Use of Checklist Method for Evaluation of HSE Performance of Tehran Municipality Contractors: Case Study of Contractors

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Abstract

Background: The purpose of this study was to evaluate and compare the performance of health, safety and environmental management of civil, traffic and urban services contractors in the 18th district of Tehran municipality in 2015-2016.

Methods: This is an applied, longitudinal, descriptive-comparative study. The statistical population of this study was construction contractors, urban services and traffic in the municipality of district 18 of Tehran in the years 2015-2016. from 52 contractors, 18 construction contractors, 21 utilities contractors and 13 traffic contractors, respectively, were selected using census method. the research instrument consisted of periodic direct observation and completion of the HSE standard checklist by researchers. Data were analyzed using Kruskal-Wallis nonparametric test by SPSS software.

Results: The HSE performance of all contractors (civil, utilities and traffic) was acceptable and the results of Kruskal-Wallis test showed that the HSE performance of contractors at the second visit of 2015 and the first visit of 2016 was significantly different in favor of civil contractors (p <۰/۰۱), but there was no significant difference between the first and third visits of 2015 and the second and third visits of 2016 (p> 0.05). visits in six periods indicate HSE Civil Contractors status increased from 100% unfavorable to 88.88% acceptable level and 11.11% good level, and in the case of civil service contractors who initially had 95.23% in an unfavorable situation and 4.76% in a favorable situation achieved 100% acceptable performance, and finally, the traffic contractors, who were 100% unfavorable, were upgraded to 100% acceptable.

Conclusion: According to the findings of the study, it seems that the supervision of municipality inspectors on HSE performance of contractors can be effective in improving and strengthening the commitment to HSE requirements, therefore, it is suggested that periodical visits be made to the municipal contractors.

Keywords: Health, Safety and Environment Management, HSE, Performance Evaluation, Checklist, Contractors.

Introduction

317 million work-related accidents occur annually, resulting in long absences from work. importantly, more than 2.3 million people die annually as a result of these accidents and work-related illnesses. thus, 4% of GDP in each country is spent on offsetting the costs of accidents and occupational diseases. Various studies have shown that unsafe behaviors are the main cause of work-related accidents, so that in different studies the direct relationship between the incidence of unsafe behaviors and the incidents has been emphasized [1-5]. in recent years, due to incorrect selection of contractors in urban projects, we have witnessed a loss of financial resources in Iran. Determining the right and proper criteria and then selecting the right contractor from among the approved contractors can be one of the solutions available to solve such problems. such decisions are often complex and many quantitative and qualitative factors can be used for evaluation. Failure to pay attention to this causes the project to be implemented in a longer time, lower quality and higher cost (due to depreciation and capitalization costs and losses due to incompleteness and timely delivery of the project), thereby losing the economic justification of the projects [6-9]. today, many companies, large and small, such as oil, gas and petrochemicals, have come to the conclusion that prevention of injury and accident of health, safety and environment requires the establishment of an integrated health, safety and environmental management and HSE-MS system [10-12]. implementation of urban and civil projects to create suitable infrastructure in the city is one of the most important urban management activities in the direction of urban development. these projects are great sensitivity and importance because of their close engagement with society and people in terms of safety, health and the environment, therefore, addressing issues in urban projects in a systematic and controlled manner is demands of Tehran's top management to reduce the adverse consequences of life, financial and environmental development activities. the Municipality of Tehran, in line with its organizational mission, keep up with the developed cities of the world, towards achieving sustainable urban development and towards realizing the twenty-year vision document of the Islamic Republic of Iran in 1404 AH, has been in sync with the developed cities of the world as the first body responsible for the introduction of HSE in the field of urban management at the national level. according to the municipality of Tehran, it has designed the urban HSE management system based on successful HSE urban management models such as the Abu Dhabi ten-element model, eight Elementary Model of Alberta Municipal HSE Management, and different models from the US, Sweden and Canada, as well as HSE management models of large companies and organizations such as the World Oil and Gas Producers Association model and the HSE model of main office of the Ministry of Oil of the Islamic Republic of Iran and localized it based on the type of activities and services of the Tehran municipality. Gholami et al. (2013) examined the performance of HSE contractors based on key indicators in the petrochemical industry and examined 14 petrochemical companies, their findings showed that all of the criteria in question related to the HSE management performance index are implemented by the contracting companies in more than 70% of cases, also, the performance status of HSE management has been acceptable, good and desirable in about 90% of all contracting companies. the results showed that there was no significant difference between the performance of companies in different indices as well as between the performance of different companies in the set of indices [13, 14]. Michael and Leonard (2013) explor the impacts and challenges of implementing safety, health and environment management system in Marvandra municipality, and suggest that effective measures have been

