Dokuz Eylül Üniversitesi Mühendislik Fakültesi Fen ve Mühendislik Dergisi
Dokuz Eylul University Faculty of Engineering Journal of Science and Engineering

Basılı/Printed ISSN: 1302-9304. Elektronik/Online ISSN: 2547-958X

Comprehensive analysis of OSH practices from perspectives of Turkish construction stakeholders

Türk inşaat paydaşları perspektifinden İSG uygulamalarının kapsamlı analizi

Savaş Bayram [1*], Ahmet Özbayrak [2]

[1] Erciyes Üniversitesi, Mühendislik Fakültesi, İnşaat Mühendisliği Bölümü, Kayseri, TÜRKİYE
[2] Erciyes Üniversitesi, Mühendislik Fakültesi, İnşaat Mühendisliği Bölümü, Kayseri, TÜRKİYE
*Sorumlu Yazar / Corresponding Author **: sbayram@erciyes.edu.tr

Geliş Tarihi / Received: 02.08.2019 *Araştırma Makalesi/Research Article*
Kabul Tarihi / Accepted: 10.01.2020 *DOI:10.21205/deufmd.2020226621*
Atıf şekli/ How to cite : BAYRAM, S., OZBAYRAK, A., (2020). Comprehensive analysis of OSH practices from perspectives of Turkish construction stakeholders. DEUFMD 22(66), 875-885.

Abstract

Theoretical improvements related to occupational safety and health (OSH) concept is observed in Turkey as a developing country in recent years. However, fatal occupational accidents are increasing in the Turkish construction sector as well as the other industries. Correspondingly this study purposes to investigate the evolution of the OSH practices from different viewpoints by stakeholders in the Turkish construction sector. A survey study was conducted to a total of 400 respondents as; chief technical officers (CTOs), employers, OSH experts, site guards and workers. The survey study consists of five sections, including; (1) demographic properties of the participants, (2) safety equipment and occupational accidents, (3) employee health, education and awareness, (4) OSH practices, and (5) working conditions of the construction sector, environmental conscience and sustainability. The results indicate that despite the conceptual improvement, there are serious perceptual differences among stakeholders; particularly between the OSH experts and the CTOs/workers. The education level is also observed as a non-determinant factor in terms of safety equipment used in the Turkish construction sector.

Keywords: *Construction sector, Evolution, OSH, Stakeholders, Turkey, Worksite*

Öz

Gelişmekte olan ülkeler arasındaki Türkiye'de, son yıllarda iş sağlığı ve güvenliği (İSG) kavramı ile ilgili yasal iyileştirmeler gözlenmektedir. Buna rağmen ölümcül iş kazaları, diğer sektörlerde olduğu gibi Türk inşaat sektöründe de artmaktadır. Buna bağlı olarak, bu çalışma, İSG uygulamalarının Türk inşaat sektöründeki paydaşların farklı bakış açıları ele alınarak gelişimini araştırmayı amaçlamaktadır. Bu kapsamda; şantiye şefleri, işverenler, İSG uzmanları, güvenlik görevlileri ve işçiler olmak üzere toplam 400 katılımcıya anket çalışması yapılmıştır. Anket çalışması; (1) katılımcıların demografik özellikleri, (2) güvenlik ekipmanı ve iş kazaları, (3) çalışan sağlığı, eğitimi ve farkındalığı, (4) İSG uygulamaları ve (5) inşaat sektörünün çalışma koşulları, çevre bilinci ve sürdürülebilirlik, olmak üzere beş ana bölümden oluşmaktadır. Sonuçlar, yasal iyileştirmelere rağmen, paydaşlar arasında; özellikle İSG uzmanları ile şantiye şefleri/işçiler arasında ciddi algısal farklılıkların olduğunu göstermektedir. Bunun yanısıra, eğitim düzeyi de Türk inşaat sektöründe kullanılan güvenlik ekipmanları açısından belirleyici olmayan bir faktör olarak gözlenmiştir.

Anahtar Kelimeler: *İnşaat sektörü, Gelişim, İSG, Paydaşlar, Türkiye, Şantiye*

1. Introduction

In developing countries, the construction industry is naturally riskier than the other sectors due to the requirement for unskilled employment as well as intensive labor force [1]. The share of the construction sector in the gross domestic product (GDP) in Turkey, as a developing country, reaches 30 percent [2]. According to the current Turkish Social Security Institution (SSI), (2016) statistics, 1,252 insured workers, the result of an occupational accident or occupational disease, died in Turkey in 2015 [3]. In 2016, the number reached 1,405 and corresponds to a 12% increase. The construction sector is ranked first among other sectors in terms of the serious consequences of occupational accidents [4]. In the Turkish construction sector, occupational accidents resulted in 473 deaths in 2015 [5]. In 2016, the number reached 496 and corresponds to a 5% increase [3]. Note that the real data is predicted as much more than these official data. These statistics indicate that although there is a theoretical improvement is observed in the Turkish legislation in recent years, there are no such corresponding improvement in the occupational safety and health (OSH) practices. Therefore, the OSH practices in Turkey should be deeply investigated. On the other hand, occupational accidents result administrative, legal and penal responsibilities for the employers. This means that the perspectives of legally responsible stakeholders working in the worksites are vital.

