

Operator Influence in Building and Maintaining Robust Safety Culture in Drilling Operations II

Cem Miral

Mark Griffin
School of Psychology

Melinda Hodkiewicz
School of Mechanical and Chemical Engineering

Abstract

Drilling for oil and gas is technically demanding and inherently risky. The operating company in the oil and gas industry plays an influential role in the development and maintenance of safety culture in drilling operations. While processes and legislation can help improve safety performance, significant reductions in incidents will only be achieved if resilient safety cultures are established and control measures take human factors into account. Safety culture is not achieved overnight. It takes constant, deliberate efforts to build and maintain over time. The study uses a framework termed the Fitness-to-Operate (FTO) Model to build a comprehensive picture of the safety culture of companies involved in drilling operations. The study involves a quantitative survey conducted offshore, yielding 60 responses. The FTO Model assesses factors underlying the organisational, social and human capital which combine to create the safety capability of an organisation. Within these capitals, 'Safety Critical Activities', 'Learning Procedures' and 'Risk Management' were perceived to be the highest functioning areas, while 'Error Management Culture', 'Performance Management Systems' and 'Interpersonal Skills' were areas identified as opportunities for improvement. Overall, the operating company had the highest perception of safety capability for the drilling operation, followed by service providers and the rig contractor.

1. Introduction

The operating company that sponsored the study recognises that operating companies in the oil and gas industry play an influential role in the development and maintenance of safety culture in drilling operations. Drilling operations involve long term contracts with multiple business partners that engage in high potential risk conditions throughout projects. As a result, it is important to know how operating companies help to build and maintain safety culture.

In order to understand the operator influence on safety culture, the interaction between a number of factors must be assessed (Helen 2005; Baker et al. 2006). These factors include; the safety capability of the operating company, which is enabled by its social, human and organisational capitals and how they influence the respective capitals of business partners involved in the drilling operation. Drilling operations involve an operating company who is responsible with the field's management and day-to-day operation, a rig contractor who owns the drilling rig and provide a drilling crew, and various service providers.

Without knowledge of how each capital contributes to these beliefs and the strength of their influence, it is difficult to make purposeful and effective changes to the way safety culture is built and maintained (Griffin et al. 2014).

The aim of this research is to understand how the operating company influences the safety culture of the rig contractor and service providers in drilling operations. By understanding the key factors that contribute to safety culture in drilling operations, more efficient allocation of resources will be possible when formulating strategies to improve and sustain safety in the long term.

2. Process

2.1 Conceptual Model

The FTO Model is a systematic approach that can be used to identify the safety capability of organisations operating in high risk environments, such as the oil and gas industry. The FTO Model provides a framework for integrating various approaches to safety capability, acting as a practical guideline that can be used by organisations (Griffin et al. 2014). Each capital can be modelled for an organisation based on critical questions that assess the level of attainment for each capital.

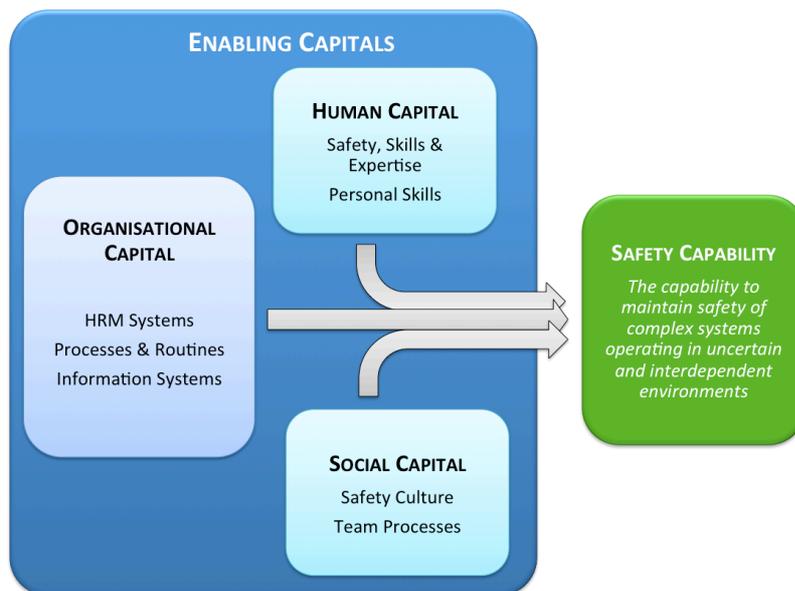


Figure 1 FTO Model and the Three Enabling Capitals

2.2 Research Methodology

The FTO Model was used to develop a 56 question survey that was distributed to employees of the operating company, the rig contractor and service providers at a drilling rig. Data from the 60 completed surveys was analysed using Microsoft Excel with consideration given to the qualitative data from interviews and survey comments when interpreting the results. A five-point Likert scale was used for responses; where higher ratings reflect a better perception of performance in the various safety elements. The upward progression of the rating scale implies the attainment of greater maturity for the particular element (Griffin et al. 2014).

