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Developing techniques for cause-responsibility analysis of occupational accidents

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ABSTRACT

The aim of this study was to specify the causes of occupational accidents, determine social responsibility and the role of groups involved in work-related accidents. This study develops occupational accidents causes tree, occupational accidents responsibility tree, and occupational accidents component-responsibility analysis worksheet; based on these methods, it develops cause-responsibility analysis (CRA) techniques, and for testing them, analyzes 100 fatal/disabling occupational accidents in the construction setting that were randomly selected from all the work-related accidents in Tehran, Iran, over a 5-year period (2010–2014). The main result of this study involves two techniques for CRA: occupational accidents tree analysis (OATA) and occupational accidents components analysis (OACA), used in parallel for determination of responsible groups and responsibilities rate. From the results, we find that the management group of construction projects has 74.65% responsibility of work-related accidents. The developed techniques are purposeful for occupational accidents investigation/analysis, especially for the determination of detailed list of tasks, responsibilities, and their rates. Therefore, it is useful for preventing work-related accidents by focusing on the responsible group's duties.

1. Introduction

Occupational accidents are a substantial expense to the society and individual companies. This loss could be avoided by preventing such accidents from happening (Rikhardsson, 2004). Corporate social responsibility is a very important factor for accident prevention. Accidents/incidents are occurrences that result in loss of production, illness or injury, damage to equipment or property, and near misses (Reese and Edison, 2006). Accidents occur every day in construction sites (Yoon et al., 2013). The construction industry is a very hazardous industry and is plagued by occupational risky situations and poor working conditions in which fatal and nonfatal occupational injuries occur most frequently due to its unique nature (Pinto et al., 2011). Iran is one of the most earthquake-prone countries. For this reason, construction and reconstruction of old buildings to retrofit them against earthquakes is increasing every day. This increases the construction activities and so accidents have increased in recent years in Iran. According to work-related accidents statistics of Iranian Social Security Organization in 2013, construction activities – with 26.69% work-related accidents – have the highest accident among all economic activities (Arji, 2013). To prevent fatal and injury accidents on construction sites, various existing researches have been carried out to identify and analyze the causes of safety hazards and risks from an integral perspective of accidents (Cheng et al., 2010; Aneziris et al., 2010; Yang et al., 2012). Environmental-, safety-, and health-management systems have also been reviewed in some papers. Yoon et al. (2013) assessed the effect of occupational health- and safety-management system on work-related accident rate and differences of occupational health- and safety-management system awareness between managers in South Korea's construction industry. Wachter and Yorio (2014) did an empirical and theoretical investigation on the system of safety-management practices and worker engagement for reducing and preventing accidents. Hallin and Gustavsson (2009) took an analytical approach to corporate social responsibility (CSR) by discussing the overlap between CSR and human resource management (HRM). Wu et al. (2013) developed an integrated information management model for proactive prevention of struck-by-falling-object accidents on construction sites. Celma et al. (2014) examined the scope, types, and degree of corporate social responsibility practices currently employed in HRM in Spain, and its determinants. The results show that practices in corporate social responsibility that are currently applied are grouped more according to the type than according to the degree of responsibility.

