

Challenges in managing oil and gas supply chain – An exploratory study

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Abstract

The current value of the oil price per barrel has severely impacted the oil and gas industry around the world. Apart from oil price fluctuation, there are multiple external factors that affect this industry such as oil resources availability, high transportation cost, as well as exposure to high uncertainties. In dealing with these external factors, it is crucial for the oil and gas practitioner to shift their focus into managing resources and capabilities. This can be conducted through performance management. As this industry relies mostly on the supply chain to deliver their services and products, it is important to understand the challenges faced by the oil and gas practitioners in managing their supply chain. Therefore, this study will explore the challenges in managing supply chain performance in the oil and gas industry. Exploratory interviews were conducted with five supply chain experts in the industry. This study has identified five main challenges in managing supply chain performance.

Keywords: Supply chain management, performance management, oil and gas industry, challenges

1. Introduction

Most industries are now relying on the third party provider to deliver the product and services. The oil and gas industry has no exceptions. The oil and gas organisations normally outsource part of their functions to subsectors to minimise their operation cost, to overcome the limitation of expertise as well as to pass some of the supply chain risks to another party (Ernst and Young 2014) In fact, research suggested that around 40% of oil and gas activities are outsourced to accomplish the project (Yusuf et al., 2014; Pillai et al. 2010). The dependency on outsourcing activities makes the company focuses more on managing supply chain performance to achieve competitive advantage (Kumar and Markeset, 2007; Cai *et al.*, 2009). Despite the considerable amount of research been published on supply chain performance management, most of the early study focuses predominantly on the industry that manufacturing discrete products (Vonderembse et al., 2006; Ruzita, 2010; Khani and Ahmadi, 2012; Oyedijo and Akewusola, 2012) In fact, in one of the review of the literature on supply chain performance from 1999 to 2009, around 80% of the case based research focusing on manufacturing industry (Arzu Akyuz and Erman Erkan, 2010). The insights of supply chain performance on other industry is worth to be explored (Gunasekaran et al., 2004; Shepherd and Günter, 2006; Gunasekaran and Kobu, 2007; Taticchi et al., 2013). The existing research on the oil and gas supply chain largely focuses on the downstream oil and gas sector (Varma, Wadhwa and Deshmukh, 2008; Lima, Relvas and Barbosa-Póvoa, 2016). Even recent research by Abubakar *et al.* (2016) examined only the financial performance of the upstream sector. Moreover, the majority of the research concentrated on designing supply chain performance measures (Gunasekaran, Patel and McGaughey, 2004; Varma, Wadhwa and Deshmukh, 2008) and the effectiveness of supply chain performance measures (Lucato *et al.*, 2014). Other areas of supply chain performance management are still

under research. This includes the challenges faced by the practitioner in managing supply chain performance. Further, the motivations of this study are the notion that the understanding of the challenges in supply chain performance management enables managers to deal with the issues beforehand.

Given the scant research to date, this study is aimed at investigating the challenges in managing supply chain performance for the oil and gas industry. This paper is organised as follows. The next section will discuss the literature on supply chain performance management and challenges in performance management. Section 3 presents the research method and the demographic profiles of interviewees involved in this study. Section 4 depicts the main insight of this study and the findings. Further, Section 5 concludes the research and explain some research limitations.

2. Literature review

Academic interest in supply chain performance management can be viewed from the high number of research discussions on this subject. The research on this area has started in the early 1980s (Bourne, 2000), where early research on performance management focusing more on monetary aspects (Neely, Gregory and Platts, 1995). This traditional performance approach has received a lot of criticism as only being suitable for short-term success (Kaplan and Norton, 1992; Bititci et al, 1997; Bourne, 2000). Similarly, Parker (2000) argues that the focus on financial measures is inward-looking and discourage inter-organisation comparison. The author also contends that the framework does not include intangible factors such as product or service reliability and are lagging indicators as it reports past events. On the same tone, Bititci (1997) claimed that organisations that only focus on financial measures might discourage continuous improvements. The researcher's concern on holistic organisational performance combined with the development of modern technology – the usage of the machine to substitute human lead to the increase of much new research on supply chain performance (Gunasekaran and Kobu, 2007). In fact, Gunasekaran and Kobu (2007) stated that the current outsourcing trends made traditional performance measurement such as activity-based costing no longer relevant. Despite the development of research on supply chain performance, there is still a lot to discover as managing supply chain performance is not a straightforward process (Overton, 2014). In other words, supply chain performance management is complex and influences by many factors such as the industrial sector (Gunasekaran et al., 2004; Shepherd and Günter, 2006; Gunasekaran and Kobu, 2007; Taticchi et al., 2013), organisational strategies (Gimenez, 2000; Wee, Peng and Wee, 2010). Adding to that, the external factors including market situations, political factors and the increase of globalisation play important roles in supply chain performance (Gunasekaran, 2004). This suggests that “there is no constant measure for all business circumstances, but measures should always be dynamic as to conform to a particular situation” (Abubakar *et al.*, 2016).