For reporting purposes, means and total scores were used to show the levels of attainment on the graphical plots.

For each element, one or more characteristics are identified at a level suitable for assessment by the raters. This was done in the format of critical questions related to day-to-day drilling operations as well as broader organisational questions. The critical questions were defined so that raters, working either individually or in small groups could assess the current level of each characteristic with information from sources such as; observation, experience and day-to-day work duties.

Of the 60 completed surveys, 50 of the surveys were collected using ‘Keepad’ technology whereby respondents completed the survey at the compulsory weekly Sunday Safety Meeting. The ‘Keepad’ technology uses interactive PowerPoint slides and handheld clickers on which responses are recorded immediately, and displayed for each question.

The meeting allowed 50 survey responses to be collected and recorded ready for analysis on Microsoft Excel within a 25 minute time frame. After briefing the process of using the interactive ‘Keepad’ technology, 25 seconds were allowed to answer each question. The result of each question was displayed to participants for feedback immediately upon completion (including supervisors, team leads and team members). The remaining 10 surveys were completed in hard copy format due to 50 handheld clickers being available for use.

3. Results and Discussion

The operator influence on building and maintaining safety culture in drilling operations was assessed in terms of the FTO Model. The assessment was performed at different levels which provide differing levels of granularity and attainment in relation to the FTO Model.

