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A Literature Review on the Relationship Between Hofstede's National Culture Framework and Occupational Safety

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Review Article

Abstract − According to data released by ILO, 340 million occupational accidents leading to economic losses, injuries, and deaths occur annually. In the literature, national culture, whose importance gradually increases with the working environment increasingly multicultural, was indicated as one of the factors that affect occupational safety. In this study, 20 articles examining the relationship between national culture and occupational safety over Hofstede's national culture dimensions were identified. These studies were reviewed in terms of the safety factor they examined, the method used, the sector and the results obtained. In addition, the studies were discussed in detail in terms of the effect of national culture on occupational safety. Accordingly, safety performance and safety attitudes were the most studied safety dimensions, questionnaires were the most used method and construction, aviation, oil and gas, and shipping sectors were the most examined sectors. Most of the studies were identified to be in favour of the negative effect of IDV on occupational safety, the negative effect or ineffectiveness of MAS, and the positive effect of UAI and LTO. However, there was a total disagreement about the impact of PDI. This study is expected to provide a better understanding of the national culture and occupational safety relationships, thereby guiding decision-makers in policy development and regulation related to occupational safety.

Keywords − *Occupational Safety, National Culture, Hofstede, Safety Performance, Safety Attitude*

Hofstede'nin Ulusal Kültür Çerçevesi ile İş Güvenliği Arasındaki İlişki Üzerine Bir Literatür Taraması

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Derleme Makalesi

Öz- ILO'nun açıkladığı verilere göre her yıl ekonomik kayıp, yaralanma ve ölümle sonuçlanan 340 milyon iş kazası meydana gelmektedir. Literatürde, çalışma ortamının giderek çok kültürlü hale gelmesiyle önemi giderek artan ulusal kültür, iş güvenliğini etkileyen unsurlardan biri olarak gösterilmektedir. Bu araştırmada ulusal kültür ile iş güvenliği arasındaki ilişkiyi Hofstede'nin ulusal kültür boyutları üzerinden inceleyen 20 makale tespit edilmiştir. Bu çalışmalar, incelenen güvenlik faktörü, kullanılan yöntem, sektörleri ve ulaşılan sonuçlar açısından incelenmiştir. Buna göre güvenlik performansı ve güvenlik tutumları en çok çalışılan güvenlik boyutları, anketler en çok kullanılan yöntem ve inşaat, havacılık, petrol ve gaz ve denizcilik sektörleri en çok incelenen sektörler olmuştur. Çalışmaların çoğu, IDV'nin iş güvenliği üzerindeki olumsuz etkisi, MAS'ın olumsuz etkisi veya etkisizliği ve UAI ve LTO'nun olumlu etkisi lehine olduğu tespit edilmiştir. Ancak, PDI'nin etkisi hakkında tam bir anlaşmazlık olduğu görülmüştür. Bu çalışmanın ulusal kültür iş güvenliği ilişkisinin daha iyi anlaşılmasına katkı sağlaması ve böylece iş güvenliği ile ilgili politika geliştirme ve düzenlemede karar vericilere yol göstermesi beklenmektedir.

Anahtar Kelimeler − *İş Güvenliği, Ulusal Kültür, Hofstede, Güvenlik Performansı, Güvenlik Davranışı*.

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1. Introduction

International Labor Organization (ILO) estimates that every year, some 2.3 million men and women succumb to occupational accidents (OA) or diseases around the world, which results in over 6000 deaths per day. Worldwide annually, over 340 million OA occur, and 160 million employees become victims of work-related illnesses (ILO, 2022). OA which started mainly with the Industrial Revolution were considered firstly as technical problems. However, firstly, Heinrich (1941) demonstrated in the 1930s that the reason for as many as 95% of all workplace accidents was unsafe acts and that the reason for almost nine out of ten accidents was a human failure, and over the recent decade, organizational factors were remarked as the causes of large-scale accidents (Pidgeon and O'Leary, 2000). Efforts to reduce occupational health and safety problems and the millions of accidents and injuries that occur every year in business life, are increasing day by day. In this context, creating a greater understanding of better preparation of safety and health professionals and better structuring of work has become a critical need. Thus, many researchers focused on the effect of organizational factors on the safety performance of employees and negative results like injuries and accidents. In addition, the researchers attempted to link organizational factors, which are impacted by different external causes like the socio-economic status of the nation, the level of technological development and national culture (NC) (Helmreich and Merritt, 1998) to employee safety behaviour. Therefore, researchers started to examine the impact of NC on occupational safety (OS), as cultural norms are learned by individuals in the social environment, and these norms show an essential role in their behaviours (Fetscherin, 2009).

