

DOI: 10.7596/taksad.v6i1.744

Citation: Hedayat, A., & Shahniani, M. (2017). Investigating the Safety Culture and Costs Arising from Safety Non-Compliance on Building Sites. *Journal of History Culture and Art Research*, 6(1), 315-325. doi:<http://dx.doi.org/10.7596/taksad.v6i1.744>

Investigating the Safety Culture and Costs Arising from Safety Non-Compliance on Building Sites

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Abstract

In addition to the positive effects of industrial development and technological progress, it also has adverse side effects such as increasing the quantity and quality of working and living environment pollution. Work-related accidents and occupational diseases are the consequences of the development of industry and technology and they increasingly threaten human life, especially the staff. Work-related Accidents are accidents that occur in the line of duty in the workplace and lead to fatal or non-fatal injuries. Although many activities have been done to reduce work-related, or in other words occupational accidents, the accident statistics is still high, in a way that The World Health Organization considered that as an epidemic in the area of public health, and considered that as a critical risk factor for health, economic and social issues. This paper deals with safety culture, costs arising from accidents and how to cope with the work-related accidents.

Keywords: Safety, Costs arising from accidents, Construction site, Occupational accidents, Work related accidents.

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1- Introduction

According to the International Labour Organization (ILO) every 15 seconds, one worker loses his life from a work-related accident or disease as well as 160 workers every 15 seconds has an accident at work. Working Communities claim that a population over 2.3 million people annually lose their lives due to occupational accidents and diseases of which the share of work-related accidents is about 350 thousand people, in addition to that 313 million annual accident occur that many of these accidents result in long-term absence in the workplace (4).

Looking back it can be seen, among a variety of industries and jobs, the construction industry is one of the riskiest industries of the world, including many fatal and injury injuries (5). Due to the high intensity and complexity in the construction industry, this industry is known as one of the most dangerous industries in terms of work-related fatalities, injuries and Workers' Compensation rate (6). Construction workers to reach their goal carry out most of their daily tasks in a crowded and unsafe environment. Work environment in a construction project is constantly changing and workforce are often faced with new risks, that is why the construction workers accidents are statistically significant compared to other industries account workers and therefore it is very challenging to monitor their health and safety (7).

According to The Bureau of Labor Statistics (BLS) of United States of America each year approximately 150,000 accidents occur on building sites (8) and in 2013 the construction industry with 796 dead had the highest number of casualties (9). Also, according to Occupational Safety and Health Administration of America (OSHA) for every 10 workers in the building industry one person get injured and for every 5 hash fatal workplace one is a building site (10).

In Iran on work-related accidents statistics occurred during the period 2010-14 show that, on average, about 45 percent of total work-related accidents are related to the construction part and while the industrial sector of occupational accident occurred in the period under about 35% share of the mining sector is about 2 percent (11).

To evaluate all aspects of the human costs, such as pain and suffering and sorrow of the victims and their relatives, despite all efforts is impossible but some of their other aspects can be evaluated. The costs arising from non-healthy environment and workforce are not easily palpable, but the impact on gross national income is calculable (12). The human costs of these daily events are very large so that the economic cost of poor performance and occupational health professionals is equivalent to 4% of global GDP per year (4).

Based on the principles of safety, any disease or premature death is a kind of cost, therefore, measuring the costs of the monetary measures is necessary (13). Premature death of workers through occupational accidents cause is a waste of human resources. Maintaining and improving the health of society is the duty of governments and with maintaining and improving the health of workforce it can have positive economic impact on society. (14). Therefore, considering the workplace safety and health is considered as one of the aspects of government intervention in the labor market. Government can invest according to their limited resources; they need to be aware of the costs incurred in this area (15 and 16). That's why economic issues found particular importance in investigating accidents and work-related injuries. Economics science can help to immune the issues of occupational accidents to determine the damage occurred and the potential damage that may occur to the estimates (17). There are two views in terms of accounting and economic cost events. In accounting perspective purely the cost of office or explicit costs are considered but in economic point of view in addition to obvious costs to hidden cost the costs of opportunity resources, receives particular attention. It should be noted at the individual level most costs are noneconomic and some parts of it, such as pain and sorrow of the victims and his family are not material. However, the cost of accidents at the individual level in terms of human and moral have priority over the other two levels of the organization and society (16).

