Case Study: Critical Analysis of Factors Affecting Change following the BP Oil Spill

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Glossary

Table 1

Glossary of Abbreviations

Abbreviation	Definition
BOEM	Bureau of Ocean Energy Management
DBEIS	Department for Business, Energy, & Industrial Strategy
DTI	Department of Trade and Industry
EIA	U.S. Energy Information Administration
HSE	Health, Safety and Environment
IOOGP	International Organisation of Oil & Gas Producers
National Commission	National Commission on the BP Deepwater Horizon Oil Spill and Offshore drilling
NRC	National Research Council
O&G	Oil and Gas
PESTE	Political, economic, social, technological and ecological

Introduction

On 20th April 2010, an explosion and fire on the BP-operated Deepwater Horizon drilling platform caused loss of life and unprecedented environmental impact (National Commission, 2011). This report critically examines factors that led to the disaster, and potential remaining risks.

Timeline of events

The Macondo well is located in the Gulf of Mexico and operated by BP (NRC et al., 2012). Owned by Transocean, the drilling platform Deepwater Horizon was operated by BP to carry out hydrocarbon exploration. In April 2010 this exploration phase was closing, behind schedule (Hodge, 2010), when the decision was made for temporary abandonment

(NRC et al., 2012). This standard procedure involves plugging the well, and removing the drilling platform to be replaced by a production platform (DTI, 2001).

Difficulties were encountered during cementing to close the well, however the Deepwater Horizon crew assessed this as having successfully completed (NRC et al., 2012). Multiple tests gave inconclusive results, yet the decision was made to continue abandonment (*ibid*). At 9.47pm, drilling mud gushed onto the rig, followed by flammable gas alarms sounding (Berman, 2010). Control actions to activate the blowout preventer and regain control over the well failed, and two explosions occurred at 9.49pm (NRC et al., 2012). Eleven workers lost their lives, and 17 sustained serious injuries (Guardian Research, 2010). In the following months, technical difficulties and adverse weather contributed to a lengthy timescale to cap the well (Guardian Research, 2010), which ultimately released nearly 5 million barrels of oil into the Gulf of Mexico (NRC et al., 2010).

Impacts

Beyond the significant loss of life, unprecedented impact was caused (EveningStandard, 2019), spanning environment, local communities, (Safina, 2010), economy, industry and international relations (Guardian Research, 2010). Ultimately, BP paid over $65bn in compensation, suffered huge reputational damage, and faced threat to its future (*ibid*). BP CEO, Tom Hayward received widespread criticism for multiple failures, and eventually stepped down in July 2010 (Macalister & Wray, 2010). President Obama imposed a moratorium on drilling in the Gulf, causing financial losses to operators in the region (Guardian Research, 2010).

The aftermath became America’s worst environmental disaster (Wray, 2010). Marine wildlife suffered significant harm, casting doubt upon of BP’s environmental risk assessment, response plan readiness, and ability to manage the environmental fallout (Marine Mammal

Commission, 2010). Arising from ecosystem damage and drilling moratorium, the local communities, economy and fishing industry were devasted (National Commission, 2010; Safina, 2010). BP's clean-up efforts were deemed ineffective (*ibid*.), using dispersant chemicals since restricted for fear of causing further pollution (Webb, 2010).

The oil spill remains in the news today, with a wave of lawsuits following emergent health issues (Kirby, 2019). Environmental impact continues, with settlement fees of $226 million recently awarded to fund 18 restoration projects (Moore, 2019).

Analysis of the Oil Spill Disaster

Following the disaster, several committees convened to investigate causality. These include the National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling (2011) and the Committee on the Analysis of Causes of the Deepwater Horizon Explosion, Fire and Oil Spill (NRC et al., 2012), concluding the tragedy was preventable and culminating in numerous recommendations. The ensuing Joint Industry Response Oil Spill project claimed to achieve industry "step change" in addressing standards for safety, human factors, and environment (International Organisation of Oil & Gas Producers; IOOGP, 2017). The following sections assess these contributary factors, resulting recommendations and actions (BP, 2010; IOOGP, 2017; NRC et al., 2012; Transocean 2011).

