Project managers' front-end decision making.

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Project Managers' Front-End Decision Making

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Abstract

In project management, Front End Loading (FEL) is a core work process before project authorization or sanction. This stage is where the extent of uncertainty is highest and if properly conducted with optimal decision making, it maximises the potential for project success. In UKCS oil and gas exploration and production, it is well known that projects can fall behind schedule, exceed estimated costs or result in spectacular failures. Extant research on decision making in project management has focused on classical analytical approaches, with less attention on more intuitive methods. This interview study is investigating how Senior Project Management Experts (SPME) in the upstream oil and gas industry make decisions during the Front-End Loading process. Adopting a cognitive task analysis approach, the aim is to examine how and when analytical and intuitive decision styles are used in the front-end stage of project management.

Keywords: Decision Making, Front End Loading, Project Management, Cognitive Task Analysis, Oil and Gas Industry

Background

Oil and gas capital projects' performance are receiving greater scrutiny in recent times due to the oil price crash of 2014 and growing competition from renewables. A project's success can be measured by metrics such as production, cost, schedule, and operability (Saputelli et al. 2013). However, most project successes are evaluated on the cost performance of the project: Rui et al. (2017), analysed data from 200 listed oil and gas companies' projects and concluded that the average total cost overrun is 18% (and this is significantly higher for large projects than for smaller ones). Similarly, Mckenna et al. (2006) asserted that capital projects above US$1 billion cap are 10% more likely to suffer from cost and/or schedule overrun greater than 10% of the allocated budget. Additionally, only 54% of oil and gas projects are completed on schedule (BCG, 2014).

Offshore oil and gas projects have particular complexities; the lead times are usually lengthy and typically involve a different team setup per project. Hence, improving performance is arduous as each project is unique in challenges and learning curve (Barbosa et al, 2017, Hamilton et al, 2019, Newman et al, 2020). Jergeas (2008) notes that though oil and gas projects are usually successful from an engineering, operational, and safety viewpoint, from a project management angle, with regards to meeting cost and schedule targets, the reverse is usually the

case. Major oil and gas (O&G) companies have adopted the Front-End Loading method in the decision-making process in order to select the most preferred project and secure suitable investments (Weijde 2008, Williams and Samset 2010, Saputelli et al, 2013). However, a key component in O&G project overspends is due to unrealistic planning within the Front-End loading (Jergeas, 2008). Therefore, given the complexity and expense of oil and gas projects and the risks of late completion, budget overspend and even project failure, this provides an ideal sector in which to base a study of decision making at the front end of project management processes.

Front End Loading (FEL) in the Oil and Gas Industry

The term Front End Loading (FEL), commonly used in the Oil and Gas industry, means a project pre-planning process to develop a detailed definition of the scope of a capital project in order to increase the probability of project success in terms of cost, schedule and operability (Saputelli et al. 2013). The Oil & Gas Authority UK (2017) defines it as a core work process before project authorisation or sanction which maximises the potential for project success if properly conducted. Wang and Gibson (2010) pointed out that decisions made during the pre-project planning phases have a significant impact on the final project performance.

Front End Loading is recognised as a foundation essential to ensuring predictable and effective project delivery (Morris 2005; Shlopak 2014). Morris (2011) defines it as the preliminary phase of the project, and Saputelli et al. (2008) explain that the front-end loading's main objective is fixated on capital project planning. According to Merrow (2011), the front-end loading process does not finish until the viability of the project is established and authorised, and investment fully awarded. The relevance of the front-end loading phase is recognised as a process that is capable of creating value for projects (Edkins et al. 2013). All project activities and tasks from the conceptualisation of an idea, to the final decision to invest in a project, occur in this phase. Most factors which are capable of significantly impacting the project outcome, either for good or bad, originate in decisions made in the project's front-end loading (Morris, 2011). Nevertheless, there are concerns about the lack of sufficient information on the front-end loading process. The concept appears under-researched: Few articles provide a clear definition and solid groundwork on front-end loading (Olsson and Samset, 2006; Williams et al. 2019).

The rationale for the application of FEL in O&G is that a project should be developed to a sufficient and acceptable level such that the cost, time and quality metrics of the project are determined before a full capital investment is committed (OGA 2017). It is a fundamental process which certifies all activities carried out before the Final Investment Decision (FID) are reached for capital projects (Weijde 2008, Saputelli et al, 2013). Activities include providing assurance regarding cost, schedule, capacity and initial production rate to decision executive and project owners (Rui et al, 2017).

