# Factors Contributing towards establishing a Positive Safety Culture in Manufacturing Sector

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## Abstract

A combination of large scale disasters and hazards has encouraged high risk, industries to reduce the potential workplace incidents and accidents with routine tasks and to improve workplace safety. This idea encourages the promotion of a strong safety culture which has attracted much attention across a broad spectrum of industries such as manufacturing, shipping, nuclear, airports, mining and construction where manufacturing sector has one of the highest and continued incidence of fatal incidents, major injury, and reportable 'over 3-day' injuries and high overall numbers. In addition, the manufacturing sector accounts for the second largest number of major injuries when compare to the services. Therefore, promoting a positive safety culture in manufacturing sector creates an atmosphere in which employees are aware of the risk in their workplace, continually on guard against them, and avoid taking any unsafe actions. Establishing a positive safety culture is affected by many factors such as safety management systems occupied including reporting procedures, communication and feedback systems, auditing processes, attitudes and behaviours, work environment, management commitment, employee involvement and employee performance including training and development, incentives, reward systems etc. Thus, understanding such aspects is crucial to create and nurturing a safety culture that suits the organization and the individuals within it. This paper, therefore, aims to investigate factors which contribute towards establishing a positive safety culture in manufacturing sector.

A comprehensive literature review and preliminary study were conducted. Key words such as safety culture, definitions of safety culture, components of safety culture and way to establishing a positive safety culture were used to gather relevant literature. Further, semi structured interviews were carried out with the industrial experts who are in charge of the concerned areas to validate the factors identified from literature review. Research findings illustrated three key areas to be considered when developing a safety culture namely; organizational environment, individual and behaviour (human), and systems and processes. Each manufacturing organization needs to consider all of these aspects in developing and strengthening the safety culture that suits the organisation and the individuals within it. Also, it was further disclosed that everybody needs to feel that safety is everyone's responsibility in order to create the safety culture in the organisation. The finding of this research will be a guideline to propose a better working condition so that the safety culture can be created.

Keywords: Safety Culture, Manufacturing Sector

#### 1.0 Introduction

A safety culture is so much more than the "Safety First" sign hanging over the entrance door. Many industries around the world are increasingly showing interest in the concept of 'safety culture' as a means of reducing the potential for large scale disasters and accidents with routing tasks as disasters and accidents and their consequences continue to be a major public safety concern (Sukadarin et al., 2012). In addition, the Occupational Safety and Health Act (OSHA) 1994 states that the self regulation concept was promulgated based on the primary responsibility of ensuring safety, health and welfare of all persons at all places of work. Therefore, an

introduction of positive safety culture can be seen as a systematic solution towards the establishment of zero accidents in the workplace. Since manufacturing sector accounts for the second largest number of major injuries when compared with services (HSE United Kingdom Government estimate, 2008; Halim, Said and Said, 2012; Madugamuwa, 2012), creating and strengthening a positive safety culture in manufacturing sector creates an atmosphere in which employees are aware of the risk in their workplace, continually on guard against them, and avoid taking any unsafe actions. Further, establishing a positive safety culture is affected by many factors. Accordingly, this paper aims to investigate factors which contribute to develop a positive safety culture in the manufacturing sector.

## 2.0 Safety Culture

Safety culture is the way in which safety is managed in the workplace, and often reflects the attitudes, beliefs, perceptions and values that employees share in relation to safety (Cox and Cox, 1991). Further, safety culture is just one of many within an overall organisational culture. With this context, following sub section explores the relevant literature in the research arena with major focus is given to two areas such as organisational culture and safety culture in manufacturing sector.

## 2.1 Organisational Culture and Safety culture

A positive safety culture should be developed within the framework of an organisational culture to help ensure organisational consistency within safety culture programs (Clarke, 1998). Before continuing with a safety culture literature review, it is necessary to understand what organisational culture is in a broader context, and why researchers continue to focus on it. Organisational culture comes from the external environment and the integration of an internal framework (Schein, 1990). Organisational culture is defined in many ways in literature. Organisational culture encompasses the central beliefs, values and basic assumptions that are shared by members of an organisation (Schein, 1990; Denison, 1996). Schein's (1990, p.111) commonly held definition of culture is 'pattern of basic assumptions, invented, discovered, or developed by a given group, as it learns to cope with its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore is to be taught to new members as the correct way to perceive, think, and feel in relation to those problems'.