taken to establish a Marvandra municipality safety, health and environmental management system, but there is still no mental contract between the worker, the contractor and the employer, and the workers have not become accustomed to creating a contracting system, due to the unacceptability of the contractors among the workers and with the establishment of the HSE, the level of accidents is still high, these include: human error, inappropriate working conditions and failure to wear protective clothing, therefore, laws and safety, health and environment management systems must be implemented at all municipal levels, and the overall solution for making the HSE system and contractor acceptable is to have inspectors monitor the performance of the system and individuals. [15]. Kordi and Heidari Bijar (2015), using Balanced Score Card (BSC) and Fuzzy Hierarchical Hierarchy Process (AHP) to evaluate the performance of Tehran municipal construction contractors in Baghershahr, the main purpose of this research was to identify and evaluate the performance of construction companies in the municipality of Baghershahr using the Balanced Scorecard in six dimensions (finance, stakeholders, internal processes, training and development, employee satisfaction, environment, and Community) as well as fuzzy hierarchical analysis method was used to weight and rank the contractors, the statistical population of this study consisted of 100 urban managers and specialists of Baghershahr. Cochran statistical method was used for analysis, the results of this study showed that it is possible to have a comprehensive attitude toward recognizing performance indicators of construction companies in Tehran Municipality. it also provided regular and structured suggestions for rating these construction companies and their performance according to the indices studied and greatly assisted in selecting the appropriate contractors [16]. The US Occupational Safety and Health Administration, by providing OSHA 1910.119, integrates two methods of "checklist" and "what if", and accepted it as one of the methods of safety analysis. District 18 of Tehran is the third largest and the 11th most populated area of Tehran in terms of population, and considering the 7 areas and the multitude of contractors at the regional level relative to other areas, it was decided to evaluate the active contractors at the regional level using a checklist designed by the HSE system, Tehran Municipality.

Figure 1 - Airspace of Tehran District 18

Given the importance of Tehran's 18th district, the following outlines the duties and actions of civil, utilities and traffic contractors.

1) Activities of Deputy Technical and Civil Contractors:

Technical and Civil Department is one of the most important and largest departments of each district of Tehran Municipality which has some policies and implementation plans implemented by its deputy contractors throughout the city, such as:

- Completing and expediting the implementation of past unfinished projects at the regional level.
- Modernization and optimization of the fleet of asphalt operations, sidewalks, leveling of urban roads.
- Expansion of roads and highways and the construction of bridges and intersections.

2) Activities of Deputy Technical and Traffic Contractors:

This department has implemented several projects for the purpose of safety and standardization of roads and highways of Tehran, upgrading of smart systems and utilization of new technologies in transportation and traffic management, management, organization and control of vehicles as well as traffic control in downtown, such as:

- Installation and maintenance of safety signs and equipment.
- Lining the roads and highways.
- Manufacture, installation and maintenance of identification boards and route signs.
- Operation and maintenance of sidewalks and park management.
- Issuance of traffic planning permits and utilization of flat and floor parking and ...

3) Activities of the Department of Public Services

Activities of contractors of this department such as:

- Creation and development of green space, maintenance of green space and parks in the area.
- Cleaning and garbage collection, waste separation plan,disposal of disturbed animals, maintenance and dredging of cattle and ...