OSH practices have always been a research field that keeps updating. Especially the OSH practices became increasingly significant following the industrial revolution. The previous studies related to OSH can generally be classified as four main groups [1];

- Statistical data analysis,
- Field studies,
- Cause-oriented studies,
- Risk analysis.

Initially, the OSH-origin selected current studies in the developing countries were investigated. Then the studies related to current OSH practices in Turkey were investigated. Jabbari & Ghorbani (2016); have shown that "fall" is responsible for 57% of the total occupational accidents in the construction worksites in Iran [6]. Adeyemo & Smallwood (2017); conducted a survey study to the stakeholders of construction sector in Nigeria. It was found that OSH legislation for the Nigerian construction industry is limited and cannot influence the OSH performance in the construction industry [7]. Obolewicz & Dąbrowski (2018); purposed to identify the perception of OSH for the managers and the workers of the construction sites in Poland. It was found that both respondents' level of knowledge in legislation affects OSH perception significantly in small, medium and large companies [8]. Ahmed, Zeeshan Shaukat, Usman, Musarrat Nawaz, & Sajid Nazir (2018); aimed to determine the current status of OSH-related practices in Pakistani construction sector. A survey was conducted on a total of 3,577 workers from 316 construction sites. It was found that both the employers and the workers lack knowledge of OSH legislation and no related practices were observed at these construction sites [9]. Forcael, Risso, Álvarez, Gómez, & Orozco (2019) considered a sample consisted of workers from the Chilean AEC industry in order to determine the occupational hazard perceptions. Significant differences in the perceived risk, associated with; noise exposure, depending on the age of the workers were obtained [10].

Turkey, as a developing country, became a member of the International Labour Organisation (ILO) in 1932. Accordingly, in 2005, the "National Occupational Health and Safety Council" was established and the "National Occupational Health and Safety Policy Document (2006-2008)" was released. Presently there are two main legislations in Turkey. The "OSH Law", no. 6331 was released in 2012. Then the "Regulation of OSH in Construction Works" was released in 2013. The OSH-focused studies in the Turkish construction sector are generally based on the aforementioned statistical data analysis and cause-oriented studies. Dikmen, Akbıyıklı, Aytekin & Baradan (2017) purposed to make an integrated evaluation of "Labor Law", no. 4857 and "Building Inspection Law", no. 4708 in terms of OSH. It was stated that OSH is a matter that should be adopted by all the stakeholders in the construction sector [11]. Gürcanlı & Müngen (2013); analyzed 1,117 expert witness reports in terms of the causes of occupational accidents from all regions of Turkey. The first four causes were ranked as; falls, struck by thrown/falling objects, structural collapses, and electrocutions

[12]. Çavuş & Taçgın (2016); classified the most common occupational accident types in the construction sector and these were divided into subgroups. It was found that 61.7% of the occupational accidents occur in small-scale construction sites [4]. Baradan, Akboğa, Çetinkaya & Usmen (2016); performed data mining for occupational accidents in the construction works. A total of 185 construction accident cases were selected for univariate analysis and cross-tabulation. It was stated that although the accident statistics of SSI are lack of some of the categorical variables (accident source, environmental factor, human factor, vocational skills training, project type, project end-use, etc.), these variables should be evaluated with a different perspective [13].

This study purposes to investigate the working conditions related to OSH practices / occupational accidents in the Turkish construction sector. Unlike the previous studies as seen focused only on a specific occupational group(s), all the stakeholders in the construction worksites were considered and their perspectives were compared. A survey study was conducted to a total of 400 respondents as; chief technical officers (CTO), employers, OSH experts, site guards, and workers. The obtained results were described in the 3rd section of the paper.

2. Material and Method

Many scales are available in almost all phenomena in the sciences. The term 'scale' is broadly divided as comparative and non-comparative. With non-comparative scaling, respondents need to evaluate a single product, brand or incentive scheme [14]. Non-comparative scaling is also grouped as; single, multiple and continuous. The most commonly used multiple scaling techniques are; Likert scale, Semantic difference scale and Guttman scale [15]. Understanding the interpretation and the analysis of data derived from Likert scales is inevitable [16]. Besides, the Likert scale is a unique technique to provide the most understandable questions for respondents with different educational levels to rate the degree to which they agree or disagree with a statement. Likert scales need a minimum of two categories and a maximum of eight or nine [17, 18]. However, the typical Likert scale is a 5-point ordinal scale. For the questionnaire survey performed in this study, a 5-point Likert scale was used to obtain the perspectives of the respondents of the Turkish construction worksites to analyze the results. These ordinal scales measure levels of different types of questions from 1 = poor to 5 = excellent. The details related to the current study are provided in Table 1.

