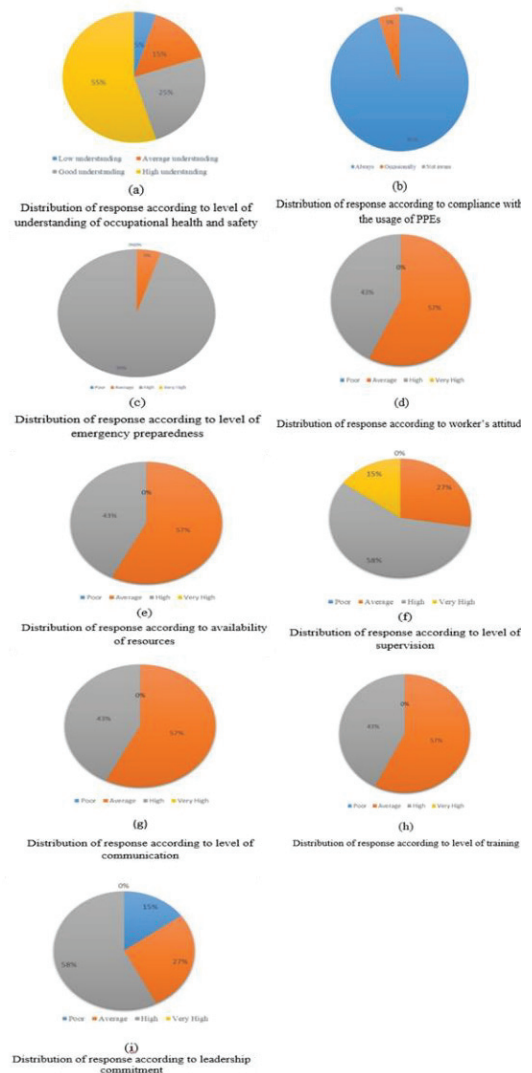


Figure 1: Distribution of parameters used to evaluate progress and challenges

3.1. Progress achieved since the adoption of ISO 45001:2018

Five determinants were used to assess the progress made since the implementation of ISO 45001:2018 standard in the seaports used as the case study. These determinants are the level of understanding of occupational health and safety, compliance with the usage of PPE, the level of emergency preparedness, the availability of work procedures to ensure safe working environment and accident records.

3.1.1. The level of understanding of occupational health and safety

On the level of understanding of occupational health and safety issues, respondents demonstrated high level of understanding. Asked on their level of understanding of the meaning of occupational health and safety, out of the 40 respondents, 55% demonstrated high level of understanding by choosing the option that best explained occupational health and safety, followed by 25% choosing second best option whereas 15% and 5% chose the third and fourth options, respectively (Fig. 1(a)).

3.1.2. Compliance with the usage of personal protective equipment

Good occupational health and safety performance requires strict compliance with the use of PPEs to protect workers from dangers they may be exposed to at the workplace. Respondents answered affirmatively on the use of PPEs (Fig. 1(b)), out of the 40 respondents asked on their usage of PPEs, 95% indicated that they always use PPEs when working while 5% indicated that they occasionally use them when working. We also observed during our field visits that large majority of the workforce always uses the appropriate PPEs during work.

3.1.3. The level of emergency preparedness

A good occupational health and safety management system requires a responsive and reliable emergency system. Majority of the respondents represented by 95% were of the opinion that the level of emergency preparedness of the port is high whereas 5% said the emergency preparedness is at an average level (Fig. 1(c)).

Also, the documentation review revealed that measures have been put in place by senior managers to handle emergencies, thus making the emergency preparedness of the ports high.

3.1.4. The availability of work procedures to ensure safe working environment

It was observed that all the sections visited during the study had a well-developed work instruction and other operational procedures to ensure that work is done well and safely. Furthermore, the sections have developed a hazard identification and risk assessment records that has identified all the hazards that are prevalent within their activities. Having identified the hazards, the section further prescribes measures to eliminate these hazards or to mitigate their effects on workers.

3.1.5. Accident records

Accident records were obtained from the fire and safety department. This department is in charge of monitoring safety performance at the seaports considered in this study. As can be seen, accident statistics from 2016 – 2018 are shown in Table 3. The 2016 records are used as the benchmark value because it is the last year after which the OHSAS 18001:2007 was adopted while 2018 is the year the transition to ISO 45001:2018 certification began.

Table 3. Real accident records

Accidents	Number of cases		
	2016	2017	2018
Cut/bruises	4	3	4
Cargo damage	6	6	4
Truck and vehicle accidents	23	8	1
Forklift, reach stacker and crane accident	14	5	1
Slips and falls	1	0	0
Fatalities	1	3	1
Chemical injuries/burns	1	0	0
Pains /dislocation	9	2	4
/swollen body parts			

3.2 Challenges to implementation of ISO 45001:2018

For every new management system that is introduced there are bound to be challenges. For the purposes of this research, workers' attitude, availability of resources, supervision, communication and training were the parameters used to assess the challenges being faced in the implementation of the ISO 45001:2018.