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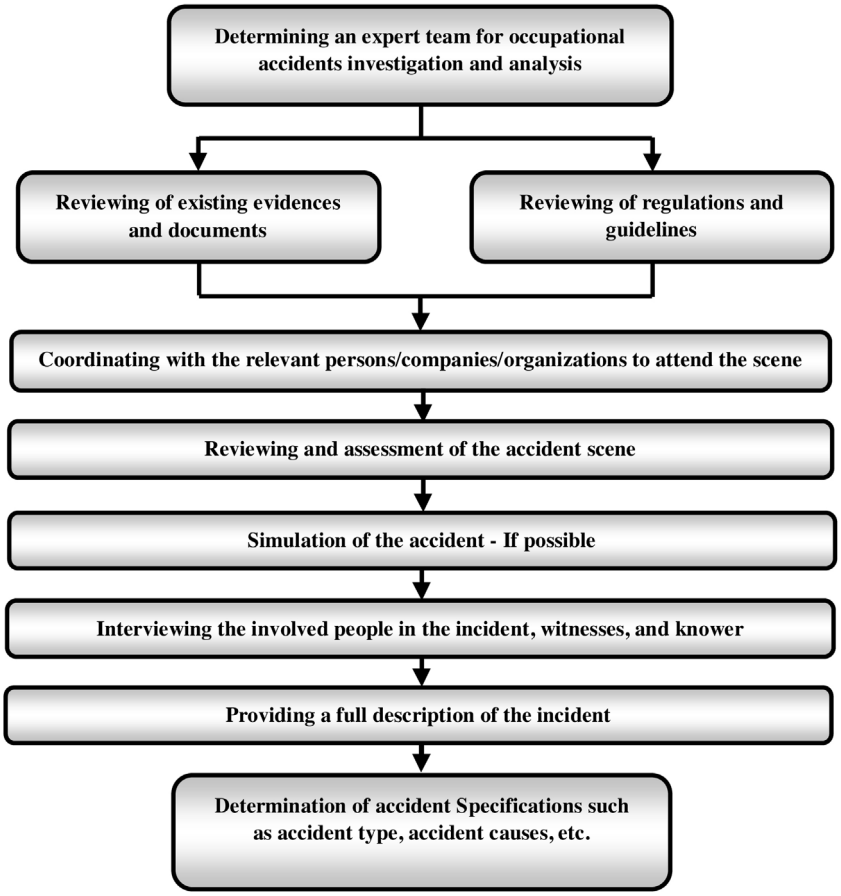

Fig. 1. General investigation and analysis of occupational accidents.

Wu et al. (2013) developed an integrated information management model for proactive prevention of struck-by-falling-object accidents on construction sites. Resources survey reflects the fact that fewer studies have been done to determine the responsibility and accountability of individuals in the accidents. The majority of contractors on construction sites are subcontractors who have been hired by other entities such as prime contractors, owners, architects, and engineers or construction managers. Subcontractors are often held accountable for the safety of their companies and employees, while the individual who hired them is protected from third-party litigation. Thus, there is no shared accountability for safety and health on the jobsite. Recently, this has begun to change and prime contractors, owners, and managers have been forced to share accountability and responsibility (Reese and Eidson, 2006). According to the existing rules and regulations and opinions of experts in Iran, each individual involved in the occupational accidents, according to his/her role in causing the incident should be held accountable in work-related accidents. Employers are motivated to implement safety regulations by many factors. These may be social, fiscal, and legal obligations (OR-OSHA, 2015). In the study, legal obligation and responsibility/accountability of the involved persons/companies/organizations were used for developing cause-responsibility analysis (CRA) techniques by determining accident causes and the role of the involved groups in the construction projects.

2. Materials and methods

Occupational accidents investigation and analysis were done in two sections as follows:

2.1. General investigation

According to the employer's and contractor's role in the prevention of work-related accidents in construction sites, 100 occupational accidents were investigated and analyzed. These accidents were randomly selected from the accidents resulting in death or disabling injuries in Tehran, Iran, over a 5-year period (2010–2014). For this reason, at first, for each incident, a group of accident investigation team from official experts of work-related accidents was formed. Most teams consist of three or five members selected from 40 people of Iranian work-related accident investigation and analysis official experts group. Then, all the documents and records about accidents were collected and full description of accidents was provided. On the other hand, determination of accident type and accident causes was done (see Fig. 1). Full description of this section is as follows:

2.1.1. Description of accident

In the first stage of accident investigation, all the documents from police records and construction accident reports were collected. Then, reviewing of documents and regulation about the accident, visiting the accident sites, hearing statements of the informed people and witnesses of all accidents, and discussing with the owner, contractor, subcontractors, relevant organizations, and families of deceased or injured personals and other involved people in the incident was done.

2.1.2. Determination of accident causes

Accident causes were determined based on the classification including direct causes, indirect causes (unsafe acts and unsafe