Table 1. Measurements scales and limit ranges of the survey sections [19]

Measurement Scale	1	2	3	4	5
Limit Range	1.00-1.80	1.81-2.60	2.61-3.40	3.41-4.20	4.21-5.00
Section 2: Safety equipment and occupational accidents	Totally Disagree	Disagree	Neutral	Agree	Totally Agree
Section 3: Employee health, education and awareness	Non Significant	Slightly Significant	Neutral	Significant	Extremely Significant
Section 4: OSH practices	Never Encountered	Slightly Encountered	Neutral	Encountered	Always Encountered
Section 5: Working conditions, environmental conscience and sustainability	Never Satisfied	Slightly Satisfied	Neutral	Satisfied	Always Satisfied

Based on the aforementioned limited OSH-focused practices in Turkey as statistical data analysis and cause-oriented, this study is purposed to perform comprehensive fieldwork. From a different point of view, the related OSH-focused field works generally considered only one respondent of the construction sector. However, this study focuses on various stakeholders of the Turkish construction sector; e.g. chief technical officers (CTO), employers, OSH experts, site guards, and workers. It is also aimed to identify the divergences of the occupational groups on this issue. The fieldwork of this study consists of a detailed OSH survey. The survey consists of five sections. The first section reflects the demographic properties of the participants. The second section demonstrates the ideas related to safety equipment and occupational accidents. The third section presents employee health, education, and awareness. The fourth section reveals the OSH practices. The fifth and the last section

investigate the working conditions of the construction sector as well as environmental conscience and sustainability. The last point is seen significant that there is no attempt to observe the environmental conscience of a construction worksite in Turkey in the previous studies.

Kayseri, the workspace of this study, is one of the metropolitans of the middle Anatolian region of Turkey hosting 1.5 million citizens. According to the data of the Turkish Employment Agency (İŞKUR); the number of registered 'men' working in the construction sector in Kayseri, Sivas and Yozgat region (TR72) is 25,865 [20]. The target population of the research is composed of these employees. The sample of the survey study consists of a total of 400 respondents, with 95% confidence limits and 4.86 percent error. The respondents are interviewed face-to-face method and actively working in the construction sector of the Kayseri region. Therefore, the sample consists of 1.55% of the target population. For many studies, sample sizes larger than 30 and less than 500 are considered appropriate [21].

The demographic properties of the respondents of this study, considered as section one, are listed below.

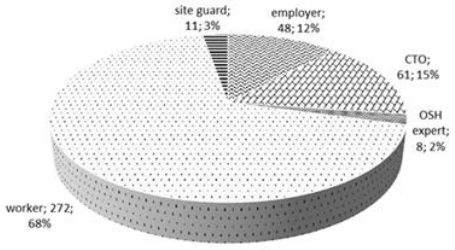

Figure 1. Job definitions of the sample

The sample of the survey study consists of five different occupations. This means that a wide range of occupations, actively working at the worksites from workers to employers have been considered. For this reason, the authors, to deeply investigate the problems of OSH practices in the construction worksites, opined that focusing only on a single profession (one of the most common deficiencies in previous studies) is not logical. The main reason why the minority is composed of OSH experts and site guards; the fact that the OSH experts are not working full-time at the construction sites and it is difficult to make a survey face-to-face. The majority of the site guards also avoided responding.

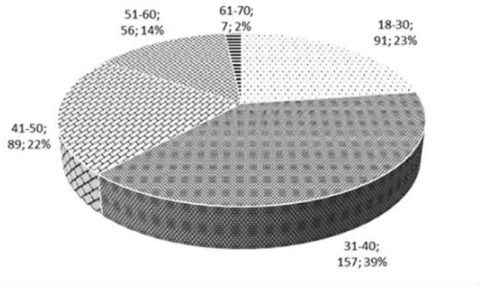

Figure 2. Age ranges of the sample

Basically, the most productive age range not only for work experience but also for a physical strength job is between 30 and 50 years. The majority of the sample, app. 61%, is between 31 and 50 years old, which indicates that the sample is compatible with its space. This means that the obtained results from the survey study should be consistent and reliable.

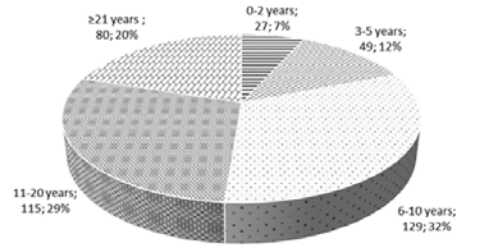

Figure 3. Work experience of the sample

The majority (61%) of the sample's work experience is between six and 20 years. These findings are consistent with the age ranges of the sample. The authors opined that the considered ages and work experiences logically reflect the target group and therefore the sample profile of this study is reliable.

3. Results and Discussions

The average values and the standard deviations(SDs) were calculated as the relative importance of these determinants which is shown in Tables 2 to 5 in this section.

The second section of the survey study following the demographic properties demonstrates the ideas related to safety equipment and occupational accidents. The third section presents employee health, education, and

awareness. The fourth section reveals the OSH practices. The fifth and the last section investigate the working conditions of the construction sector as well as environmental conscience and sustainability. The obtained results from these sections are presented below respectively.