3.2.1. Worker's attitude

Notwithstanding an improved appreciation of occupational health and safety issues among the workers, respondent feel the attitude towards health and safety issues could still be improved. Out of the 40 respondents, 57% indicated that the attitude is high whereas 43% indicated that it is average (Fig. 1(d)).

3.2.2 Availability of resources

The problem of resource availability can be a major challenge in the implementation of occupational health and safety management system. As shown (Fig. 1(e)), 57% of the participants responded that resources available for the implementation of ISO 45001 are high whereas 43% indicated that resource availability is at an average level.

3.2.3 Level of supervision

Supervision is a key factor in the implementation of occupational health and safety management system, since workers need to be monitored and guided to ensure that they go about their activities safely. For this parameter (Fig. 1(f)), 15% out of the 40 respondents indicated that the level of supervision is very high, followed by 58% as high and then 27% as average.

3.2.4 Level of communication

The flow of information can determine the success or otherwise of an occupational health and safety management system. Out of the 40 respondents, 57% indicated that the level of communication relating to occupational health and safety is at the average level whereas 43% indicated it is high (Fig. 1(g)).

3.2.5 Level of training

Training is critical in the successful implementation of occupational health and safety management system. Workers need to be trained on new and safe working procedures, how to behave during an emergency etc. As can be seen (Fig. 1(h)), 57% out of the 40 respondents indicated that the level of training received on occupational health and safety issues is average whereas 43 indicated it is high.

3.2.6 Leadership commitment

Leadership commitment can drive interest and motivate workers towards improved performance. In terms of leadership commitment, 58% of the respondents indicated that it is high, followed by 27% as average and 15% as poor while none of the respondents indicated that it is very high (Fig. 1(i)).

4. Discussion

Occupational health and safety management systems progress when certain parameters are set and maintained. The results of this study indicate that, since the adoption of ISO 45001:2018, safety culture at seaport in Ghana have improved. Based on the findings of the study, it was revealed that workers in seaports demonstrated sufficient knowledge about ISO 45001:2018. This is in contrast with the finding from Ghahramani (2016b) which identified personnel's insufficient knowledge about occupational health safety systems as one the barriers to overcome in implementing OHSAS 18001 standards in Iranian companies. The reason for this may have been due to the level of appreciation on the part of the workers about the benefits of OHSAS 18001. The findings also showed that employee's compliance with the usage of PPE's as well as following of laid down procedures of work to ensure their personal safety, safety of others and safety of equipment has further progressed, since the adoption of ISO 45001:2018 by the seaports. This is because effort has been made to document all working procedures and hazards related to their work and the required mitigating strategies identified. Another satisfactory progress worth highlighting is the workforce confidence in the emergency preparedness of the safety department.

The identified reason for this is the frequent successful simulation exercises carried out since the implementation of ISO 45001:2018. Although the level of emergency preparedness was satisfactory, none of the respondent suggested that the level is very high, therefore senior management should endeavour to improve on the level of emergency prepared, so as to inspire the confidence of the workforce.

Although the number of cut/bruises and pains /dislocation/swollen body parts increased by 33% and 100% in 2018 as against the 2017 numbers, the rate of accidents and damages with reference to 2016 as the base year have improved. Thus, it can be established that there is a marginal improvement of safety within the seaports since the introduction of OHSAS 18001:2007 and subsequent migration to ISO 45001:2018 standard.

On another hand, the implementation of new occupational health and safety management system comes with its challenges. Although, the results of the study indicated that factors such as level of supervision, workers attitude and leadership commitment were scored “high” by respondents, it was observed that the “average” responses were equally high and therefore can be considered as challenges. This means that these factors can potentially influence the effective implementation of occupational health and safety management system in seaports.

In line with the findings of this study, supervision, leadership commitment, training, and communication have been identified by previous studies as some of the key challenges toward implementation of OHSAS 18001 in other sectors (Ghahramani 2016b; Vinodkumar and Bhasi 2010). Challenges such supervision and leadership commitment requires that a lot more needs to be done in terms of supervision and commitment from leadership by leading by the example of what they expect from their subordinates. For example, wearing of PPEs, following laid down safety procedures of work and also involving their subordinates in decisions making concerning their health and safety. Effective flow of communication which is essential to the sustenance of any occupational health and safety management system was identified as a challenge. In order to overcome the challenge of communication, proper communication structure and regular information

flow concerning ISO 45001:2018 implementation can help leaders to give instructions and expect feedback from subordinates. In addition, addressing the concerns of workers through the flow of information can ensure that workers have great sense of belonging and also encourages effective involvement of the workforce in decision making. Effective involvement of employees in occupational health and safety decision making process promotes safety performance in organizations (Vinodkumar and Bhasi 2011). This could also serve as another way of motivating workers.

