

ESTABLISHING A POSITIVE SAFETY CULTURE IN RUBBER MANUFACTURING SECTOR: HUMAN FACTORS

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ABSTRACT

Safety and health in the rubber products manufacturing sector has been a neglected subject, though this sector is still a major foreign exchange contributor to the national economy in Sri Lanka, with significant contribution of Rs 72.3 billion in 2008. The rubber industry in the Sri Lanka employs many thousands of people and as it is a heavy industry, it poses a number of safety and health risks to workers employed in that sector. Occupational safety and health concerns in rubber manufacturing facilities have always been and continue to be of the utmost importance. Often the impact of serious workplace injuries overshadows the damage associated with illnesses which may be linked to workplace exposures. Thus, establishing of a positive safety culture is most critical in rubber manufacturing environments with a high risk of health and safety concerns. The cause analysis for failings related to safety culture in rubber manufacturing sector are varied and far reaching; with each issue coming into play at one critical point in time. However, these weaknesses include human and other factors such organisational, systems and processes etc. where majority of failures come under the category of human factors. Thus, understanding of these human aspects is crucial to establish and nurturing a safety culture that suits the organisation and the individuals within it. This paper therefore aims to investigate human factors which contribute towards establishing a positive safety culture in rubber manufacturing sector.

A comprehensive literature review and preliminary study were used as the research methodology for this paper. Key words; safety culture, definitions of safety culture, components of safety culture and way to establishing a good safety culture in rubber manufacturing sector were used to search the literature. Further, semi structured interviews were carried out with the industrial experts who are in charge of the concerned areas and with few shop floor level workers who are directly involved in production process. Research findings illustrated that yet, like in any other employment sector, workers in the rubber industry run an equal if not higher risk of being injured as a result of the type of work they do. Due to management and worker ignorance and rubber products manufacturing chemicals and bad work practices in some factories, serious hazards have been created and many accidents have occurred. Research findings illustrated that establishing a positive safety culture is about more than removing hazards and institutionalising safety procedures. It is about working with people of the organisation to change their attitudes, behaviours and thoughts, and improve their situational awareness. Research findings further illustrated that two key aspects under human factors to be considered when developing a safety culture in this sector namely; Psychological aspects and Behavioural aspects. These two aspects are inter-related where if something happens in one aspect it will influence the other aspect. Thus, each organisation needs to consider these aspects in establishing a positive safety culture that suits the organisation and the individuals within it. The finding of this research will be a guideline to propose a better working condition so that the safety culture can be created.

Keywords: Human Factors; Rubber Manufacturing Sector; Safety Culture.

1. INTRODUCTION

A safety culture is so much more than the “Safety First” sign hanging over the entrance door. Many industries around the world are showing an increasing 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). Besides, the Occupational Safety and Health Act (OSHA) (1994 cited in Hughes and Ferrett, 2013)

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stated that the self-regulation concept was promoted 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, 2007 cited in Crime Risk and Incident Management e-Service, 2008; Halim, Said and Said, 2012; Madugamuwa, 2012), establishing and strengthening a positive safety culture in manufacturing sector is important and it 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. This is crucial in rubber manufacturing sector because it as a heavy industry, it poses a number of safety and health risks to workers employed in that sector. Establishing a positive safety culture is affected by many factors such as human, organisational, systems and processes, etc. Accordingly, this paper aims to investigate only human factors which contribute to develop a positive safety culture in the rubber manufacturing sector.

2. SAFETY CULTURE

Safety culture is an abstract concept, giving researchers a large degree of freedom on how they understand these concepts and put them into practice (Havold, 2005). It is the ways 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). Moreover, 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 where major focus is given to two areas; Organisational culture and safety culture and safety culture in rubber manufacturing sector.

2.1. ORGANISATIONAL CULTURE AND SAFETY CULTURE

A positive safety culture should be developed within the framework of an organisational culture to ensure organisational consistency within safety culture programs (Clarke, 1999). Before continuing with a safety culture literature review, it is necessary to understand what organisational culture is in a broader context. 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) and is often defined as “the way we do things around here” (Gludenmund, 2010, p.21). Part of that culture in hazardous industries relates to safety, which was defined by Reason (2000) as the ability of individuals or organisations to deal with risks and hazards so as to avoid damage or losses and yet still achieve their goals. The beliefs and values that refer specifically to safety and health form the subset of organisational culture referred to as safety culture (Clarke, 1999).

