

SPE 112251

Successful Interaction Between People, Technology and Organisation— A Prerequisite for Harvesting the Full Potentials From Integrated Operations Steinar Roland, Olav Yttredal, and Ivan O. Moldskred, StatoilHydro ASA

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This paper was prepared for presentation at the 2008 SPE Intelligent Energy Conference and Exhibition held in Amsterdam, The Netherlands, 25-27 February 2008.

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Abstract

The full value potential of implementing Integrated Operations on the NCS is estimated to \$42 billion. In order to harvest this full potential we argue that a balanced integration of people, technology and organization (PTO) is necessary. Our focus is on the people and organisation aspects; what characterizes teamwork and collaboration in the new IO arenas; and, composition of teams and team performance.

IO represents a set of new work forms, and we argue that collaboration and team work are fundamental aspects in this new reality. Hence, we have used Dr. M. Belbin and his theories on roles and team composition to show how to design and develop good teams.

Our observations and findings indicates that it is important with continuously focus on the people and organizational aspects in order to harvest the full potentials from Integrated Operations. However, this focus must be balanced with technology in order achieve the most optimal work processes, which will give all parties safer and better decisions faster, and contribute to added value.

Background and scope

Based on a report from The Norwegian Oil Industry Association (OLF) published in April 2006, it is estimated that the full value potential of implementing Integrated Operations (IO) on the Norwegian Continental Shelf (NCS) is estimated at \$42 billion for the 2005-2015 period. OLF argues that the speed of implementing IO is a key element to harvest the full potential of the NCS, and that a slower pace will reduce the \$42 billion potential considerably.

The newly merged company StatoilHydro ASA will operate approximately 80 % of the oil and gas reserves on

the NCS. This implies that a full scale development and implementation of IO on the NCS represents a \$33

billion value potential for StatoilHydro – this fact alone is a key argument for prioritizing IO. In fact this is the key argument used to create a sense of urgency and opportunity in the company.

We would like to point out that this paper was written before the merger was finalized on October 1st 2007, and therefore references are mainly made to Statoil ASA. However, the paper is presented on behalf of StatoilHydro ASA.

The following definition of IO was used in Statoil, and will also be used in this paper: "Collaboration across disciplines, companies, organizational and geographical boundaries made possible by real time data and new work processes in order to reach safer and better decisions faster." (Statoil ASA 2007)

If we take a closer look at this definition we see that there are three goals associated with decision making. Decisions are to be safer, better and faster. In order to achieve these safer, better and faster decisions the IO teams and collaboration arenas need to be optimal. Hence we will focus on the following aspects in the IO context:

- A balanced integration of PTO
- What characterizes teamwork and collaboration in the new IO arenas
- Composition of teams and team performance

In order to better understand the overreaching changes that are needed in work processes it is also necessary to understand the key differences between traditional work modes and integrated work modes and processes. Figure 1 illustrates the important differences:

Figure 1: Old and new work forms



From serial to parallel work processes

A shift from serial processes to parallel processes requires increased synchronization between individuals and teams. New collaboration tools and work arenas enable subject matter experts and operators in the field to work much closer together. We even see a reduced need for mid-level managers who previously acted as coordinators and information channels. Information is available real-time and all participants in a project or operation can access the same information. Through the use of real-time data and new work arenas we also see that the need for coordinating functions performed by management is reduced as teams tend to self- synchronize.

From single discipline to multidiscipline teams

In traditional work processes a great number of tasks have been solved by subject matter experts working in a cell office. This required a specific task to be handed from one expert to the next as in a relay race. In order to accelerate the work process subject matter experts from the relevant disciplines are now established as multidisciplinary teams often working in a collaboration room (operational support room or concurrent design room) and we see a great reduction in the time needed to reach decisions or produce design solutions. These may even be virtual teams as members of the team can be working from different locations.

From being dependent on a physical location to being independent of a physical location

Without real time data, video conferencing and collaboration tools it was necessary to move the expert to the data and the operations itself. This meant that experts and engineers would spend a significant amount of their available time on the road, at heliports, in helicopters and finally waiting for the operation to commence offshore. Many trips would even be made in vain due to botched operations (bad weather, equipment breakdown etc.) In fact several platforms in tail production have reduced their crew sizes by up to 70% (OLF/ eDrift på norsk sokkel i 2010).