Schneider (1988) stated that national or societal culture was proposed as an important determinant of an organization's culture within the organizational culture and climate literature. Recently, there has been an acknowledgement of the relationship between safety and NC (Helmreich and Merritt, 1998). In fact, Helmreich (1999) contends that to make the safety measures beneficial and effective, organizations must appreciate the impact of NC on the working of these measures completely. In this context, the thought that people's demeanour to risk will change according to their values, convictions, and suspicions, i.e., the establishment of national cultural differences, seems reasonable.

The framework developed by Hofstede (1980) is the foremost broadly utilized one for looking at NC differences in human resource management and organizational practices (Trinadis, 2004). Although there are also similar frameworks proposed by other researchers [e.g., House et al., 2004; Inglehart and Baker, 2000; Schwartz, 1999) for examining cultural differences, Hofstede's dimensions were generally demonstrated to be stable over time (Barkema and Vermeulen, 1997) and they became the most common classification of national value orientations (Yeganesh et al., 2009). Many researchers examined the relationship between organizational culture and the five dimensions of NC (power distance (PDI), uncertainty avoidance (UAV), individualism (IDV), masculinity (MAS), and long-term orientation (LTO)) outlined by Hofstede (2001).

This paradigm assumes that a nation's residents share a set of fundamental principles and customs that influence and normalize how people behave and think. Noort et al. (2016) contended that the national cultural tendencies that create inside a society and verifiably shape the beliefs and work behaviours of employees might also be anticipated to influence norms, values, and practices related to safety. In this setting, some researchers like Kopelman et al. (1989) indeed fought that societal or NC might have a possibly more prominent impact than organizational factors on the nature and adequacy of human resource management practices. They contended that NC, by definition, could be a higher everlasting characteristic of an organization and functions at a more profound level (preconscious, subconscious, or oblivious) than organizational climate. Similarly, Moran and Volkwein (1992) argued that culture was dominant in comparison to climate.

When it comes to the relationship between NC and OS, although it is frequently referred to the NC in the case of OA in the working life (e.g., our employees do not listen, it does not fit our culture, etc.), in the literature, the number of the studies on this subject are observed to be limited. Moreover, it was observed that the results of these studies were different from each other and that while some studies argued that NC did not affect OS, some others argued that it had a partial effect or a significant effect. For example, Spangenberg et al. (2003) detected that the safety performance of Norway and Sweden was significantly different. However, these two national groups have comparative profiles concerning values such as PDI, MAS, and IDV, agreeing to Hofstede. In another study, which was conducted on the cultural values, and management commitment related to safety and risk-taking behaviour in six diverse national groups working for the same organization, management commitment was detected to be a more critical determinant of behaviour at work in comparison to NC. On the other hand, there are moreover a significant number of studies, which were conducted over the recent years and established relationships between

NC and safety, especially in high-reliability industries such as construction, aviation, chemicals, and shipping (Merritt, 2000; Mearns and Yule, 2009; Lu et al., 2012).

The correct understanding of the role of NC in OS is crucial about taking the right precautions. This is important especially in sectors such as aviation, the oil and gas industry, shipping, and international construction projects, where the results of OA are extremely severe and where there is a multicultural work environment. This study was carried out with this point of view and aimed to review the literature and reveal the differences and similarities between the studies in terms of their methods and results. The results of the studies have been discussed in detail in terms of the effect of Hofstede's five NC dimensions (i.e., PDI, IDV, UAV, MAS, LTO) on OS. It is predicted that this study will significantly improve our understanding of how NC affects OS.

1.1. NC and its Dimensions

In his widely read book Primitive Culture Taylor (1874) defined culture as the multifaceted wholeness that includes knowledge, belief, art, ethics, law, tradition, and any other abilities and habits attained by man as a part of society. Trompenaars and Hampden-Turner (1997) likened culture to an iceberg and expressed that the pith of culture was not what was visible on the surface and that culture was the way of how groups of individuals get it and depict the world. Samovar et al. (1981) see culture as the entirety of knowledge, convictions, values, experiences, states of mind, timing, roles, spatial relations, implications, hierarchies, religion, concepts of the universe and material objects and belongings gained by the majority of individuals within the course of generation through individual and group endeavouring.

Hofstede (1980) characterizes NC as the communal programming of the mind that distinguishes between members of one group or civilization and those of another. To study the effect of culture on societies, dimensions, which can be utilized to analyse the behaviours, activities, and values of the individuals of society, are needed. Hofstede's (1980) original study, which might be considered the most successful endeavour to dimensionalize culture, distinguished four national cultural dimensions, namely PDI, IDV, UAV, and MAS. Afterwards, the fifth dimension, "LTO" and the sixth dimension, "indulgence versus restraint" were included in the framework.