Given that the construction industry in terms of nature, relies on human resources and a healthy person is an essential component of sustainable development, so paying attention to the safety and health of people or those who may be involved in the implementation process in the area of effect damaged operations it is essential and without considering manpower no process will move to the desired result and lack of attention to this important result would be the collapse and disintegration system (6).

2- Safety History

It seems in the past fines and penalties were applied to control events causing injury and the reason and way of injury was not substantial, it was simply thought that the injury will be controlled with interactions punitive measures. More than 2,000 years B.C, the Babylonian recommended a way to pay compensation to the injured person. A set of Hammurabi rules provides important evidence that at least 4,000 years ago, there was awareness about the need to regulate and control unwanted defects. By the end of the 15th century was insufficient

information about the location of industrial action, In the eighteenth century in England (a country where the industrial revolution began) after a series of interesting inventions, such as mechanical loom, the industry has gradually transformed and production at homes was substituted with manufacturing in factories. The result of this work requires a lot of cheap labor which easily among low-income children in big cities was entrusted to the General Administration institutions. In 1802 Ethics and Health Act of trainees (young workers) adopted the first step towards legislation injury prevention and protection work in the factories of England. Due to restrictive laws on child labor, many English employers began to hire women to work with their new steam machines. In 1844, the first English rule was conducted that the number of hours of young women should be 12 hours a day and the first accurate predictions emerge from Health and Safety Act. Criminal compensation was provided for avoidable injuries caused by the unprotected mining machines in 1842 by the Mines Regulations. This law established the presence of observers in mines, stopped underground works of women and girls and obstruct the work of boys less than 10 years. But apparently the injury in the mines continued, as a result of the government's mine safety monitoring program began in 1850. It was followed by regulations adopted in 1855 in which seven mines that inspectors should consider the need for public safety were assessed. Since 1844, in parallel with the development of mine safety regulations, the main effort was that professional career should be covered by this branch of the law. A series of accidents and explosions in coal mines, led to the development of English law (Act of Mines 1860). Strong evidence was obtained of poor management and negligence of safety rules in several studies. Therefore enlisting only qualified managers were seen in mining safety. As a result new regulations were developed (Directive 1872 coal) Act 1872 has developed general safety rules, to improve safety of specific measures, create efficient management and increased inspections. Finally, an example of which was created in Great Britain affected other developed countries (18).

3- The most common construction accidents

Falling on the ground from height, falling objects, falling debris and excavation walls, falling elevators, electric shock, are the most common cases that construction workers are faced with. Studies have shown that about 80 percent of the accidents occurred on building sites including damage and cleaned or compliance with basic safety and low cost can be prevented which what can be found in this section to install temporary protection in the launch control load

carrying materials, mandatory use of personal protective equipment (helmet, shoes, belt) and observe the safety distances in the vicinity of high-voltage power lines can be noted (19). How workers can help to identify the risk of their jobs: Workers often play an important role in identifying risk factors because they know the hidden facts of their job better than anyone; they know the needs and capabilities of each job's needs. They can be effective in the prevention and control of their risk factors. Workers must report any signs and symptoms of musculoskeletal injuries to report without delay to the relevant responsible. If the workers report the injury related to the musculoskeletal system. The employer must investigate the possible causes of the roots and take necessary measures. It helps to identify the risk factors that lead to damage to the unsafe condition and try to control and solve that (20).