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). The investigation report by the International Nuclear Safety Advisory Group (INSAG) of the International Atomic Energy Agency (IAEA) identified that poor safety culture as one of the contributing factors to this worst nuclear power plant accident in history (INSAG, 1986 cited in European Agency for Safety and Health at Work, 2010) and 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. From then on the concept of safety culture has been used more and more in safety research, particularly in industries which have high potential for health and safety issues.

2.1.1. DEFINING SAFETY CULTURE

A safety culture generally refers to the extent to which every 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 literature, and examples of selected definitions are shown in Table 1.

Table 1: Definitions of Safety Culture

Reference	Definition
Cox and Cox (1991)	Safety culture is the ways in which safety is managed in the workplace, and often reflects the attitudes, beliefs, perceptions and values that employees share in relation to safety
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)	Aspects of the organisational culture which will impact on attitudes and behaviour related to increasing or decreasing risk
Cooper (2000)	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 <i>et al.</i> (2006)	A set of prevailing indicators, beliefs and values that the organisation owns in safety
National Institute for Occupational Safety and Health (NIOSH) (2008)	Underlying organisational principles, norms, commitments and values related to the operation of safety and health, as well as its importance compared with other workplace goals.

Most of the definitions are relatively similar in the beliefs perspective, with each focusing, to varying degrees, on the way people think and behave in relation to safety. The definitions (refer 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 *et al.* (2006): a set of prevailing indicators, beliefs and that the organisation owns in safety. In practice, establishing 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 hazardous industries, like aviation, nuclear power, rubber manufacturing and fuel transportation this makes sense. The next section reviews the safety culture in rubber manufacturing industry.

2.2. SAFETY CULTURE IN RUBBER MANUFACTURING SECTOR

Safety and health in the rubber products manufacturing sector has been a neglected subject, though this sector is still a major foreign exchange contributor to the national economy in Sri Lanka, with significant contribution of Rs 72.3 billion in 2008 (Yogarathnam, 2010). Occupational safety and health concerns in rubber manufacturing facilities have always been and continue to be of the utmost importance. Often the impact of serious workplace injuries overshadows the damage associated with illnesses which may be linked to workplace exposures. Yet, like in any other employment sector, workers in the rubber industry run an equal if not higher risk of being injured as a result of the type of work they do. Many mechanical and chemical hazards exist in the rubber manufacturing organisations, where a large number of unskilled and semi-skilled workers are employed. Further, due to management and worker ignorance and rubber products manufacturing chemicals and bad work practices in some factories, serious hazards have been created and many accidents have occurred (Vecchio-Sudus and Griffiths, 2004; Yogarathnam, 2010).

Generally, the production of rubber items involves subjecting heterogeneous mixtures of hundreds of chemicals to heat, pressure, and catalytic action during a variety of manufacturing processes. As a result, the work environment may be contaminated with dusts, gases, vapors, fumes, and chemical byproducts. Workers may be exposed to these hazards through inhalation and skin absorption during rubber processing and product manufacturing. Physical hazards such as noise, repetitive motion, and lifting may also be present (Centre for Disease Control and Prevention, 1993; Thompsons Solicitors, 2013). Thus, establishing of the safety culture is most critical in rubber manufacturing environments with a high risk of safety and health concerns and it can be an effective tool for improving safety and addressing safety related issues within the above said sector.

As an overall, the cause analysis for failings related to safety culture in rubber manufacturing sector are varied and far reaching; with each issue coming into play at one critical point in time. However, these weaknesses include human and other factors which festering in the organisation, reflecting the underlying safety culture, are often also contributory factors (Gunasekara and De Alwis, 2008; Ahmed and Hossain, 2009; GL Noble Denton, 2013). Weaknesses in safety culture related to; Poor management commitment to safety, Prioritising cost-cutting and production above safety, Complacency about risks, Staffing issues and excessive workload, Inappropriate rewards and incentives for reporting incident, Inadequate training for emergencies, Leaders inconsistently modeling safety behaviours, Absence of learning from past incidents, Fear of speaking up by staff, Poor competency of managers in risk/hazard management, Safety critical tasks not performed, Organisational change poorly managed and Inadequate communication etc. (GL Noble Denton, 2013). Most of the weaknesses mentioned in above are related with 'Human factors'. Thus, having better understanding on human factors on this perspective will be an effective tool in addressing those failures and establishing a positive safety culture in rubber manufacturing environment will ensure the long term business continuity together with protection of employees, customers and properties.

