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Umar T and Egbu C (2018)

Perceptions on safety climate: a case study in the Omani construction industry. *Proceedings of the Institution of Civil Engineering – Management, Procurement and Law*.

## Abstract

Generally, a mature safety climate and a rich safety culture contribute to achieving a safe workplace. The purpose of this paper is to examine the understanding of using safety climate and to make explicit some of the main elements that have a greater impact in the construction industry in Oman. Relevant safety climate factors from literature have been identified using specific search criteria, which resulted in 62 factors spanning over a period of 37 years from 1980 to 2017. The results of face-to-face interviews with construction professionals from chosen construction companies in Oman that show a high level of safety performance are also presented. The result shows that management commitment; alignment and integration of safety as a value; accountability across the board; supervisory management; empowerment and involvement of workers; improvement of communication; and training and education are some of the main elements that significantly affect safety climate in Oman. The common safety climate factors reported in this research are based on the views of selected interviewees working in the construction industry in Oman. It is suggested that these factors may be validated further considering views of other members of the construction team, before being used for safety climate assessment.

## 1. Introduction

The International Labour Organization data for the year 2015 reveals that every year, more than 100 000 workers die on construction sites due to different occupational safety and health (OS&H) conditions. This number is nearly 30% of all occupational deadly injuries. Different statistical data reveal that construction labourers in different developed countries are three to four times more likely to die from accidents on-site compared to workers in other industrial sectors. In the developing world, there is a higher risk (three to six times more) of death linked with construction work than in developed countries (ILO, 2015). Many construction workers suffer and die from work-related illness developed from prior influence of dangerous materials, such as asbestos and other chemicals. The construction industry is among the world's major industrial sectors; it includes subsectors such as building, civil engineering, demolition and maintenance. It is reported to make up a considerable percentage of the gross domestic product in different countries – for instance, 6-10% in the UK, 5-50% in Japan and 9-0% in Oman (NCSI, 2017; ONS, 2017; SHJ, 2017). Statistics published by the Oman Society of Contractors in 2016 show that the total number of residents working in this industry was 738 593 (OSC, 2016a). Current and planned development projects in various sectors in Oman, including construction, for the financial year 2015–2016 are shown in Figure 1. Projects in the construction sector stand out as having the largest value: US\$43.16 billion. According to the budget report, spending on development projects is estimated at US\$3.12 billion (1.2 billion OMR), representing the amount to be paid during the year 2017, as the actual work progresses (OB, 2017).

The construction industry is growing rapidly in different developing countries and is thus recognised as a main source of jobs to different labours (Duranton, 2015; Umar and Wamuziri, 2016a). However, at the same time, it is recognised as one of the risky industries. Construction workers' jobs may include a variety of tasks while they are working in different projects. These

projects may be related to building; repair and maintenance; renovation and demolition; transportation including construction of highways, bridges and airports; and projects related to docks and harbours. Construction workers are expected to be open to different types of risks during their work, such as dust and condensation, stiff working situation, handling heavy load, hot climatic conditions, working at heights, excessive noise, vibration and heavy machinery, and different chemicals. Different causes of accidents and illnesses in the construction sector are well projected by many researchers and can thus be prevented (ILO, 2015). Umar and Wamuziri (2016a) noted that, officially, there are no statistics in Oman as to how many construction workers were injured at work. However, data from ten reputable construction organisations show that in 2014, more than 3500 construction workers received medical treatment due to work injuries. Due to the severity of injuries, around 10% of these workers were hospitalised. The report further reveals that roughly 18% of these workers, who were hospitalised, later died at their work or in hospital. In comparison to the previous year's data, the number of injured workers rose by 246. For various reasons including reputation, company owners hesitate to publicise such information. Umar et al. (2018), while quoting the data from the Public Authority of Social Insurance in Oman (PASI), observed that the expenditure related to OS&H rose from 1 million OMR (= US\$2.6 million) in 2012 to 2.9 million OMR (= US\$7.53 million) in 2016, as shown in Figure 2. It is also important to note that only Omani citizens are eligible to register in the PASI system, despite the fact that only 8% of citizens work in the construction industry in Oman (OSC, 2016b). Foreign workers in construction and other industries are insured under a private insurance scheme in the country.

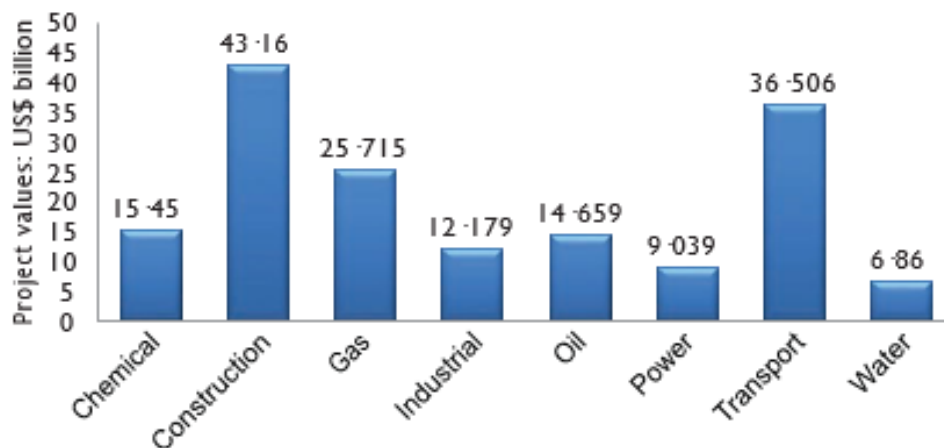


Figure 1. Values of ongoing and planned projects in different sectors of Oman (Deloitte, 2015)