4- Safety culture, behavior and perception based on safety research

A general definition of corporate culture is very useful for understanding safety culture. Corporate culture can be considered as "a model based on the assumptions in the exploration and innovation provided by a group to adapt to external and internal integration problems that its function is valid enough and to train new people through the correct way to perceive, think and feel in relation to these deals." There are other definitions of corporate culture in the university's history. Corporate culture is a means to the success of an organization. Corporate culture provides the working environment for staff. When people work in an environment where they know they will get a reward, they are very willing to work at a high level. In addition to this success is a result of organizing a very good performance of certain tasks. Corporate culture is what defines the work environment, as well as tasks that are superior. Safety culture can be a particular aspect or a subset of the corporate culture assessment. In other words, an organization (or one of its subunits), a culture, and this culture underlying features that may be more or less support safety, quality, production, or have any other purpose. So, a very useful formulation of talking about safety culture is to ask whether corporate culture helps the safety culture. (21). However, the definition of safety culture exists in the literature and this expression is used when a description of the subset of organizational culture on behavior and attitudes of workers in relation to the safety performance of the work is in progress. Advisory Committee on the safety of nuclear facilities (ACSN) defines safety culture as: "safety culture is a product of group values, attitudes, perceptions, competencies and patterns of behavior that commitment and style and skill of a safety culture in the organization's health and safety management." There are various definitions of safety culture

in the academic literature. More definitions on believing with a focus, in varying degrees, to the way people behave or think in relation to safety is in a parallel connection. Although definitions vary, but there are social safety culture in which safety is moving to the active subject. Almost safety culture is accepted that if it is implemented (22). A safe environment is "a summary of the moral understanding of the benefit that employees in the workplace." Researchers consider that as a minor component of a safety culture and a reflection of the true safety culture. Safety culture, is concerned with the factors influencing safety management ability, while, the safety of the workers is dealing with an understanding of the role that safety plays in workshops. Thus, culture is considered as something deeper sense and in the long run, changes and impacts organizational performance through highly functional areas. Understanding, on the other hand, has changed very fast and quickly, reflects leadership attention. As the occurrence of certain events that impact on the organization or any other factor is change the perception of safety. A remarkable example for quick understanding of safety is immediately after death or serious accident. Most of the time such an event strengthens the immune understanding, however, these changes are not appropriate for the long term. Behavior-based safety (BBS) is referring to the use and application of psychological research on human behavior. This is a data-driven analytical approach, where behaviors are critical for identifying and targeting changes. The behavior-based safety is the primary concern for the safety-oriented behaviors that are normally done by workers. The performance of workers to figure out the base period of privileges can be regulated with the use of this privilege and goal setting sessions are organized with the participation of workers available to set realistic goals and performance. Workers are encouraged to practice safe behavior. Providing feedback for continuous improvement education is essential to reinforce desired safe behaviors. It should be noted that more than 80 per cent of workshops accidents and injuries are related to unsafe behaviors (23). In recent years, a move away from safety measure is formed based on past data "or indicators of backwardness" such as the rate of accidents start to the "leading economic indicators" such as measuring the perception of safety. This shift in focus has been on understanding the organization, management and human factors techniques to fail, the causes were the first incidents were preferred. "Garrett and Kodinjal in 2000 presented a socio-technical model that safety culture and safety management systems, safety culture were related to design overall organization." corporate culture is the production of multi-cultural interactions between people, enterprises and organizations and the knowledge about the existence of an interactive relationship between psychological factors, situational and behavioral provides, safety perception, behavior-based

safety and safety culture model allows the immune system to various aspects of safety culture construction be measured alone or integrated(24). Baravord 2011 showed that Social Security must pay pensions of average 45 million Tomans to disabled and the blood money of per person is calculated 90 million. It should be noted that due to inflation and rising costs in recent years this amount has increased significantly. Based on research conducted at the Department of Labor, unofficial statistic of death of every worker will cost 7,200 working days the cost for each skilled and trained worker is about 4 billion Tomans. It includes the cost of training and worker training, to help the deceased families. Indirect events include problems for other employees, the psychological consequences for affected families, the cost of replacement personnel, delays in project completion, damage to company reputation, increased insurance premiums, increase equipment performance risks and the impact on productivity of labor. Although the quantity of some of the indirect costs cannot be accurately determined, but American research institutions, the indirect costs of an accident have been estimated four times of the direct costs. The results of 50 studies in this area presents the average amount of productive time lost productivity reported below (Table 1):