3. RESEARCH METHOD

The study was 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 rubber manufacturing sector. The interview guideline consisted of five stages as Introduction to the research, Importance of safety culture for rubber manufacturing industry, Involvement of individual and behavioural (human) and management for developing a positive safety culture in rubber manufacturing sector. Data collected from respondents whom are in charge of the concerned areas of rubber manufacturing sector and from few shop floor level employees who are directly engaged with production process (refer Table 2). The industrial experts were selected based on number of years of experience in the respective industries. Semi structured interviews were carried out with them to identify factors which contribute towards establishing a positive safety culture in manufacturing sector.

Table 2: Interview Profile

Selected Respondents	Designation	No. of Years of Experience in the Respective Industries
<i>Industrial Experts (IE)</i>		
IE1	Senior Manager - Environmental Health and Safety (EHS)	12
IE2	Manufacturing Manager	15
IE3	Senior Manager - Compliance and EHS Systems	10
IE4	Senior Compliance Office	8
IE5	Senior Safety Engineer	11
<i>Shop Floor Level Employees</i>		
Few Machine Operators		7 - 12

4. RESEARCH FINDINGS AND DISCUSSION

It is not possible to graft a general safety culture into rubber manufacturing organisation, as each 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. Safety performance of the human is strongly linked to organisation's safety culture. Safety culture can be divided into three aspects as psychological, behavioural and situational (Cooper, 2000). Psychological and behavioural aspects directly link with human factors (refer Figure 1). Situational aspects will not be discussed in this study as it mainly discuss about the 'what the organisations has' which includes policies, procedures, regulations, organisational structures and management system.