Although there were some criticisms of Hofstede's studies (Mearns and Yule, 2009; Jones, 2007) and there were different frameworks created by other researchers for understanding culture, in most cases, they have similarities with Hofstede's dimensions. For illustration, Chinese Cultural Connections executed in 1987 another extensive empirical research study about Chinese culture. As a result of this study, it was revealed that except the Confucian dynamism dimension, which was afterwards adopted by Hofstede and Bond (1988) as the fifth dimension and called long-term orientation, all other dimensions are in line with Hofstede's dimensions (1987). Anyway, the framework of Hofstede (1980) is the foremost duplicated and cited one in cross-cultural research, and numerous researchers have depended on this framework when making cross-country comparisons. The five dimensions of which brief explanations were given below were included in this review study.

Power Distance Index (PDI): The PDI dimension is related to the degree of acceptance of power's unequal distribution by the members of societies, organizations, and institutions. Individuals whose PDI score is high, advocate increased centralization of decision-making authority and participate less in decision-making processes, or at least are more deliberate about accepting it (Merchant et al., 1995).
Individualism (IDV) versus Collectivism (COL): The IDV-COL dimension defines differences between individualistic cultures, in which individuals consider circumstances in terms of costs and benefits for themselves, and collectivist cultures, in which the individuals care about the harmony within their essential workgroup or family (Helmreich et al., 2001). Persons with a high level of IDV have loose relationships with other parts of society and are more concerned with their personal interests and those of their immediate family, whereas persons with a high level of COL act as part of a group inside an organization like a member of a family (Helmreich and Merritt, 1998).
Uncertainty Avoidance Index (UAI): UAI is the degree of people's feeling awkward with uncertainty and ambiguity, and this prompts them to back ideas that seem certain and uphold institutional norms (Hofstede, 1985). In cultures with high UAI, people try to minimize the uncertainty possibility through strict regulations and rules and safety and security measures. In cultures with low UAI, people are more tolerant of thoughts that are different from what they are used to, and they tend to have as few rules as possible, but at the same time, they could be more successful in dealing with conditions not covered by procedures (Helmreich et al., 2001; Hofstede and McCrae, 2004).

Masculinity (MAS) versus Femininity (FEM): Instead of referring absolutely to the gender's dominance, the MAS dimension represents the degree of preference of masculine traits like performance, success, authority, and assertiveness to female characteristics like welfare, personal relationships, and quality of life service (Jones, 2007). Ringov and Zollo (2007) argue that people with high MAS have a lower appreciation of cooperative strategies.
Long-Term (LTO) versus Short-Term Orientation (STO): This dimension is related to the degree to which a culture centres on the long run (Bearden et al., 2006). LTO is mostly future-focused and related to the virtues of tenacity and thrift. In cultures having a high LTO, individuals work without expecting an urgent result in comparison to the cultures with a high STO, in which great significance is attached to annual results (Martinez-Fiestas, 2017).

2. Material and Method

The literature on the subject was first researched using the keywords "Hofstede", "NC", and "OS" on the Web of Science, and many studies were found. These studies were examined, and 20 studies meeting the inclusion criteria were determined. The inclusion criteria were as follows.

- Since it is aimed to provide standardization while comparing the results and most of the studies in the literature were based on Hofstede's framework, the studies examining NC OS relationship through Hofstede's NC dimensions were included in the study. (Studies (Anicich et al., 2015; Hsu et al., 2010; Reader et al., 2015) based on NC dimensions determined by other researchers were not included in the study)
- Examination of any of the factors such as safety performance, climate, culture, etc. was found sufficient to include in the review study, as all these factors are associated with OS.
- Only articles were included in the study, and because of their extensive contents, studies like dissertations (Bardakçı, 2016; Keiser, 2017) were excluded.

3. Literature Examining the Impact of Hofstede's NC Framework on OS

The full texts of the studies meeting the inclusion criteria were examined. The results of the examination are presented in Table 1.

3.1. The safety factors investigated by the studies

As mentioned earlier, no restriction is imposed related to the OS-related factors examined in the studies, and all organizational factor issues related to OS, like safety culture (SC), safety climate, risk perception, safety behaviour, safety training, safety performance, and safety orientation, were included.

Safety is a notion that encompasses all actions taken and methods used to protect a person's life, health, and physical integrity (Safeopedia, 2022), and safety performance is measured through a series of indicators. **Six of the studies (30%)** investigated **safety performance**, and they used fatal occupational injuries (FOI), lost time injury frequency, unintentional injuries, human failures, and safety-related outcome factors like safety violations as indicators of safety performance. For example, in study 8, data on FOI related to 60 countries between 1979-2008 were taken from ILO, and study 19 used mortality rates for occupational traffic accidents, fallings, fire, and drowning data.

An employee's tendency to respond to safety goals, plans, procedures, prevention, or situations positively or negatively in a workplace can be defined as a safety attitude and that employees must accept as supporting safety procedures and activities to prevent workplace accidents can be defined as safety behaviour (Zin and Ismail, 2012). **Five of the studies (25%)** examined both **safety attitude and safety behaviour** together, or either one of them. For example, the hypothesis of study 10 was determined as "culture dimensions do not significantly promote safe behaviours and perceptions of construction workers." Study 4 investigated whether Hofstede's five dimensions of NC are negatively or positively related to safety attitude and safety behaviour.