Safety culture, like organisational culture, does not have a universal definition. The concept of Safety Culture came into international usage following a report by the International Atomic Energy Agency (IAEA) in 1991, after the Chernobyl nuclear disaster in 1986 (Flin et al., 2000) which led to safety culture being defined as an organisational atmosphere where safety and health is understood to be, and is accepted as, the number one priority. This definition highlights two major points: (1) while safety culture is about positive safety attitudes, it is also about positive safety management established by organisations; (2) good safety culture means assigning the highest priority to safety. Since then, a number of organisations and researchers have developed the concept, applying it more widely to non-nuclear industries and linking it to the need for preventative approaches to occupational safety health and to human and behavioural aspects of effective safety management (ILO, 2005).

#### 2.1.1 Defining safety culture

A safety culture generally refers to the extent to which very individual and every group of the organisation is aware of the risks and unknown hazards induced by its activities; is continuously behaving so as to preserve and enhance safety; is willing and able to adapt itself when facing safety issues; is willing to communicate safety issues; and consistently evaluates safety related behaviour. The term is loosely used to describe the corporate atmosphere or culture in which safety is understood to be, and is accepted as, the number one priority (Cullen, 1990). Numerous

definitions of safety culture exist in the academic literature and examples of selected definitions are shown in Table 1.

Table 12: Definitions of Safety Culture

Reference	Definition
Kennedy and Kirwan (1998)	An abstract concept, which is underpinned by the amalgamation of individual and group perceptions, thought processes, feelings and behaviours, which in turn gives rise to the particular way of doing things in the organisation. It is a sub-element of the overall organisational culture
Hale (2000)	Refers to 'the attitudes, beliefs and perceptions shared by natural groups as defining norms and values, which determine how they act and react in relation to risks and risk control systems'
Glendon and Stanton (2000)	Comprises attitudes, behaviours, norms and values, personal responsibilities as well as human resources features such as training and development
Guldenmund (2000)	Those aspects of the organisational culture which will impact on attitudes and behaviour related to increasing or decreasing risk
Cooper (2000)	Culture is 'the product of multiple goal-directed interactions between people (psychological), jobs (behavioural) and the organisation (situational); while safety culture is 'that observable degree of effort by which all organisational members directs their attention and actions toward improving safety on a daily basis'
Mohamed (2003)	A sub facet of organisational culture, which affects workers' attitudes and behaviour in relation to an organisation's on-going safety performance
Richter and Koch (2004)	Shared and learned meanings, experiences and interpretations of work and safety - expressed partially symbolically - which guide people's actions towards risk, accidents and prevention
Fang et al. (2006)	A set of prevailing indicators, beliefs and values that the organisation owns in safety

Most of the definitions are relatively similar in the beliefs perspective, with each focusing to varying degrees, on the way people think and/or behave in relation to safety. The definitions (see Table 1) adopted by Hale (2000), Glendon and Stanton (2000) and Cooper (2000) are the most practical, as they clearly outline the contents of safety culture. Lee and Harrison (2000) reveal that basically, any safety management system is a social system, wholly reliant upon the employees who operate it. Its success depends on three things: its scope, whether employees have knowledge about it and whether they are committed to making it work. The concept of safety culture has evolved as a way of formulating and addressing this new focus. In line with this, the Advisory Committee on the Safety of Nuclear Installations (ACSNI, 1993) provides the definition that 'the safety culture of an organisation is the product of individual and group values, attitudes perceptions, competencies and patterns of behaviour that determine the commitment to and the style and proficiency of an organisation's health and safety management'.

The latest definition of safety culture is proposed by Fang and co-workers (2006): a set of prevailing indicators, beliefs and that the organisation owns in safety. In practice, creating or engineering a safety culture is due to the goal directed of various organisational characteristics by considering the impact upon safety management practices. The specific principles are reductions in number of accidents and incidents, ensuring that safety issues receive appropriate attention, ensuring that organisational members share the same ideas and beliefs about risks, accidents, and illness related to health and, determining the style and proficiency of an organisation's health and safety programs. Companies are being encouraged to adopt a positive organisational safety

culture in order to safeguard their operations against accidents and it is accepted as the number one priority (Clarke, 2003; Sukadarin et al., 2012). In high-risk industries, like aviation, nuclear power, manufacturing and fuel transportation this makes sense. The next section reviews the safety culture in manufacturing industry.