Table 2. The results of the second section (Safety equipment and occupational accidents)

Number and Definition	Worker (n=272)		CTO (n=61)		Employer (n=48)		Site guard (n=11)		OSH expert (n=8)	
	x̄	SD	x̄	SD	x̄	SD	x̄	SD	x̄	SD
2.1. Safety equipment is used at the worksite.	3.44	1.16	3.85	1.19	3.79	1.22	3.64	1.12	3.50	1.31
2.2. There are safety signs at the worksite.	3.43	1.11	3.79	1.23	4.17	0.88	3.64	1.03	4.63	0.74
2.3. Safety signs are available at the required working areas.	3.40	1.12	4.11	0.95	4.35	0.67	3.64	0.67	4.38	0.74
2.4. The number of safety equipment at the worksite is sufficient.	2.88	1.11	2.97	1.14	4.13	0.94	4.09	0.70	4.13	0.83
2.5. Safety equipment of high quality is used at the worksite.	3.11	1.15	3.21	1.43	3.42	1.30	3.82	0.75	4.63	0.52
2.6. The most significant cause of fatal occupational accidents is not using safety equipment.	3.51	1.13	2.34	1.18	2.23	1.40	3.55	0.69	4.38	0.52
2.7. Even if all the safety precautions are taken at the worksite, occupational accidents cannot be prevented.	3.67	1.02	3.87	1.16	4.19	0.64	3.18	1.17	3.38	1.60
2.8. There is a first-aid officer for the probable occupational accidents at the worksite.	2.83	1.13	3.61	1.38	3.54	1.30	2.45	1.37	4.25	0.71
2.9. There is at least one first-aid officer for each 20 employees at the worksite.	2.71	1.17	3.00	1.49	2.56	1.24	2.18	1.25	4.00	1.07
2.10. There is a warning sign at the worksite related “safety belt usage”.	3.16	1.14	3.00	1.52	3.38	1.27	3.82	0.75	4.50	0.76
AVERAGE	3.21	1.13	3.38	1.27	3.58	1.09	3.40	0.95	4.18	0.88

Table 2 indicates the workers agree that even if all the safety precautions are taken at the worksite, occupational accidents cannot be prevented (definition 2.7). The SD of 1.02 obtained from the workers and 0.64 from the employers as the ‘minimum values’ indicate that these stakeholders generally agree with the definition 2.7. However, the remaining professions highly agree that the safety signs are present, available and sufficient at the worksite (definitions 2.2., 2.3 and 2.4). This contradiction shows that the workers are rather in the thought of predestinarianism. On the other hand, CTOs and employers disagree with safety equipment usage is not the most significant cause of occupational accidents, which opposed to the OSH experts (definition 2.6). However, the highest SD obtained from the employers as 1.40 indicates a clash of ideas whereas OSH experts are almost like-minded. The most complained topic according to the workers and the site guards is the nonpresence of the first aid officer at the worksite (definitions 2.8 and 2.9).

Another interesting finding is OSH experts do not agree with the workers for the mentioned predestinarianism. However, the highest SD obtained from the OSH experts as 1.60 indicates that the responses are non-homogeneously distributed. The graphical explanation of the arithmetic means for each question is provided in Figure 4.

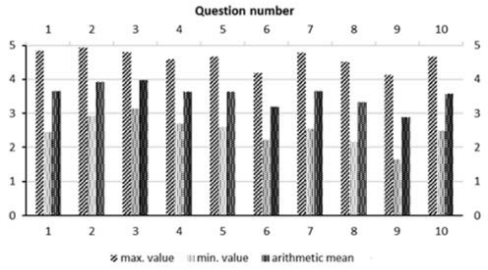

Figure 4. Arithmetic mean of each question in section 2 for all job definitions

The maximum value is obtained from ($\bar{x}$+SD) while the minimum value is obtained from ($\bar{x}$-SD). The maximum and the minimum deviations were obtained from the 9th and the 3rd questions respectively. These results coincide with the arithmetic means since the sample agrees with the safety signs that are available at the required working areas (definition 2.3) while disagrees with the presence of a first aid officer at the worksite (definition 2.9). The main reason of the maximum deviation obtained from the 9th question [($\bar{x}$+SD)-($\bar{x}$-SD)=2.49] seems like the dispute between the CTOs [($\bar{x}$+SD)-($\bar{x}$-SD)=2.99].

Table 3. The results of the third section (Employee health, education and awareness)

Number and Definition	Worker (n=272)		CTO (n=61)		Employer (n=48)		Site guard (n=11)		OSH expert (n=8)	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
3.1. The required equipment should always be readily available at the pre-determined location.	3.72	0.99	3.90	1.12	4.52	0.50	3.09	1.38	4.63	0.52
3.2. All employees should be aware of evacuation plan and emergency exit routes in case of an emergency.	4.10	0.84	4.34	0.75	4.02	1.02	3.64	0.67	4.13	1.36
3.3. Emergency plans must be prepared at all worksites.	4.11	0.85	4.48	0.59	2.90	1.42	3.73	0.79	4.00	1.31
3.4. Emergency assembly point must be predetermined at all worksites.	3.94	1.09	4.33	0.75	2.67	1.33	4.00	0.63	4.88	0.35
3.5. The availability of safety signs at the worksite is effective in reducing occupational accidents.	3.95	0.98	4.25	0.91	4.02	1.12	3.82	0.60	4.75	0.46
3.6. Employees at the worksite must have job training before starting work.	4.08	0.83	4.31	0.90	4.44	0.50	3.73	0.65	4.13	0.99
3.7. Employees at the worksite should experience periodic work trainings during their working life.	3.76	1.11	3.26	1.55	2.79	1.32	3.91	0.70	3.88	0.83
3.8. The check-ups of the employees at the worksite must regularly be done via employer.	3.83	1.06	4.23	0.67	2.67	1.43	3.45	0.93	4.25	1.04
3.9. Safety equipment usage limits the worksite employees' mobility.	4.09	0.99	4.36	0.68	4.10	0.93	3.36	1.29	2.88	0.83
3.10. At least one occupational physician should be available at all construction sites.	3.59	1.33	3.87	1.09	2.40	1.43	2.64	1.29	4.88	0.35
AVERAGE	3.92	1.01	4.13	0.90	3.45	1.10	3.54	0.89	4.24	0.80