In view of the above, the main purpose of this study was to investigate the following:

1) Two-year performance evaluation (٢٠١٥ and ٢٠١٦ years) of Safety, Health and Environmental Management of Contractors (Civil, Urban and Traffic Services) of District 18 of Tehran.
2) Comparison of two-year performance (٢٠١٥ and ٢٠١٦ years) of safety, health and environmental management of contractors (Civil, Urban and Traffic Services) of District 18 of Tehran.

Methods

This study was conducted in 2016, and is an applied, longitudinal and descriptive-comparative study. In this study, due to the number of active contractors in district 18 of Tehran municipality each year, three inspection periods (a: planning and preparation, b: inspection, c: reporting, registration and follow-up) were conducted. and within the interval of visits the nonconformities were communicated to the respective deputy of the contractor, so that the contractors would, as soon as possible, take action to rectify the recorded nonconformities. The statistical population of the present study included all civil, urban services and active traffic contractors in the 18th district of Tehran during the years 2015-2016, out of 52 active contractors, 18 civil contractors, 21 civil service contractors and 13 traffic contractors. The present study was a direct observation and general standard checklist of HSE management performance assessment, designed by health, safety and environmental experts in HSE system of Tehran municipality and based on this, the activity of contractors was evaluated and analyzed. This checklist is 30 items. (18 safety items, 7 health items, 4 environmental items and 1 educational item are listed). In each checklists item, they are rated 0 to 3 and classified into four categories: safety, health, environment and education, that the sum of the scores reflects the HSE performance of the contractors. (Low score indicates undesirable status and higher score indicates favorable status.). Descriptive statistics including graphs and tables were used to describe the quantitative information from the checklist and in the analytical statistics section, Kruskal-Wallis non-parametric test was used to test general and partial hypotheses. All statistical analyzes were performed using SPSS 20 software.

Results

As the results of the Kruskal-Wallis test are presented in Table 1, it can be observed that at the second visit of 2015, the significant value is Sig = 0.007 and $p < 0.01$, therefore, with a probability of 0.99, it can be stated that there is a significant difference between civil, traffic and services contractors. and civil contractors had better HSE performance than the other two groups. Also, in the first visit of the year 2016 there was a significant value of Sig = 0.01 and $p < 0.05$, so with a probability of 0.95 it can be said that there is a significant difference between HSE performance of civil, service and traffic contractors, so that civil contractors performed better overall than other contractors. As can be seen, there was no significant difference between the contractors in the first and third visits of 2015 and the second and third visits in 2016.

Charts 1 to 6 show the contractors' HSE performance trends, respectively.

Table 1 - Kruskal-Wallis test results

Inspections	Chi-Square	DF	Sig
First Inspection of 2015	3.789	2	0.150
Second Inspection of 2015	9.864	2	0.007
Third Inspection of 2015	5.472	2	0.065
First Inspection of 2016	9.184	2	0.010
Second Inspection of 2016	3.064	2	0.216
Third Inspection of 2016	4.924	2	0.085

