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Enablers for the Successful Implementation of Intelligent Energy: The Statoil Case

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Abstract

Statoil has implemented a strategy for wide deployment of Integrated Operations (IO), which has evolved on the basis of the company's cultural and organisational characteristics, the experiences it has gained and the assets it operates.

A phase of experimentation, including R&D activities, pilots and wide deployment, was identified as necessary for the understanding of the challenges ahead to mature. Two examples are the development of work processes for production optimization and the design of new wells and drilling with net present value as the main quality criterion.

The second phase was to establish field-specific plans in order to ensure more rapid and broader progress. The third phase recognised that the ambition could be set higher if a concrete vision was established: "to strengthen decision-making onshore and strengthen execution offshore". In addition, IO synergies were identified across assets.

One success factor has been the wholehearted support of senior management, the CEO and the E&P senior vice president and his team. Another factor has been the change management process, which was established through a core team consisting of both discipline and asset expertise, with the formal support of the technical and administrative organisations

The empowerment of the assets and their multidisciplinary groups to develop and implement a broad set of initiatives has been crucial. It provided the enthusiasm, experience and confidence required to make the transition to company-wide solutions.

The impact on the bottom line is already being felt: in 2006, the production increase as a resulted of IO generated USD1.5 billion.

Introduction

In the last few years, several oil companies have made extensive changes in the way their business is conducted in order to maintain or increase their competitiveness. Based on available information and communication technology such as high bandwidth trough fibre optics, real-time data and new sensors, work processes (tasks to be done) and ways of working (how to perform the tasks) are being developed in order to increase value and improve safety. Statoil, which is operator for 60 per cent of the total production on the Norwegian Continental Shelf (NCS), has chosen the term Integrated Operations (IO) to refer to these changes. Some related initiatives among suppliers and operators are Smart Operations (Petoro), Integrated Operations (Statoil, OLF and others), eOperations (Hydro), Smart Fields™ (Shell), Field of the future™ (BP), Real Time Operations (Halliburton), Smart Wells (Schlumberger) and i-field™ (Chevron) (OLF, 2006).

Several organisations, for example Cera, have mentioned the NCS as the most advanced basin in terms of developing such initiatives (Langeland, 2006). There are several reasons for this leading position. Firstly, the fibre optic infrastructure on the NCS facilitates real-time reliable data transmission across assets and onshore locations. Secondly, the harsh environmental conditions in the North Sea have both necessitated and encouraged the use of advanced technologies in the performance of operations. Another important reason is the increase in net present value that can be expected in the NCS as a result of the implementation of Integrated Operations. It has been documented to be as high as USD 35 billion in absolute terms (Jansen, 2006). The importance the authorities attach to resource management has also played an important role. In this specific case, the Norwegian Petroleum Directorate initiated the formation of an ad-hoc

forum, a broad-based cooperation aimed at promoting the use of Integrated Operations. This forum consists of representatives from oil companies, suppliers, trade unions, the authorities and research institutions (Norwegian Petroleum Directorate).

From being ranked in 2004 as number five of six operators in terms of implementing Integrated Operations (IO) as a 'business as usual' concept and being at the forefront of IO development, Statoil has become one of the leading IO practitioners on the NCS (Petoro, 2005; Petoro 2007). This position has been achieved through several different strategic approaches. The purpose of this paper is to present the different approaches employed by Statoil to achieve its strong status in terms of IO implementation prior to its merger with Norsk Hydro in October 2007. Important success criteria for IO implementation will also be discussed. Together, the strategies and success criteria contribute to the exchange of experience needed to advance the introduction of IO in the oil and gas industry.

This paper is limited to the period prior to the merger between Statoil and Norsk Hydro on 1 October 2007.

Integrated Operations

White Paper No. 38 to the Storting (Norwegian Parliament) defines IO as 'The use of information technology to change work processes in order to ensure better decisions, remote control of processes and equipment, and to move functions and personnel onshore' (OLF 2006). Similarly, Statoil defines the term as collaboration across disciplines, companies and organisational and geographical boundaries based on the use of modern information and communication technology in order to ensure safer, better and more rapid decisions. The implementation is driven by the potential increase in production, the expansion of reserves and the reduction of costs (Petoro, 2007). By enabling a shared understanding among all those involved in operations, facilitating the relocation of personnel onshore, improving proactive maintenance and focusing offshore management on safe operations, IO is also considered to be a tool for HSE improvement (OLF, 2007).