In Oman, the majority of construction workers are foreigners, representing more than 90% of the total workforce in this industry. These workers are, however, not insured under the government agency scheme (NCSI, 2015). As per the law of the land, construction organisations need to pursue private insurance for their workers. Since the risk connected with construction workers is huge, the insurance premium for workers in construction is relatively more than those workers in other sectors. Construction contractors further carry high

expenses at the time of hiring and pay for repatriation, compensation and replacement in case of accidents resulting in injuries and fatalities (Dube et al., 2010).

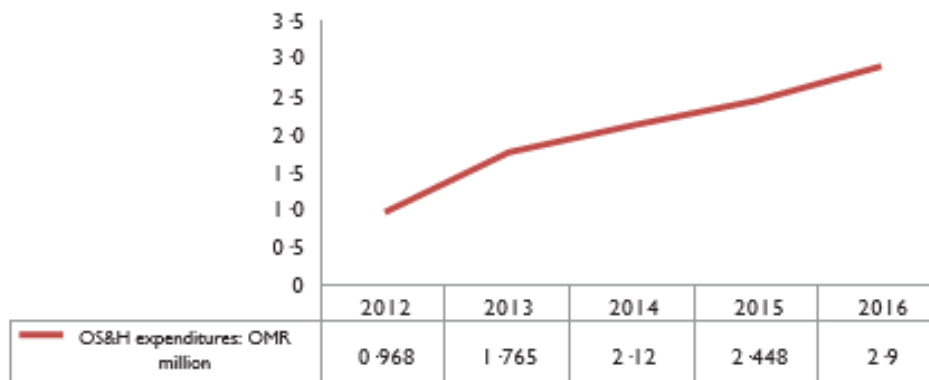


Figure 2. Increase in OS&H expenditure in Oman (Umar et al., 2018)

The appreciation and importance of administrative, managerial and social factors for safety performance has increased in the last two decades (Kines et al., 2011). Safety climate is a subgroup of the organisational climate providing a direction for safety management, complementing the frequently predominant engineering path. James and Jones (1974) viewed safety climate as an individual attribute as opposed to an organisational attribute. Zohar (1980) mentioned that the safety climate mirrors employees' understanding about the comparative significance of safe performance in their job-related behaviour. An understanding of the safety climate elements can be helpful in improving the safety performance of a construction organisation. Although long-term studies are relatively few, there is an increasing sign that safety climate is a precursor of safety performance (Clarke, 2010, 2006; Kines et al., 2011; Kuenzi and Schminke, 2009; Larsson et al., 2008; Neal and Griffin, 2006; Nielsen and Mikkelsen, 2007; Pousette et al., 2008; Wallace et al., 2006; Zohar, 2002). Additionally, safety climate findings are regarded to be more precise (e.g. multisliced) and are proactive for improving safety, rather than reactive (after the fact) data from accident numbers and accident and incident investigations (Seo et al., 2004). The focus on elements that impact safety and safety improvements within organisations has been shifted in the last century. Hale and Hovden (1998) define three periods of safety that includes the technical period (1920s), the human factor period (1970s) and the management system period (1980s). The third period of safety spread the focus to include safety culture; the approach of safety culture was accurately presented and delineated after the Chernobyl accident, which took place in 1986 (INSAG, 1992). Thus, enthusiasm for the safety culture approach has increased as safety researchers and practitioners have been solicited to characterise and operationalise this approach. Also, increasingly, the two terms 'safety climate' and 'safety culture' have been confused (Glendon and Stanton, 2000; Hale, 2000). Although differences do exist, safety culture and safety climate are the approaches that have attracted more concentration across a broad number of industrial businesses including construction (Clarke, 2000). One of the

reasons for this is that a rich safety culture and a mature safety climate are considered among the most important elements in attaining a safe workplace (Bergh et al., 2013). To enhance the level of safety culture and safety climate, it is crucial first to gauge the existing level of safety culture and safety climate; then agree what level of safety culture and safety climate is required, obtainable and desired; and then make strategies to accomplish the desired safety culture and safety climate (AIChE, 2012).