The main aim of FEL is to provide a complete definition for the capital project. Hence, the goal is to optimise the possibility for a successful execution that meets the objectives of the project, including cost, schedule and operability (Saputelli et al, 2013) by gathering relevant information, simplifying inherent risks and reducing uncertainties to make the best decision (Weijde 2008, Newman et al. 2018a). During the FEL phase, project uncertainties are usually

high with minimal information available. However, as the FEL phase progresses, the uncertainty is reduced as more information is collected via available data, appraisal, front-end engineering and design (FEED) and other conceptual designs (Nava and Rivolta 2013).

FEL is typically a three-phased process to developing the project definition before the execution phase. There are important deliverables for consideration during each of the phases. For example, to develop a new oil field, preliminary analysis of the project is considered to determine feasibility in the Phase 1. In Phase 2, project options are considered and ranked based on agreed value drivers which includes number of wells required for development, facility capacity requirement, facility type (platform, FPSO, tie-back to existing facilities) etc. Finally, in Phase 3, the preferred option is developed which involves Front-end engineering and design (FEED), a more advanced assessment, analysis, and design stage.

Decision Making

The main distinction that characterises most decision research is between the slower more analytical and the faster intuitive styles of decision making. Much of the underpinning research on the normative, analytical mode has been laboratory based, with static, well-defined, unfamiliar problems given to students to solve, rather than studying expert decision makers in their own work environments. This type of research has tended to emphasise the typical errors that can contaminate decision making, especially those relating to the use of heuristics (rules of thumb) and resulting biases (e.g. confirmation bias).

An alternative descriptive approach strives to capture how decisions are actually made by practitioners in familiar work environments. Following a sequence of major incidents where poor decision making was implicated, psychologists began to develop techniques to study expert decision makers in higher risk work environments, typically fire fighters, military personnel and pilots (Klein et al 1993). This approach was named naturalistic decision making (NDM) and the aim was to describe how experienced practitioners make decisions in real world settings. Klein (1993) found that experienced decision makers were more reliant on intuitive processes built on their stored memories of previous events and their ability to recognise familiar features in new incidents. They often did not have time or sufficient information to apply formal decision analysis techniques. The NDM researchers use observational and interview techniques, such as cognitive task analysis (Crandall et al, 2006; Gore et al, 2016) and methods based on the critical incident interview (Flanagan, 1954).

In fact, humans rely on both the faster, more intuitive thinking processes, and the slower, analytical mode and the two systems can function in a complementary fashion during decision making (Evans, 2007, Kahneman, 2011). While there is no doubt that analytical decision-making techniques are frequently used by managers and formal decision analysis methods constitute the basis of most managerial decision training, this is not the only method they use. It is well documented that managers use intuition when making decisions (Burke & Miller, 1999; Sadler-Smith & Shefy, 2004), including project managers (Leybourne & Sadler-Smith, 2006). In a seminal paper, Kahneman and Klein, (2009), concluded that an evaluation of the likely quality of an intuitive judgement requires an assessment of the predictability of the environment in which the judgement is made and of the individual's opportunity to learn the

regularities of that situation. There have been few studies examining these cognitive aspects of managers' decision making in the oil and gas industry.

Decision Making in Front End Loading

The process of decision making is an essential aspect of a Project Manager's task, and it is usually not a straightforward one. The ability to make the right decisions is subject to the goal of the decision, the course of action and amount or extent of knowledge on the consequence of actions (Bratvold and Begg, 2010). However, because decisions in work settings are often made under time pressure, cost constraints and uncertainty (Jamshid, 2011), managers' ability to carefully consider all the options or alternatives can be limited. Arguably, improving decision-making skills in FEL will increase the chances of achieving good project outcomes.

Oil and gas (O&G) projects involve a high cost of investment. The decision to invest in a capital project or not is difficult due to the high-risk nature and uncertainty of the environment and not surprisingly, Newendorp and Schuyler (2000) refer to projects in the oil and gas industry as a classic example of decision making under uncertainty. The failure of many decisions in this territory to return the expected outcome and recover the money invested has led to a growing interest in the way crucial investment decisions are made. Yet the only available industry guidance on decision making for the UK oil and gas industry appears to be related to safety and risk management (OGUK, 2014). According to Mackie et al. (2008), the evaluation and decision-making procedures in major O&G companies results in either a systematic overestimation of returns or underestimation of the risks. In a later paper (Mackie et al, 2010), they discussed how the research evidence on human decision making could be applied to the upstream oil and gas industry. They concluded that there is a need to understand decision type and decision process and to show how decision processes could be better tailored to fit decision type.