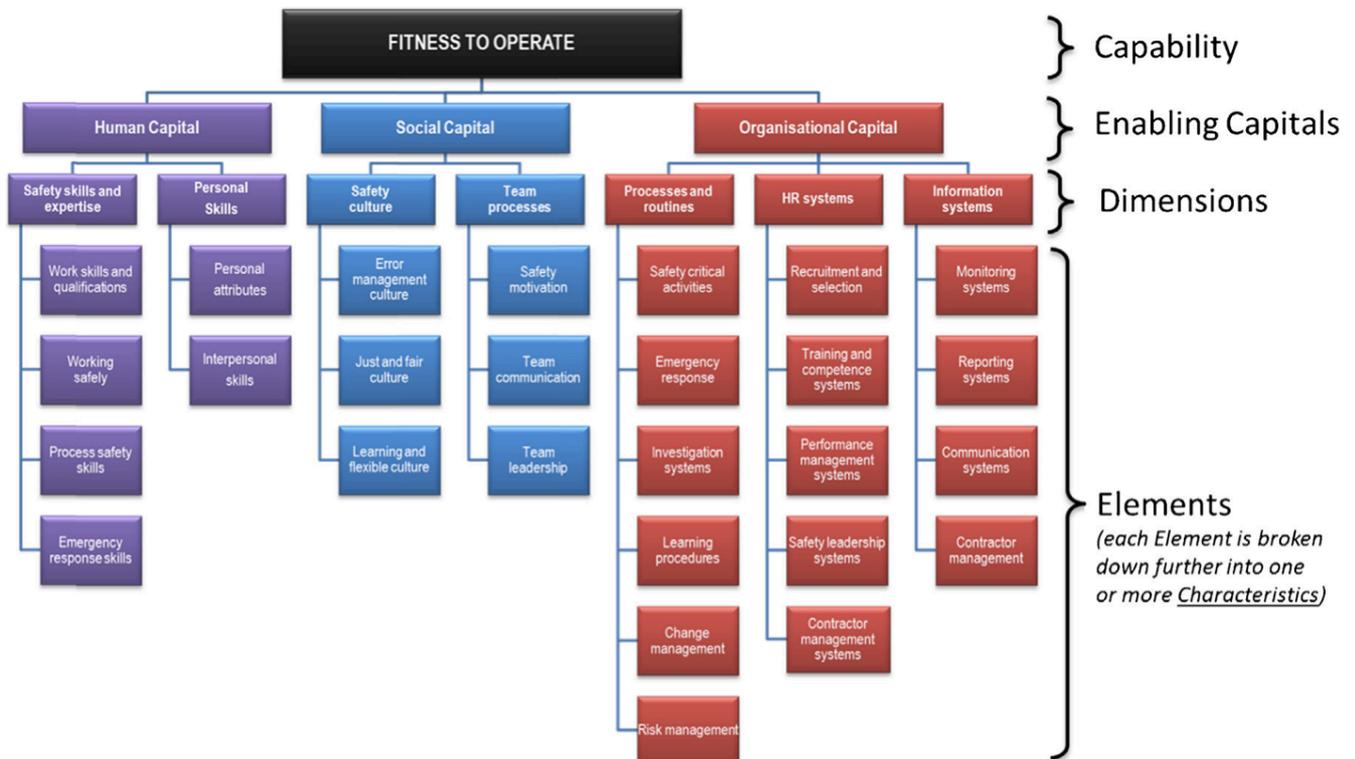


Figure 2 FTO Model: Underlying Capitals, Dimensions and Elements

3.1 Results

By examining the feedback provided, it can be seen that differing levels of attainment have been achieved for each of the capitals. Given that appropriate levels of relationships exist between the enabling capitals, overall, the analysis revealed that the operating company had the highest perceived level of attainment of safety capability for the drilling operation, followed closely by the service providers and rig contractor. Although these results show the overall safety capability of organisations, more granularity is required to benchmark specific criteria in terms of the FTO Model. This is achieved by assessing the perceived attainment of each capital by the operating company, the rig contractor and service providers.

Table 1 shows the mean score for each of the three enabling capitals as perceived by the participants of the survey. As such, the differing perception of each company can be quantified in relation to the FTO Model. This adds value by providing an opportunity to compare safety capability at a high level.

Capital	Operating Company	Rig Contractor	Service Providers
Organisational	4.07	3.82	3.95
Social	3.87	3.68	3.68
Human	3.82	3.73	3.74

Table 1 Mean Scores of Perceived Levels of Attainment for Each Capital

Figure 3 graphically demonstrates the mean score of the perceived levels of attainment for each capital. Representing information graphically allows visual comparison across the three enabling capitals.

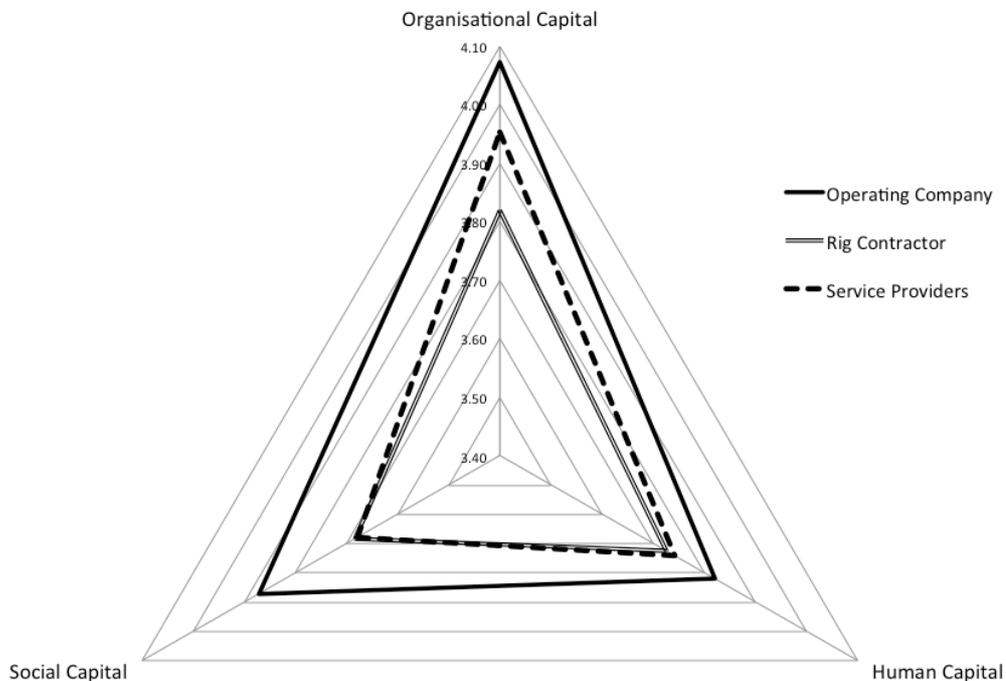


Figure 3 Graphical Representation of Perceived Levels of Attainment for Each Capital

3.2 Assessment of Elements

Assessing the elements of the FTO Model allows benchmarking across specific areas between organisations. As such, opportunities for development can be identified, as well as any areas where performance is above accepted internal benchmarks. Table 2 shows the three highest mean scores of the perceived level of attainment for each element across all three organisations. As such, safety performance trends can be identified for each drilling operation to determine the highest performing areas.

Element	Mean Score
Safety Critical Activities	4.35
Learning Procedures	4.33
Risk Management	4.26

Table 2 Mean Scores of Perceived Levels of Attainment for the Highest Three Elements

Table 3 shows the three lowest mean scores of the perceived level of attainment for each element across all three organisations. As such, safety performance trends can be identified for each drilling operation to determine areas with the potential for the most improvement.

