geoconvention
Calgary • Canada • May 13-17 2019

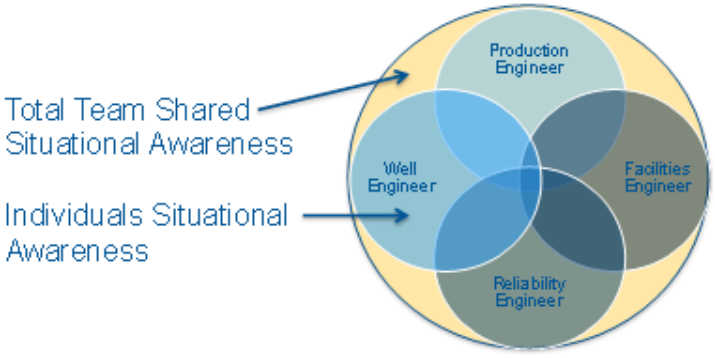
Big Data: Re-thinking the Operating Model with Integrated Operations

Dr. Denise T. Chenger, Assistant Professor, Supply Chain Management, Mount Royal University
Dr. Rachael N. Pettigrew, Assistant Professor, General Management, Mount Royal University

Summary

Annual capital investment in the oil and gas (O&G) industry averages $1 trillion dollars (Rui et al. 2017). The O&G value chain, recognized by its high complexity level with decision-making processes (Cláudio Benevenuto de Campos, Gilson Brito Alves and José Francisco Tebaldi de 2015), is undergoing a fundamental change with their business processes, facilitated by information technology (Moltu and Nærheim 2010).

Large, global oil & gas and mining companies are moving towards a concept titled “Integrated Operations (IO),” which involves a team based, real time, multi-discipline, and co-located team. The focus is on employing real-time data and new technology to remove barriers between disciplines, expert groups, geography and the company (Moltu 2013). The team’s sole focus is on decision-making, which drives value stream optimization. Reducing decision-making from days or weeks down to minutes through synchronized decisions across multiple functions is proving beneficial on many fronts. First, optimization of assets, which leads to improved financial results (as opposed to functional decision making). Second, IO’s can also create a safer work environment by removing employees away from the actual asset. Additional benefits can include higher recruitment and retention by removing employees from isolated and remote assets (e.g. off shore platform) and increased employee satisfaction through integrated decision-making.



Integrated Operations, a term unique to the O&G industry, requires a new highly collaborative decision-making process through a five pillar approach including: people, processes, organization (e.g. culture), technology (e.g. big data, predictive analytics) and the physical environment. Integrated Operations can be achieved by maximizing five key pillars:

1. Process – core processes and underlying processes that deliver value (asset optimization).
2. Technology – what technologies are required to provide visibility to key indicators, which all IO team understand.
3. People – the skills, competencies, leadership and behaviours are required of the synchronized and integrated team to work side by side and execute effective decisions.
4. Physical environment – impacts the way people work and needs to facilitate a new way of working with a multi-functional team.
5. Organization – changes to organizational structure, roles, accountabilities, and rewards are required. Further, one team based goal is typically required.

Early results with IO have been shown to reduce a firm's capital investment while increasing productivity (Cláudio Benevenuto de Campos et al. 2015) and agility (McGowan, Andrews, Criscuolo and Nicoletti 2015). For example, one study found production increases of 1-5% and no additional investment in capital spending (Hoffmann, Sunjerga, Teixeira, Silva and Camponogara May 9, 2017). While the results are positive, these initiatives are considered major human change projects (Madsen, Hansson and Danielsen 2013).

Because as much as 80% of an oil and gas company's production can come from their supply chain partners (Rosendahl, Johan and Revang 2014), this study also chose to include non-producers and gain insight into their current technology projects.

Integrated Operating Centers (IOCs) (noun) are intended to improve financial results and provide long-term organization value yet these are complex initiatives impacting the organization on many levels. Our research focused on understanding the drivers leading to the decision to implement an IOC and discover the factors leading to a successful implementation.