## 2.2 Safety Culture in Manufacturing Sector

According to the HSE United Kingdom Government estimates (as cited in Crime Risk and Incident Management e-Service, 2008), the manufacturing sector has one of the highest and continued incidence of fatal incidents, major injury, and reportable 'over 3-day' injuries and high overall numbers. They further emphasised that the rate of fatal injury in manufacturing was 1.27 per 100,000 employees in 2004/2005 and 1.39 per 100,000 in 2005/2006 where the manufacturing sector accounts for the second largest number of major injuries each year (6078 in 2003/2004) when compared with services. A recent study by Halim et al. (2012) revealed that among all sectors, the number of accidents reported for the manufacturing sector has been the highest in Malaysia. This reflects that the workers in the manufacturing sector are exposed to higher accidental risks. It is often the case that rapid expansion of manufacturing industries during economic expansion is associated with large employment of new workers and new technologies, machineries and equipments. While the application of new technologies would expose new hazards to the workers, hiring new worker might as well pose higher risk of accident as they are not accustomed to the hazard of workplace environment (Said et al., 2012). As stated by Allahakoon, Colombo District Factory Inspection Engineer (Madugamuwa, 2012), in Sri Lanka around 2,000 occupational accidents were reported annually and over 80 Sri Lankans lost their lives in work-related accidents every year where manufacturing sector has the second highest number of work place accidents. Thus, creating and strengthening of the safety culture is most critical in manufacturing environments with a high risk of accidents and safety-related incidents. Developing of a positive safety culture is affected by many factors. The next section discusses factors that contribute towards establishing a positive safety culture in manufacturing sector.

#### 3.0 Research Method

The study is structured in several steps. A background study was carried out on a broader perspective with the purpose of getting familiarised with the subject areas of the research study while holding the focus on research problem. The background study took the attention of journal articles, online journals, e-books, web sites, electronic library data base and other publications. Based on knowledge gained, an interview guideline was developed, investigating the research question of what are the factors which contribute to develop a positive safety culture in manufacturing sector. The interview guideline consisted of five stages as Introduction to the research, Importance of safety culture for manufacturing industry, Involvement of organisational environment, Involvement of individual and behavioural (human) and Involvement of systems and processes for developing a positive safety culture in manufacturing sector.

Data collected from respondents who are in charge of the concerned areas of manufacturing sector. The respondents include industrial experts based on number of years of experience in the respective industries (see Table 02). Semi structured interviews were carried out with them to identify factors which contribute towards establishing a positive safety culture in manufacturing sector. Finally, collected data were analysed using code based- content analysis. The QSR.NVivo - version 10.0 produced by QSR (Qualitative Solutions and Research Private Limited); computer software was used.

Table 23: Interview Profile

Selected Industrial Experts (IE)	Designation	Nature of Manufacturing organisation (currently their working in)	No of years of experience in the respective industries
IE1	Senior Manager – Environmental Health and Safety (EHS)	Pharmaceutical	12
IE2	Manufacturing Manager	Pharmaceutical	15
IE3	Senior Manager – Compliance and EHS Systems	Apparel	10
IE4	Senior Compliance office	Apparel	8
IE5	Senior Safety Engineer	Fast Moving Consumer Goods (Dairy products)	11

#### 4.0 Research findings and Discussion

It is not possible to graft a general safety culture onto manufacturing organisation as each manufacturing organisation is unique with their nature of business, processes, systems, etc. and the best safety systems in the world will fail without a supportive culture. The coding structure (see Figure 1) related to factors that contribute towards developing a positive safety culture in manufacturing sector is presented in this section which will be the basis of following discussion.

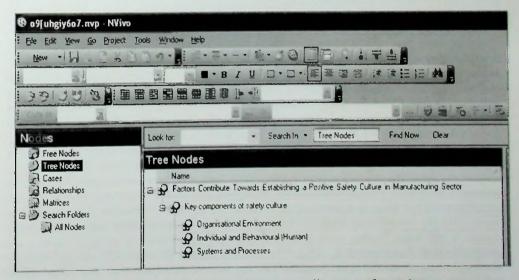


Figure 15: Coding structure for factors contribute to safety culture

Many industrial experts and results from the preliminary study revealed that the key factors such as Management systems such as integrated management systems for Environmental Health and Safety (EHS), risk management plan, EHS policies, standards (e.g. OSHAS 18000) and international EHS rating systems (e.g. Nike bronze rating) etc., Workforce, Rules, Standard Operating

Procedures (SOPs), and Systems including reporting procedures, communication and feedback systems, auditing processes, investigation processes, etc. are really needed in developing and nurturing a safety culture that suits the organisation and the individuals within it. This was more alike with the literature where many researchers believed that the key factors in developing an environment which is conducive to a positive safety culture include: (1) Management (Cox et al., 2000), (2) Individual and behavioural (workforce) (Cooper, 2000) and (3) Rules and procedures. These factors and their elements are summarised in Table 3.