Element	Mean Score
Error Management Culture	3.35
Performance Management Systems	3.42
Interpersonal Skills	3.42

Table 3 Mean Scores of Perceived Levels of Attainment for the Lowest Three Elements

Figure 4 demonstrates the perceived levels of attainment for all elements of the FTO Model. The graphical visualisation can be used as a means of identifying the areas where the highest perceived differences occur between organisations for a given drilling operation. Through targeted strategies, they may pose the greatest opportunity for improving safety capability.

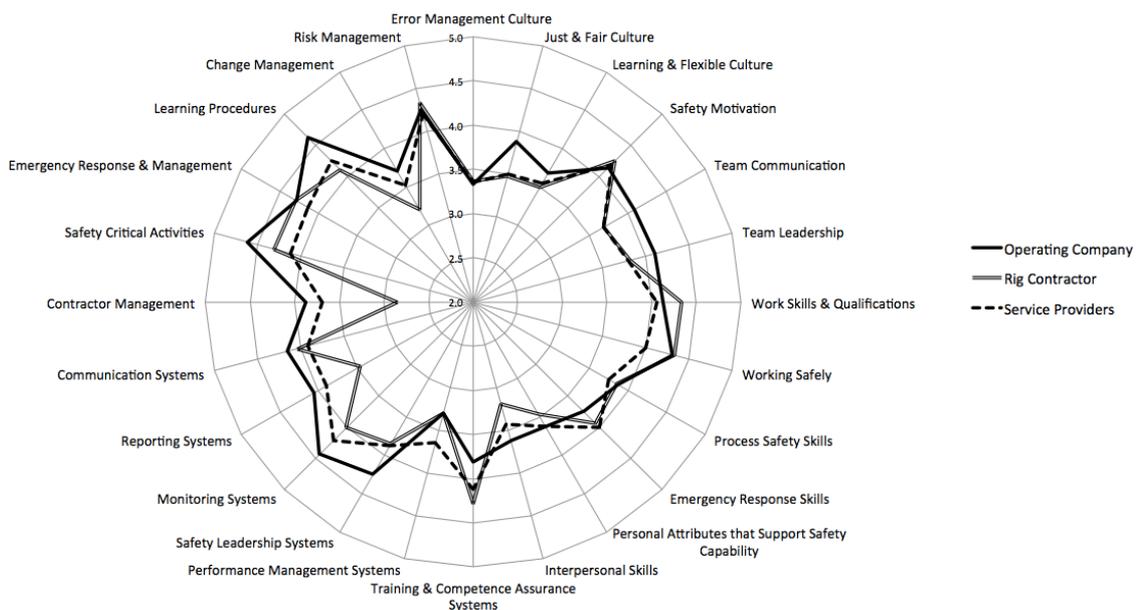


Figure 4 Perceived Levels of Attainment for Each Element

4. Conclusions and Future Work

By examining the aggregated scores and feedback provided, the FTO Model can be used by organisations to gain an insight into how performance across organisational, social and human capitals compare (Griffin et al. 2014). If any capital falls below a targeted acceptable standard, detailed information can be derived by examining the profile of the ratings for each characteristic question. As such, shortcomings that require attention can be identified. Targeted levels can be set by operators in collaboration with other business partners in light of their current goals for improvement. Operating companies can apply the FTO Model to compare safety capability across drilling operations, and clearly identify areas that pose opportunities for improvement. Repeating the FTO Model assessment at regular intervals over the lifecycle of a drilling operation allows any improvement efforts to be assessed (Griffin et al. 2014).

This research will be conducted on one other drilling rig and in the operating company office, possibly yielding another ~120 surveys. Extending the research within the organisation will allow targeted strategies to be formulated for each specific drilling operation. Other drilling operations will inevitably have differing levels of attainment due to the differences in the projects, primary rig contractor and service providers, as well as the team dynamics.

5. Acknowledgements

The author would like to thank the staff at The University of Western Australia Centre for Safety. In particular, Dannielle Finnerty who provided her insight and expertise during the course of the research. The author would also like to thank Clare McPherson for her continuous support and assistance throughout the research.

6. References

Baker, D.P., Day, R., Salas, E., 2006, 'Teamwork as an essential component of high-reliability organisations', *Health Services Research*, Vol. 41, No. 4, Pp. 1576 – 1598.

Griffin, M.A., Hodkiewicz, M.R, Dunster, J., Kanse, L., Parkes, K.R., Finnerty, D., Cordery, J.L., Unsworth, K.L., 2014, 'A conceptual framework and practical guide for assessing fitness-to-operate in the offshore oil and gas industry', *Accident Analysis and Prevention*, Vol. 68, Pp. 156 – 171.

Helen, F., 2005, 'Irretrievable breakdown? A review of operator/contractor relationships in the offshore oil and gas industry', *Journal of Energy & Natural Resources Law*, Vol. 23, No. 1, Pp. 1 – 14.