With all the new tools available we can now move the data to the expert and he or she can support operations far away without having to be present at the site. This does also require increased teamwork as the expert can give answers and advice but will depend on operational personnel to carry out certain tasks. This makes it also very important to focus on communication skills and establishing trust and confidence between supporting personnel onshore and operational personnel offshore.

From decisions based on experience data to decisions based on real time data

Much as in the above-mentioned points this requires increased team work. The elapsed time from incident to decision and correcting action is now very short. The work process does not allow for a serial work process. For instance, experts in condition monitoring are co-located in a specialist centre and need to act on real-time data in order to perform effective condition-based maintenance. This has greatly reduced unnecessary workloads and has improved regularity (unplanned shutdowns are less frequent). Again we see a great increase in team-based work processes as opposed to individuals working in serial processes as in a relay race.

From reactive to proactive work processes

Instead of reacting to incidents with corrective actions or compensating changes IO work processes emphasize proactive approaches to both operational as well as supporting functions. A good example is actually to be found in the above-mentioned focus on condition-based maintenance through real-time condition monitoring. Proactive measures are taken as opposed to corrective action after equipment break-down.

If we look at truly proactive operational support this also requires instant or near-instant access to subject matter experts. Statoil was actively using this approach when supporting ongoing drilling operations. Onshore drilling organizations are trained in "proactive operational support". The focus of this training is to build wellfunctioning onshore multidisciplinary support teams that are highly adept at supporting an ongoing offshore drilling operation – in a proactive manner. Statoil has even demonstrated the capability to support drilling operations on the NCS with a multidisciplinary team located in Houston, Texas. (Mydland et. al., 2007)

From the five key characteristics of IO work processes we see that collaboration and team work are fundamental. If we look at the business goals as defined by OLF in more detail, one can identify some key success factors that are vital if the benefits of IO are to be realized:

- "Improvement initiatives should focus on key value-adding decisions and complete value chains, e.g. on well placement and the complete well delivery process.
- Planning, prioritization and execution activities should be integrated across the key work processes.
- The operational teams should be allocated the expertise and given the authority to make decisions whenever a problem occurs.

- The teams should use ICT solutions and be located in facilities that enable real-time collaboration.
- The teams should use tools that filter information, e.g. produce intelligent alarms, automate repeatable tasks and keep the processes within acceptable limits without breaching alarm or plant trip limits.
- Teams with true decision-making authority and tools for real-time collaboration and automatic analysis of information are critical for the successful implementation of IO"

(Source: OLF "Integrated Work Processes Nov 2005)

This description of success factors show the importance of having a strong focus on teams and collaborative work styles

Statoil has had a long tradition for teamwork and this was also manifested in the corporate values: "work in teams, break down barriers and make constructive demands on each other" (Statoil corporate values). Corporate values were thoroughly communicated throughout the company and served as an important tool in shaping corporate culture in Statoil. In StatoilHydro's management system the focus on teamwork remains important; "Be curious, work together and share experience" (StatoilHydro ASA, 2007)

Collaboration - Theories and definitions

A **team** comprises a group of people linked in a common purpose. Teams are especially appropriate for conducting tasks that are high in complexity and have many interdependent subtasks. Based on this definition teams in Statoil and in an IO context would experience both the benefits of teamwork but also the challenges.

Collaboration is recursive interaction involving knowledge sharing and mutual learning between two or more people who are working together, toward a common goal which is typically creative in nature.

A lot of research and theories about teams can be found in scientific and management literature. For simplicity and brevity in this paper we have chosen to focus on the team theory established by Dr.M. Belbin. He has in his work documented the importance of team composition with regards to various roles in the team, and that several factors influence team performance (Belbin 1981, 1993, 1999 and 2000).

According to Dr. Belbin there are nine different team roles. It is possible for one person in a team to cover more than one specific role, and team members can switch between roles depending on the task at hand. It is also important to keep in mind that a team can function without all nine roles being present. In this context team role is a set of preferences held by a team member and not to be confused with personality types.