Theory / Method / Workflow

The study was conducted in the Canadian oil and gas industry, because of the abundance of high-risk major projects and access to CEOs and other senior executives. Industrial projects costing more than $1 billion have a one in three chance of achieving completion within 125% of budget. Major oil and gas projects, however, cost a company twice as much as about a decade ago, and their rate of success is only one in five (Westney, Evans and Tsai 2013). Completing a major project on budget is critical, particularly when oil prices are depressed. The oil and gas industry is one of the most highly regulated industries, which further necessitates a careful evaluation of triggers for new projects. This context offered an excellent window to study the ideation process for implementing an IO.

We chose cases based on having a head office in Calgary along with their recent initiation of an Integrated Operating Center. Some of the companies were in the design phase whereas others had an IOC up and running. All companies were familiar with an IO model. The researchers interviewed 16 individuals from ten oil and gas companies and included CEOs, executives, project leaders and members of the company IOC.

Each case (company) included four to six types of data (documents, archival records, interviews, direct observations, participant observation and physical artifacts), making the data set rich and extensive (Yin 2009). Following each interview, handwritten notes were made about contextual observations and

reflective thoughts. Each interview was recorded and transcribed. Transcripts included pauses, emotion, intonation, and anything else that stood out during transcription. They were cross-referenced with the interview notes and researcher observations.

Steps were taken to ensure validity and reliability of the findings. First, consistent and thorough data collection procedures were followed and documented. Second, interview information was verified with other data sources. Third, multiple sources of evidence were gathered, organized and documented. Finally, a database was built to allow for an easier comparison of information and data.

Results, Observations, Conclusions

This is exploratory research aimed to examine the business model of local companies incorporating a real time decision making models into their operations. The reasons why the participants pursued an IOC were varied. We did see a higher risk tolerance and a willingness to experiment with new tools and resources. Some of the companies exhibited a culture of continuous improvement, which included a constant awareness of new methods aimed at streamlining or improving operations. Others saw an IOC model as a lean tool, which can help improve economics within a recessed industry. We saw a natural diffusion occurring within the Calgary market; as the new concept makes its way into Calgary, word of mouth has been spreading through the community.

The research results, to be reviewed at the 2019 geoconvention includes the reasons why Calgary companies pursued an IO way of working, the implementation process, business results, and best practices or advice for other companies looking to re-think their business model and re-define their operations.

References

Cláudio Benevenuto de Campos, L., L. Gilson Brito Alves and C. José Francisco Tebaldi de (2015). "Improving value in oil business with integrated operations: A practical case of knowledge management." International Journal of Knowledge Management (IJKM) **11**(3): 55-72.

Hoffmann, A., S. Sunjerga, A. Teixeira, T. L. Silva, et al. (May 9, 2017). Benefits of real-time production optimization for a complex offshore multi-field asset in Brazil, Society of Petroleum Engineers.

Madsen, B.-E., L. Hansson and J. E. Danielsen (2013). Creating an IO Capable Organization. Integrated operations in the oil and gas industry: Sustainability and capability development T. Rosendahl and V. Hepso. Hershey PA, USA, IGI Global 18.

McGowan, M., D. Andrews, C. Criscuolo and G. Nicoletti (2015). The future of productivity The Organisation for Economic Co-operation and Development (OECD)**:** 102.

Moltu, B. (2013). Good IO - Design is more than IO - Rooms. Integrated operationsin the oil and gas industry: sustainability and capability development T. Rosendahl and V. hepso. Hershey PA, USA, IGI Global 12.

Moltu, B. and J. Nærheim (2010). "IO Design Gives High Efficiency." SPE Economics & Management **2**(01): 6.

Rosendahl, T., O. Johan and O. Revang (2014). "Internal Communication as Value Creation in a Change Process: A Case Study of Norwegian Statoil." Journal of Applied Management and Entrepreneurship **19**(3): 101-128.

Rui, Z., F. Peng, K. Ling, H. Chang, et al. (2017). "Investigation into the performance of oil and gas projects." Journal of Natural Gas Science and Engineering **38**(Supplement C): 12-20.

Westney, R., J. Evans and S. Tsai (2013). Board oversight of major capital projects Business Insights: Essentials Vanguard Publications Inc. .

Yin, R. K. (2009). Case study research: Design and methods Thousand Oaks, CA Sage.