Table 3 indicates that the preparation of the emergency plans at the worksites is extremely significant for the CTOs consistent with their SDs of 0.59 (definition 3.3). The employers, on the other hand, disagree and inconsistent (SD=1.42) for this definition. The predetermination of an emergency assembly point at the worksite, on the other hand, is regarded as crucial by the site guards and the OSH experts (definition 3.4). Employers highlight the requisite of the related equipment at the worksite independently from the other professions (definition 3.1). An unexpected finding of this section is; employers and site guards regard the occupational physicians at the worksites as unnecessary (definition 3.10). The workers regard this definition as 'significant' with the lowest arithmetic mean ($\bar{x}$=3.59) among all the questions.

However, the high SDs obtained from the workers (SD=1.33) and the employers (SD=1.43) indicate that these stakeholders are inconsistent with this definition. The definition 3.9 also indicates that the OSH experts stand for a firm position than the other stakeholders related to the limitation of safety equipment usage at the worksite. However, e.g. the CTO agrees that the safety equipment usage limits the mobility of the employees.

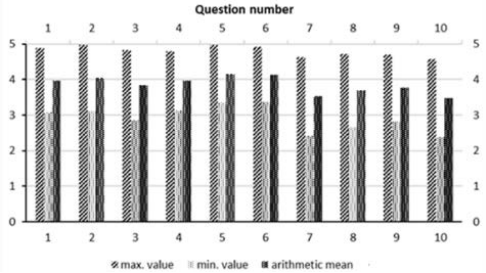

Figure 5. Arithmetic mean of each question in section 3 for all job definitions

Another interesting result is that although the workers and the CTOs agree with the awareness of all employees in case of an emergency, the SDs show that the workers are consistent, but the CTOs are inconsistent (definition 3.2). A graphical explanation of the arithmetic means is provided in Figure 5.

In general, the sample agrees with the availability of safety signs at the worksite is effective in reducing occupational accidents (Definition 3.5) while disagrees with at least one occupational physician should be available at all the construction sites (Definition 3.10). The maximum value is obtained from ($\bar{x}$+SD) while the minimum value is obtained from ($\bar{x}$-SD). The maximum deviation was obtained from the 7th question [($\bar{x}$+SD)-($\bar{x}$-SD)=2.20] and the minimum deviation was obtained from the 6th question [($\bar{x}$+SD)-($\bar{x}$-SD)=1.55] as the average of the stakeholders. It is surprising that although definitions 3.6 and 3.7 are based on similar topics; the responses indicate them as incompatible. The reason for the maximum deviation on the 7th question is the conflict of the ideas between the CTOs [($\bar{x}$+SD)-($\bar{x}$-SD)=3.10].

Table 4. The results of the fourth section (Occupational health and safety)

Number and Definition	Worker (n=272)		CTO (n=61)		Employer (n=48)		Site guard (n=11)		OSH expert (n=8)	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
4.1. Periodical maintenance of the equipment used at the worksite (elevator, etc.) is regularly done.	3.43	1.36	4.00	0.95	4.40	0.82	3.73	1.01	4.88	0.35
4.2. There is a sufficient number of OSH signs at the worksite.	2.91	1.16	3.11	1.20	3.75	1.04	3.18	1.40	4.75	0.46
4.3. Protective clothes, equipment and materials are provided for the worksite employees.	3.08	1.10	3.41	1.13	2.98	1.25	3.55	1.29	4.75	0.46
4.4. Worksite administration immediately solve security problems those arise during inspections.	3.26	1.07	3.82	1.13	4.29	0.58	3.36	1.43	4.00	0.93
4.5. Employees take care of each other's safety.	3.42	1.07	3.23	1.26	3.48	1.37	4.00	0.89	4.13	1.36
4.6. At the worksite the works are done practically and in the shortest time.	3.47	1.04	3.52	1.25	3.21	1.37	3.82	1.25	3.25	1.49
4.7. There is a full time OSH expert at the worksite.	2.96	1.26	3.10	1.30	2.50	1.38	3.36	1.29	3.88	0.99
4.8. OSH expert reports the shortcomings related OSH at the worksite to the Chief Technical Officer	2.95	1.20	3.16	1.47	3.06	1.45	2.73	1.01	4.38	0.52
4.9. Possible occupational accidents can previously be prevented in case of intervene in security	3.05	1.19	3.38	1.19	3.69	1.34	3.09	0.83	4.63	0.52
4.10. The careless behavior of the employees at the worksite are ignored.	3.47	1.09	3.82	1.01	3.52	1.32	3.36	0.92	2.75	1.28
AVERAGE	3.20	1.16	3.46	1.19	3.49	1.19	3.42	1.13	4.14	0.84