Table 1. Studies in the Literature Conducted on the Relationship between Hofstede's NC Framework and OS

Nu.	Study	What is measured?	Method	Sector	Results
1	The relationship between NC and SC: Implications for international SC assessments (Noort et al., 2016)	SC, UAI dimension of NC, and the implications of this relationship.	SC surveys were conducted with 13,616 employees working in Air Navigation Service Providers in 21 European countries.	Aviation	A negative relation between SC and national norm data for UAI was found.
2	Assessment of NC Dimensions and Construction HS Climate in Nigeria (Okolie and Okoye, 2013)	The influence of NC on the construction workers' safety climate in Southeast Nigeria.	118 questionnaires were distributed to construction workers in 16 selected construction sites.	Construction	Large PDI, weak UAI, and STO cultures encourage unsafe behaviours, perceptions, and attitudes of construction workers towards safety on site. COL and FEM encourage safe behaviours.
3	The Influence of Individual Cultural Values on Construction Workers' Risk Perception (Habibnezhad, 2016)	Cultural dimensions and risk perception of participants	A questionnaire was filled out by 44 undergraduate students having experience in the construction industry	Construction	Individuals with high UAI and COL attribute lower probability to low-impact consequences, especially for fall hazards. Larger MAS underestimate the likelihood of serious outcomes like fatality.
4	The Impact of Seafarers' Perceptions of NC and Leadership on Safety Attitude and Safety Behaviour in Dry Bulk Shipping (Lu et al., 2016)	The influence of NC and leadership styles on safety attitude and safety behaviour	Survey data was collected from 322 respondents working in dry bulk carriers.	Shipping	NC dimensions such as PDI, UAI, COL, and LTO had a positive effect on safety behaviour. LTO had a positive effect on the safety attitude, while MAS had a negative effect on the safety attitude of seafarers.
5	Culture, Error, and Crew Resource Management (Helmreich et al., 2001)	Positive and negative impacts of professional, organizational, NCs on safe flight.	Literature review	Aviation	Hofstede's cultural model has proven to be a useful starting point for examining the effects of NC. The description of appropriate behavioural countermeasures must be in a culturally consistent context.
6	Culture in the Cockpit Do Hofstede's Dimensions Replicate? (Merritt, 2000)	Pilots' attitudes toward co-command, communication, stress, automation, organizational climate, and work values.	A country-level database was compiled from the responses of 9,417 pilots in 26 airlines in 19 countries. Items from the Work Values Survey, an earlier pilot survey, were included to capture Hofstede's dimensions.	Aviation	The research confirms that the influence of NC is seen to be higher in the professional pilot culture and that one-size-fits-all training is not proper.
7	Effects of NC on human failures in container shipping: The moderating role of Confucian dynamism (Lu and Tsai, 2010)	Developing a model adopting Hofstede's NC construct of five dimensions.	Survey data were collected from 608 seafarers. Respondents were asked to indicate the number of human failures they experienced on board the year before the survey.	Shipping	NC is one of the critical factors affecting human failures in ship operations which influences workplace safety. Human failures will be fewer in shipping with low PD, and high collectivism and UAI. It is discovered that Confucian dynamism has an important moderating role.
8	The impacts of NC on fatal occupational injuries (Keser et al., 2015)	To incorporate the impacts of the dimensions of NC on fatal occupational injuries (FOI)	Data on FOI of 60 countries (1979-2008) are gathered from ILO. The NC is obtained online from Hofstede.	General	While the correlation between PDI and the number of FOI at the country level is positive, this is reversed for the IDV dimension.
9	Role of Cultural Dimensions in the Safety Performance of Global Oil and Gas Industry (Gharpurea et al., 2018)	The possible influence of cultural factors on the safety performance	Cultural dimensions were obtained online from Hofstede and Lost Time Injury Frequency of 28 countries from annual OGP reports.	Oil and gas industry.	The analysis indicates that safety performance is improved with high PDI, low IDV, low UAI, and high LTO. On the other hand, the influence of MAS on human losses is not significant.
10	Appraising the influence of cultural determinants of construction workers safety perception and behaviour in Nigeria (Okolie and Okoye, 2013)	Cultural factors that influence the behaviour and perceptions of construction workers towards safety.	Questionnaires were distributed to 250 site operatives and 100 management personnel in the 28 selected construction sites.	Construction	COL, strong UAI, and LTO cultures contribute to safe behaviours, perceptions, and attitudes of construction workers about workplace safety, while both large PDI and MAS cultures contribute to unsafe behaviours of construction workers.
11	The role of NC in determining safety performance: Challenges for the global oil and gas industry (Mearns and Yule, 2009)	How globalization influences the safety attitudes, beliefs, and behaviour of disparate 'national' workforces.	Reviews literature on cross-cultural differences in safety attitudes, perceptions, and beliefs, and a study about the relationship between Hofstede's NC dimensions in detail.	Oil gas industry	Globalization values are stronger than locally held cultural values in the determination of behaviour in a given environment.