Table 1: The average of lost hours of productive productivity

The average of lost hours of productive productivity per incident	
Labour lost time injury (damage days and later days)	76 hours
Transporting the injured worker to treat	4
Lost time of working team (damage days and later days)	56
Lost time due to less experienced replacement workers	14
The workers' disruption of work due to injury watching	6
Lost work time to repair damage and restore conditions to normal	10
Total lost time	166

Office lost working time (Table 2) is as:

Table 2: Office lost working time

The average of lost hours of office time per incident	
Helping injured workers and ensure his immediate treatment	76 hours
Researching about the incident and prepare a report	4
Other times (media, central administration, etc.)	46

5- Conclusion

Staff working in the construction site needs support due to the nature of the work and the risks involved far more than constant production workshops. Therefore, the following points can help significantly to improve safety on building sites resulting in the reduction of accidents:

- Creating an integrated and effective safety management system in the construction industry and recording construction-related accidents.
- Employing new methods to improve the executive health and safety
- More control and supervision of qualified construction contractors
- Construction workers organizing training workshops in the city to eliminate high-risk habits with the help of construction engineering.
- Identifying and paying more attention to the risk factors to prevent severe accidents.
- Integrating and coordinating the activities of regulatory bodies such as construction engineering system, Ministry of Labour and Social Affairs, Social Security Insurance, Housing and Urban Development and organization of vocational training and impose strict rules regarding the occurrence and frequency of accidents in workshops building
- Holding security courses for engineers, safety officers and supervisors
- Creating a rewarding and punishment system for contractors as well as engineering officers and supervisors

Footnotes

1-Snashall, D., Occupational health in the construction industry. *Scandinavian Journal of Work, Environment and Health*. 2005; 31:5–10

2-International Labor Organization. *Safety in numbers: pointers for the global safety at work*. Geneva 2003.

3-Raouf, B. *System assessment: A quantitative approach*. London, Lewis Publishers, 1994; 67 -89.

4-International Labor Organization (ILO). *Safety and health at work*. <http://www.ilo.org/global/topics/safety-and-health-at-work/lang--en/index.htm>

- 5-Ji J, Zhong W, Li K, Shen X, Zhang Y, Huo R. A simplified calculation method on maximum smoke temperature under the ceiling in subway station fires. *Tunnelling and Underground Space Technology*. 2011;26(3):490-6.
- 6- Beard A. N. Fire safety in tunnels. *Fire Safety Journal*. 2009;44(2):276-8.
- 7-Cheah CYJ. Construction Safety and Health Factors at the Industry Level: The Case of Singapore. *JCDC*. 2007;12(2).
- 8-Waehrer, G.M., Dong, X, Miller, T., Haile, E, Men, Y., Costs of occupational injuries in construction in the United States. *Accident Analysis & Prevention*. 2007;39(6):1258-1266.
- 9-Bureau of Labor Statistics (BLS). National Census of Fatal Occupational Injuries In 2013 (Preliminary Results). www.bls.gov/iif/oshcfoi1.htm
- 10-Jahangiri M., Sareban Zadeh K., Saleh Zadeh, H., Risk perception, safety attitude and safety performance in supervisors of construction sites in Shiraz. *Journal of Ergonomics* 2013; 1(2):10-18.
- 11-The Ministry of Cooperatives, Labour and Social Welfare. General Department of Labour Inspection. <http://bazresikar.mcls.gov.ir/fa/news/41684> (Persian).
- 12-Dorman Peter, Tree preliminary papers on the economics of occupational safety and health, ILO, www.ILO/public/english/protection/safework/papers, April 2000, pp:10-12.
- 13-Grandner, D., Barriers to the implementation of management systems: lessons from the past. *Quality assurance*. 2000; 8:3–10.
- 14-Reason, J., *Managing the risks of organizational accidents*, Aldersho; 1997.
- 15- Sobhani, H. *Labor Economics*, Tehran. The Publishing SAMT 1372; Page: 86-99(Persian).
- 16-Mohammadfam, I., Zokaei, H.R., Simaee, N. Epidemiological evaluation of fatal occupational accidents and estimation of related human costs in Tehran. *J Zahedan Univ. Med. Science* 2006; 4 :299-307(Persian).
- 17-Jorgensen, K., *One taxonomy for occupational accidents. A systematic description of causal relation*. DTU; 2002