Workers need to be trained on ISO 45001:2018 standards to ensure safe working environment. However, this study found out the regular training of workforce on ISO 45001:2018 is a challenge. Hence, institution of periodic training programs to sensitize workers on ISO 45001:2018 is increasingly becoming important in Ghanaian seaports.

The problem of resource availability was also identified as barrier to the implementation of the ISO 45001:2018 standard in seaports. The reason for this challenge in the context of this study was due to poor budgetary allocation toward provision of essential resources to achieve safety performance targets. Therefore, enough budgetary allocation needs to be made towards the provision of resources to ensure effective implementation of occupational health and safety system and also to guarantee its sustainability in seaports.

5. Conclusion

Considering seaports as risk prone area, employees and other users are faced with various kinds of occupational hazards including movement of heavy machines, handling of hazardous substances and cargo as well as human interactions. These risks can be managed through the implementation of internationally accepted occupational health and safety management system. Due to this, many organizations in different industries and countries have pursued OHSAS 18001:2007 and are in the process of transitioning to ISO 45001:2018 certification for health and safety management. In this context, the study analyzed the progress seaports in Ghana have made with regards to the implementation of ISO

45001:2018 standard and, also identified the potential challenges likely to confront its implementation.

The results from the analysis indicated that there has been marginal progress on issues such as understanding of occupational health and safety, compliance with the usage of PPEs, the level of emergency preparedness and the availability of work procedures. On the other hand, the level of supervision and training as well as the problem of resource availability were identified as the main barriers capable of impacting the implementation of ISO 45001:2018 standard in seaports in Ghana. We therefore recommended that safety departments in various seaports should adopt appropriate strategies to overcome the identified barriers in order to continuously improve on health and safety.

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References

- Bayram, Metin. 2020. "Factors Affecting Employee Safety Productivity : An Empirical Study in an OHSAS 18001-Certified." *International Journal of Occupational Safety and Ergonomics* 0 (0): 1–36.
- British Standard Institution (BSI) OHSAS 18001. 2007. "Occupational Health and Safety Management Systems-Specification."
- Dejanović, Dejana, and Milenko Heleta. 2016. "An Airport Occupational Health and Safety Management System from the OHSAS 18001 Perspective." *International Journal of Occupational Safety and Ergonomics* 22 (3): 439–47.
- Ghahramani, Abolfazl. 2016a. "An Investigation of Safety Climate in OHSAS 18001- Certified and Non-Certified Organizations." *International Journal of Occupational Safety and Ergonomics* 22 (3): 414–21.
- Ghahramani, Abolfazl. 2016b. "Factors That Influence the Maintenance and Improvement of OHSAS 18001 in Adopting Companies : A Qualitative Study." *Journal of Cleaner Production* 137: 283–90.
- Ghahramani, Abolfazl, and Simo Salminen. 2019. "Evaluating Effectiveness of OHSAS 18001 on Safety Performance in Manufacturing Companies in Iran." *Safety Science* 112 : 206–12.
- Ghahramani, Abolfazl, and Heikki Summala. 2017. "A Study of the Effect of OHSAS 18001 on the Occupational Injury Rate in Iran." *International Journal of Injury Control and Safety Promotion* 24 (1): 78–83.
- Karanikas, Nektarios, David Weber, Kaitlyn Bruschi, and Sophia Brown. 2022. "Identification of Systems Thinking Aspects in ISO 45001: 2018 on Occupational Health & Safety Management." *Safety Science*, no. 148: 105671.
- Lafuente, Esteban, and Jesús Abad. 2018. "Analysis of the Relationship between the Adoption of the OHSAS 18001 and Business Performance in Different Organizational Contexts." *Safety Science* 103: 12–22.
- Lee, Junghyun, Jinyeub Jung, Seok J. Yoon, and Sang Hoon Byeon. 2020. "Implementation of ISO45001 Considering Strengthened Demands for OHSMS in South Korea: Based on Comparing Surveys Conducted in 2004 and 2018." *Safety and Health at Work* 11 (4): 418–24.
- Morgado, L., F. J.G. Silva, and L. M. Fonseca. 2019. "Mapping Occupational Health and Safety Management Systems in Portugal: Outlook for ISO 45001:2018 Adoption." *Procedia Manufacturing* 38 (2019): 755–64.
- Palačić, Darko. 2017. "The Impact of Implementation of the Requirements of Standard No . OHSAS 18001 : 2007 to Reduce the Number of Injuries at Work and Financial Costs in the Republic of Croatia." *International Journal of Occupational Safety and Ergonomics* 23 (2): 205–13.
- Vinodkumar, M N, and M Bhasi. 2010. "Safety Management Practices and Safety Behaviour : Assessing the Mediating Role of Safety Knowledge and Motivation." *Accident Analysis and Prevention* 42 (6): 2082–93.
- Vinodkumar, M. N., and M. Bhasi 2011. "A Study on the Impact of Management System Certification on Safety Management." *Safety Science* 49 (3): 498–507.