Table 2 Continuation of Table 1

Nu.	Study	What is measured?	Method	Sector	Results
12	Relationship between NC and Safety Behaviour: Evidence from Petrochemical Employees in Saudi Arabia (Alshahrani et al., 2014)	The important NC dimensions that influence the safety behaviour of employees	A questionnaire was used to collect the data for two constructs from 407 petrochemical employees in Saudi Arabia: NC dimensions (NC); and safety behaviour.	Petrochemical industry	The researchers discovered that there was a significant difference between the perceptions of Saudi and non-Saudi employees. For Saudi employees, while higher levels of MAS and LTO are related to a higher level of behaviour, a higher level of IDV is related to a lower level. For the non-Saudi sample, only UAI has a positive relation with the level of behaviour.
13	The role of NC and organizational climate in safety training effectiveness (Burke et al., 2008)	Moderating roles of NC (UAI) and organizational climate on the transfer of safety training to the work context.	Data from 68 organizations in 14 nations and a database comprising 95 studies, including 20991 participants, were used.	General	As an NC dimension, UAI has a moderation effect on the transfer of safety training about reducing accidents and injuries.
14	NCs and safety orientation: A study of seafarers working for Norwegian shipping companies (Havold, 2007)	The association between NC and the safety orientation of seafarers	Survey data was collected from 2,558 seafarers from 27 countries.	Shipping	(a) there is a relation between the number of nationalities represented on a vessel and their attitude towards safety issues (b) There is a relation between NC and SC, for example, high PDI, UAI, and IDV had a positive influence.
15	Analysis of perceived risk among construction workers: a cross-cultural study and reflection on the Hofstede model (Martinez-Fiestas et al., 2017)	Explain how construction workers perceive their occupational hazards and analyse how it is related to their NC.	Questionnaires comprising of sociodemographic; perceived risk and cultural constructs carried out with 514 individuals (204 Spanish, 213 Peruvian, 97 Nicaraguan)	Construction	The results of this analysis and the relationship with perceived risk indicated that risk perception in construction is independent of NC. In addition, it shows that the influence of culture on the construction worker's risk perception is not strong.
16	NC and safe work behaviour of construction workers in Pakistan (Mohamed et al., 2009)	Construction workers' safety behaviour, perception, and attitude are tried to link to NC.	Data were collected from 8 large construction sites in Pakistan from 140 workers.	Construction	The study revealed that workers operating in a more collective and higher UA environment are more seemingly to have safety beliefs and awareness.
17	The influence of organizational factors on safety in Taiwanese high-risk industries (Hsu et al., 2010)	Safety leadership and safety climate perspective influence on group-level safety management.	A safety climate questionnaire was applied to ten Taiwanese plants in high-risk industries—312 from chemical plants, 289 from steel, and 89 from semiconductor foundries.	High-risk industries	The study indicated that in Taiwanese high-risk industries, the style of safety leadership and organizational harmony can show significant influences on workgroup processes, which in turn have a greater impact on individual safety awareness and practices.
18	The impact of masculinity on safety oversights, safety priority and safety violations in two male-dominated occupations (Nielsen et al., 2015)	The association between masculinity and safety oversights, safety priority, and safety violations in two male-dominated occupations.	Questionnaires covering trait-based and norm-based measures of MAS were administered twice to Danish ambulance workers (n = 1157) and slaughterhouse workers (n = 920).	Service sector	Although the level of MAS differed, the same general pattern of relations was observed across the two study populations. A high score on the Male Role Norms Inventory was associated with a higher level of safety violations and a reduced tendency to report safety violations to supervisory authorities.
19	The role of personality, culture, and economy in unintentional fatalities: An aggregated level analysis (Özkan and Lajunen, 2007)	The relationship between personality, Hofstede's cultural dimensions, and Schwartz's values, GNP per capita per country, and unintentional injuries.	GNP per capita, mortality rates for occupational traffic accidents, fallings, fire, and drowning were obtained for 46 countries.)	General	The results showed that there is a negative relationship between GNPs per capita and work and traffic fatality rates. The correlation between PDI, hierarchy, and LTO with the work safety component is positive, and it is negative for IND and intellectual autonomy. While the relation of Neuroticism, UAI avoidance, and PDI with the traffic safety component is positive, it is negative for IND and conservatism.
20	Safety sans Frontieres: An International SC Model (Reader et al., 2015).	Examination of whether SC can be measured in industry operating different cultures and there is an association between SC and NC.	Participants were ATM operational staff (n = 5,176) and management staff (n = 1,230) from 17 European countries.	Air traffic management	SC is observed to be most positive in Northern Europe, less in Western and Eastern Europe, and least positive in Southern Europe. This situation indicates that NC characteristics can affect the development of organizational SC.