The various types of team roles are:

Figure 2:	Belbin	Team	roles
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Overall	Belbin roles	Description	
Doing / acting	Implementer	Well-organized and predictable. Takes basic ideas and makes them work in practice. Can be slow.	
	Shaper	Lots of energy and action, challenging others to move forwards. Can be insensitive.	
	Completer/Finisher	Reliably sees things through to the end, ironing out the wrinkles and ensuring everything works well. Can worry too much and not trust others.	
Thinking / problem- solving	Plant	Solves difficult problems with original and creative ideas. Can be poor communicator and may ignore the details.	
	Monitor/Evaluator	Sees the big picture. Thinks carefully and accurately about things. May lack energy or ability to inspire others.	
	Specialist	Has expert knowledge/skills in key areas and will solve many problems here. Can be disinterested in all other areas.	
People / feelings	Coordinator	Respected leader who helps everyone focus on their task. Can be seen as excessively controlling.	
	Team worker	Cares for individuals and the team. Good listener and works to resolve social problems. Can have problems making difficult decisions.	
	Resource/investigat or	Explores new ideas and possibilities with energy and with others. Good networker. Can be too optimistic and lose energy after the initial flush.	

(Belbin, 1981, 1993)

Focus on roles is important both when teams are established and during training and coaching of existing teams. Considerations should also be made regarding qualifications and selection criteria when recruiting into existing teams.

What has been done in Statoil? In Statoil teams were generally established and based on organizational or operational functions. IO has however introduced teams that are to a larger degree established across functional and organizational boundaries. Statoil management has through several decisions clearly demonstrated the urgency of working across boundaries.

It is important to distinguish between the nine Belbin roles and functional team roles. Very often a team will be established with functional requirements as a primary driver i.e. geologists, engineers etc. A team member is then selected based on professional qualifications and back ground. Increased focus on team performance and challenging IO work processes emphasizes the need to focus on the broader qualifications of team members.

When team work and collaboration is required in order to achieve IO goals it will be reflected in work descriptions. This will again influence key qualifications both in the recruitment process and in the selection of IO team members.

For change to be sustainable it needs to be reflected in the recruiting and selection of people (Kotter, 1996). People inclined to collaborative work styles and team players have a greater chance at success than those who do not value teamwork and collaboration.

According to Belbin a team with one Shaper and a group of "yes" men may perform well, especially if predictability is high. In his books he identifies a number of combinations that performed well in exercises, especially when team members were aware of "missing" roles within the team.

Belbin has emphasized that the team roles are not personality types. According to Belbin they are clusters of characteristics, and psychological preference is only one dimension (Belbin 1981).

Only a well-functioning and well-composed team will be able to make decisions faster and at the same time make safer decisions. It is of utmost importance that the team itself is able to recognize when speed in decision making could compromise the quality or safety of the decision.

Ringstad and Andersen looked at the decision making process in the IO context, a theme related to the team and collaboration aspect: IO introduces potential challenges to the decision making process. These challenges include: resistance to change, group based and decentralized decision making that can blur lines of command, information overload, reduced understanding of local and installation specific factors as decision makers are remote from drilling and production facilities, and increased complexity and interactivity can make it difficult for decision makers to maintain an overview. (Ringstad et.al. 2007)

IO team work and collaboration is often characterized by personal exposure, open arenas, fast decision making, information transparency, multi discipline teams and distributed teams - aspects which supports the importance of good team work and collaboration in order to reach good decisions. Internal enquires in Statoil has indicated that a highly collaborative work environment is positive, but it can also induce stress. Research supports these findings, and has shown that stress to a certain extent may be positive for personal performance, but if it passes a critical point the level of stress compromises the performance. Stress and decision making processes in the IO context are important to keep in mind, especially related to team work and collaboration. Feedback from team members has also proved that team based work provides a more supportive environment that can reduce frustration and negative stress.

Empirics

Another challenge that needs to be addressed is the fact that two or more teams need to collaborate and in fact function as one integrated team (onshore and offshore teams).

Studies and interviews have uncovered a disparity between onshore and offshore staff with regards to knowledge about IO and IO work processes.

In order to map the status quo in Statoil, and identify the key people and organizational challenges, we used several methods. Our arguments and preferences are based on recommendations from the "*Integrated Operations Core Group in Statoil*", data from internal employee surveys,

interviews with line-mangers and IO related group work at leadership summits.

Internal employee surveys - GPS 2006

Global People Survey (GPS) is an internal employee survey which has been conducted every year in Statoil since 1986. One of the questions asked in 2006 was as following: "We improve onshore-offshore collaboration by using new information- and communication technology (integrated operations)?" Approximately 3,700 employees from the business area Exploration and Production Norway (EPN) answered the question, where 50% worked onshore and 50% offshore.

On a scale from 1 - 6 (1 is lowest) EPN had a total score of 4.1on this question, whereas onshore scored 4.4 and offshore 3.9. The difference between personnel with leadership responsibilities and those without offshore were 4.5 and 3.8 respectively. But, if we compare only leaders, offshore scores 4.5 while onshore scores 4.8.