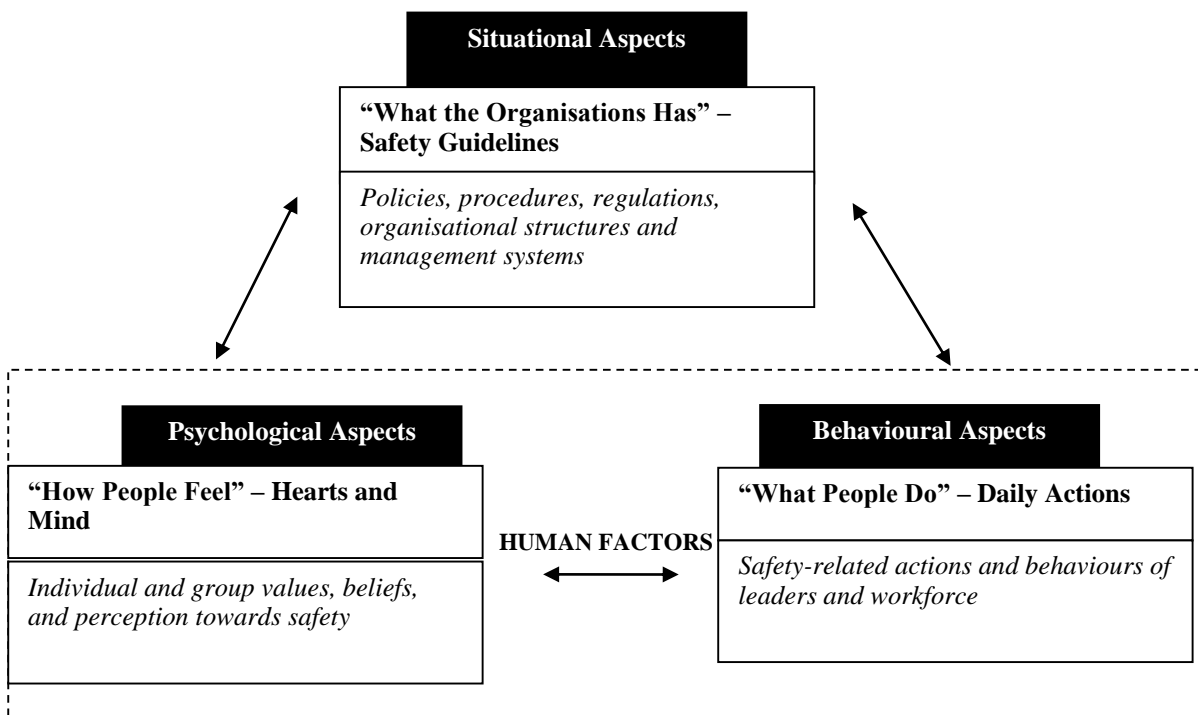


Figure 1: Elements of Safety Culture
Source: Adapted from Cooper (2000)

These three aspects are inter-related where if something happens in one aspect it will influence the other two. The next two sub sections discuss about the psychological and behavioural aspects.

4.1. PSYCHOLOGICAL ASPECTS

The psychological aspects state how employees think and feel about safety and it is usually about winning over people’s heart and minds. Many industrial experts and results from the preliminary study revealed that the key factors such as individual and group values, beliefs and perception and attitudes towards safety significantly contribute in establishing a safety atmosphere in rubber manufacturing environment. This is more alike with literature where many researchers stated that safety culture often reflects the attitudes, beliefs, perceptions and values that employees share in relation to safety. For an example, the definitions adapted by Mohamed (2003) clearly indicate that safety culture affects workers’ attitudes and behaviour in relation to an organisation’s on-going safety performance.

Attitudes, both personal and organisational, affect development of a safety culture in a workplace. According to Lin and Mills (2001) and Sukadarin *et al.*, (2012), safety is something found to be the first item to face cost cutting as the employers who often believe that implementing a safety system will cost more. In addition, managerial focus tend to concentrate on production “at cost” and safety does not help production therefore it suffers when expenses runs over budget. This was the same idea of most of the shop floor level workers who are working in rubber manufacturing organisations as machine operators. Some of the workers mentioned that “*profit before safety where productivity always came before safety, as safety was viewed as a cost, not an investment.*” However, the industrial experts (IE1, IE2, IE3 and IE5) who are in charge of the concerned areas disagreed with this fact and they stated that “*we are providing the safety for them. But some of the workers still neglect safety guidelines provided with them. 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 some employees are reluctant, or neglect, to wear it.*” He further mentioned that some workers still not fully understand the purpose of conducting accident investigations. They assumed that, it is made to find who is to be blame in any accident or incident rather than to focus on reoccurrence of accident or incident prevention. The misunderstanding between both parties shows the conflict of attitudes towards safety and at the same time it highlights importance of positive attitudes, individual and group values, beliefs and perception towards safety in terms of establishing a positive safety culture in rubber manufacturing

environment. Hence, the good understanding and strong relationship between both management and employees help to feel them that safety is everyone's responsibility in order to create the safety culture in the organisation. 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 should be evident throughout the organisation from the managing director through to the newest and most inexperienced member of the workforce.

However, workers tend to be more careful in what they do when their social responsibilities are higher. Industrial experts did clarify that those workers who are married and have more dependences in their families tend to follow safety instructions and guidelines onsite than others. The study by Hinze (1997) and Choudhry *et al.* (2009) found that the married workers exhibited more positive attitudes towards safety. Workers' mental stability is crucial factor to be concerned with the complexity of manufacturing processes carried out and especially when workers operate machines. Therefore, counselling has become a key factor of safety culture in rubber manufacturing environment which has not disused in literature yet. According the Hale (2000), safety culture 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'. As per this definition, safety culture is not about psychological aspects and these aspects influence people to behave in relation to safety. The behavioural aspects comprise of employees' everyday actions in regards to safety and next section discuss about the behavioural aspects.

4.2. BEHAVIOURAL ASPECTS

Behavioural aspects dictate what employees do in regards to safety and it includes their day-today activities towards safety in their working environment. 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. However, literature findings show 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 who are in charge of the concerned areas disagreed with this fact (refer Section 4.1). As explained in Section 4.1, some workers are reluctant to wear safety clothing and safety equipments during the working time. Consequently, the provision of safety equipment alone does not improve safety, there also needs to be a corporate culture that encourages its use. At this level, management commitment plays a significant role and also it is required to enforce the wearing of safety equipment. Not only commitment from management but also commitment at all levels is another important human factor in creating a safety culture. Since health and safety concerns in rubber manufacturing facilities have always been and continue to be of the utmost importance, commitment at all level is required to establish a positive safety culture.