As the definitions of IO states, the implementation of the IO concept is divided into two main areas. Firstly, proper technology is needed in order to acquire and share information. Secondly, people and organisational factors are important in order to optimise the use of the information collected. The first area is considered to be manageable by Statoil, as the company is very involved in a wide range of sophisticated technologies. The biggest challenges are related to organisational and people factors, and strategies must be carefully chosen in order for the IO concept to be successfully implemented throughout the company.

Strategies for extensive IO implementation

The strategies chosen for the IO implementation can be viewed as the basic enablers for the successful establishment of IO concepts throughout the company. The strategies have not, however, remained unchanged from their inception until the present. They have been developed through a dynamic process in which they have evolved on the basis of the company's cultural and organisational characteristics, the experience it has acquired and the assets it operates. This section presents three main strategic approaches used by Statoil. The approaches have started at different points in time, but have all been utilised during the period up to the StatoilHydro merger.

From pilots to broad implementation

In the first approach to the IO strategy, pilots have been used to demonstrate and adjust technology, organisational structures and ways of working. The use of pilots has the advantage of minimising risk and ensuring focus on overcoming any challenges that arise. Enthusiastic teams can also be chosen. The latter is important since creativity cannot be forced on teams, but will be stimulated where a sense of ownership is in place with respect to finding solutions. It is also the experience with pilots that they allow the effort and need to prepare for change to be communicated to all other assets.

Several criteria have been used to choose pilots. These include anticipated clear impact on the bottom line through increased production and the importance of creating short-term gains (for more details see Henriquez et al 2007); enthusiasm on the part of asset involved; the availability of the technical means to implement the pilot, such as operation centres and real-time high broadband data transfer using fibre optic cables etc. Examples of pilots are given below:

Production optimisation pilot

Statoil relies heavily on the use of operation support centres (OSC). The company's experience is that these centres allow data to reach the right people at the right time in order for the right decisions to be made in real time. One way to profit from the possibilities offered by an OSC is to maximise production in real time. One of the pilots involved the development of work processes with a view to achieving detailed production optimization on the Heidrun field.

The work process for short and long-term control and optimization of the value chain from the reservoir to export was changed. Three production engineers moved into an operation centre, together with a representative from Schlumberger, as well as a reservoir engineer when needed. The operation and maintenance engineers also contributed on the same level as the subsurface personnel. This provided new possibilities for collaboration, access to real-time data, time for analyses and integrated focus on the field. Over the course of the three-month pilot project, they managed to increase production by more than 150,000 Sm3. These increased levels have been maintained also after termination of the pilot.

Drilling remote-support pilot

Real-time data transfer from offshore to onshore enables drilling and well intervention to be supported in an efficient manner. New work processes were required in order to facilitate remote support as well as quality control of production logging, measurement while drilling, drilling parameters, geology structures, and well completion. New software was also developed to optimise well placement, net present value being the main criterion. This pilot has been carried out on several operated fields. The results so far are good. Onshore engineering support has resulted in much better utilisation of engineering resources and continuity.

A fundamental part of the first strategic approach has consisted of moving from pilots to broad deployment. Once a pilot has been performed, an evaluation is done by the project team. Together with the core Integrated Operations team, the project team recommends whether or not to continue with broad implementation. An impact assessment of broad deployment is carried out by a Quality Assurance (QA) team under the auspices of the IO core team, with input from the project team and with the participation of the trade unions. The QA team considers all implications of wide deployment, with the emphasis on positive and negative HSE aspects (Ringstad and Andersen, 2006). The need for specialised training (Hepsø, 2006), consequences for human resources and cost-benefits are other aspects considered.