Safety climate can be defined as common understandings between the employees of a social unit of policies, procedures and practices connected to safety in a business (Kines et al., 2011). The Centre for Construction Research and Training (CPWR) defined 'safety climate' as workgroup members' common thoughts of management and workgroup safety-related policies, procedures and practices (CPWR, 2014). Similarly, Zohar (1980) described safety climate as a view of workers' understandings about the respective significance of safer acts in their work-related behaviour. There are several definitions of safety culture endorsed by researchers; however, the Cox and Cox (1991) definition appears to be more concise and simple. They described safety culture as attitudes, beliefs, understandings and values that employees contribute in connection to safety. Scientists and experts have established safety culture and safety climate as a fundamental element in curtailing injuries, illnesses and deaths at workstations. Many construction organisations are trying to enhance safety climate gauges as a way to step closer to the target of obtaining zero-accident workplaces (CPWR, 2013). This paper presents a review of using the safety climate approach to enhance safety performance along with the results of a semistructured interview conducted in Oman. A recent safety climate assessment questionnaire developed in 2011 by a group of researchers from Nordic countries consists of 50 questions on different elements of safety climate related to management and workers. The management factors include safety competency, commitment, priority, empowerment and justice. The workers' factors consist of safety commitment, prioritising safety, non-acceptance of risk, learning and trust on coworkers' safety competency. Common factors such as effective safety communication and confidence in the efficacy of safety management systems are related to both management and workers (Kines et al., 2011).

## 2. Literature Review

Umar (2016) expressed that costs of accidents in construction in Oman would be comparatively more than those in the USA and UK, considering the fact that the construction industry, in terms of maturity and safety performance, is not as developed as those in the USA and UK. The reports published in a single newspaper in Oman, spreading over a period of 6 months from 1 May to 30 November 2015, reveal that a total of nine workers were killed and more than 25 were injured in accidents that took place at different construction sites. The actual number of death and injuries during this period could be more as data published in the newspaper may not include the accidents that may have occurred in a remote area or those where the numbers of injuries were fewer and thus did not attract the focus of the newspaper. The costs of accidents in construction in Oman reported by Umar (2016) is estimated at US\$3.237 billion (based on the total value of construction projects), while the compensation costs are approximately US\$3.74 million/year. There are challenges for safety in construction in Oman, but opportunities do exist. Safety regulatory organisations such as the Occupational Safety and Health Administration in the USA and the Health and Safety Executive (HSE) in the UK

have played significant roles in improving the safety performance in their jurisdictions. Statistics indicate that worker deaths in America were reduced, from nearly 38 deaths per day in 1970 to 12 per day in 2014. Similarly, the number of worker injuries and illnesses declined from 10.9 incidents per 100 workers in 1972 to 3.3 per 100 workers in 2013 (OSHA, 2014). The national framework for safety improvement in Oman presented by Umar and Wamuziri (2016a) involves all stakeholders under a regulatory organisation, as shown in Figure 3. Some researchers claim that small and medium construction organisations have a low capability to comply with safety regulations or they need to bear a high cost for this, which results in less financial benefits (Lancaster et al., 2003; Tang et al., 2004). The results of the research conducted by Ikpe et al. (2012) in the UK shows that the argument that construction organisations have very low capability and financial benefits from improved safety performance is no longer valid. The results of a cost–benefit analysis affirmed that when the total costs of accident prevention were matched to the total benefits of accident prevention, the profits far exceed the costs of accident prevention by a ratio of nearly 3:1. This means that when contractors, regardless of their sizes, spend £1.00 on accident prevention, they gain £3.00 (Ikpe et al., 2012). The approach describing the use of safety climate factors to improve safety performance is shown in Figure 4 (Umar and Wamuziri, 2016a).

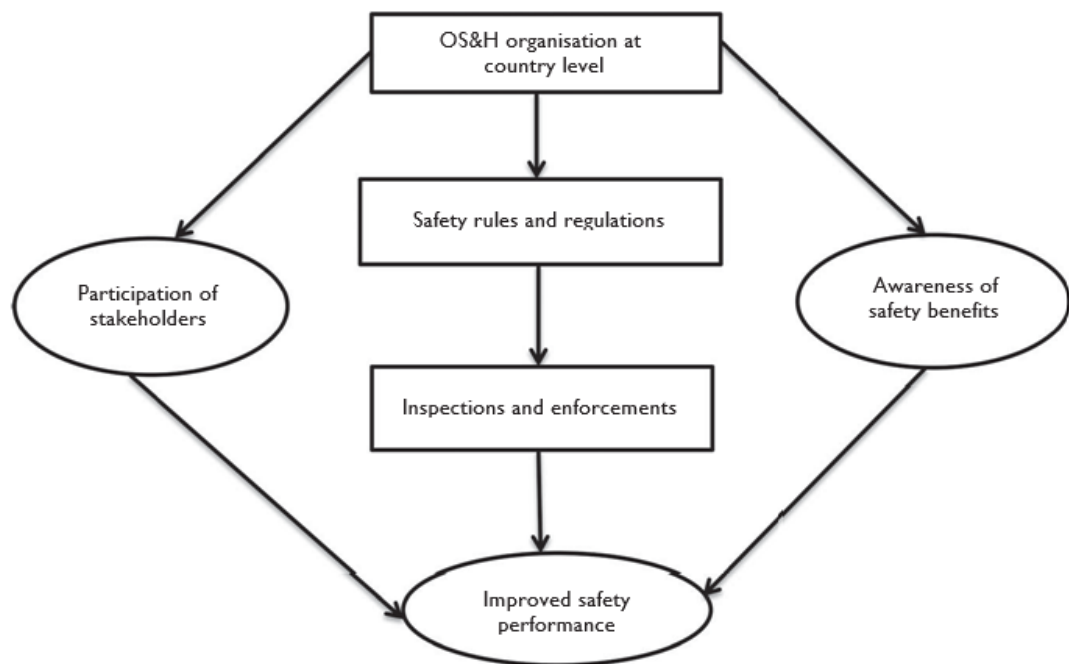


Figure 3. Safety model for construction (Umar and Wamuziri, 2016a)