IE5 (Senior Safety Engineer) highlighted that strong leadership is very much essential to drive the safety culture within manufacturing environment. Ineffective leadership, where blinkered leadership and the prevailing corporate culture prevented the recognition of risk and opportunities leading to wrong safety decisions being made at the wrong time and for the wrong reasons. Experts have observed that the workers who are older in age more cautious about work safety than youngsters in the industry and they tend to behave more safely for their own protection. 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 (refer 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. Workers 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. Employee participation is another important human factor which 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.

Fleming and Lardner (1999) have discovered the human factors contribute to 80-90% of all industrial accidents. Thus, each organisation needs to consider all of these aspects in developing and strengthening the safety culture that suits the organisation and the individuals within it. Figure 2 depicts the all the human factors including psychological and behavioural factors discussed in above.

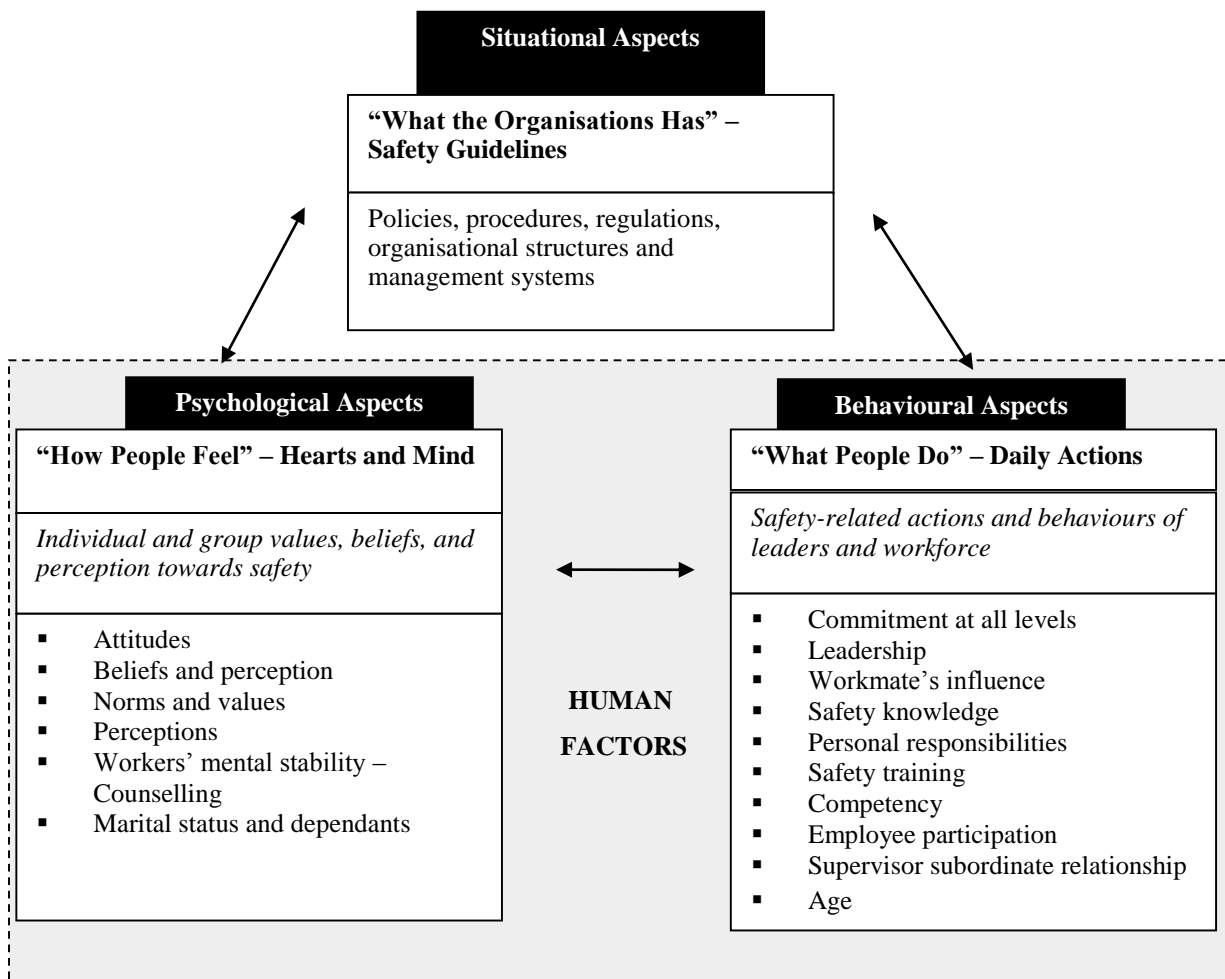


Figure 2: Human Factors Contributing Towards Establishing a Positive Safety Culture in Rubber Manufacturing Sector

5. CONCLUSIONS

This paper reviewed the existing literature and preliminary findings to investigate human factors which contribute towards establishing a positive safety culture in rubber manufacturing sector. Since health and safety concerns in rubber manufacturing environment have always been and continue to be of the

utmost importance, creating a positive safety culture is very important. Research findings revealed that creating a strong safety culture is about more than removing hazards and institutionalising safety procedures. It's about working with people of the organisation to change their attitudes, behaviours and thoughts, and improve their situational awareness within the dynamics of today's world. Also, literature findings disclosed that safety culture is mainly focus on the way people think and behave. Therefore, this highlights the importance of human factors in establishing a positive culture. Human factors include both psychological and behavioural aspects. These two aspects are inter-related where if something happens in one aspect it will influence the other aspect. Each organisation needs to consider all of these aspects in developing and strengthening the safety culture that suits the organisation and the individuals within it. Moreover, everybody needs to understand that safety is everyone's responsibility in order to create the safety culture in the organisation.

6. REFERENCES

- Advisory Committee on the Safety of Nuclear Installations (ACSNI), 1993. *Study Group on Human Factors, Third report: Organising for safety*. London: HMSO.