Table 4 shows that the highest arithmetic means for CTOs, employers and OSH experts belong to regular periodical maintenance of the equipment used at the worksite (definition 4.1). Also, the lowest SD is obtained from the CTOs (SD=0.95) and the OSH experts (SD=0.35) for this definition. Although the workers claim that they are 'encountered' regular periodical maintenance of the equipment used at the worksite, the highest SD=1.36 for the workers indicates that they are inconsistent (definition 4.1). Besides, the employers claim that they solve security problems during inspections, and this is consistent with the SD=0.58. However, the site guards seem 'neutral' and the problem is that the highest SD, 1.43 points a disagreement (definition 4.4). A contrast is although the workers 'encounter' the ignorance of the careless behavior at the worksite ($\bar{x}$=3.47) in definition 4.10; OSH experts rank this definition as the lowest ($\bar{x}$=2.75).

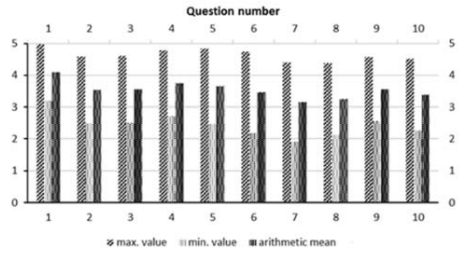

Figure 6. Arithmetic mean of each question in section 4 for all job definitions

In general, the sample disagrees with there is a full-time OSH expert at the worksite (definition 4.7) while agrees with the aforementioned definition 4.1. Indeed the minimum deviation was obtained from the 1st question [($\bar{x}$+SD)-($\bar{x}$-SD)=1.80] as the average of the stakeholders, which shows that the periodical maintenance of the equipment used at the worksite is regularly done. The maximum deviation, on the other hand, was obtained from the 6th question [($\bar{x}$+SD)-($\bar{x}$-SD)=2.56] as the average of the stakeholders, which is related to the works in practice at the worksite. The reason is the conflict of the ideas between the OSH experts [($\bar{x}$+SD)-($\bar{x}$-SD)=3.10].

Table 5. The results of the fifth section (Working conditions, environmental conscience, sustainability)

Number and Definition	Worker (n=272)		CTO (n=61)		Employer (n=48)		Site guard (n=11)		OSH expert (n=8)	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
5.1. Hygiene of the dormitory, showers and toilets (if any) at the worksite.	2.83	1.25	3.08	1.13	2.29	1.22	3.45	1.21	4.00	1.31
5.2. The mess hall at the worksite is sufficient for the needs and clean.	3.04	1.28	2.85	1.26	3.50	1.17	3.64	1.36	3.75	1.16
5.3. The possibility of meal based on to the average calorie requirement at the worksite is available.	2.80	1.18	2.93	1.22	3.75	0.96	3.64	1.21	3.38	1.69
5.4. Ensuring worksite safety 24 hours (Site guard etc).	3.03	1.14	2.98	1.20	4.13	0.67	3.18	1.33	4.00	0.93
5.5. There is a strong work motivation and sense of belonging at the worksite.	3.20	1.18	3.56	1.19	4.25	0.60	3.45	1.13	3.50	1.60
5.6. The worksite area is isolated from the adjacent regions.	3.10	1.19	3.00	1.17	2.67	1.40	3.36	0.92	4.25	0.71
5.7. Complaints such as dust and noise received via adjacent regions are prevented.	2.72	1.19	3.16	1.16	2.35	1.33	3.27	0.90	3.75	1.49
5.8. Waste materials are stored in a separate area from the worksite.	3.14	1.12	3.36	1.11	4.10	0.95	3.36	0.81	3.88	0.99
5.9. People are responsive to the losses of materials at the worksite.	3.19	1.17	3.08	1.29	2.60	1.36	3.45	1.04	3.88	0.64
5.10. Waste recycling arising from production is performed at the worksite.	2.91	1.13	3.44	1.30	3.50	1.03	3.18	1.25	3.63	1.30
AVERAGE	3.00	1.18	3.15	1.20	3.31	1.07	3.40	1.12	3.80	1.18

Table 5 shows one issue that the workers, CTOs and the employers rarely agree with is the presence of strong work motivation and a sense of belonging at the worksite. The responses, which observed around the arithmetic mean, support the idea (definition 5.5). OSH experts on the other hand 'always satisfied' with the isolation of the worksite area from the adjacent regions whereas the employers 'slightly satisfied' with this topic (definition 5.6). CTOs and the employers are mostly 'dissatisfied' from the cleanliness of the shared area (definitions 5.1 and 5.2) whereas the complaints from adjacent regions are mostly evaluated by the workers as a problem (definition 5.7). On the other hand, although the workers, CTOs and the site guards are 'neutral' related to the storage of the waste materials in a separate area from the worksite, they seem consistent with the smallest SDs. This indicates that the concept of waste management has not yet been realized by the stakeholders of the construction sector (definition 5.8).

