

Risk can be identified and controlled.

Therefore all industrial disasters are preventable.

Introduction

The essay title suggests that all industrial disasters can be avoided if risk is identified and controlled. It looks like a simple recipe, yet the world faces industrial disasters in a regular manner. The process of risk identification and control is complex, extensive and cannot only be seen in a physical context (e.g. engineering) but needs to be examined in the light of psychological, sociological and cultural theories. The author, therefore, takes the position, that not all industrial disasters can be prevented, even if risk is identified and controlled to a certain degree. While it should be considered if certain disasters can possibly be better avoided than others, this essay focuses on underlying biases which influence the process of risk identification and control.

The essay starts with a clarification of the terms *risk* and *industrial disaster*. In a separate paragraph the author introduces the *cultural theory* and the debate about *organisational culture* as one possibility to look at the difficulties of risk identification and control processes. In the second section the circumstances of the chosen case study, the Fukushima Nuclear Accident, are briefly introduced. This section is followed by the analysis of the case study in the light of the introduced theories. The essay concludes in the last section the findings and examines if the initial doubts of the author have been appropriate and what can be learned from the findings.

Definitions and theory

While Warner (1992: 4) e.g. describes *risk* as "a combination of the probability, or frequency, of occurrence of a defined hazard and the magnitude of the consequences of the occurrence",

many other definitions exist in the academic discourse, used depending on the context. More specific definitions can be found for certain branches, released by agencies or regulative bodies. The Health and Safety Executive (HSE) (2011: 2) e.g. looks at risk in relation to hazard (which is defined as " … anything that may cause harm, such as chemicals, electricity … etc.") and defines it as "the chance, high or low, that somebody could be harmed by these and other hazards, together with an indication of how serious the harm could be". As the chosen case study for this essay is the Fukushima Nuclear Accident it shall be added at this stage that the HSE (1988: 20-21) further specifies risk in the normal operation of nuclear installations and the risk of nuclear accidents.

The term *disaster* can best be paraphrased as the product of ill-handled emergencies and crisis (Borodzicz, 2005). The features of a disastrous event (in contrary to an emergency or a crisis) are its overwhelming magnitude and inevitability. The term *industrial disaster* implies the contribution of technical and human elements in the disaster to a certain extent. Turner (1978: 3) discusses the relation and interaction of these elements and refers to disasters as 'socio-technical' problems.

The evidence of lacking risk control rather than identification in the Fukushima Nuclear Accident is stunning. The author therefore focusses her analysis on one area of possible research and looks at the disaster in the light of *cultural theory* and *organisational culture*. While the *cultural theory* offers a way to categorise human beings in stereotypes with specific predispositions, culture in general *or organisational culture* in specific describes more broadly the predominant world-view on different levels (Module I, Unit 6: 6.1). Both aspects provide a helpful approach for the analysis of the Fukushima Nuclear Accident and are explained in detail in the next two paragraphs.

The work of Douglas (1970: 60) is fundamental for those cultural theorists who claim that culture is socially constructed and human beings can be seen in a universal group-grid relation that determines their world-view and acquaintance with risk. While the group dimension describes to what degree an ego is independent or controlled by other people's pressure, the grid dimension defines to what degree its system of classification is shared or private. Four main stereotypes in the group-grid dimension are explained in the literature (e.g. Borodzicz,

2005; Bellaby, 1989; Pidgeon et al, 1992: 112-114). The 'individualist' with a low level to both grid and group orientation and its opposite the 'hierarchist' with a high level of both grid and group orientation; furthermore the 'egalitarian' with a low level of grid but a high level of group orientation and its opposite the 'fatalist' with a high level of grid but a low level of group orientation. The interesting, albeit controversial argument of this theory is the already mentioned implication that human species cannot only be categorised in the above mentioned group-grid bias but also show specific tendencies in risk behaviour. While individualists accept high level of risk and see it as entrepreneurial opportunity, the hierarchists are claimed to seek for a low level of risk and only accept it as part of an institutionally sanctioned process. Egalitarian and fatalist accept risk as a given fact, but while the former see it as caused by the actions of others, the fatalists see it on the ground that there is little they can do against it (Borodzicz, 2005). Bellaby (1989) argues that at the mid point of each dimension a *risk-averse* culture might be found. Nevertheless he criticises the model on the base of the analysis of two case studies and claims that the group-grid model has its limitations as it looks at stereotypes in a completely static manner, not considering the fact that individuals might change their group-grid dimension depending on the context.

Coming back to culture in general, two categories of *organisational culture* are proposed by Burrell and Morgan (1979) and Smircich (1983) cited in Module I, Unit 6: 6.3: The functionalist and the interpretative world view. The two opposites are characterised by a set of assumptions (Waring, (1992, 1993, 1996a) cited in Module I, Unit 6: 6.4-6.5) likely to be seen in relation to their risk attitude as well. While the functionalist point of view can be simplified as to be deterministic, rational and fact-driven, the interpretative point of view is more holistic, considering the world as to be emergent, dynamic and interacting. Given these features, it can be said that functionalist rely more on quantitative risk assessment methodologies and the interpretative point of view is more likely to use qualitative approaches. Based on this argument, the analytical section will examine if the parties involved in the Fukushima Nuclear Accident fit into the introduced world-views and stereotypes and if the formerly identified risk attitude of these biases did influence the risk identification and control process.