Table 34: Factors that contribute to safety culture

Management	Management commitment	Rules	Clear
Source: Literature	Ability	Source: Literature	Practical
findings		findings	
	Leadership	Reporting	Reporting near
		procedure	misses
	Communication	Source: Literature	Open door policy
	Flexible culture	findings;	No blame culture
	Co-ordination	Preliminary	Analysis
Individual and	Attitude	findings)	Risk / incident
behavioural			analysis
(workforce – at all	Behaviour		Confidentiality
levels) Source:	Involvement		Feedback
Literature findings;	Training	Supervisor	Open door policy
Preliminary findings)	Competency	subordinate	Participation
Communication	Internal and external	relationship	Support correct
Source: Literature	communication	Source: Literature	behaviour
findings Preliminary	Commitment	findings;	
findings)	Internal and external	Preliminary	
	communication	findings)	
	Visual aids		
	Newsletters		
	competitions		

MacDonald et al. (2000) (cited Sukadarin et al., 2012) claimed that the reason for many accidents is deeply linked in organisational and management factors. Also, preliminary findings disclosed that incompatibility management policies and practices may cause a fuzzy understanding about priorities. It stated that the safety communication, safety training and safety systems must be considered for developing and measuring an organisational safety culture. Further, many industrial experts believed that commitment at all levels as another important factor of safety culture. They further mentioned that organisation should adopt safety and health as a core value and actively cares for the workforce. The vision for the organisation is that the workplace will be free of incidents/injuries and safety and health is integrated into every aspect of the work process. This attitude is evident throughout the organisation from the managing director through to the newest and most inexperienced member of the workforce. However, literature finding shows that the commitment from the managerial level in order to create and promote safety culture is still weak. Putting more priority in making profit instead of workers, safety is not acceptable at all (Sukadarin et al., 2012). The industrial experts (IE1, IE2, IE3 and IE5) who are in charge of the concerned areas disagreed with this fact and they stated that "some workers still not fully understand with the purpose of conducting accident investigations. They assumed that it is made to find who's to be blame in any accident or incident rather than to focus on reoccurrence of accident or incident prevention."

Since the concept of safety culture developed, there has been comprehensive research that has been carried out to establish the model of safety culture. Geller (1994) presented a model that has discriminated three dynamic and interactive factors consist of Person, Behaviour and Environment. Cooper (2000) proposed the Reciprocal Safety Culture model by adopting the

Bandura's model of Reciprocal Determinism which derived from Social Cognitive Theory (SCT). This model suggested that the concept of safety culture to facilitate the measurement and quantification of safety culture. It constitutes of three dominant dimensions of safety culture such as Psychological (people; the values and beliefs that inspire their behaviour), Jobs (behavioural; brought to the surface through the observable practices) and Organisation (situational; an international organisation's environment reinforced the preferred behaviour and the adaptability on the safety).

IE5 (Senior Safety Engineer) highlighted that strong leadership is very much essential to drive the safety culture within manufacturing environment. This was more similar to the study by Reason (1998). However, he discovered few more factors apart from strong leadership, which include conditions, past events, and the overall attitude of the workplace. When it comes to the overall attitude of the workplace, IE3 (Manager – Compliance and EHS Systems) stated that "Attitudes, both personal and organisational, affect development of a safety culture in a workplace. For an example, the wearing of protective clothing and the use of safety equipment is crucial in reducing the effects of accidents on production area. It is often the case that safety equipment is provided, but employees are reluctant, or neglect, to mear it. Consequently, the provision of safety equipment alone does not improve safety, there also needs to be a corporate culture that encourages its use". He further stated that management commitment is required to enforce the wearing of safety equipment and with that, Rules and procedures have become crucial factor in developing of safety culture in manufacturing sector. Also, everybody needs to feel that safety is everyone's responsibility in order to create the safety culture in the organisation.