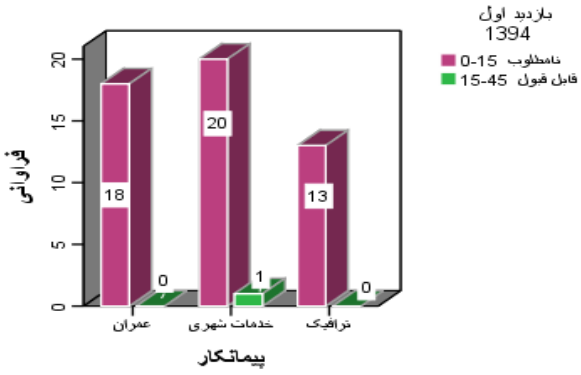

Figure 1: First Inspection of 2015

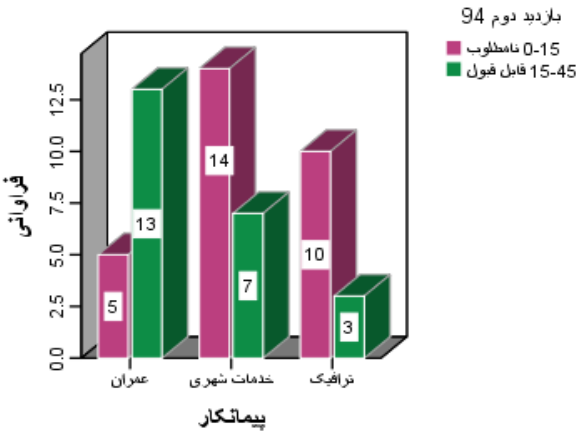

Figure 2: Second Inspection of 2015

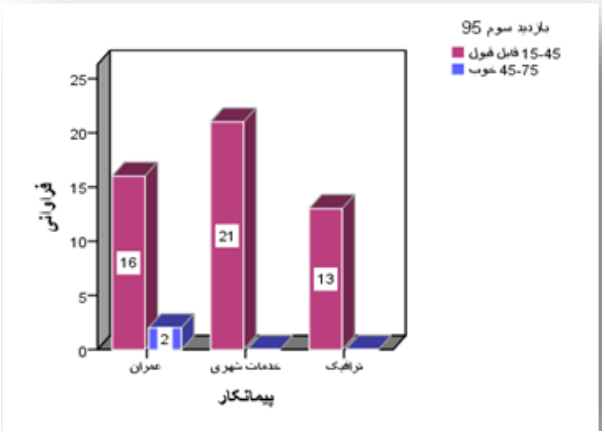

Figure 3: Third Inspection of 2015

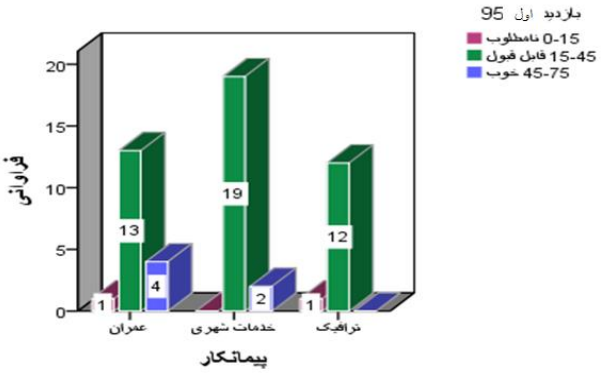

Figure 4: First Inspection of 2016

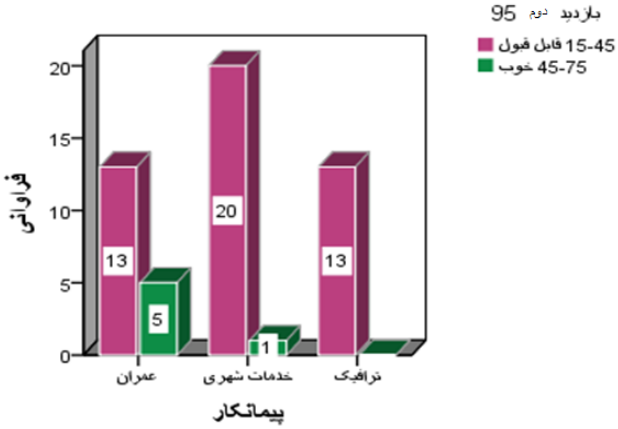

Figure 5: Second Inspection of 2016

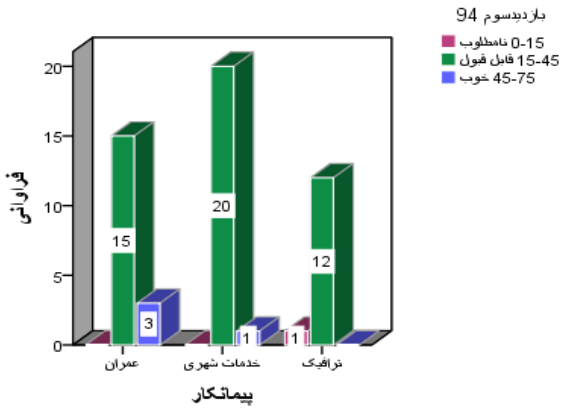

Figure 6: Third Inspection of 2016

It can be seen in Figure 1 that all three civil, traffic and service contractors were in poor condition at the first inspection of the year 2015 in terms of HSE performance. In the second inspection (Figure 2), out of 13 civil contractors (72.2%), 7 service contractors (33.33%) and 3 traffic contractors (23.08%) had acceptable performance, indicating that the time interval between Two contractor visits have put HSE-related issues on the agenda to reach an acceptable level. At the