If a decision is made to deploy the pilot widely, an implementation team is selected. Its tasks include customisation to local conditions, supporting the asset units, establishing and giving specialised training, and making the experiences known throughout the company. Implementation is the responsibility of each asset, which then assumes ownership of the project locally. A process aimed at following up progress is established with technical and line management participation, ensuring that experience is exchanged across assets. Some of the pilots that have been approved for wide deployment are the pilots described above. After the successful pilot, Production Optimisation Groups have now been established in practically all Statoil-operated fields, based on new governing documents and computerised systems. The new work processes in remote drilling support have also been included in governing documents and they are now the mandatory way of working in Statoil.

In addition to the pilots and the efforts aimed at wide deployment, Statoil has carried out several research and development (R&D) projects that have been crucial in terms of enabling both pilots and wide deployment. The projects have mainly concerned technological challenges relating to data collection, analysis and utilisation, and real-time interaction and communication between organisational entities.

In recent years, Statoil has carried out more than 16 major pilots for, for instance, condition monitoring of control valves from onshore, development of a condition monitoring portal and remote diagnosis of frequency transformers. Some pilots were performed on more than one operated field, and ten of them have been selected for broad implementation across the company. A production increase in 2006 worth USD 1.5 billion can be traced to IO efforts. The equivalent value in 2007 is estimated to be USD1.35 billion .

Field-specific action plans

Although the strategy of executing pilots and evaluating them for wide deployment has produced many positive results, it has some shortcomings:

- Depending on its extent, the process of selecting, executing and evaluating a pilot is a time-consuming one. It means that wide deployment has to wait for the result of a pilot before IO actions can be taken. In a mature organisation in which IO is widely recognised, this implementation strategy is too time-consuming to achieve the real potential.
- If the number of pilots is too high, focus could be lost. Several good initiatives may not be followed up since, for various reasons, they are not defined as *pilots*.
- The successful completion of pilots is particularly dependent on a team that is highly enthusiastic about the IO concept. In an early phase of IO implementation, such enthusiasts may be difficult to find.
- The different fields operated by Statoil are not a set of identical entities, but reflect a wide range of both technological and organisational differences. This complicates the process of wide deployment of a successful pilot since some fields might have characteristics that impede the implementation of a pilot developed by a field with other characteristics.

Because of these challenges, field-specific action plans were established in order to progress more quickly and broadly. In this additional approach, each business entity was asked to develop its own action plans for the implementation of IO concepts, in addition to already planned pilots and/or broad implementation efforts. This strategy has encouraged each field to develop its own initiatives, thereby improving creativity and ownership of the change process. Planned efforts in the IO field-specific action plans have also been incorporated into the corporate performance measurement system to help senior management to gain an overview of the various efforts and their progress. This strategy has resulted in more than 40 different initiatives among the operated fields. Examples of such initiatives include: concurrent planning in modification projects on the Sleipner field, increased use of analysis tools in drilling optimization on the Heidrun field and the establishment of an operation simulation centre on the Åsgard field etc.

Note that this new approach does not mean that the approach of executing pilots followed by wide deployment has been discontinued. The two approaches have been

used more or less in parallel. In addition to being engaged in pilots or wide deployment efforts, each field has its own action plan for other IO initiatives. In addition, another approach has been identified as being required for successful IO implementation.

Decision-making onshore and executing offshore

This third approach has been initiated as a result of recognising that the ambition could be higher if a concrete vision/objective was established: 'to strengthen decision-making onshore and strengthen execution offshore'. The strategy was inspired by the successful strategy chosen by Norsk Hydro on the Brage field. Huldra-Veslefrikk (HVF) has run a pilot for this new IO-based operating model in operations and maintenance, thereby eliminating the perception of distance between onshore and offshore. The new operating model has been developed since spring 2006 and it is based on Figure 1 presented below.