Safety climate and SC are terms which are mainly used in a complementary manner. According to Okoye (2010), although safety climate and SC are not synonymous concepts, they shaped the nucleus of organizational climate and culture, respectively. In general, safety climate is thought to refer to the "surface characteristics of SC at a given moment" with safety climate measures exploring and capturing individual perceptions of an organization's safety priority (Flin et al., 2000). Safety climate refers to an individual's perceptions and attitudes towards safety (OSHC, 2022) and is the expression of SC in the behaviour and attitudes of employees (Cox and Flin, 1998). It was examined **Safety climate (10%) in two of the studies**. Besides the safety climate, study 17 also investigated safety leadership.

SC, which can be defined in various ways, is a component of organizational culture that describes the shared standards, beliefs, and behaviours related to risk and safety between groups. (Hale, 2000; Pidgeon, 1998). SC is considered as an important and useful concept because "strong" SC, the safety-related beliefs and actions of employees are positive, which prevents organizational faults. On the other hand, a "weak" SC means poor safety practices causing the increase of OA. **Two of the studies (10%)** investigated the relationship between **SC** and dimensions of NC. To measure SC, study 1 used a six-dimension SC survey to be management commitment to safety, collaborating for safety, incident reporting, communication, colleague commitment to safety, and safety support.

Sjoberg and Rundmo (2004) defined risk perception as an internal concept of uncertainty that helps people evaluate and act on a situation. Rundmo (2000) stated that risk perception is an individual's subjective assessment of the likelihood of an accident or illness when exposed to risk. **Three of the studies (15%)** examined **risk perception**. Study 16 also examined safety attitudes besides risk perception. As an example, in study 3, the risk perception of workers was measured by showing them ten different pictures depicting various hazardous scenarios and instructing them to assess the frequency and severity of potential accidents in each picture."

According to Havold (2005), cultural and contextual elements that influence attitudes and actions that have an impact on OS and health make up safety orientation. Organizations that place a high priority on safety may have a favourable view of the significance of OHS. **Study 14 (5%)** investigated the relationship between NCs and **safety orientation.**

The series of activities designed to give staff members the knowledge and skills they need to carry out their tasks safely is referred to as safety training (Trenchlesspedia, 2022). **Study 13 (5%)** investigated the role of NC in **safety training effectiveness**.

3.2. The methods that the studies used

12 (60 %) of the studies were conducted by applying **questionnaires**. These studies investigated both the NC dimension and the studied OS factor through surveys. Study 1 included 13,616 participants, which was the highest number of participants. In study 14, the questionnaire data were collected from 2,558 seafarers from 27 countries.

5 (25%) of the studies used the data obtained from **databases.** Among them, in study 13, the researchers used data obtained from 68 organizations in 14 nations, and they also used a database comprising 95 studies that were conducted from 1971-2003 and included 20,991 participants.

In 2 (10%) studies, the researchers reviewed **literature**. For example, study 11 reviewed published literature on the disparities between attitudes, perceptions, and beliefs about safety among cultures.

1 (5%) of the studies were conducted using **both questionnaires and databases**. In this study (study 20), while questionnaires were applied to air traffic management ATM operational staff (n = 5,176) and management staff (n = 1,230) to obtain the psychometric properties of a SC model, both regional and national level SC scores were linked with country-level data on five NC dimensions of Hofstede.

3.3. The sectors in which the studies were conducted

Five of the studies (25%) were conducted in the **construction sector**. Compared to other labour-intensive sectors, the construction sector is known for its disproportionately high rate of disability injuries and fatalities (Hinze, 1997). For example, although this sector employs only 10% of the working population, it alone causes 30% of all fatal industrial accidents across the European Union (Mckenzie et al., 1999). Bomel (2001) claimed that in Japan, construction accidents made up 30%–40% of all industrial accidents, while this percentage was 50% in Ireland

and 25% in the UK. Although many injury prevention programs were implemented, the construction sector became the most dangerous sector in the United States (Bureau of Labor, 2022).

Four of the studies (20%) were conducted in the **aviation sector**. Safety is very critical in the aviation sector since the results of the accidents are often severe both in terms of human life and the economy. According to Helmreich et al. (2001) studying the impact of NC in the aviation sector is critical, since the cockpit where pilots from all nationalities carry out their common duty of flying safely from one point to another, is accepted as a culture-free zone. Since air traffic management performance is assumed to be based upon a reliable and safe system, any mishaps result in catastrophic situations (Johnson and Shea, 2007). All of these examine the influence of NC on OS in the aviation sector critically.