The management’s commitment towards safety has been regarded as a main element for improving safety performance. Zohar (1980) concluded that the senior management’s engagement in safety and programming safety issues are two separate subjects. Similarly, Flin et al. (2000), while determining typical attributes for the assessment of safety climate, established that perceptions of management safety commitment and priority are the most commonly appraised factors in safety climate research. Apart from management commitment,

Clarke and Ward (2006) noted that the workgroup is the most influential in the socialisation of new members in the group of organisation and recommended that understandings of workgroup norms are highly influential for group safety climate. Similarly, Hofmann and Morgeson (1999) urged that management boosting open communication on safety delivers a firm message on how safety is admired. Jeffcott et al. (2006) noted the significance of learning for a constructive safety culture through regular meeting, analysing and propagating information in an environment valuing expertise and being based on trust, where workers can classify and have the willingness to convey unusual acts and mistakes. Cox et al. (2006), while discussing the trust in high-reliability institutions, concluded that low-trust relations may have negative impacts on the effectiveness of safety culture in organisations. The coworker's perceptions of the general standard of the workforce's educations, skills and understanding was one of the six most common elements in safety climate research established by Flin et al. (2000). An improved safety performance cannot be achieved without a well-functioning safety system. This was confirmed by Törner and Pousette (2009) through a qualitative research involving direct line managers and employees' safety agents from a construction project. Trust in the management has been confirmed as a positive indication towards an improved safety result. Mayer et al. (1995) noted that confidence in the management incorporates a willingness to take a risk in a relationship and to be vulnerable to the other party.

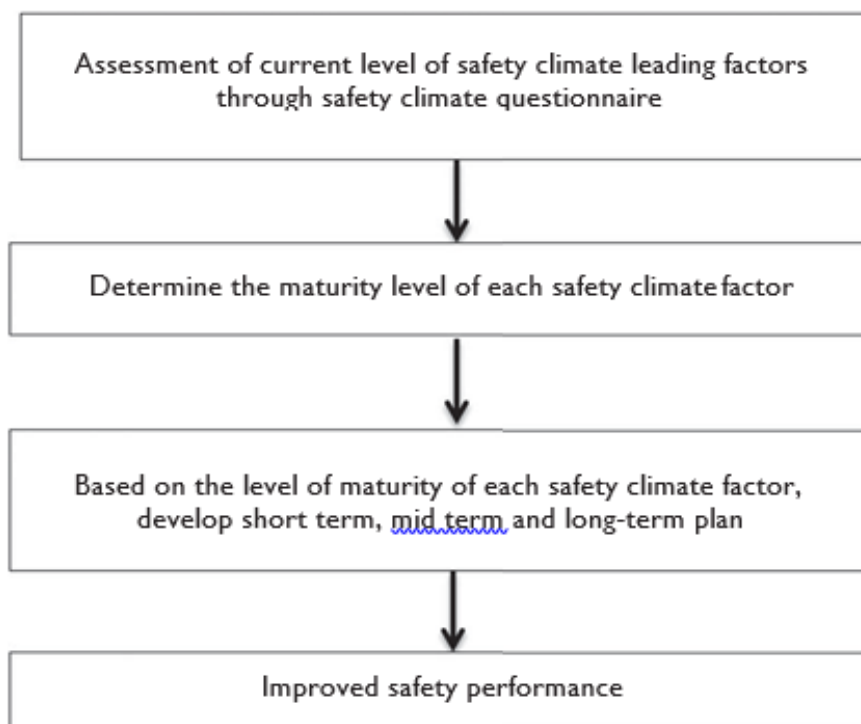


Figure 4. Process of using safety climate to improve safety performance (Umar and Wamuziri, 2016b)

Safety is a complex issue, and for an improved safety performance, a variety of approaches can be adopted. For instance, knowing the causes of accidents in a project can be helpful in making strategies to avoid or reduce those causes in similar future projects (Umar and Egbu, 2018). Similarly, Smith et al. (2018) noted that stress and work-family conflict can negatively

affect personal protective equipment compliance, loyalty to work safety procedures and safety reporting and communication. Extreme heat stress has a serious impact on a human's physiological responses, which can result in work-related injuries, fatalities and reduced production (Yi and Chan, 2017). In the Gulf region, construction workers can be specifically affected by heat stress, due to body heat generation produced by physically demanding tasks and a hot and humid working environment.

### 3. Research aim and methodology

The overall aim of this research was to find safety climate elements/dimensions that have a high influence on the safety climate in construction in Oman. To identify existing safety climate assessment tools, an internet search using Google Scholar was conducted with the key words of 'safety climate assessment tools' (N = 353 000) and 'safety climate factors' (1 470 000). The selected search period was from 1980 to 2017. The selection of assessment tools was kept limited to the tools used in construction, utilities and oil and gas sectors. To narrow the results further, the number of Google citations was used for research-based tools. The tools that were developed by renowned health and safety organisations were also considered. After screening, a total of 13 (N = 13) safety climate assessment tools obtained from this search have been compiled with full details as shown in Table 1 in Appendix 1. Briefly, the number of assessment tools found through the internet search was one in each of the years 1980, 1991, 1997, 2000, 2004, 2005, 2006, 2008 and 2010; there were three assessment tools found in 2011 and one assessment tool in 2017. The number of leading safety climate factors used in these assessment tools was 62. The result shows that in the first 19 years from 1980 to 1999, only three safety climate assessment tools were developed. In the next phase of 17 years from 2000 to 2017, the number of safety climate assessment tools was ten. Full details of the safety climate assessment tools used in this article are shown in Appendix 1.