Only a few studies have explored FEL and decision-making processes in project management in the O&G industry. Mackie at al. (2007) pointed out that 'the vast majority of the research in the upstream oil and gas decision making area has been focused on decision analysis' (p308). Newman et al, (2016) found that only 25% of interviewees from this sector had a good understanding of decision analysis and even less had a good understanding of decision quality assessment. In a later study, Newman et al. (2018a, b) conducted a survey of 78 oil and gas personnel involved in developments and projects (the sample was mainly based in Australia and it included some of the interview participants). They found that around 90% of respondents thought that decision analysis and decision quality techniques should be used for major project decisions, but only 50% thought that they were actually used for major project decisions. This appeared to be due to: a) the techniques not being well understood, b) reliance on experience and judgement and c) schedule pressures.

There does not appear to have been any research examining the extent to which project managers in the upstream O&G industry rely on intuitive, as opposed to analytical, modes of decision making. Newman et al (2018b; 2020a) argued, based on the conditions proposed by Kahneman and Klein (2009, 2010), that decisions made through intuitive processes are 'not suitable for complex decisions under uncertainty, such as key decisions on oil and gas projects,

where a structured approach to decision-making is required' (2020a, p90). The two main conditions, Kahneman and Klein discussed in which it can be appropriate to rely on intuition and to put more trust in 'gut feel' were: a) where the situation is familiar and b) feedback has been received on previous decisions.

Given that project managers, like other managers, are known to use intuition (Leybourne and Sadler-Smith, 2006), then it would be valuable to ascertain when they use intuitive decision making and to what extent does it complement the more structured, analytical approaches. Therefore, the aim of the current study is to examine how and when analytical and intuitive decision styles are used in the front-end stage of project management and to provide recommendations for improving decision-making during this phase.

Method

This study generated data through a cognitive task analysis (CTA) method, which utilizes interview processes or observation strategies to capture information about the knowledge and thought processes professional or experts use to perform complex tasks. (Clark et al. 2008). Open questions were used to elicit the general view of FEL and their experience in the FEL stage of projects.

Participants

The study consisted of semi structured interviews with 16 experienced senior project managers from the UKCS oil and gas sector.

The initial target sample was 20, but recruiting participants proved slightly challenging due to Covid 19 pandemic impacting participant's availability to attend online interviews. However, snowball sampling was employed when necessary. Nevertheless, because the data reached saturation around the 14th interviewee, the researchers were comfortable concluding the interview phase at the 16th participant. The 16 that agreed to participate were highly experienced project professionals, having an average of 25 years of industry experience and over 10 years working at the front-end loading stage of oil and gas projects. Participants are all UK-based working in the UKCS region, mainly from an oil and gas operator or EPCI contracting firm. The average years of experience is 25years and the average years as a senior project management expert is 12 years.

Interview schedule

The 12 interview questions were grouped under 3 parts (A to C):

Part A consisted of demographic questions. Part B had questions that focused on the interviewee's experience of the Front-End Loading stage: such as a description of the different FEL stages used in the participant's organisation? Part C asked questions to probe the interviewee's practice of decision making in the FEL stage: such as procedures for selecting project options and making decisions when faced with external risks during FEL.

In Part D, a version of the CTA method (Crandall et al, 2006; Gore et al, 2016) was applied by asking participants to think of a particularly memorable and challenging decision that they had to make during the front-end stage of an O&G project. They were then asked to describe the situation in which they had to make the decision and their thought processes in reaching it. At the end of the interview, participants were asked if they have had any formal training on how to make decisions for project management and what it consisted of if they had?

The semi-structured format of the interview questions allowed for probing of responses and further exploration of how decision making is achieved.

Procedure

The length of each interview ranged from 60 to 90mins, with an average length of about ~ 75mins (an hour and 15mins). The interviews were conducted by two or three members of the research team via Zoom or Ms Teams video conferencing tool and subsequently transcribed. No participant objected to the recording as they had each signed the ethics and consent form prior to the interview.

Data Analysis

In this study, thematic analysis is used for data analysis to identify emerging themes and validate existing themes through an iterative process. Thematic analysis focuses on the qualitative features of the data analysed. Analysis is often theory driven, but also allows for researcher's knowledge and presumptions to influence the identifications of themes (Marks and Yardley, 2004). Also, the NVivo software is used to facilitate the thematic analysis as it provides an avenue to better sort, organize and manage qualitative data (Braun and Clarke 2006).

The interviews have all been completed and transcribed, and the coding and data analysis are underway. The potential outcome of the current study is a preliminary framework that indicates when and how the intuitive and analytical processes may be integrated to assist senior project managers at the front-end loading stage of project management.

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