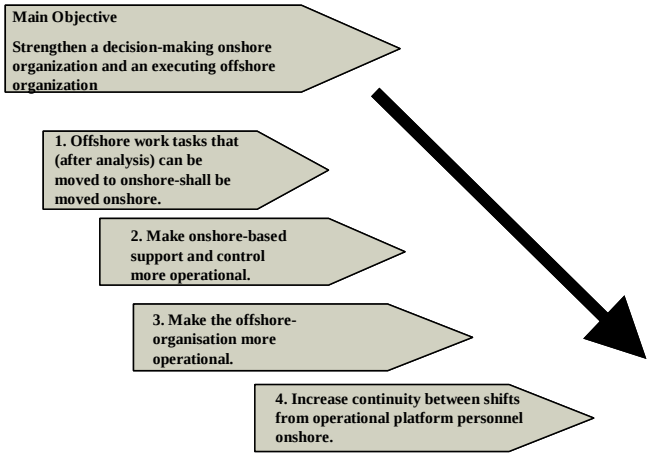

Figure 1 Basis for new operating model

As the model illustrates, the first step in the approach is to perform an analysis to identify roles that are redundant or can be moved onshore after implementation of new communication technologies. The analysis used, called CORD, is an MTO (Man, technology and organisational) method for the analysis of organisations that plan to make extensive use of information technology, and it was developed by IFE, Marintek and Sintef in cooperation with Statoil, Norsk Hydro, ConocoPhillips and Total (for more information, see Holst and Nystad 2007). Typical work tasks that can be moved onshore are administrative tasks such as personnel functions, planning operations in a time frame of more than one day, responsibility for the exchange of experience, authorisation of normal operations and technical case consideration.

The second and third steps involve the standardisation of work processes onshore and offshore to enable continuity and support to be provided by one support centre to several assets, improving effectiveness as well as making use of competence among employees. Fourthly, continuity between offshore shifts will be increased by, for example, performing the planning and work preparation onshore.

The new operating model has several advantages:

- HSE will be improved due to better integration of management offshore and onshore, greater continuity and integration of activities. Offshore management's attention can be more focused on direct operational follow-up and less on administrative tasks. Performing the planning and work preparation onshore will ensure a holistic approach and increase the long-term focus of each asset, increase safety and reduce the risk of environmental hazards.
- By moving technical managers to onshore interdisciplinary teams, the organisation's capabilities will increase by enabling the sharing of experience and competence and facilitating effective communication between the offshore and onshore organisations.
- Moving administrative tasks from offshore to onshore increases efficiency.

It is planned to implement this new operating model throughout the organisation.

Other enablers for IO implementation

In addition to the strategies that have worked as the basic enablers for IO implementation, there are several other factors that are considered to be major success factors in terms of Statoil's IO progress. Some of the most important success criteria will be presented in the following. Many of the factors are in accordance with the theory of John Kotter, an authority on change (for more details, see Kotter 1996).

Support from top management

Both the CEO and the Senior Vice President of Exploration & Production and his team have given wholehearted support to IO implementation. The implementation of IO was actually one of several corporate initiatives established by senior management in 2004. Following the merger between Statoil and Norsk Hydro in October 2007, IO has been selected as one of three corporate initiatives. The IO effort can therefore be considered to have a strong basis in and support from top management.

The top management is an important part of the coalition guiding IO. This guiding coalition is directly or indirectly responsible for the change efforts. Organisations should form powerful guiding coalitions in order to have enough power to lead change efforts. Since the top management is part of the IO guiding coalition in Statoil, the coalition has had enough power to enable the IO concepts to be implemented (for details, see Henriquez et al 2007).

The strong support of senior management also strengthens the sense of urgency in terms of the implementation of IO at the different levels in the organisation, another important criterion for successful change. If the sense of urgency is too weak, the change effort is not considered to be of major importance among employees, thereby reducing their efforts and sense of

ownership of the change (for details, see Henriquez et al 2007).

Management of the change process

The change process has been managed by a strong core team with both discipline and asset expertise, with the formal support of the technical and the administrative organisations. The team has representatives from several Business Units (BUs), senior process managers (process owners), HSE, Human Resources, Information and Communication Technology, internal competence training, Facility Management, Research and Development, discipline advisors, discipline networks and the Technology & Projects business area.

The core team has weekly meetings to coordinate and promote IO activities, and to develop strategies and action plans for IO implementation. This concentration of expertise and authority from across the company's organisational entities is a powerful supplement to the guiding coalition. They are critical in terms of giving professional support to the IO team and communicating the IO concept throughout Statoil.

