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Human factors and safety culture: Challenges and opportunities for the port environment

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ABSTRACT

The critical role of understanding Human Factors and the importance of Safety Culture in the maritime sector is becoming much more topical. While the key focus of much of the research in this sector has been on seagoing vessels, it is also important to recognise that ports and docks can be particularly dangerous and hazardous environments. The objective of this paper is to report on an exploratory research study assessing the safety culture and human factor awareness in a large European port environment. The research study adopted a multi-methods approach that included the completion of a Safety Culture Assessment Survey across a port environment (161 responses) and research interviews (11 in total) with a port authority company. The research concludes that there is an increasing awareness of human factors and a move towards a positive safety culture that facilitates an open and resilient approach to all safety practices. However much more focused research is required focusing on the specific complexities, constraints and shared processes of our port environments.

1. Introduction

The maritime sector is facing many challenges with recent reports of an increase in the frequency of accidents both in shipping and at ports (Global Risk Reports, 2016). Human and organisational factors account for 80% of maritime accidents worldwide (Berg, 2013). An understanding of the role of human factors and safety culture has become an important issue for this sector.

To date, most of the research and practice has been concerned with “human behaviour aboard seagoing vessels, with the major focus being on maritime transport – the merchant or merchant marine” (MacLachlan, 2017; p. 2).

Berg (2013) highlights that the “maritime transport system is 25 times riskier than the air transport system according to the accounts for deaths for every 100 km” (p. 344). In addition, a number of recent high profile incidents suggest that the absence of a fully implemented safety culture is still an issue which some shipping companies will need to address as a matter of priority.

While the key focus of much of the research in this sector has been on seagoing vessels, it is also important to recognise that ports and docks can be particularly dangerous and hazardous environments, especially if there is not awareness of human factors and a move towards a positive safety culture that facilitates an open and resilient

approach to all safety practices.

The objective of this paper is to report on an exploratory research study assessing the safety culture and human factor awareness in a large European port environment and to propose some challenges and opportunities for the port environment in relation to safety culture. The research study took a socio-technical systems approach and employed mixed-methods that included the completion of a Safety Culture Assessment Survey (SCAS) across a port environment and qualitative interviews with key stakeholders in a port authority company.

1.1. Background to the port environment

The International Maritime Organisation (IMO) is the specialised agency with responsibility for developing conventions and protocols governing every facet of shipping (including the port environment) and these are then adopted into law and codes of practice by the relevant national agencies. Their overall philosophy is that of continuous improvement and the national agencies provide practical guidelines on how health and safety can be achieved in the ports and docks sector.

International statistics indicate that the main causes of accidents in ports are slips and trips: one in five personal injury accidents in the maritime industry is due to slips, trips and falls (see IMO, 2006), being hit by moving or falling objects, falls and manual handling (see

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International Shipping Federation, 2011). Threats to the health of people working in ports and docks include back and other musculoskeletal injuries, noise and dust related injuries. A high proportion of accidents to port workers occur on container ships. There is also an increasing trend in the number of accidents involving port cranes and other port mobile equipment which have resulted in serious injuries and fatalities (Darbra et al., 2006). Contributing factors have been identified as lack of an effective safety culture, inadequate risk assessment and operations management, inadequate operating procedures, lack of training and awareness, bigger and faster port equipment, bigger ships, increased port throughputs, faster ship turnarounds, more extreme weather conditions (International Shipping Federation, 2011).

1.2. Safety culture

While there is no single definition of ‘safety culture,’ in light of the Chernobyl disaster, safety culture was defined by INSAG as “an organisational atmosphere where safety and health is understood to be, and is accepted as, the number one priority” (INSAG, 1996). Therefore a positive safety culture needs to be seen as the way safety is perceived, valued and prioritised in an organisation. It reflects the tangible commitment to safety at all levels in the organisation and should permeate all aspects of the work environment. All of which requires a level of awareness, support and accountability for safety on the part of every individual in an organisation.

The International Maritime Organisation (IMO, 2003) offers their own practical working definition:

“A safety culture can be defined as a culture in which there is considerable informed endeavour to reduce risks to the individual, ships and the marine environment to a level that is as low as is reasonably practicable.” (p.2)

Gordon et al. (2007) state that if there is a safety management system (SMS) but no real commitment or culture towards safety, then the management system will not be effective, as decisions will not prioritise safety. Similarly, if there is a good safety culture, but no management system, then the way that safety is organised may be inconsistent, under-resourced and not seen as business driven.