Three of the studies (15%) were conducted in the **oil and gas sector**, which is known for its high risks and substantial losses in case of accidents. Gharpuera (2018) said that between 2009 and 2013, this industry had the largest average insurance claim value, averaging roughly €20.8 million per claim, with the aviation industry coming in second with an average claim value of €5.27 million. The sector is truly global in nature, such that the operating companies are discovering and extracting hydrocarbon deposits from varied geographic and cultural regions. The situation is particularly compounded by the large number of contractor and subcontractor businesses that support the operational businesses. In this context, the relationship between NC and OS also seems to be an essential safety issue that should be examined in the oil and gas sector.

Three of the studies (15%) were conducted in the **shipping sector**. As an example of the international nature of the shipping sector, Havold (2005) stated that almost half of the crew of all ships registered in Norway are foreigners, and the popular nationalities among them were Filipinos (24.2%), Indians (5.2%), Poles (5.0%), and Russian (3.5%). Multiculturalism and cultural differences between crews on board that do not share a common language can make the work environment on ships risky (Theotokas and Progoulake, 2007). On 7 November 2007, the container ship Cosco Busan struck the San Francisco Bay Bridge, and the discharge of 53,500 gallons of bunker fuel into the bay caused severe pollution. It is known that one of the main reasons for this accident was the deficiency of effective communication between the American pilot and the Chinese captain (Marine Department, 2022). Similarly, Hanson (1996) reported that compared to other Danish male labourers, the rate of fatal injuries and drowning among sailors was 11.5 times greater. Considering the issues mentioned above, it could be said that doing investigations on the effect of NC on OS in the shipping sector is critical.

Three of the studies (15%) were not carried out in **any specific sector**; rather, they used data from different sectors together. From these studies, study (19) used mortality rates for occupational traffic accidents, fallings, fire, and drowning in 46 countries, study (8) used total FOI data independently from sectors, and study (13) used data from 68 organizations embedded within 14 nations.

One of the other two studies (10%) was conducted in high-risk industries and the other one in the service sector. One of these studies was conducted on safety leadership and safety climate in high-risk industries (17), and the other examined Danish ambulance workers and slaughterhouse workers (18).

3.4. The results achieved by the studies

The details of the results obtained regarding the relationship between the NC dimension and safety factors examined in the studies are presented in Table 2. Since, instead of examining specifically any NC dimension, the studies numbered 5, 6, 11, 15, and 20 examined the relationship between NC and safety factors directly. These studies' overall results were expressed in Table 2.

For the IDV dimension, except for one study, a negative effect was mentioned in eleven studies. In general, COL promotes cooperative communication, harmony, and obedience (Hofstede, 2001). Thus, compliance with rules that benefit the collective and the preference of the goals of the group to that of the individual is encouraged in collectivist cultures. Chow et al. (Chow et al., 2001) determined that as group interests are more significant to them, team members in a collectivist culture are much more content with imposed, stretched safety performance criteria. Based on the mentioned issues, it can be stated that not IDV, the COL can help to secure OS in a working environment that requires order and organization. Thus, finding out that IDV has a negative effect on safety is an expected result.

It is possible to say that the UAI dimension was found to have generally a positive effect. Nevertheless, 3 of the 13 studies concluded that UAI had a negative effect, and two studies concluded that UAI had no effect. While high

UAI describes the situation where people are in favour of strict rules, regulations, guidelines, and laws, low UAI describes the situation where people are in favour of less regulation. Members of high UAI cultures are uncomfortable with unforeseen outcomes that may occur in the future and try to minimize the likelihood of the same (Bird, 2000). Since members of high UAI cultures are likely to induce the creation of rules and regulations and subsequently comply with them, high UAI is expected to affect OS positively. On the other hand, people with low UAI are likely to be more successful in unexpected situations.

While most of the studies (58.3%) determined that the MAS dimension had no effect, the negative effect also appeared to be a significant result, with 33.3%. Lu et al. (2012) stated that low MAS seems to encourage safe behaviour more. Moreover, it was also suggested that excessive confidence was responsible for the decreasing sensitivity in certain contexts, which caused the weakening of alertness against behaviours deviating from safety (Gharpurea et al., 2018). As a result, most of the studies in the literature demonstrated that MAS had no effect, and some of them demonstrated that MAS had a negative effect.

While six of the eight studies investigating the LTO effect reported a positive effect, none of the studies reported a negative effect. LTO is anticipated to enhance planning procedures, compliance, and management discipline, all of which are anticipated to support safety behaviour (Gharpurea et al., 2018). As a result, almost all of the studies in the literature were determined to favour the positive effect of LTO.

When the results of the studies examining the impact of NC generally were evaluated, it was observed that while three of the studies argued that NC had an impact on OS, one study (study 11) found out that globalization was more important than culture.