A recent study by Sukadarin et al. (2012) stated that workmate's influence, safety knowledge and safety behaviour are also crucial factors in grafting the safety culture onto manufacturing sector. He further indicated that, most of the workers in the manufacturing sector have the knowledge to work safely for the example, they know about hazard in the specific job, the control measure that need to be taken in avoiding any accident to happen and any necessary information regarding to their job task. The definition (see Table 1) adopted by Glendon and Stanton (2000) stated that safety culture comprises with attitudes, behaviours, norms and values, personal responsibilities as well as human resources features such as training and development. Considering the effective safety training and development, IE1 (Senior Manager - EHS) stated that "It is essential to provide proper Training and Safety information for everyone. People who are provided with regular information about safety and health at work are more likely to be mindful of safety and health issues and the ways in which their actions can affect themselves and others. Further, Davies and Tomasin (1999) suggest that effective training in workplace is one means by which safety can be improved and company management must be active in order to reduce the number of injuries and fatalities. Nishgaki (1994) and Garza (1988) both recommended that educating and training of workers about all aspects of work safety and giving them the skill to look after themselves is the right thing to do. However,

Preliminary findings further revealed that posters, warning signs and policies are not enough and safety and health discussions and information distribution should be built into all aspects of the work process from board meetings to individual interactions. People who are properly trained in their jobs and are aware of the hazards associated with the role they, or those they supervise, perform are less likely to suffer or cause injury. Therefore, training can take a variety of forms and should be ongoing throughout an individual's time with the organisation.

According to the discussion had with IE3 (Senior Manager – Compliance and EHS Systems), External and internal reporting procedures on accidents, workplace monitoring and employee participation are other few components helpful in fostering a positive safety culture. Empirical data further revealed that employee participation includes EHS committee meetings, near miss promotional campaigns, rewarding and poster competitions, street drama, and quiz competitions as way of communicating the importance of safety culture to the organisation. Further, observations disclosed that safety communication can be many forms including internal and external communication, visual aids, newsletters and healthy communication etc. Workers' mental stability is crucial factor to be concerned with the complexity of manufacturing processes

carried out and especially when workers operate machines. Therefore, Counseling has become a key factor of safety culture in manufacturing environment which has not disused in literature yet. Safety evaluation is also another important factor in ensuring the positive safety culture and IE5 (Senior Compliance Officer) revealed that "Normally, we conduct comprehensive evaluation on Health and Safety (OSH) performance bi-annually which helps us to ensure that safety level is up to the required level".

As mentioned in beginning of this section, all the above discussed factors can be divided into three key areas, namely, Organisational environment, Individual and behavioural (human) and finally Systems (see Figure 2). In conclusion, human (Individual and behavioural) factors including attitudes, both personal and organisational, strong leadership, supervisor subordinate relationship etc. affect development of a safety culture in a workplace. The organisational environment in which people work and the systems and processes in the organisation also influence the safety culture. Therefore, each manufacturing organisation needs to consider all of these aspects in developing and nurturing a safety culture that suits the organisation and the individuals within it.

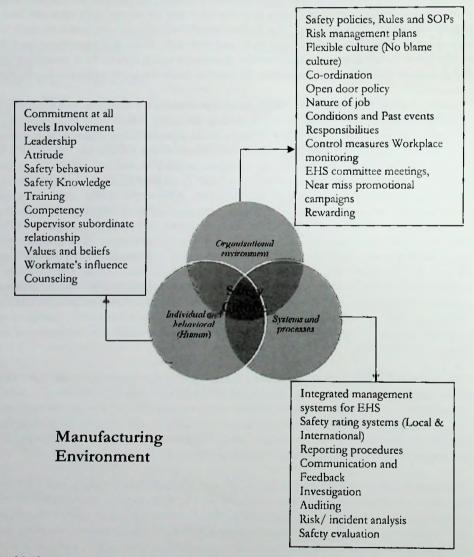


Figure 26: Factors contribute towards establishing a positive safety culture in manufacturing sector

### 4.0 Conclusion

This paper reviewed the existing literature and preliminary findings to investigate factors which contribute towards establishing a positive safety culture in manufacturing sector. Research findings revealed that creating a robust safety culture is about more than removing hazards and institutionalizing safety procedures. It is about working with people to change their attitudes, behaviours and thoughts, and improve their situational awareness within the dynamics of today's world. Safety culture is not a one day implementation; it is an on-going instillation to the work environment. The management must ensure all machinery and engineering and workplace related issues have been addressed first to create the safety culture. Sense of belonging must first been taken into consideration before any other aspect of safety culture being instilled. Both the management and employees need to play their own roles and responsibility in order to ensure the objective of safety culture is achieved. Research findings illustrated three areas to be considered when developing a safety culture namely; organitional environment, individual and behaviour (human), and systems and processes. Each manufacturing organisation needs to consider all of these aspects in developing and strengthening the safety culture that suits the organisation and the individuals within it. And also, everybody needs to feel that safety is everyone's responsibility in order to create the safety culture in the organisation.

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