Environmental factors

Analysis of political, economic, social, technological and ecological (PESTE; Cawsey, Dezca, & Ingols, 2016) factors surrounding the oil spill reveals a complex operating environment, with multiple, interrelated, actors (NRC et al, 2012; Sterman, 2001). Figure 1 illustrates this stakeholder and influence map.

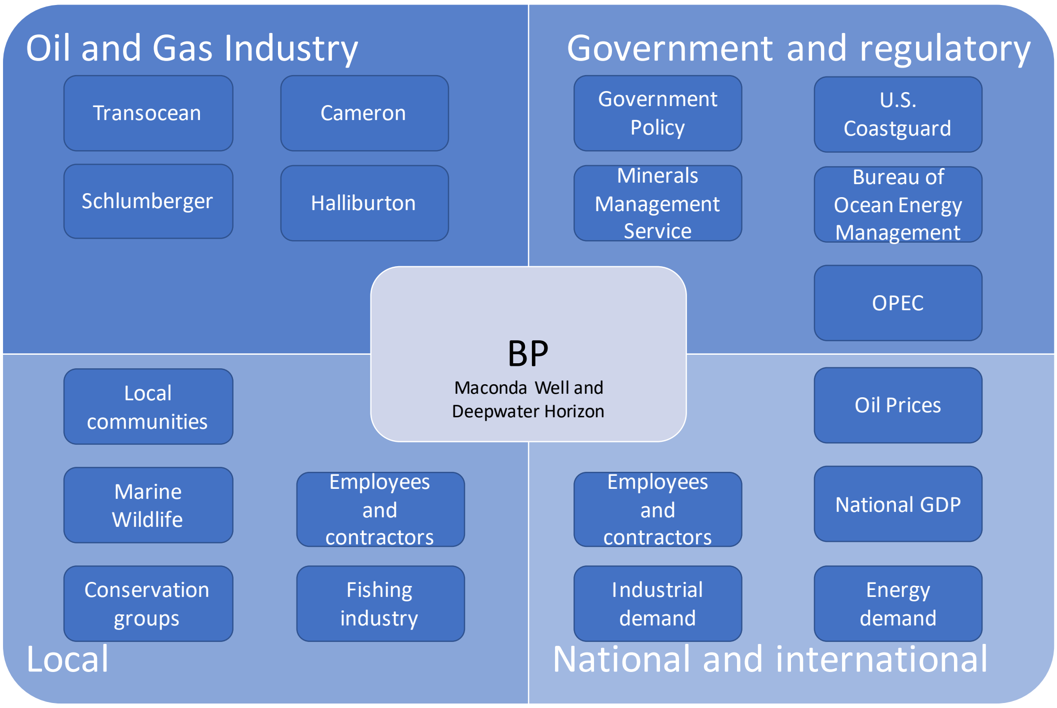

Figure 1. Stakeholder and influence map of the external environment surrounding BP in April 2020. Sources: Ati et al. (2018), Berman (2010), British Geological Survey (2011), Guardian Research (2010), Marine Mammal Commission (2010), NRC et al., (2012), Safina (2010), Transocean (2011).

In addition to BP, multiple sub-contractors were retained across operations (Transocean, 2011), with local and multi-national workers present on Deepwater Horizon at the time of disaster (NRC et al, 2012).

Offshore oil makes important contribution to U.S. energy supply and economy (Ati, Brinkman, Peacock, & Wood, 2018), but requires high breakeven oil prices of $60/barrel (U.S. Energy Information Administration; EIA, 2016). Low oil price in early 2010 (Ati et al., 2018), coupled with high capital investment (EIA, 2016) and depleting reserves (British Geological Survey, 2011) drove increased efficiencies, reduced timescales and cost control (Humphries, 2016). Furthermore, regulatory control was weak (NRC et al., 2012), following a period of government deregulation (Safina, 2010). Figure 2 summarizes these internal and external pressures and outcome.