The Fukushima Nuclear Accident

The following summary of the accident is paraphrased from the official report of The Fukushima Nuclear Accident Independent Investigation Commission (NAIIC) of The National Diet of Japan (2012a: 12-14) and aims to support the reader with a chronology of the events.
In the afternoon of March 11, 2011 the Fukushima Nuclear Power Plant was seriously affected by an earthquake. The accident was declared a Level 7 ("Major Accident") by the International Nuclear Event Scale (INES) (International Atomic Energy Agency, 2008: 1-4). The Fukushima plant persists of 6 reactors (units). Units 1 to 3 were in operation within their specifications; Units 4 to 6 were undergoing periodical inspections. The emergency shut-down feature went into operation at Units 1 to 3 immediately after seismic activity was recognized. The seismic tremors damaged external electricity transmission facilities resulting in a total loss of off-site electricity. The tsunami caused by the earthquake led gradually to the final loss of all power in the Units 1 to 5. The tsunami damaged or destroyed machinery, buildings, equipment etc. and entering seawater reached the high pressure operating sections of Units 3 and 4, and a supplemental operation common facility. After the water retreated, access to and within the plant site became exceptionally difficult. The loss of electricity resulted in the loss of monitoring and lighting equipment and communications, decisions and responses to the accident had to be made on the spot by operational staff at the site. The situation made it very difficult to cool down the reactors in a timely manner and the lack of access hindered the delivery of the necessary emergency responses. These series of events ultimately resulted in the emission of enormous amount of radioactive material into the environment.

Analytical section

Different parties involved can be identified in the Fukushima Nuclear Accident. On the governmental side the Ministry of Economy, Trade and Industry (METI); the Nuclear Safety Commission (NSC) and the Nuclear and Industrial Safety Agency (NISA) have to take a part of the responsibility for the accident. On the industrial side the main actor can be identified as the nuclear operator of Fukushima, which is the Tokyo Electric Power Company (TEPCO) but

nevertheless the Federation of Electric Power Companies (FEPC) has to be mentioned as an additional player. Relevant to the accident are the agendas of and the relations between these different players. METI was actively promoting nuclear power as a safe energy source on maintaining that accidents could not occur in Japan (NAIIC, 2012b). The agenda was supported by the FEPC as supplier for the nuclear energy. TEPCO as one of the main members of FEPC aggressively opposed the safety regulators via the FEPC. The regulators NISA and NCS failed to take an independent and unswayable position as NISA itself was a part of METI at one hand and on the other hand the regulators were afraid of potential lawsuits concerning nuclear power plants they had approved in the past. Reading the NAIIC report and seeing how risks had been identified but no appropriate measures were taken, I agree with to conclusion of the NAIIC who states that "… regulatory authorities gradually became the 'captives of electric power operators. As a result, we considered that the functions of monitoring and supervising nuclear safety came to collapse. " The organisational and institutional structure of the parties involved in the Fukushima Nuclear Accident would allow a wide range of research on risk debates, but the analysis shall answer the question of how this structure is related to a specific world view, what stereotypes can be detected and how this influenced the risk management process. The culture in this inter-organisational construct shows characteristics specific to what was identified as a functionalist world-view. As an example it has been mentioned before, that the regulatory bodies did not hold a strong and independent opinion, while TEPCO heavily advocated for its position and daunted regulatory bodies. Based on the fact that the superior industrial consortium and the superior governmental authority shared the same goal (to promote nuclear power) it can be argued that, in an inter-organisational context, the culture was seen as to be manipulated to serve corporate interest and that the culture had a pre-determined function (Waring, (1992, 1993, 1996a) cited in Module I, Unit 6: 6.6). Also the repeatedly postulated affirmation that circumstances were beyond the assumptions shows that the construct remained in its managerial mind set following its primary aim of promoting nuclear energy, ignoring identified risks and not acknowledging the extent of risks beyond the applied quantitative methods. Applying the cultural theory, it can be argued, that TEPCO shows tendencies of an egalitarian stereotype, being strongly bounded to its own social unit but not dedicated to a wider grid. On the opposite the regulatory bodies can be seen as having a fatalist tendency, showing strong grid connections but lacking the cohesion of a social unit. Regarding

risk behaviour these categorisation would imply that the nuclear operator and the regulatory bodies both did accept risk, but while TEPCO sees this risk as caused by others (e.g. “the unpredictable”), the regulatory bodies do accept it as given fact. This gives a possible explanation of TEPCOS behaviour of blaming “the unexpected” and of the regulatory body not insisting more strongly in measures to be taken.

Conclusion

Coming back to the initial claim that risk can be identified and controlled and therefore all industrial disasters are preventable, the analysis in the light of a cultural approach offers an interesting suggestion: If opposite stereotypes are interacting in a system in favour of a functionalist view, it can result in a standoff. The standoff based on different risk attitudes and a world-view based on a pre-determined framework hampers a change in culture and organisational learning that would be essential to engage in a holistic and effective risk management process. Seen so, it is still possible to identify and control risk to a certain amount, but some will remain undetected or unaddressed. It is therefore likely that not all industrial disasters can be prevented.

It remains a challenge for further research how different world-views in relation with different pairs of stereotypes would react and if the suggestion given in this essay can be proved with further case studies. As a recommendation out of the findings, the author suggests not only to involve different stakeholders in the risk management process as this was argued e.g. by the Royal Academy of Engineering (2003a), but primarily to assess the stakeholders cultural predispositions. This will help to understand the agenda of the players and adequate measures to avoid a standoff in the risk management process can be taken. Hopefully, this will help to prevent more industrial disaster.

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