Table 3. Results of the Studies

Study	**Impact of NC dimension on the examined OS factor**				
	PDI	**IDV**	**UAI**	**MAS**	**LTO**
1			N		
2	N	N	P	N	P
3	No	N	P	N	No
4	P	N	P	No	P
5	Organizations are responsible for promoting an SC and for maximizing P and minimizing N aspects of NCs.				
6	The influence of NC is seen to be higher in the professional pilot culture, and one-size-fits-all training is not proper.				
7	N	N	P	No	Moder.
8	N	N	No	No	No
9	P	N	N	No	P
10	N	N	P	N	P
11	The globalization values that are embodied by management practices are stronger than locally held cultural values.				
12	No	N	P	P	P
13			N		
14	P	P	P	No	No
15	Risk perception in construction is independent of NC.				
16	No	N	P	No	No
17		N			
18				N	
19	P	N	No	No	P
20	NC characteristics can influence the development of an organization's SC.				
Total	P	4(36.4%)	1(8.3%)	8(61.5%)	1(8.3%)	6(75.0%)
	N	4(36.4%)	11(91.7%)	3(23.1%)	4(33.3%)	0(0%)
	No	3(27.3%)	0(0%)	2(15.4%)	7(58.3%	2(25.0%)
	Total	11	12	13	12	8

N-Negative P-Positive

4. Discussion

It has been determined that the studies were mainly carried out on safety performance and safety attitude/behaviour. However, both safety climate and SC are indicators of the OS level in an organization. Safety climate and SC, which complement each other, shape the core of organizational climate and culture. The expression of safety culture in behaviour and attitudes is safety climate and expresses the individual's perceptions and attitudes towards safety. Safety climate measures are extremely important in that they investigate individual perceptions of safety priority. In addition, workplace safety training is a process that aims to provide the workforce with the knowledge and skills that will enable them to perform their jobs safely for themselves and their colleagues. In this respect, it has a critical importance in terms of preventing work accidents. In this context, it is considered that NC's effect on safety climate, SC, and safety training effectiveness needs further investigation.

A significant part of the studies was observed to be conducted through questionnaires. There are many advantages of questionnaires like large-scale data collection, standardized responses, anonymity and confidentiality, cost-effectiveness, flexibility, simultaneous quantitative and qualitative data collection, ease of analysis, standardization across studies, ease of replication and time efficiency. On the other hand, they have important disadvantages like limited depth of information, response bias, low response rates, misinterpretation of questions, inability to capture non-verbal cues, limited engagement, lack of context, inability to probe for clarification, sampling limitations, potential for measurement error and potential for response fatigue (Lindeman, 2023). Doing more studies by using databases may produce clearer results in terms of observing the impact of NC on OS. On the other hand, any study about real cases could not be found in the literature. It is thought that studies analysing accidents for the impact of NC can also provide striking and vital data.

Most of the studies were in favour of the negative effect of IDV, the positive effect of UAI and LTO, and the negative effect or ineffectiveness of MAS. On the other hand, there is a total disagreement about how PDI affects OS. Nevertheless, although there are studies in the literature examining each of the UAI, IDV, and MAS dimensions separately, no such study has been observed for PDI. The Power Distance Index reflects the degree to which members of a culture accept and expect that power is unequally distributed in a society (Hofstede, 1980). Investigating PDI is important to understand how it shapes safety culture. It is also critical to understand the impact of organizational hierarchy and NC related to power distance on perceptions of SC.In this sense, carrying out new studies focusing on PDI may provide new information to clarify the subject.

The studies examined mainly concerned aviation, the oil and gas industry and the construction sector. These are sectors in which the consequences of occupational accidents are very serious and fatality rates are high. At the same time, there is a multicultural working environment in these sectors. For all these reasons, it can be said that these sectors are the most suitable for studying the impact of national culture on occupational safety.

5. Conclusion

Today, OA are still one of the significant problems of working life and globalization is increasing the number of international companies operating in areas such as aviation, construction, oil and gas industry, and shipping. The fact that hundreds, sometimes even thousands of employees from very different cultures come together under the roof of these companies, makes the NC differences between employees more critical in terms of OS. Despite all these, it is seen that the number of studies examining the NC OS relationship in the literature is limited.

The examination of the studies indicated that;

- to carry out more studies on the safety-related factors such as safety climate, SC besides safety performance,
- to carry out studies based on real data and case studies,
- to continue to do studies, especially in multicultural sectors and sectors that are more dangerous in terms of OS.
- to examine the PDI effect in more detail will be beneficial.

Whatever the case, the findings of this study will help to clarify the link between NC OS. This will prompt the decision-makers to think about the implications of cultural differences during the process of designing policies and designing activities, and this will contribute to the improvement of OS. New studies clarifying the NC-OS relationship may contribute significantly to the efforts aiming to maximize the positive effects of NC on OS and eliminate or minimize its negative effects and provide safer work environments.

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Participation Rates of Researchers / Araştırmacıların Katılım Oranları

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