2.1 The oil and gas supply chain

Outsourcing has played a major role in the oil and gas supply chain due to its complex operation activities. The oil and gas supply chain is unique from other industries. Firstly, it has a very long link since it involves many parties from the exploration of oil and gas to the ultimate customer which is the oil and gas consumers (Varma et al., 2008). Secondly, there is an involvement of expensive machinery and equipment and also specialised logistic services. Most of this equipment requires specific maintenance and operation by skilled workers. Thirdly, this industry is also influenced by political factors as most oil and gas industry businesses are controlled by the local government (Ngoasong, 2014).

Fourthly, for the upstream sector, the location of oil and gas drilling activities are determined by the natural oil and gas resources location. The oil and gas reservoirs' location vary and their existence underwater is beyond human intervention. In some cases, it might be far from basic amenities, which requires additional cost for the logistic services. Even though the refinery process in the downstream sector might not need to be at a remote location as in the case of the upstream sector, there are some restrictions applied which are driven by environmental concerns. Moreover, it needs to be operated in an area that has sufficient energy supply for its operation. In most cases, refinery plants are located near to coast to make it easy to be accessed by the crude oil tanker (International Energy Agency, 2012).

Finally, the industry is subjected to high exposure of risks which require specific mitigation and measures to prevent accidents (Varma et al., 2008; Mearns and Yule, 2009). This factor needs to be considered in managing the supply chain to ensure all operations are safe for people, equipment, and the environment. The diverse sectors (upstream and downstream) and the multiple business activities within the sectors require a comprehensive understanding of the industry to enable efficient supply chain management. The involvement of many business functions within the industry

makes it a necessity for the oil and gas companies to outsource some of their non-core activities through supply chain networks.

3. Methodologies

The exploratory interview was employed to gain empirical insight on challenges in managing supply chain performance. To gain meaningful outcome from the study, five interviews were conducted amongst industrial practitioners involved directly in supply chain management. A similar approach has been widely used for exploring an area when there is a limited publication on the topic (Asrilhant, Dyson and Meadows, 2007; Urciuoli *et al.*, 2014). All interviewees have 15 – 30 years experiences in the supply chain and oil and gas industry. Table 1 shows the demographic profile of interviewees in this study. The five interviews were recorded and transcribed. The thematic analysis was adopted, where the data underwent coding and constructing themes according to similarities and differences (Leonard-Barton, 1990; Voss, Tsiriktsis and Frohlich, 2002).

Table 1: Interviewees demographic

| Interviewee | Year of experience | Role in the company | Country | Current company | Previous companies |
|-------------|--------------------|-----------------------------|-----------|------------------------|--|
| I1 | 20 | President | UK | Services advisory | Services advisory and oil and gas operator |
| I2 | 25 | Project procurement manager | USA | Services advisory | Oil and gas operator and contractor |
| I3 | 15 | Senior supply chain manager | Indonesia | Oil and gas operator | Oil and gas operator and contractor |
| I4 | 30 | Head of the supply chain | Malaysia | Oil and gas contractor | Oil and gas operator and contractor |
| I5 | 15 | Leader, supply chain | Malaysia | Oil and gas contractor | Oil and gas operator and contractor |

4. Finding and discussion

Literature suggests various challenges faced by the oil and gas industry. These include high logistics costs, long lead times, uncertainties in supply chain distribution among others (Othman *et al.*, 2008; Chima and Hills, 2007; Fernandes *et al.*, 2010; Varma *et al.*, 2008). These complexities require an efficient supply chain performance management. The interview focuses on the challenges in managing supply chain performance in the industry.