This leads the authors to proceed with their research and to find which safety climate factors/dimensions will be more relevant to the construction industry in Oman. Apart from this, the authors also wanted to solicit the views of construction professionals in Oman on the relevance of a safety climate approach and how well it is understood in Oman. In order to accomplish this goal, a qualitative method, as opposed to a quantitative method, was employed in this research. Concisely, the difference between these two research methods is given below.

Quantitative research stresses quantification in the data collection and examination. It applies a deducible approach to the connection between theory and research, and stress is kept on the confirmation of theories. The quantitative research method integrates the norms and practices of the natural scientific model and positivism. It views social phenomenon as an outer objective truth (Cooper et al., 2006).

On the other hand, a qualitative research approach stresses words and contexts rather than quantification in data collection (Opdenakker, 2006). It stresses an introductory approach in the relationship between theory and research, and the focus is on the formation of theories. The majority of researchers prefer to incorporate both qualitative and quantitative methods, referred to as a combined research method and highly appreciated in the literature due to certain advantages (Wamuziri, 2013). Since the research presented in this paper is exploratory in nature, a qualitative method was considered as the most suitable method to



collect the data. A face-to-face interview method was employed to gather related information. The set of questions used for data collection in this research is presented in Appendix 2.

The interviewees were picked based on a deliberative sampling. Such sampling is critical in nature, and the principles or intention was to interview respondents who were more appropriate to the research questions. This was accomplished by interviewing a total of six top managers from leading construction contractors in Oman. Managers working at the top level with safety responsibilities in construction organisations were considered as the most appropriate people to supply characterisations of the actual world with regard to safety climate factors. The criteria adopted to select the interviewees were that each interviewee should have at least 5 years' experience in Oman; the interviewee's company must be an international company and registered as 'excellent grade' or 'grade one' company with the Tender Board of Oman. The Tender Board of Oman takes care of all government tenders valued at 3 million OMR (US\$7.79 million) or more (TBO, 2018). A brief description of each interviewee is presented here.

(a) Interviewee one: a senior engineer in a construction organisation mainly working in the transportation sector in Oman having more than 20 years of project management experience in the highway sector. The company in Oman was initially established in 1973.

(b) Interviewee two: a senior project engineer in a construction organisation working in the housing sector in Oman, with more than 25 years of experience of project management in building sector. The organisation was initially established in 1972 and is currently registered as an excellent grade company in Oman.

(c) Interviewee three: a senior construction manager with more than 10 years of experience in one of the major construction companies with offices in all Gulf Cooperation Council (GCC) countries. The company is 100% privately owned with more than 1000 employees in Oman. The interviewee is currently working as project director of a highway construction project with an estimated cost of US\$305.90 million.

(d) Interviewee four: a senior construction manager with over 12 years of experience in one of the main construction companies. The organisation was established in 1992 and is currently executing some of the main building projects pertaining to both the government and private sector in Oman. The construction manager interviewed from this organisation is working on a construction project with an estimated cost of US\$60 million.

(e) Interviewee five: a senior contract manager with over 15 years of experience in one of the world's leading consulting organisations, having offices in the USA, Europe and Middle East. The organisation was founded in 1944 and is 100% owned by the employee stock ownership trust, with total revenues of US\$3.2 billion in 2015.

(f) Interviewee six: a senior design consultant with more than 8 years of experience in one of the leading international consultants operating in the Middle East, Africa, Asia and Europe, with more than 10 000 staff. The interviewee is currently involved as design and supervision consultant in some of the megaroad projects in Oman.

Bryman (2015) noted that the use of semistructured interview methods enable the investigator to check the level of understanding that a participant has around a specific issue – generally

in more detail than a paper questionnaire – and can be utilised as an effective tool of exploratory evaluation. Similarly, it can be helpful to understand how a participant thinks about a specific topic prior to using a secondary method such as respondent observation and deeper interviewing to collect a larger extent of information. Face-to-face interviews can also be useful to recognise participants whose perspectives may be investigated in more detail through the use of focus groups (Brannen, 2017). The method further allows asking the majority of the questions to respondents in a similar pattern. This makes the process simple for the researcher to repeat and replicate the interview. Overall, such a method of research approach is easy to standardise. Furthermore, it allows researchers to contact acceptable numbers of respondents comfortably and quickly and can collect reliable data (Cooper et al., 2006; Thurman, 2018). There are, however, some weaknesses and limitations in this approach. For instance, Bryman (2015) noted that such methods are time-consuming if the selected sample group is larger, the reason being that the researcher or their representative is required to be available at the time of the face-to-face interview. Similarly, Punch (2013) mentioned that the quality and value of the collected information are deeply dependent on the nature of the questions asked. The pattern of the questionnaire makes it difficult for the researcher to evaluate complicated issues and beliefs. Even where open-ended questions are utilised, the extent of the answers the participant can give turns out to be more restricted than with other qualitative approaches (Brannen, 2017; Cooper et al., 2006).