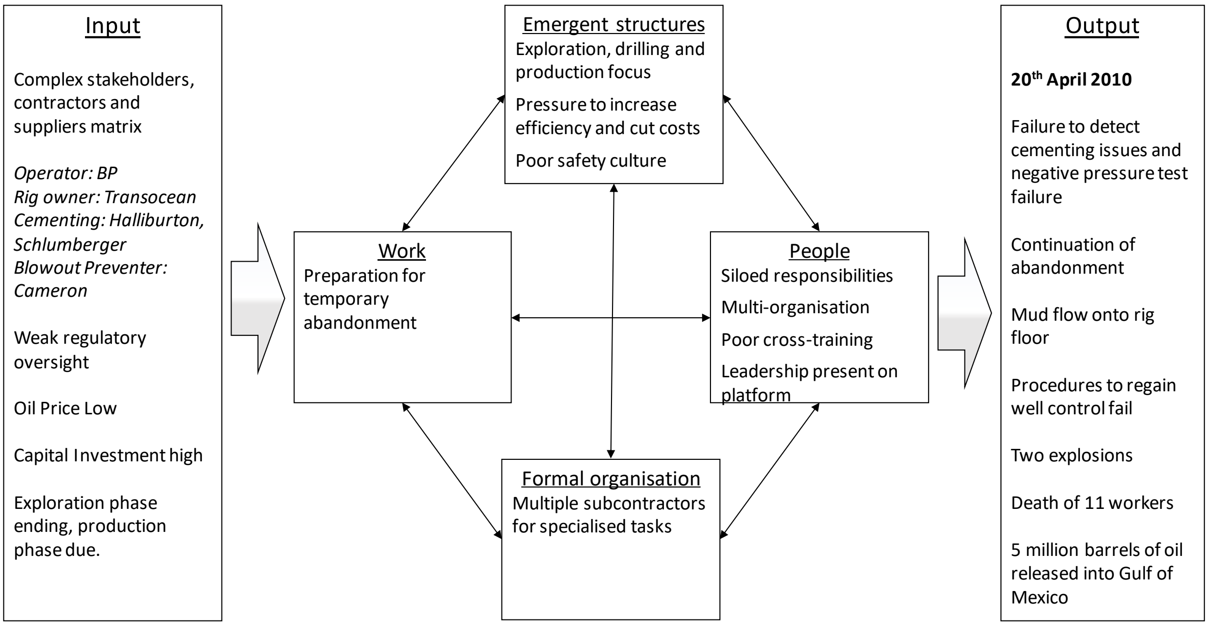

Figure 2. An Organisational Congruence Model annotated with key internal and external factors impacting BP's Maconda Well/Deepwater Horizon operation, and the ensuing events (Nadler & Tushman, 1989).

Safety culture

Schein (1990) defines organisational culture as the pattern of assumptions as an organisation "learns to cope with its problems of external adaptation and internal integration" (pp.111). The complex environment, relationships and pressures surrounding Deepwater Horizon elucidate the prevailing culture throughout the oil and gas (O&G) industry, regulators and government (National Commission, 2011). Despite a review of BP's safety culture in 2005, a lacking safety climate was observed, with cost cutting and efficiency valued above safety (NRC et al., 2012; Schein, 1990; Schneider et al., 2013). The diverse and siloed workforce further contributed to weakening the safety climate (Schneider et al., 2013).

Schein (1990) measures culture at three levels: artefacts, values, and underlying assumptions, and recommendations assess each level. NRC et al. (2012) recommend full evaluation of potential safety issues, processes to plan and control work, safety values reflected in decision making, heightened personal accountability and an environment of continuous learning. Recommended regulatory reform identifies safety critical points for regulatory review and approval (Bureau of Ocean Energy Management, 2019).

In response, BP and the wider industry implemented comprehensive Health, Safety and Environment (HSE) policies, recognising safe operations extend beyond the technical to include people, process and culture (e.g. BP Exploration Alaska, 2014; ExxonMobil, 2019a; 2019b; Halliburton, 2017). BP's espoused values now lead with safety, with defined processes to encourage everyone to speak up (BP, 2017b; 2019).