We can see that the difference is substantial between offshore leaders and other employees. Among leaders onshore and offshore there is however a strong belief in IO. This represents a good starting point for good teamwork and collaboration. Information efforts should be intensified with regard to non-management employees offshore.

As we will later describe we have used this data to focus on communication and information in order to familiarize the organization with the term IO - Communication and information is necessary to succeed with such big change processes that IO represents, and at the same time contribute to increased ownership – a key element in all change processes.

Interviews with line managers

In connection with our work we conducted a series of interviews with line managers, 11 in total. The subjects were centered on the people and organizational aspects of IO, and the respondents varied from Platform managers, HR managers, Operations managers to maintenance leaders.

The main impression from the interviews is that the people and organizational aspects occupy the leader's attention. There are also different challenges for those working offshore and onshore, and it is also apparent that leaders are more familiar than other employees with IO. Our effort regarding communication and information is also based on these interviews, where leaders offshore requested more information to be distributed in order to familiarize the employees with IO.

IO is seen by many employees offshore as something unknown and even as a threat (i.e. move jobs onshore). Uncertainty and insecurity in the organization, both offshore and onshore, may lead to resistance against the change process which IO represents, and in the long run undermine teamwork and collaboration.

Other elements pointed out by leaders in the interviews were the need for well-functioning work plans and related An integrated onshorecompensation. offshore organization means that the onshore organization must be available to support offshore at any given time during the day, and it is therefore important that work plans and related compensation and benefits are designed according to these needs. Compensation, benefits and work plans represent important elements for employees and must be adapted to new work processes in order to avoid undesirable disturbance from the organization which may slow down the IO process.

Training and learning were also pointed out as important elements. The implementation of IO means that the organization must familiarize itself with new work forms, work processes and new technology. This means that training and learning must be prioritized, especially related to teamwork, personal and inter-personal skills. StatoilHydro has developed and implemented five different IO training courses to support these needs.

Leadership summit and SWOT analyses of IO

In connection with an EPN leadership summit in the spring of 2007 group work was arranged with a focus on IO.

The participants were asked the following: "*Please identify strengths, weaknesses, opportunities and threats related to IO in our own unit.*" They were also asked to identify potential challenges and solutions related to IO.

Approximately 250 leaders from all management levels attended the summit. The main impression from the group work was that the leaders have a solution-oriented approach to IO. The overall list over strengths, weaknesses, opportunities and threats was extensive, but an abstract gives us an impression of how the leaders see IO.

Strengths and opportunities:

- better continuity between shifts
- HSE benefits
- faster response time to problems offshore
- more effective resource usage
- larger focus on "us" rather than "offshore vs. onshore"
- the possibility to use expertise and resources between licenses
- better cooperation between different disciplines

Weaknesses and threats:

- the physical distance between onshore OPS room and platform to long
- the organization is not willing to change
- industrial espionage

- the lack of a credible onshore support (expertise, resources, experience)
- reduced motivation offshore might jeopardize safety and regularity
- decisions are made too quickly due to a high level of activity between onshore and offshore organization- may lead to more complex decision processes and important details being left out

Based on these aspects one may read between the lines that teamwork and collaboration are important. Focus on "us" rather than "offshore vs. onshore", the possibility to use expertise and resources between licenses and better cooperation between different disciplines are all related to the focus of this paper.

Weaknesses and threats such as the lack of a credible onshore support (expertise, resources, and experience) and reduced motivation offshore might jeopardize safety and regularity, elements which may be reduced by a focus on teamwork and collaboration.

Based on the presented theories and internal empirics we will in the next chapter discuss these elements and present our conclusions and way forward about how we plan to realize a balanced interaction of people, technology and organization.

Discussion

The technological aspects related to IO are easy to grasp and constitute for example a variety of ICT tools, data systems and programs, fiber-optic and advanced collaboration rooms, both onshore and offshore. The technology is important and must be in place as an enabler for developing and implementing IO.