Notwithstanding these constraints, the six participants in this research proved to be a rich source of useful facts, which can be helpful in further deeper examination in the subject area.

The data gathered through the face-to-face interview approach are assessed, evaluated and presented in the next section.

## 4. Results and Discussion

### 4.1 Effectiveness of safety climate for safety improvement

Research conducted by Zohar (1980) shows that there is reconciliation among employees' perceptions concerning the safety climate in their company and that the level of this climate is correlated with safety programme effectiveness as evidenced by safety inspectors. He further suggested that the organisational climate, when operationalised and validated, can be used as a helpful instrument in understanding work-related behaviour. From the discussion with the interviewees, a consensus was observed on the effectiveness of the safety climate approach towards a better safety output. All interviewees agreed that an understanding of the safety climate approach and using appropriate safety climate dimensions and factors is the main key to the effectiveness of the safety climate approach. Interviewees two and three, however, mentioned that safety is something in which responsibility cannot be put only on construction organisations. Interviewee three stressed the importance of safety inspections by external regulatory organisations. He stated that effective health and safety regulations and their implementation across construction organisations are very important for the maximum safety performance. Interviewees four and five mentioned that although safety is everyone's responsibility, poor safety performance and increased number of accidents are not in the interest of contractors as it is they who are affected by this. Overall, all interviewees were in support of the safety climate approach, but since none of them has used this approach, their focus was on other aspects including inspections and implementation of

regulations and awareness of improved safety performance among construction organisations.

#### 4.2 Safety climate factors

Interviewees were firstly briefed on the different safety climate factors shown in Appendix 1. Their views on safety climate factors were different when asked the question on different dimensions or factors that would need to be considered to achieve a mature safety climate and rich safety culture in construction organisations in Oman. They agreed that construction organisations in Oman need to adopt the approach of improving safety culture and safety climate to improve their safety performance. Interviewee one stated that safety training, management commitment and competence for safety and effective safety communication are the key elements of a rich safety culture and as such need to be considered as safety climate factors. Interviewee two's and interviewee three's views on safety climate factors were almost the same. They noted that personal commitment towards safety has a significant impact on safety outcome; therefore, personal safety commitment and knowledge of safety are some of the important elements that will influence safety culture and safety climate. Interviewee three, however, did mention safety empowerment and stated that workers need to have the right of non-acceptance of risk. Interviewee four highlighted the importance of accountability for safety through active monitoring and enforcing. He stated that safety compliance is important towards a safe work environment, and therefore, there has to be a system that ensures that safety is not to be compromised at any level. The workers must have training on job safety or at least a safety briefing before taking on a specific job or task. Interviewee five stated that the main factor that can lead towards an improved safe workplace is management involvement in safety. How much safety is important to management and how much they are committed towards safety is a key element. Other elements, apart from management commitment, that need to be considered are safety communication on-site, training of workers and motivation and behaviour of workers. He stressed that although personal safety comes first, workers need a level of motivation to ensure coworkers' safety as well, which is very important in achieving a safer working environment. Interviewee six stated that the factors that can lead a construction organisation towards an improved safety performance are related to the individual and the organisation. Individual factors are motivation, behaviour, knowledge and non-acceptance of risk, while organisational factors are commitment and compliance of safety, training, accountability and effective communication of safety-related matters.

#### 4.3 Safety climate assessment tool

From the literature review, the authors came across different forms of safety climate tools. For instance, the tool proposed by Zohar (1980) has seven organisational dimensions with a five-point scale for evaluation. Similarly, Dedobbeleer and Béland (1991) suggested a four-point scale for some factors and a five-point scale for other items. The significant item in these tools is, however, the set of factors that were used in these tools for assessment. In this research, an opportunity was given to the interviewees to express their view on the possible format of such an instrument if developed for construction organisations in Oman. All the interviewees agreed that they are not using any such tool for the assessment of their safety climate. Interviewees two and five did mention that they normally use accidents analysis to identify the root causes of accidents and to develop strategies to avoid such accidents in future. Interviewee five mentioned that if the accident has taken place because of worker

knowledge, then they incorporate the appropriate training to avoid such accidents in the future. All interviewees agreed that leading safety climate factors need to be measured on a scoring scale of 1–5 (strongly agreed–strongly disagreed). Interviewee one stated that there is no need to give an option for neutral in the scoring of any leading safety climate factor and the scale can be from 1 to 4 (strongly agreed–strongly disagreed). Interviewee three mentioned that such a questionnaire needs to be prepared in multiple languages in order to serve the diverse construction industry in Oman effectively. Interviewee six mentioned the use of technology tools for using such a questionnaire, rather than a paper-based approach.

