



Disaster prevention through a harmonized framework for high reliability organisations

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ABSTRACT

The increasing havoc wrecked by catastrophic incidents on organisations worldwide, as well as the increasing devastating effects of these incidents, has necessitated the development of a framework to improve the reliability of organisations. Despite operating in tightly coupled and complex technologies, high reliability organisations (HROs) continue to operate mindfully with minimal incidents. Given that most disasters have occurred in organisations and industries not considered as truly HROs, this paper argues that applying organisational learning from HROs across diverse organisations in different industries could potentially reduce organisational disasters. This paper recognised the numerous researches in HRO theory, but noticed the unavailability of a harmonized measurable framework that could be standardized and applied across diverse organisations. Using the HRO principles, this paper conducted a research in 8 organisations, in 3 industries across 2 continents. It developed the organisational reliability maturity model (ORM²) to track the progression organisations through 5 maturity levels. It developed the framework for organisational reliability maturity (FORM) to measure maturity levels of organisations, predict potentials for disasters, benchmark, and improvement organisations. It is hoped that this paper will deepen existing research in disaster prevention and HRO theory, while opening up new areas of knowledge.

1. Introduction

The old English saying “don’t spoil the ship for a ha’p’orth of tar”, which means that one should not risk the failure of a large project by trying to make savings on trivial things, suggests that catastrophic failures could be prevented by implementing minor but timely activities. Studies have shown that most catastrophic failures have been caused by series of seemingly minor and retrospectively avoidable individual and organisational behaviours (Labib and Read, 2013, 2015; Labib, 2014; Savioja et al., 2014; Waring, 2015; Harvey et al., 2016; Li et al., 2017). Despite operating with complex technologies in highly hazardous environments, and with tightly coupled processes, where minor failures could result in catastrophes, certain organisations continue to operate with nearly error free and harm free performance. They continuously avoid failures, or operate such that failures do not result in catastrophe. Should catastrophic failures eventually occur, these organisations are able to withstand the consequences. Weick and Sutcliffe, (2007, 2015) referred to them as *High Reliability Organisations* (HROs). Given the continuously remarkable safety records, these highly reliable organisations are therefore highly safer organisations.

Research into organisational reliability has been conducted in a number of industries. These have included transportation, aviation and military (Roberts et al., 1994; La Porte and Consolini, 1998; Busby, 2006; Jeffcott et al., 2006; O’Neil, 2011); nuclear (Bierly and Spender, 1995; Ashley et al., 2009); fire and disasters (Keller, 2004; Weick and Sutcliffe, 2007; Berardi, 2010); and healthcare (Baker et al., 2006; Frankel et al 2006; Madsen et al., 2006; Roberts et al 2005; Stralen et al 2006; Tamuz and Harrison, 2006; Vogus and Sutcliffe, 2007a; Costella et al., 2009; Riley, 2009; Samuels, 2010; Sutcliffe, 2011; Hales and Chakravorty, 2016). There have also been some HRO research with respect to space (Schulman, 2008); energy (Hoffmann et al., 1995; Miller, 2009; Hopkins, 2009; Lekka and Sugden, 2011); education (Stringfield, 1995; Taylor and Angelle, 2000; Azzaro, 2005; Bellamy et al., 2005; Stringfield et al., 2008); food retail (Ciravenga and Brenes, 2016); information technology (Valorinta, 2009; Carlo et al., 2012) and virtual organisations (Grabowski and Roberts, 2016). Some have aimed at the relationship with other concepts such as resilience engineering (Aven and Krohn, 2014; Righi et al., 2015; Bergstrom et al., 2015; Haavik et al., 2016; Harvey et al., 2016; Le Coze, 2016) and safety (Vogus and Sutcliffe, 2007a; Vogus and Sutcliffe, 2007b; Ausserhofer

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et al., 2013; Vogus et al., 2014; Vogus and Iacobucci, 2016). There is no evidence of a research conducted across different types of organisations at the same time to test the theory, demonstrate how it could be progressively achieved. Such research would not only provide a balanced perspective about the HRO theory, but would also show the extent to which the theory could be standardized across organisations with diverse characteristics. Furthermore, HRO researches have been mostly reactive. While some have studied how the HRO theory could have helped avoid catastrophic events retrospectively, others have mostly studied the HROs with the view to understanding behaviours make them reliable – the end point. This research is more interested in the “journey” than the “end point” - it is more interested in how organisations could become reliable.

This paper expands the HRO study to different and diverse organisations at the same time horizon using the same methodology in an attempt to obtain a balanced data. It tries to demonstrate that organisations could make progressive improvements over time as they tend towards higher reliability. To achieve this, there must be a means to measure the expected behaviours from HROs, assess the extent to which organisations exhibit these behaviours, as well as a framework that guides the organisation towards becoming HROs. Zietsma et al (2002) had identified the four feed-forward learning process as means for organisations to learn in the face of considerable external changes. Tsoukas and Mylonopoulos (2004) focused on the processes, practices and strategies through which knowledge is constructed and created in organisations. While these are important aspects towards achieving reliability, they do not specify simplified step wise approaches for adoption. Weick et al (2008) acknowledges the need for a roadmap for HRO implementation. Hales and Chakravorty (2016) attempted to “articulate” these and “show how to systematically implement HROs using a soft research methods approach moderated with mindfulness”. This purely qualitative work involved a close collaboration between the researchers and the different people within a hospital on issues of organisational reliability, as well as training and mentoring. It does not however answer some basic question: How do we measure the reliability of the organisation? At what point does the organisation move from being reliable to not being reliable or vice versa? How do we compare the reliability of different organisations? How do we measure which organisation to apply these systematic processes to? These could be achieved through a staged maturity framework.