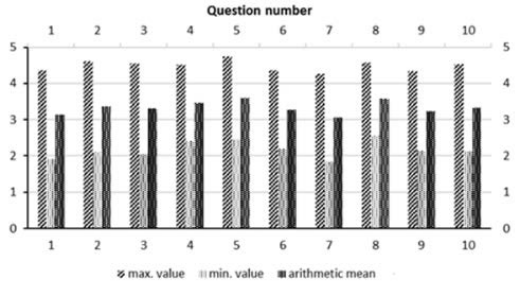

Figure 7. Arithmetic mean of each question in section 5 for all job definitions

In general, the sample is 'satisfied' with the storage of waste materials in a separate area from the worksite (definition 5.8) while 'dissatisfied' with the prevention of complaints such as dust and noise received via adjacent regions (definition 5.7). The maximum deviation, on the other hand, was obtained from the 3rd question [($\bar{x}$+SD)-($\bar{x}$-SD)=2.50] as the average of the stakeholders, which is related to the average calorie requirement at the worksite. The reason is the conflict of the ideas between the OSH experts [($\bar{x}$+SD)-($\bar{x}$-SD)=3.37]. Consequently, a brief summary of the respondents' responses in all sections is provided in Figure 8.

Figure 8. Trend of the arithmetic means of the sections for the stakeholders

In general, the stakeholders except workers opined in the measurement scale of '4' on average of all sections. However, the workers seem 'neutral' on the measurement scale of '3' on average. This can be interpreted as the workers, in general, have no idea (seems as a result of the educational level) and signs that the workers are not aware of their rights. The responses of the OSH experts, employers and site guards are rather consistent in all the sections. However, the CTOs and the workers seem inconsistent significantly in section 3 than the other sections, which is related to employee health, education and awareness. The fact is that the CTOs and the workers are actively taking part in the production (as the producers and the inspectors) at the worksites. Therefore, as the stakeholders who dominate the worksite conditions, they are more conscious. This can be the reason for their rigid and distinctive responses related to employee health, education and awareness in section 3 than the other sections. On the other hand, although OSH experts do not actively take part in the production, they do not consider the difficulties in practice and regard section 3 as 'extremely significant'.

4. Conclusions

The findings of this study indicate that different occupational groups can interpret the OSH concept and the practices differently. In general, OSH experts represent the most optimistic and self-confident profession among all the stakeholders; e.g. 'safety equipment and occupational accidents' topic in section 2 indicates that OSH experts conflict with the workers in terms of predestinarianism. The workers and the CTOs, as the employees actively take part in the production, generally agree with

the 'Employee health, education, and awareness' topic in section 3. Although the workers and the CTOs regard the occupational physicians at the worksites as necessary, employers and site guards are opposed. Similarly, although the workers and the CTOs agree that the safety equipment usage limits the mobility of the employees, the OSH experts are opposed. This means that the educated professions as the OSH experts and the CTOs diverge even in how to use safety equipment basically. In this case, the education level seems as a non-determinant factor in safety equipment usage. Another conflict between the workers and the OSH experts has been observed in the 'Occupational health and safety' topic in section 4. Although the workers experience the ignorance of the careless behavior at the worksite, OSH experts disagree. Another interesting finding has been obtained from 'Working conditions, environmental conscience, sustainability' topic in section 5. Namely, the employers are mostly dissatisfied with the cleanliness of the shared area whereas the OSH experts seem satisfied. These results indicate that despite the conceptual improvement of OSH in the Turkish construction sector, there are serious perceptual differences among stakeholders. The suggestions based on the obtained results to provide improvements in OSH practices are listed below:

- The conflicts of the OSH experts with the other stakeholders indicate that the vocational education of the OSH experts should be reconsidered.
- At least one OSH expert should be continuously employed to realize the working conditions as well as to inspect the safety behaviors at the worksites.
- There should be a team in the organizational hierarchy that can be employed as a subordinate of the OSH expert to implement the required safety measures.
- Sanctions for the non-compliant employees in terms of OSH should be deterrent. For this purpose, the sanctions should be defined in the "Regulation of OSH in Construction Works".
- The cause of the aforementioned disputes between the OSH experts and the CTOs/workers seems as non-ergonomic nature of the safety equipment materials. Therefore, a standard should be established in order to determine the sufficiency of the safety equipment.

Consequently, inspection by Governments is essential to prevent abuse in practice in developing countries. Building inspection started as an individual process in Turkey previously, has been evolved into a corporate identity in 2011 by the Government. Similarly, it is vital that the OSH issue should have a corporate inspection mechanism. The legal limitations, the penal sanctions, and the responsibilities should also be clearly determined by the legislation.

References

[1] Bayram, S. 2018. Şantiyelerde Yaşanan Güncel İş Kazaları, Çalışan Farkındalıkları ve Eğitim Seviyeleri Arasındaki İlişki, Çukurova University Journal of the Faculty of Engineering and Architecture, Cilt. 33, s. 241-252. https://doi.org/10.21605/cukurovaummfd.420738

[2] KPMG. 2018. Sektörel Bakış 2018 - İnşaat. https://assets.kpmg/content/dam/kpmg/tr/pdf/2018/01/sektorel-bakis-2018-insaat.pdf (Erişim Tarihi: 02.08.2019).