#### 4.4 Effectiveness of safety climate assessment tool

Although safety climate assessment tools are successfully used in different industries including construction worldwide, the authors were interested to know the views of construction industry professionals in Oman of their effectiveness (NRCWE, 2018). Research carried out by Dedobbeleer and Béland (1991) claims that the results of the safety climate assessment can help in the development of safety policies in an organisation. Neal et al. (2000), while examining the results of general organisational climate on safety climate and safety performance, noted that general organisational climate had a powerful impact on safety climate. They further explained the significance of both organisational climate and safety climate on individual safety practice. Kines et al. (2011) noted that there is increasing indication that safety climate is a precursor of safety performance. All interviewees agreed that a safety climate assessment tool which will allow construction organisations in Oman to assess their level of safety culture and safety climate will be helpful to improve the safety performance of construction organisations. Interviewee two mentioned that construction organisations should have sufficient knowledge of such tools before they use it in order to use it properly and get full benefits from it. Interviewees one, three and five stated that it is possible for all sizes of construction organisations to prepare their plans for safety improvement through the results of the safety climate assessment; however, small construction organisations can face financial and technical issues because of their capacity to implement such plans. Small construction organisations will need to have some external support to implement such plans to achieve the required level of maturity for any safety climate dimension. Factors that differentiate the safety performance of small and medium enterprises (SMEs) from larger organisations have attracted the attention of many researchers, including financial capacity as identified by the interviewees. For instance, Masi et al. (2014) stated that SMEs have less financial and human assets at their disposal. Thus, under such conditions of economic uncertainty, owners of SMEs are afraid to invest time and resources on problems that do not arise on a regular basis, and this would certainly include safety and health issues (Agumba and Haupt, 2012; MacEachen et al., 2010).

#### 5. Conclusion

This article discusses the concept of using of the safety climate approach to enhance safety performance in construction. The third wave of safety, commonly known as the management system age (1980s), extended the focus to include safety culture and drive the approach of safety climate. The literature review indicates that there is an increasing confirmation of safety climate as a precursor of safety performance. Specific criteria have been used to identify the relevant safety climate factors, resulting in 62 factors spanning over a period of 37 years from 1980 to 2017. The safety climate approach and the identified factors were discussed with the

selected group of construction professionals working in Oman. The results of face-to-face interviews with construction professionals working in Oman show that their organisations are currently not using this approach. The overall aim of this study was to find safety climate elements/dimensions that will have more influence on the safety climate in construction in Oman. Interviewees identified several factors that could have a high level of influence on safety climate, including management commitment; alignment and integration of safety as a value; accountability across the board; supervisory management; empowerment and involvement of workers; improvement of communication; and training and education. This research is based on the views of six construction professionals working as top managers in their construction organisation. The construction team of any organisation is composed of managers, supervisors, skilled workers and labourers; therefore, their views on the use of safety climate approach and different factors would add advantage and a wider acceptability. Such research will help develop a safety climate assessment tool that will be more relevant to the Omani construction industry. It is anticipated that the similarity between GCC construction industries will allow such a tool to be acceptable in all member countries.

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## Appendix 1

Table 1. Compilation of safety climate assessment tools (continued on next page)

S number	Source	Used in construction?	Number of questions	Number and name of included dimensions/factors	Citation (Google Scholar)
01	Zohar (1980)	Yes	40	Eight <ul style="list-style-type: none"> <li>■ Management attitude toward safety</li> <li>■ Work pace and safety</li> <li>■ Effects of safe conduct on promotion</li> <li>■ Effect of safe conduct on social status</li> <li>■ Perceived risks</li> <li>■ Perceived importance of safety training</li> <li>■ Perceived status of safety officer</li> <li>■ Perceived status of safety committee</li> </ul>	2408
02	Dedobbeleer and Béland (1991)	Yes	9	Two <ul style="list-style-type: none"> <li>■ Management commitment</li> <li>■ Worker involvement</li> </ul>	692
03	UK HSE Safety Climate Tool, 1997 <a href="http://www.lboro.ac.uk/departments/sbe/downloads/pmdc/safety-climate-assessment-toolkit.pdf">http://www.lboro.ac.uk/departments/sbe/downloads/pmdc/safety-climate-assessment-toolkit.pdf</a>	Yes (2012 London Olympics)	43	Eight <ul style="list-style-type: none"> <li>■ Organisational commitment</li> <li>■ Health and safety-oriented behaviour</li> <li>■ Health and safety trust</li> <li>■ Usability of procedures</li> <li>■ Engagement in health and safety</li> <li>■ Peer group attitude</li> <li>■ Resources of health and safety</li> <li>■ Accidents and near-miss reporting</li> </ul>	N/A
04	Neal <i>et al.</i> (2000)	Yes, but not published	35	Eight <ul style="list-style-type: none"> <li>■ Management values</li> <li>■ Communication</li> <li>■ Training</li> <li>■ Physical work environment</li> <li>■ Safety systems</li> <li>■ Knowledge</li> <li>■ Motivation</li> <li>■ Behaviour</li> </ul>	1220