- Ahmed, J.U. and Hossain., 2009. Industrial safety in the readymade garment sector: A developing country perspective. *Sri Lankan Journal of Management*, 14(1).
- Centre for Disease Control and Prevention, 1993. *Special NIOSH hazard review rubber products manufacturing industry* [online]. Available from: <http://www.cdc.gov/niosh/docs/93-106/> [Accessed 15 March 2014].
- Choudhry, M.R., Fang, D.P. and Lingard, H., 2009. Measuring safety climate of a construction company. *Journal of Construction Engineering and Management*, 135(9), 890-899.
- Clarke, S., 1999. Perceptions of organisational safety: Implications for the development of safety culture. *Journal of Organisational Behaviour*, 20, 185–198.
- Clarke, S., 2003. The contemporary workforce: Implications for organisations safety culture. *Personnel Review*, 32(1), 40-57.
- Cooper, M.D., 2000. Towards a model of safety culture. *Safety Science*, 36, 111–136.
- Cox, S. and Cox, T., 1991. The structure of employee attitudes to safety - a European example. *Work and Stress*, 5, 93 - 106
- Cox, S. and Flin, R., 1998. Safety Culture: Philosopher's Stone or Man of Straw?. *Work and Stress*, 12(3), 189-201.
- Crime Risk and Incident Management e-Service, 2008. *Industry verticals: manufacturing industry* [online]. Available from: <http://www.crime-s.com> [Accessed 25 November 2013].
- Cullen, W.D., 1990. *The public inquiry into the piper alpha disaster*. London: HMSO.
- Davis, V. and Tomasin, K., 1999. *Construction Safety Handbook*. 2nd ed., Thomas Telford: New York.
- Denison, D. R., 1996. What is the difference between organisational culture and organisational climate? A native's point of view on a decade of paradigm wars. *The Academy of Management Review*, 21(3), 619–654.
- European Agency for Safety and Health at Work. 2010. *Mainstreaming OSH into business, Luxembourg, Office for Official Publications of the European Communities* [online]. Available from: http://osha.europa.eu/en/publications/report_s/mainstreaming_osh_business [Accessed 15 March 2014].
- Fang, D.P., Chen, Y. and Louisa, W., 2006. Safety climate in construction industry: a case study in Hong Kong. *Journal of Construction Engineering and Management*, 132(6), 573–584.
- Fleming, M. and Lardner, R., 1999. Safety culture – the way forward. *The Chemical Engineer*, 6-18.
- Flin, R., Mearns, K., O'conner, P. and Bryden, R., 2000. Measuring safety climate: Identifying the common features. *Safety Science*, 34, 177-192.
- Garza, J., 1988. Analysis of safety indicators in construction. *Journal of Construction Engineering and Management*, 124(4), 312-14.
- GL Noble Denton, 2013. *Tackling the safety culture challenge* [online]. Available from: <http://www.glnobledenton.com> [Accessed 08 December 2013].
- Glendon, A.I. and Stanton, N. A., 2000. Perspectives on safety culture. *Safety Science*, 34, 193–214.