- 18- Publication No. 447 "Safety management development workshops". Deputy Strategic, technical and operational system office, 2009
- 19- Ghaderi Fatemeh (2011), Safety of building sites, strengths, challenges and needs. "Tehran Second National Conference on Building Safety, Civil House, pp. 1-10
- 20- Ruhi Pejman (2010), Health, Safety and the Environment, train and equip manpower contractors Gas Company, winter, manpower training and equipping the National Iranian Gas Company, pp. 6-20.
- 21-Maloney, W. F., Federal, M. O., Organizational Culture in Engineering Construction Organizations, Source Document No. 52, Construction Industry Institute, Austin, Tex, 1990.
- 22-Advisory Committee on The Safety of Nuclear Installations (ACSNI) Report: Organizing for Safety, Stusy Group on Human Factors, Health and Executives, UK, 1993.
- 23-Bureau of Labor Statistics (BLS). National census of fatal occupational injuries in 2013 (preliminary results). [Www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)
- 24-Grote, G., Kunzler, C., Diagnosis of Safety Culture in Safety Management Dits, Safety Science, 2000, P 131- 150.

References

- Beard A. N. (2009). Fire Safety in Tunnels. *Fire Safety Journal*. 44(2): 276-8.
- Cheah, C. Y. J. (2007). Construction Safety and Health Factors at the Industry Level: The Case of Singapore. *Journal of Construction in Developing Countries*. 12(2).
- Gardner, D. (2000). Barriers to The Implementation of Management Systems: Lessons from The Past. *Quality Assurance*. 8(1): 3–10.
- Ghaderi, Fatemeh (2011). Safety of Building Sites, Strengths, Challenges and Needs. Tehran Second National Conference on Building Safety, Civil House, pp. 1-10
- Grote, G. & Kunzler, C. (2000). Diagnosis of Safety Culture in Safety Management Audits, *Safety Science*, 34, pp. 131-150.

Jahangiri, M., Sareban Zadeh, K. & Saleh Zadeh, H. (2013). Risk Perception, Safety Attitude and Safety Performance in Supervisors of Construction Sites in Shiraz. *Journal of Ergonomics*. 1(2):10-18.

Ji, J., Zhong, W., Li, K. Y., Shen, X. B, Zhang, Y., Huo, R. (2011). A Simplified Calculation Method on Maximum Smoke Temperature Under the Ceiling in Subway Station Fires. *Tunnelling and Underground Space Technology*. 26 (3): 490-6. <http://dx.doi.org/10.1016/j.tust.2011.02.001>

Jorgensen, K. (2002). *One Taxonomy for Occupational Accidents. A Systematic Description of Causal Relations*. DTU.

Maloney, W. F., Federal, M. O. (1990). *Organizational Culture in Engineering and Construction Organizations*, Source Document No. 52, Construction Industry Institute, Austin, Texas.

Mohammadfam, I., Zokaei, H. R. & Simaee, N. (2006). Epidemiological evaluation of fatal occupational accidents and estimation of related human costs in Tehran. *Zahedan Journal of Research in Medical Sciences*. 8(4): 299-307 (Persian).

Raouf, B. (1994). *System Assessment: A quantitative Approach*. London: Lewis Publishers.

Reason, J. (1997). *Managing the Risks of Organizational Accidents*. Aldershot: Ashgate Publishing Limited.

Snashall, D. (2005). Occupational Health in The Construction Industry. *Scandinavian Journal of Work, Environment and Health*. 31:5–10

Sobhani, H. (1372) *Labor Economics*, Tehran. SAMT publishing. (Persian).

Waehrer, G. M., Dong, X. S., Miller, T., Haile, E. & Men, Y. (2007). Costs of occupational injuries in construction in the United States. *Accident Analysis & Prevention*. 39(6): 1258-1266. <http://dx.doi.org/10.1016/j.aap.2007.03.012>