Table 1. Continued

S number	Source	Used in construction?	Number of questions	Number and name of included dimensions/factors	Citation (Google Scholar)
05	Seo <i>et al.</i> (2004)	No	30	Five <ul style="list-style-type: none"> <li>■ Management commitment to safety</li> <li>■ Supervisor safety support</li> <li>■ Coworker safety support</li> <li>■ Employee participation in safety-related decision making and activities</li> <li>■ Competence level of employees with regard to safety</li> </ul>	269
06	Zohar and Luria (2005)	Yes	16	Six Three organisational levels <ul style="list-style-type: none"> <li>■ Active practices (monitoring, enforcing)</li> <li>■ Proactive practices (promoting learning, development)</li> <li>■ Declarative practices (declaring, informing)</li> </ul> Three group levels	958
07	Parker <i>et al.</i> (2006)	No (oil industry)	18	<ul style="list-style-type: none"> <li>■ Active practices (monitoring, controlling)</li> <li>■ Proactive practices (instructing, guiding)</li> <li>■ Declarative practices (declaring, informing)</li> </ul> Uses five descriptions (text-based rubrics) reflecting level of organisational safety culture maturity Descriptions divided into two categories	333
08	Pousette <i>et al.</i> (2008)	Yes, Swedish tunnel workers	33	<ul style="list-style-type: none"> <li>■ Concrete organisational aspects</li> <li>■ Abstract organisational concepts</li> </ul> Four <ul style="list-style-type: none"> <li>■ Management safety priority</li> <li>■ Safety management</li> <li>■ Safety communication</li> <li>■ Workgroup safety involvement</li> </ul>	161



Table 1. Continued

S number	Source	Used in construction?	Number of questions	Number and name of included dimensions/factors	Citation (Google Scholar)
09	Gittleman <i>et al.</i> (2010)	Yes (Las Vegas City Centre Project)	44	Not divided into factors Survey includes separate questions for general contractor and subcontractors	42
10	Institute of Work and Health (Amick <i>et al.</i> , 2011)	Utilities	8	<ul style="list-style-type: none"> <li>■ Not divided into factors</li> <li>■ Leading indicator tool developed for Ontario workplaces</li> </ul>	N/A
11	DeArmond <i>et al.</i> (2011)	Yes	10	Two	24
12	Kines <i>et al.</i> (2011)	Yes	50	Seven <ul style="list-style-type: none"> <li>■ Safety compliance</li> <li>■ Safety participation</li> </ul>	120
13	CPWR (2017)	Yes	65	Eight <ul style="list-style-type: none"> <li>■ Management safety priority, commitment and competence</li> <li>■ Management safety empowerment</li> <li>■ Management safety justice</li> <li>■ Workers' safety commitment</li> <li>■ Workers' safety priority and risk non-acceptance</li> <li>■ Safety communication, learning and trust in coworkers safety competence</li> <li>■ Trust in the efficacy of safety systems</li> <li>■ Currently translated into 25 languages.</li> </ul>	N/A
				<ul style="list-style-type: none"> <li>■ Demonstrating management commitment</li> <li>■ Aligning and integrating safety as a value</li> <li>■ Ensuring accountability at all levels</li> <li>■ Improving supervisory leadership</li> <li>■ Empowering and involving employees</li> <li>■ Improving communication</li> <li>■ Training at all levels</li> <li>■ Encouraging owner/client involvement</li> </ul>	

## Appendix 2. Semistructured interview questions

1. In recent years, the awareness of the importance for safety performance of organisational, managerial and social factors, has increased. Safety climate is a subset of organisational climate, offers a route for safety management, complementing the often predominant engineering approach. What is your opinion on the effectiveness of this new approach to enhancing safety performance in construction organisations?
2. Most organisations use records of their health and safety performance as an indication of the effectiveness of their health and safety management and systems. Do you think that an understanding of the safety climate dimensions or factors can be useful in improving the safety performance of construction organisation?
3. There is a generally held view by researchers that a mature safety climate can help in building a rich safety culture, and there are different dimensions or factors identified which influence safety climate. What is your view on different dimensions or factors that would need to be considered to achieve a mature safety climate and rich safety culture in a construction organisation in Oman?
4. Researchers and practitioners have identified safety culture and safety climate as key to reducing injuries, illnesses and fatalities on construction worksites. Many construction contractors are trying to improve these indicators as a way to move closer to a goal of achieving zero-injury worksites. Do you think construction organisations in Oman need to adopt the concept of improving safety culture and safety climate to improve their safety performance?
5. Safety climate of a construction project or construction organisation can be assessed by means of quantitative, psychometric questionnaire surveys, so-called safety climate scales, measuring the shared perceptions/opinions of a group of workers on certain safety-related dimensions or factors. The outcome of such safety climate scales is regarded as a predictor or indicator of safety performance. What is your opinion on such a tool? Does your organisation use such a tool to assess the safety climate?
6. The leading safety climate dimensions or factors can be measured among different categories of staff working in construction organisation or in a project undertaken by the construction organisation on a scoring scale of 1–5 (strongly agreed–strongly disagreed). The results will reflect the safety climate of the organisation or safety climate of the specific project. After the assessment of safety climate leading dimensions or factors, construction organisations will be able to identify and prioritize the weak area for improvement. What could be the possible format if we want to develop a safety climate assessment tool for construction organisation in Oman?
7. Do you think that the assessment of the safety climate will help the decision-making unit (DMU) of construction organisations to develop different plans to achieve the required level of maturity of safety climate?
8. Different sizes of construction organisations (small, medium and large) have different levels of resources and competencies. In your view, how will different sizes of construction organisation benefit from adopting the concept improving of safety performance through safety climate?

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