4.1 Ensuring the accuracy of data

One of the challenges suggested by Interviewees (I1 and I5) is to ensure the accuracy of data for the purpose of assessing performance. Apart from choosing the right measures and framework, there is a need to track performance progress, where data accuracy is essential.

"I think we can design an ideal performance scorecard. But, being able to catch and capture information accurately and reliably is very difficult often." [I1].

Data accuracy is considered one of the measures in supply chain performance, as stated in the literature of supply chain and logistics management (Chae *et al.*, 2013; Kumar and Nambirajan, 2009). Moreover, many authors perceive it as the driver to increase process efficiency (Hall *et al.*, 2013; Shafiee *et al.*, 2014). The same applies for the oil and gas industry as inaccurate data would not bring any added value in improving supply chain performance.

4.2 Various structures of data

Regarding the structures of data, Interviewees I1 and I2 pointed out that there are some difficulties in standardising the data for comparison purposes. The involvement of multiple expertise in delivering a task complicates the matters. For example, it is difficult to assess suppliers providing installation services as it involves manpower, vessel rates, diesel consumables for vessels and machinery, the working capacity of machinery and many other factors. This

especially true if different suppliers offer dissimilar options for the same work. The involvement of a company's operation and engineering departments is necessary to assess the cost structure offered by a supplier and to ensure every angle has been covered. This makes the process of assessing the performance very challenging.

"Even as something as simple as how much spend you have with one supplier or another is not always accurate because the companies supplying us are structured into many parts and it's not always obvious if they have combined and the information is not entered accurately into the information capture system." [I1].

Furthermore, Participant B considered managing the assessment tools to monitor supply chain performance as one of the obstacles that they have.

"One of the obstacles we have is in managing the integrated tool to monitor the performance of the supply chain." [I2]

4.3 Lack of inter-departmental cooperation

Interviewees I1 and I2 mentioned that there is also a lack of inter-departmental cooperation among employees in utilising the established performance measurement framework. The following extracts explain this situation;

"People who have more experiences tend to say, I will use my experience and judgements rather than driving hard to insist the accurate information is captured." [I1]

"I think there are companies who have bought a lot of gadgets to measuring performance but haven't put it into the culture." [I1]

"Then, getting people outside of supply chain to focus on performance measurement can be very difficult. Because most of the time they are being asked to get the job completed and when you say we should be measuring stuff, they might probably come back and say I'm not interested in it and it has no value to me." [I2]

Although supply chain emphasis on external collaboration with the supplier, customer and business partner, it must be supported by collaboration between departments to make it successful (Vanichchinchai and Igel, 2011). In fact, inter-departmental cooperation allows the firm to enhance information sharing between departments, reduce redundancy in organisational tasks and increase overall efficiency (Chang et al., 2016). Adding to this, previous research on the supply chain integrations found that inter-departmental cooperation has a positive impact on the organisations' performance (Flynn et al., 2010; Afshan, 2013). This includes operational performance, logistical performance, and enhancement of its efficiency, which eventually improves their financial returns (Flynn et al., 2010; Chang et al., 2016). Thus, the lack of inter-departmental cooperation needs to be resolved to improve overall organisational performance. Pertaining to this, (Zin et al., 2013) proposed the need for top management involvement to address this barrier effectively; this is also suggested by Interviewee 2.

"I think inter-departmental cooperation is difficult to achieve, except when someone higher up in the company support having certain measurement and must say we need to be measuring this. But, if you have to work from the supply chain point, it becomes much more difficult." [I2]

4.4 Local content challenges

Interviewees I1, I2, I4, and I5 commented on the difficulties they encountered in complying with the stringent requirements set out by the country in which they were operating.

Among the barriers suggested by Interviewee I1 is a very high requirement set by the country, which requires a lot of efforts to achieve. The participant added that some of the requirements stipulated by the country need to be factored into long-term plans as they are very difficult to achieve in a short period of time.