third inspection of year 2015 (Figure 3) all three contractors had a significant increase in HSE performance and in addition a small percentage of civil and service contractors were at good HSE performance level, and overall, the HSE compliance of contractors has been positive in 94 years. If the performance was at its lowest level. In the first inspection of 2016 (Figure 4), in addition to the acceptable performance of civil, service and traffic contractors, 27.77% of civil contractors and 4.77% of services contractors performed well, in the second (Figure 5) and third (Figure 6) inspection, most contractors had acceptable performance and a small percentage had good HSE status.

So, over the two years the performance of the HSE contractors has been growing steadily, which continued steadily after an initial jump (second visit in 94), but at no point in time did any of the contractors of civil, service, and traffic get to their desired level, and no contractor scored above 75 on the checklist. This explains the establishment of the HSE management system in the contracting companies and the impact of periodic and continuous research supervision over two years.

Conclusion

In a similar study by Farshad et al. (2006), a case study of the positive impact of the HSE management system on improving the health, safety and environmental performance of organizations and sustainable development in an oil company during 2001-2003 revealed that despite increasing number of projects and working hours In the company, the implementation of the HSE system has improved health, safety and environmental performance indicators [17]. Ebrahimi et al. (2010) also mentioned in their research the systematic process of supervision, audit and management review in contractors' work projects. and suggested that to create a culture of safety, health and environment management system and to institutionalize it into a construction site called inspector or HSE inspectors in relevant institutions such as Ministry of Housing and Urban Development, Ministry of Labor, Ministry of Health, Engineering and Control Organization and especially municipalities with responsibility for monitoring the activities of contractors and consultants on a regular basis, filing relevant reports and issuing penalties if any non-compliance is observed, will be effective in establishing and implementing the HSE management system [18]. Shafaie et al. (2013) argue that the relatively favorable performance status of the contracted companies may be due to the establishment of the HSE management system as well as the degree of commitment of contractors to comply with HSE requirement [19]. In the present study, a comparison of the performance commitment of civil, service and traffic companies showed that civil society companies, with respect to sample size, meet a higher percentage of HSE requirements, this may be due to the HSE's concerted management and its importance in development projects to reduce occupational accidents. According to the results obtained, it can be concluded that periodic inspections of HSE units of affiliated companies can improve performance and commitment. So that regardless of the type of contracting company, the safety, health and environmental requirements must be met. Overall, although there are fluctuations in ratings in each area of expertise, it can be stated that the structure and culture of the HSE is still in transition, and as shown in this study, periodic audit and overhead system monitoring can be important in accelerating this deployment.

Limitations

- Lack of control over one's mental state when completing a checklist.
- Non-control of interaction variables such as visitor orientation.
- Inequality of sample size of civil, service and traffic contractors.
- Practical restrictions, including non-cooperation and coordination of contractors, at sometimes.

Suggestions

- Establishment of HSE management unit in contracting companies.
- Establishment of an inspector-supervisor on the HSE management units of contractors in the municipality.
- The need for a system of encouragement, greater participation of people and continuous training of staff should be given greater attention by contractor authorities.
- Increase the content validity of the checklist with the requirements of HSE urban and traffic services contractors.
- Conduct periodic inspections to check contractors' HSE status.
- Develop and encourage stakeholders in the prevention of work-related accidents, in particular the employer and the worker.
- Practical and realistic research and prioritizing safe work.
- Authorities restriction from request unsafe work to expedite completion of projects.
- Simplify general and specialized safety guidelines.

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