- Guldenmund, F.W., 2000. The nature of safety culture: A review of theory and research. *Safety Science*, 34, 215–257.
- Gunasekera, M.Y. and De Alwis, A.A.P., 2008. Process industry accidents in Sri Lanka: analysis and basic lessons learnt. *Process Safety and Environment Protection*, 86, 421-426.
- Hale, A.R., 2000. Editorial: culture's confusions. *Safety Science*, 34, 1–14.
- Havold, J.I., 2005. Measuring occupational safety: from safety culture to safety orientation? *IOSH, Policy and Practice in Health and Safety*, 2005(1), 85-105.
- Hinze, J.W., 1997. *Construction safety*. New Jersey: Prentice-hall
- Hughes, P. and Ferrett, E., 2013. *International health and safety at work: The handbook for the NEBOSH international general certificate*. 2nd ed. Routledge, New York.
- Kennedy, R., Kirwan, B., 1998. Development of a hazard and operability-based method for identifying safety management vulnerabilities in high risk systems. *Safety Science*, 30, 249–274.
- Lee, T. and Harrison, K., 2000. Assessing safety culture in nuclear power stations. *Safety Science*, 34, 61–97.
- Lin, J. and Mills, A., 2001. Measuring the occupational health and safety performance of construction companies in Australia. *Facilities*.19(3/4), 131-138.
- Madugamuwa, M. 2012, May 7. Work related accidents: Construction, manufacturing sectors most dangerous sectors. *The Island*.
- Mohamed, S., 2003. Scorecard approach to benchmarking organisational safety culture in construction. *Journal of Construction Engineering and Management*, 129 (1), 80–88.
- National Institute for Occupational safety and Health (NIOSH), 2008. *National Occupational Research Agenda: National construction agenda for occupational safety and health research and practice in the U.S. construction sector* [online]. Available from: www.cdc.gov/niosh/nora/comment/agendas/construction/pdfs/ConstOct2008.pdf [Accessed 17 March 2014].
- Nishgaki, S., 1994. Humanware, human error and Hiyari-hat: a template of unsafe symptoms. *Journal of Construction Engineering and Management*, 120 (2), 421-41.
- Reason, J., 2000. Safety paradoxes and safety culture. *Journal of Injury Control and Safety Promotion*, 7, 3–14.
- Richter, A. and Koch, C., 2004. Integration, differentiation and ambiguity in safety cultures. *Safety Science*, 42, 703–722.
- Said, S.M., Said, F. And Halim, Z.A., 2012. The determinants of industrial accidents in the Malaysian manufacturing sector. *African Journal of Business Management*, 6(5), 1999-2006.
- Schein, E. H., 1990. Organisational culture. *American Psychologist*, 45, 109–119.
- Sukadarin, E.H., Suhaimi, N.H. and Abdull, N., 2012. Preliminary study of the safety culture in a manufacturing industry. *International Journal of Humanities and Social Science*, 2(4), 176-183.
- Thompsons Solicitors, 2013. *Rubber industry health and safety* [online]. Available from: <http://www.thompsons.law.co.uk/workplace-illnesses-and-diseases/rubber-industry-health-and-safety.htm> [Accessed 15 March 2014].
- Vecchio-Sudus, A.M. and Griffiths, S., 2004. Marketing strategies for enhancing safety culture. *Safety Science*, 42, 601– 619.
- Yogarathnam, N., 2010, September 21. Safety, health issues in rubber sector. *Daily News*.