1.3. Safety culture maturity

The maturity model concept is a fairly recent research phenomena within the discipline of safety management and safety culture and has been applied to safety culture development within a number of “safety critical” industries, such as mining, aviation, petro-chemical, oil and gas. Parker et al. (2006) demonstrated the real need for a novel multi-dimensional and dynamic concept of safety culture which was developed from Westrum’s Typology of Organisational Culture (Westrum, 1996, 2004) and Reason’s work on managing the risks of organisational accidents (e.g. Reason, 1997).

These models were advanced to allow organisations to understand their own level of safety culture maturity by ‘assessing the level of compliance with various key elements of safety culture across a number of stages that represent different levels of maturity’ (Foster and Hout, 2013). In most organisations a combination of survey, safety performance indicators and audits have been used in order to get a picture of the current safety levels.

Fig. 1 provides an example of a typical Cultural Safety Maturity Model (Foster and Hout, 2013). This approach highlights a five stage approach towards an effective safety culture from a highly vulnerable (where the organisation will ‘accept that accidents happen’ to a highly resilient state (which is used to describe an organisation that has successfully integrated safety and risk management into its operations).

The framework advances the notion that as an organisation’s safety culture develops and becomes more mature as it progresses upwards through the levels. This then should result in greater trust,

accountability, free and open reporting and transparency as staff view the changes positively (Reason, 1997; Weick and Sutcliffe, 2001).

1.4. Socio-technical systems and human factors

There is no doubt that human factors are contributory factors in relation to the main causes of accidents in ports (e.g., slips and trips, falls, etc.) and for many organisations embracing safety and human factor initiatives is all part of the same discussion (Parker et al., 2006). For example, the Port of London Authority was motivated to launch a safety culture campaign to help reduce the number of incidents in the Port when it emerged that human factors contributed to over half of all reported incidents. This was an excellent initiative, however it is important to highlight that a critical element when examining human factors and violations is to fully understand how individuals within the system (the organisation) make sense of the system (Weick, 1995) and this can only be done with a cogent analysis of how the system really works in practice (McDonald, 2015). Therefore there is a very strong argument about focusing on normal operational practice: how work is actually done; the variability in performance; and understanding ways in which people make operational systems function effectively all of which are essential to understanding how things break down (McDonald, 2015). Similarly, the emphasis of making safety work in everyday practices, supported by interpersonal processes, is in line with the aspirations of current safety management but are often very difficult to fulfil (Hollnagel, 2018). We can begin to see how these aspects work if we consider safety culture and human factors from a Socio-Technical Systems (STS) perspective which has the capability to provide the basis for moving from a reactive state to a more resilient state of safety culture maturity.

Despite muchwork done on Systems approaches and Systems of Systems (Corrigan and McDonald, 2014; Stanton et al., 2017) there is still a tendency to adhere to the practices of Safety I (Hollnagel, 2014, 2018). Many safety critical industries are well aware of the philosophy behind Safety II and yet do not always embrace this in practice (Hollnagel, 2018). There are numerous potential reasons for this such as operational cost, resources (time, money, human resources, facilities etc.), political and organisation will within the respective organisations. Mansouri et al. (2010) describe a risk management-based decision analysis framework which may go some lengths in supporting decisions to priorities how to move cost-effectively from Safety I towards Safety II. However, if Ports now and Ports of the future are to contend with the changing economic, political and geographic forces that will undoubtedly present themselves, they must be ready. They must be resilient and in doing so need to go beyond Safety II. We need to strive for “Safety II +” and the safety culture of our Ports need to reflect this.

Pant et al. (2014) and Hosseini and Barker (2016) welcome the measurement of resilience (in terms of vulnerability and recoverability) which is worthy of further exploration in future research in this area. It is worthy of establishing how mature an organisation’s safety culture is and how resilient an organisation is likely to be when faced with both every day and adverse operational conditions, but it is also prudent to attempt to predict how an organisation will deal with potential disruption. Disruption is keenly depicted in Lam and Su (2015) with respect to Asian Ports. This work highlights the potential warnings of likely disruptions that we may face such as climate change, security challenges and political instability. It also stresses the importance of multi-agency co-operation and collaboration. Bauk et al. (2016, 2017) highlight examples of how Ports can benefit from improved Information and Communication Technology (ICT), to support such co-ordination which is especially important for ports which are still developing.

Such complex interplay between agencies requires appropriate methods of analysis if stakeholders are to be able to communicate and co-ordinate effectively at the operational level. This is why a socio-technical systems approach was chosen as the main vehicle for the analysis.

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