Power and Politics

Unclear authority, responsibility and lacking access to information were conducive for failure, with diverse stakeholders, siloed expertise, poor communication and little oversight (Marcella & Pirie, 2011; National Commission, 2011). Inadequate technical monitoring, testing and maintenance discipline meant risks to integrity went unnoticed (Berman, 2010).

On the day of disaster, BP executive leadership was aboard the Deepwater Horizon (Transocean, 2011). Their presence prompted avoidance of conflict when anomalies arose in the abandonment procedure, particularly given time pressure for completion (Daft et al., 2017; NRC, 2017). A confounding factor was the multi-national team composition (Hofstede, Hofstede, & Minkov, 2010; Schneider et al., 2013). There is notable similarity with aviation disasters where a knowledgeable co-pilot could have averted tragedy but feared disclosure (Hodge, 2010).

Following the explosion, BP resisted responsibility (Webb, 2010; Whelan-Berry & Somerville, 2010), with BP, Halliburton and Transocean all implicating each other (BP, 2010; Transocean, 2011; Guardian Research, 2010). Public perception, media outcry and committee findings shifted the power base to mount pressure for change (Guardian Research, 2010; National Commission, 2011).

Hodge (2010) suggests human factors were inadequately addressed, and mechanisms missing in the regulatory approach. NRC et al. (2012) unambiguously recommend that in such complex environments, clear accountability must be established, with the operator ultimately responsible and accountable. Several reports recommend lessons must be learned from the aviation industry (Hodge, 2010; Marcella, Pirie & Rowlands, 2013; National Commission, 2011), and a risk-based approach adopted (NRC et al., 2012; Security Directors Report, 2010). BP's safety report (2018) acknowledges these recommendations, describing learning good practice from aviation and nuclear.

Decision-Making Processes

Decision-making processes leading up to the disaster were characterised by a Carnegie or incremental model (Daft et al., 2017). However, complex systems, incomplete analysis and ill-recognised problems diminished ability to make systematic analysis (National Commission, 2011). Decisions were emergent, rather than rational (Law, 2013). Due to lacking information, there was low problem consensus, and faulty shortcuts were taken based in intuition and experience (Daft et al., 2017; National Commission, 2011).

On the day.

The decision was made for temporary abandonment to continue despite warning signs (Berman, 2010). As described in the previous section, contributory factors were inadequate monitoring, poor information availability, and presence of executive leadership.

Throughout the asset lifecycle.

Multiple points of failure throughout the lifecycle were noted (NRC et al., 2012), including lacking authority to examine test results to approve continuation, and lacking design guidelines to ensure design allows adequate safety margins. Systems, procedures and training were inadequate to address the incident, meaning staff and contractors were not equipped to make good decisions (*ibid.*). The regulatory body was found to lack data and awareness of risks (National Commission, 2011). Inadequate record of activities, maintenance schedule and risk assessment were kept (Marcella, Pirie, & Rowlands, 2013), with consequence that multiple opportunities for accurate and timely decisions were missed.

After the oil spill.

Although swift action was taken to mount rescue, cap the well and begin clean-up, BP were slow to accept responsibility and necessity to change (Nadina, 2011; National Commission, 2011; Webb, 2010), publicly denying severity of impact (Ketola, 2006). Local and federal government responses also attracted strong criticism of a poor and mismanaged response plan (National Commission, 2011; Safina, 2010), with ineffective emergent decisions, taken under extreme time pressure (Daft et al., 2017).

Resultant changes.

Recent BP (2017a, 2019) reports indicate many changes, including action to transform into a learning organisation (Law, 2013), with a systematic approach to learn from mistakes. They commit transparency of information, with accurate and complete records (BP, 2017a), as per the recommendations of Marcella et al. (2013).