Empowerment of the assets

As described in the strategies for IO implementation above, the assets (Business Units) have to a large extent played an active part in the change process. Each asset unit has been given responsibility for implementing pilots that have been approved for broad implementation. The development of field-specific action plans has also required the attention and involvement of each individual asset. This empowerment has been a critical enabler that has resulted in employee ownership and enthusiasm for the IO concept, thereby accelerating the process of implementing IO.

Communication and training throughout the organisation

Statoil has made great efforts to communicate the IO concept to all levels throughout the company. The message has been communicated through newsletters, fact sheets, intranet, the corporate news magazine, information posters and a specially developed DVD about IO. Meetings, workshops and conferences have also been held as part of information sharing. By using all these communication media and channels, Statoil has been able to constantly keep employees aware of what IO is, its rationale and how it will influence them in the future.

In addition, Statoil has established a series of courses to prepare employees for the new technology and work processes. The courses include general training in and an introduction to IO, ICT tools used in IO and training in remote collaboration rooms, as well as more specific training, such as well planning methodology and proactive operation support.

Measuring the effects of IO

Statoil has considered it important to measure the progress of implementation. All heads of production are required to report on the progress of IO implementation to their managers and the corporate initiative in order to enable the progress of each field to be monitored, and to enable corrective action to be taken when needed. Performance measurement is also the basis for bonus payments, which ensures that the heads of production and their managers have the necessary incentive to prioritise IO activities.

Challenges and post-merger strategies

The above sections describe the strategies and factors that have made successful progress possible. It is important, however, to recognise that the process of achieving its current leading position in IO has not been straightforward for the company. There have been and are challenges that need the careful attention of those responsible for IO implementation. The challenges have mainly concerned resistance to change and the alignment of performance appraisal with the new vision. It is also a difficult task to ensure that the new approaches are firmly rooted in the corporate culture. If the importance of these challenges is ignored, there is a great possibility of failure during implementation (Henriquez et al 2007).

On 1 October 2007, Statoil merged with Norsk Hydro and became the major operator on the Norwegian Continental Shelf. This has consequences for IO implementation. Since both companies have worked extensively on IO, the merger enables the new StatoilHydro to take the best IO concepts from each company and create a more vigorous strategy. Its status as one of three corporate initiatives, as described above, also illustrates that the importance of IO has been recognised. It is suggested that IO can be used to ease the integration process between the two companies since IO implementation requires the company to cooperate closely across former organisational boundaries in addition to restructuring work processes throughout the company. The main strategy for the new StatoilHydro will be to strengthen the decision-making organisation onshore and the executing organisation offshore. This strategy has been followed by both companies in advance of the merger.

Finally, the new company has a vision of expanding IO across international and organisational borders. Operation centres located in America and Asia can provide continuous 24-hour support to the assets on the NCS without undesirable shift work being required. A pilot study has already been performed involving the Åsgard field, the Norwegian onshore office at Stjørdal and onshore facilities in Houston, Texas that has proved that this vision is achievable. Suppliers are an important part of the real-time support function, adapting to the new IO work processes in StatoilHydro and raising field effectiveness to an even higher level.

Conclusions

As this paper argues, Statoil's progress from lagging behind in terms of IO development and implementation to becoming a leading player has been made possible through the careful selection of strategies and other enablers. The strategies have evolved on the basis of the company's cultural and organisational characteristics, the experience

it has gained and the assets it operates. The three main strategic phases have been from pilots to wide deployment, field-specific action plans and strengthening the decision-making onshore organisation and executing offshore organisation. These strategies have not been pursued sequentially, but in parallel with each other.

In addition, the support of top management, the management of the change process and the empowerment of the assets have been important enablers and critical success factors for the successful progress of IO implementation in Statoil.

In future, IO will continue to be given high priority in the merged StatoilHydro. Its implementation is seen as easing the integration of the two companies. The IO concepts will also be expanded to include international locations in order to enable continuous 24-hour support to be provided to assets on the NCS without shift work, and to include suppliers for additional support.

Acknowledgements

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