"So, typically countries set those requirements a bit unrealistically often deliberately so to make the oil companies stretch." [I1]

"And the capabilities and capacities in the industry in those countries in order to be able to provide the services required to comply with the country's regulations are insufficient." [I1]

Furthermore, Interviewee I3 claimed that there is a lack of knowledge among the service providers due to their role as an intermediary for the services they offer. This might disrupt the business operations as there is a communication barrier between the client's expectation and services delivered.

"The local content required us to deal with the local supplier where most of them are the middle person and do not have sufficient knowledge on the product/ services they provided." [I3]

In addition, Interviewee I4 stated that there is a limited number of vendors for certain services because of local content requirements on the need to purchase only from a local supplier. This eventually weakens the competitive advantage.

“Here in Malaysia, the government objective is to maximise local participation. By doing that, you demarcate your market. This regulation makes your market became narrower.” [I4].

It can be noted that similar opinions raised by participants operating in developing and developed countries with regard to local content issues. This leads to the next question as to whether there is a similarity in the local content requirements for the work performed in developing and developed countries. The follow-up question clarified this matter. Participant B explains that the local content requirements in developed countries, ie the USA are more concern on safety, environmental and social responsibilities issues. In other words, it does not particularly concentrate on engaging local services providers or in employing local people. A recent article from Ngoasong (2014) discusses how international oil and gas companies have to respond to local content requirements. This includes renegotiating local content requirements with local government, which underlines the fact that it is a vital component in supply chain performance management.

4.5 The need to manage the project at minimal cost

There are two situations raised by participants with regard to this issue. First, there is a need to manage efficiency at minimal cost. While the other is to provide the services at minimal cost. The following sections presented the issues.

4.5.1 The need to manage urgency at minimal cost

Interviewee I2 suggested that they have to deal with the pressure of delivering the task within a shorter time-scale at the minimum cost.

“I think the obstacles and challenges that we talked about is the need to have a fast completion schedule that overrides cost control performance measurement.” [I2]

Interviewee 4 suggested that there are times they have to manage their urgent requirements at minimal cost which is somewhat difficult to perform. Most of the time, they have to avoid competitive bidding, which would entail a longer process.

“At the end user perspective, they used to issue the request at the very last minute. When it comes to a very last-minute request, it is not viable to do open bidding. To have a proper procurement process, I think we need to have a minimum of 7 days from delivery time. If it involves bigger value and more complicated services, we need even longer time. That is always a challenge for us.” [I4]

4.5.2 The need to have the best services at the lowest cost

Another cost-driven pressure claimed by Interviewee 4 is to have the best services or product at a minimal cost.

One of the biggest challenges we have in the procurement and supply chain is they want the best services or products and the cheapest cost. These two rarely go hand in hand. Obviously, most of the time we have to consider the vendor to meet the minimal requirement at the cheapest price. [I4].

In line with the Interviewee I4 opinion, Cai *et al.* (2009) highlighted the difficulty in trading off measures to obtain supply chain improvements. The qualitative extracts show that there are five main challenges in managing performance involved in this industry as in Table 2.

Table 2: Challenges in managing supply chain performance from the interviews

| Challenges in managing supply chain performance | I1 | I2 | I3 | I4 | I5 |
|--|-----------|-----------|-----------|-----------|-----------|
| To ensure the accuracy of data | √ | | | | √ |
| Various structure of data | √ | √ | | | |

| | | | | |
|--|---|---|---|---|
| Lack of inter-department cooperation | √ | √ | | |
| Local content challenges | √ | | √ | √ |
| The need to manage the project at minimal cost | | √ | √ | √ |

5.0 Conclusion

This exploratory research has provides significant findings on the challenges faced by the oil and gas practitioner in managing supply chain performance. There are five main challenges identified in this research. Further, these findings were contrasted with a similar study in other industry. Through the interview, the local content requirement has been the challenge mentioned by four interviewees. Hence, it is critical to place greater importance in managing this challenge. It is also reveals the different areas of focus on local content issues between developing and developed countries. As a local content issue involves the country in operation renegotiation is one of the ways to achieve the solution work best for all parties. Further, three interviewees highlighted the pressure to manage the project at minimal cost. This outcome might influences by the low oil price environment that hit the industry during the study period (2015- 2016). The limitation of this study is the involvement of low numbers of interviewees. Better insight can be obtained by involving more industrial practitioners.

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