However, Law (2013) warns document trails may create a false impression, so this is insufficient to prove deep change. A contrary report by Burgis (2016) indicates continuing "near misses" at refineries, and lack of a gold standard approach to managing engineering information. Thus, the effectiveness of change remains uncertain.

Ethical Issues

"Energy is a moral issue" (Safina, 2010), with ethical considerations often arising from cost-cutting and efficiency-seeking initiatives, including BP's enacted values of cost-saving above safety (NRC, 2012; Schein, 1990). Inadequate risk assessment and preparation lead to environmental control measures that were later deemed ineffective, and even harmful (Safina, 2010; Webb, 2010). In the wake of the disaster, rather than accepting responsibility, BP CEO, Tony Hayward, denied the seriousness of the event and apportioned blame elsewhere, attracting wide condemnation and costing his job (Bradford & Garret, 1995; Ketola, 2006; Webb, 2010). However, Fryer (2011) argues that placing all responsibility with leaders shifts attention from systemic shortcomings. An effectiveness driven culture gives little space ethical reflection (*ibid.*), often placing stakeholder needs below corporate aims (Crane & Ruebottom, 2011).

O&G supermajors now publish information regarding social wellbeing, corporate responsibility and ethical expectations (e.g. BP 2017a; Chevron, 2018). Affirming this commitment to environmental responsibility, low-carbon energy supply proportions in the U.K. have risen from 10.2% in 2010 to 18.4% in 2017 (DBEIS, 2018).

Potential Change Drivers

Likely areas of further risk and the associated impacts are considered.

Legislative or regulatory changes

O&G is a tightly regulated industry (BOEM, 2019). Possible legislative change may, for example, impose restrictions on offshore drilling based on a public health threat. This would necessitate shifting operations onshore to maintain production rates (Ati et al, 2018). Strengthened safety culture indicates time and production pressures now pose lower safety risk than prior to the disaster. Renewable sources currently contribute only 16.9% of U.S. energy supply (EIA, 2019). Coupled with new corporate responsibility commitments (e.g. BP, 2018), acceleration of renewable technology development may become advantageous.

Market changes

A drop in revenue, for example by a sudden drop in oil price, is likely to necessitate streamlining costs and drive greater efficiencies. Although safety culture is strengthened, doubt remains whether adequate protection is provided from these pressures (Burgis, 2016).

Capital expenditure requirements

Repair and overhaul of assets requires major investment (EIA, 2016). However, these are regular features of the asset lifecycle (Copello, n.d.), with high capital expenditure typically offset by government contracts (EIA, 2016). Costs remain a concern, particularly in times when oil price is low, similarly bringing pressure to decrease spending and increase efficiencies (Ati et al, 2018).

Political and social changes

In the event of "green" political pressure influencing policy, strengthened industry culture may lead to a progressive response, indicated by published Health, Safety and Environment policies (e.g. BP, 2018). U.K. greenhouse gas emissions are down 43% from 1990 to 2017 (DBEIS, 2018). However, activists argue this change is too slow (Watts, 2019), and accusations have been levied at BP of "greenwashing" to create an overly optimistic impression (Chapman, 2019). Darko (2014) provides a more favourable account of O&G activities, including social and environmental investment brought to communities where they operate. Changes to become listening organisations (Law, 2013) indicate collaborative response, grounded in stakeholder needs (Crane & Ruebottom, 2011), has become a realistic possibility.

Conclusions

While ultimate accountability and responsibility was determined to lie with BP, industry- and regulatory-wide complacency for safety created an environment conducive to disaster (National Commission, 2011). Following the Deepwater Horizon tragedy, evidence presented in this report indicates broad change to industry, regulation and policy has occurred, establishing a culture of safety that brings increased resilience to pressures of increasing efficiencies and reducing costs. Newly established capabilities for organisational learning increase ability of the O&G industry to adapt to emerging external pressures (Schein, 2010), including political, environmental and social changes. Nonetheless, time will test the strength of this industry "step change" (IOOGP, 2017) in standards for safety, human factors, and environment.

[Word count: 2,217

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