[3] Society of Occupational Health and Safety Professionals. 2016. Statistics. https://tuisag.com/2016-yili-is-kazasi-meslek-hastaliklari-istatistikleri (Erişim Tarihi: 02.08.2019).

[4] Çavuş, A., Taçgın, E. 2016. Türkiye'de İnşaat Sektöründeki İş Kazalarının Sınıflandırılarak Nedenlerinin İncelenmesi, Academic Platform Journal of Engineering and Science, Cilt. 4, s. 13-24. https://doi.org/10.21541/apjes.63338

[5] Society of Occupational Health and Safety Professionals. 2015. Statistics. Retrieved from https://tuisag.com/2015-yili-is-kazasi-meslek-hastaliklari-istatistikleri (Erişim Tarihi: 02.08.2019).

[6] Jabbari, M., Ghorbani, R. 2016. Developing Techniques for Cause-responsibility Analysis of Occupational Accidents, Accident Analysis and Prevention, cilt. 96, s. 101–107. https://doi.org/10.1016/j.aap.2016.07.039

[7] Adeyemo, O., Smallwood, J. 2017. Impact of Occupational Health and Safety Legislation on Performance Improvement in the Nigerian Construction Industry, Procedia Engineering, cilt. 196, s. 785–791. https://doi.org/10.1016/j.proeng.2017.08.008

[8] Obolewicz, J., Dąbrowski, A. 2018. An Application of the Pareto Method in Surveys to Diagnose Managers' and Workers' Perception of Occupational Safety and Health on Selected Polish Construction Sites, International Journal of Occupational Safety and Ergonomics, cilt. 24, s. 406–421. https://doi.org/10.1080/10803548.2017.1375781

[9] Ahmed, I., Zeeshan Shaukat, M., Usman, A., Musarrat Nawaz, M., Sajid Nazir, M. 2018. Occupational Health And Safety Issues in the Informal Economic Segment of Pakistan: A Survey of Construction Sites,

International Journal of Occupational Safety and Ergonomics, cilt. 24, s. 240–250. https://doi.org/10.1080/10803548.2017.1366145

[10] Forcael, E., Risso, L., Álvarez, P., Gómez, N., Orozco, F. 2019. Evaluation of the Occupational Hazard Perception of Building Construction Workers from a Psychometric Paradigm and Considering Sociodemographic Variables, Revista de La Construcción, cilt. 17, s. 436–456. https://doi.org/10.7764/RDLC.17.3.436

[11] Dikmen, S. Ü., Akbıyıklı, R., Aytekin, O., Baradan, S. 2017. İş ve Yapı Denetim Yasalarının İş Sağlığı ve Güvenliği Açısından Bütünleşik İncelenmesi, Eskişehir Osmangazi Üniversitesi Mühendislik Mimarlık Fakültesi Dergisi. Cilt. 24, s. 117-131.

[12] Gürcanli, G. E., Müngen, U. 2013. Analysis of Construction Accidents in Turkey and Responsible Parties, Industrial Health, cilt. 51, s. 581–59. https://doi.org/10.2486/indhealth.2012-0139

[13] Baradan, S., Akboğa, Ö., Çetinkaya, U., Usmen, M. A. 2016. Ege Bölgesindeki İnşaat İş Kazalarının Sıklık ve Çapraz Tablolama Analizleri, Teknik Dergi, Yazı 448, 7345-7370.

[14] Bhattacharyya, D. K. 2018. Statistical Tools and Analysis in Human Resources Management (1st ed.), IGI Global, PA, USA. https://doi.org/10.4018/978-1-5225-4947-5

[15] Padem, H., Göksu, A., Konaklı, Z. 2012. Araştırma Yöntemleri-SPSS Uygulamalı (1st ed.), IBU Publications, Sarajevo, Bosnia and Herzegovina.

[16] Sullivan, G. M., Artino, A. R. 2013. Analyzing and Interpreting Data From Likert-Type Scales, Journal of Graduate Medical Education, s. 541-542. https://doi.org/10.4300/JGME-5-4-18

[17] Neuman, W. L. 1997. Social Research Methods: Qualitative and Quantitative Approaches (3rd ed.), Allyn & Bacon, Boston, USA.

[18] Leedy, P. D., Ormrod, J. E. 2010. Practical Research: Planning and Design (11th ed.), Pearson, Boston, USA.

[19] Memnun, D., Hart, L. C., Akkaya, R. 2012. A Research on the Mathematical Problem Solving Beliefs of Mathematics, Science and Elementary Pre-Service Teachers in Turkey in terms of Different Variables, International Journal of Humanities and Social Science, Cilt. 2, s. 172-184.

[20] Türkiye İş Kurumu. 2017. İnşaat Sektörü Raporu. https://media.iskur.gov.tr/15166/insaat-sektoru-raporu.pdf (Erişim Tarihi: 20.11.2019).

[21] Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö.E., Karadeniz, Ş., Demirel, F. (2012). Bilimsel Araştırma Yöntemleri (11th ed.), Pegem Akademi, Ankara, Turkey.