Chassin and Loeb (2011, 2013) had developed a staged maturity model to guide organisations towards the path of higher reliability (Sullivan et al., 2016). This had focused on the organisational characteristics of leadership, safety culture and process improvement, mapped in three maturity stages of minimal, developing and approaching reliability. They rightly recommended organisational self-assessment as an important first step. While this is very detailed within the context it addresses, the model focuses narrowly on a healthcare organisation with no clear path to expand to different industries. Furthermore, they focused narrowly on the three dimensions of leadership, safety culture and process improvement. While these are worthy characteristics, organisational mindfulness goes beyond leadership and safety culture. It is concerned with a focus on a ‘clear and detailed comprehension of emerging threats, and on factors that interfere with such comprehension’ (Weick and Sutcliffe, 2007). It is organisational consciousness characterized by ‘being (1) situated in the present, (2) sensitive to context and perspectives, (3) guided (but not governed) by rules and routines’ (Langer, 2014). Mindfulness ensures everyone, not just leadership, works and communicates collectively with a common purpose to focus on what really matters based on current situational realities (Sutcliffe et al., 2016; Agwu, 2018). Organisational mindfulness comprises of five interrelated behaviours at multiple organisational levels: preoccupation with failure, reluctance to simplify, sensitivity to operations, commitment to resilience, and deference to expertise (Weick and Sutcliffe, 2015). Developing the model in line with these five interrelated behaviours at multiple organisational levels

would therefore make more sense. It would enhance the identification of expected behaviours at different maturity levels for each of the five mindfulness principles, making it easy to actualize the organisational self-assessment goal identified by Chassin and Loeb (2011, 2013), and develop improvement plan.

The paper therefore developed the Organisational Reliability Maturity Model (ORM²) as a five stage maturity model that maps organisations into various stages of organisational reliability. It further developed the Framework for Organisational Reliability Maturity (FORM), a framework that leverages on the Organisational Reliability Maturity Model (ORM²) to develop a stepwise organisational reliability learning and improvement process. The research behind this paper was conducted in eight organisations purposively selected from three industries between July 2016 and January 2017, using the same research methods. The next section will further discuss some related concepts such as disasters, HROs and organisational learning. Section three will describe the data collection and analysis process, and the results. Section four will describe the proposed maturity model and measurement framework for organisational reliability maturity, while section five will describe the various applications of the measurement framework. Section six shall conclude paper.

2. Disasters, HROs and organisational learning

2.1. Disasters

Labib and Read (2015) considered disasters as black swans with the distinct attributes of rarity, extreme impact, and retrospective predictability. Within the late twentieth and the twenty first centuries, the incidence of disasters has accelerated. This is due in part to the increasing complexity of the world and its technologies (Taleb, 2010), increasing populations and environmental changes (Rougier et al., 2010), and increasing stakeholder demands. A trend of these safety incidents over the years ties the causative factors to mostly organisational and individual errors. Reviews of the 1912 Titanic disaster that killed an estimated 1514 passengers and crew, considered management decisions and other human factors as key causative factors (Labib and Read, 2013). The March 2005 BP Texas city disaster led to 15 fatalities, injured 170 people, and resulted in damages worth hundreds of millions of dollars (Labib and Read, 2013). Again, management decisions and employees’ actions and inactions were considered to be the major causative factors. Similarly, management decisions were among the contributory factors to the April 1986 Chernobyl nuclear disaster in Ukraine (INSAG, 1992), NASA’s Columbia’s incident of 2003 (Labib and Read, 2013); the 2010 BP Deep water horizon incident; (Labib, 2014); the Rio-Paris Flight 447 (Moura et al., 2016), the 2011 Fukushima nuclear disaster (Labib and Harris, 2015), and the 2000 Concorde crash (Labib, 2014) all share similar characteristics of the significance of management and people related retrospectively avoidable causative factors. In some cases, the organisations involved could not recover from the social and financial impact of these disasters. In some other cases, the organisations were resilient and withstood the financial and social impact and evolved to become stronger and more competitive organisations. This paper hopes to tap from the understanding of the differences between these organisations to develop a harmonized framework for organisational reliability.

A lot of organisations and industries could certainly benefit from HRO theory implementation. Some may argue that implementing the HRO theory in non-traditional HRO related industries does not make financial sense. They however forget that most of the catastrophic failures in recent history have come from non-traditional HROs such as manufacturing and petroleum industries. An oil and gas facility, a brewery or a restaurant chain might not be as complex as a nuclear energy organisation, but certain failures in these industries could lead to multiple fatalities and massive environmental pollution as have happened multiple times in recent past. Hudson (2007) described the

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