The point however, is that in order to take IO one step further, we need to give the people and organizational aspects similar focus, and see the PTO perspective in balance, and as a whole. A comprehensive analysis was conducted in Statoil after a gas seabed blow-out on 28 November 2004 on the Snorre A platform. The analysis showed that several factors caused the accident, but the conclusion was as follows: "The results show the importance of viewing the technological, organizational and human factors in conjunction in order to best understand the underlying factors and to draw up relevant, focused follow-up measures". (Moldskred et.al. 2006/ SPE-98739-PP). This report emphasizes the importance of communication and cooperation between on and offshore organizations. The goal is that the new work styles and processes of IO will contribute towards improved HSE and help to reduce the probability of a recurrence of similar incidents.

The people and organizational aspects are complex, and we have chosen to focus on teamwork and collaboration. Within this scope we must also keep in mind that leadership constitutes an important role i.e. decision making, responsibility and proxy.

The theories and empirics we have used imply the importance of roles in team work and collaboration. As Belbin argues in his theories, a conscious focus on roles in teams is important. Related to this one should be conscious when recruiting personnel to IO teams. Personal qualities as team players and the ability to work in the new work forms and work processes which IO represents, should be taken into consideration.

One cannot recruit personnel based on these criteria's alone of course. The implementation of IO means that the organization must familiarize itself with new work forms, work processes and new technology. This means that training and learning for both new and more experienced personnel must be prioritized, especially related to teamwork, personal and inter-personal skills. Once again – focus on communication, leadership and how to work better together will in the next step lead to better team work and collaboration.

But there are other important aspects of the people and organization dimension important to remember in order to drive change related to IO. Compensation, benefits and work plans must be adapted in order to motivate personnel. These aspects could disturb the IO process if not optimal. Another related aspect is general communication and information to the entire organization. Communication and information is necessary in order to succeed with such large scale change processes as IO represents, and at the same time contribute to increased ownership – a key element in all change processes.

Referring to question 1a on the technical categories matrix from SPE- *how do we enable people to work in new ways in our new business model?*- we argue that the topics mentioned above must be handled during the IO change process to enable people to work in new ways in a new IO business model. As the empirics show, there is an urgent need for this, and Statoil has in a recent report finalized in June 2007 analyzed these specific challenges and proposed the listed efforts to meet these challenges.

Conclusions and way forward

The fundamental statement of this paper is that IO is based on teams and collaboration. Technology is an enabler but does in itself not give the organization a competitive advantage. Competent individuals and teams correctly organized and able to collaborate well is necessary in order to take advantage of the technology implemented – we believe this is one of several impacts on the PPO which IO will bring about.

We also argue that basic hygienic factors i.e. compensation, benefits, work plans and communication related to the IO change process must be addressed up front in order to enable people to work in new ways.

Training and recruitment strategies must also be aligned with IO requirements.

A key success factor for the successes Statoil has achieved in the implementation of IO is that the organization recognized the importance of the people and organizational aspects of IO at an early stage. Special training courses were designed and implemented in order to enable individuals and organizations to utilize the tools and to employ new work processes in their day to day work.

With teamwork and collaborative work styles being one of the cornerstones of Integrated Operations and new work processes, we need to pay very close attention to how we define teams and how we actually put together, as well as train teams in order to optimize team performance. This statement sums up question 1b on the technical categories matrix from SPE on "how do we integrate across disciplines, geographical boundaries, remote locations, diverse cultures, suppliers and operators?"

Working as a team, and not just a collection of individuals is important. Managers will often claim to have a team when in fact they have a committee or hierarchy. As more effort is put in to support team performance, the guiding coalition becomes stronger and more able to achieve its goals. During change and the associated stress, leaders throughout the organization need to draw on reserves of expertise, energy and, most important, trust. Personnel problems often lurking beneath the surface of a team are easy to ignore but will often come to the surface during times of change. The pressures of change make a strong team an essential success factor. Beyond the social teambuilding and events, strong teams are built by solving real problems and challenges together, sharing a vision, and commitment to a goal. (Kotter, 1998).

Our main argument is as stated earlier that technology alone will not give the desired results, and that a balanced interaction of people, technology and organization is a prerequisite for harvesting the full potentials from Integrated Operations.

To support our hypothesis we have referred to existing theories on related subjects, and present data from internal employee surveys, interviews with line mangers and IOrelated group work at leadership summits. This data has been supplemented with inputs from the "Integrated Operations Core Group in Statoil" which has the overall responsibility for the development and implementation of IO in Statoil.

By balanced interaction we mean that the development of IO work forms and work process must incorporate the needs of the people, organizational and technical dimensions.

Our observations and findings indicates that it is important with continuously focus on the people and organizational aspects in order to harvest the full potentials from Integrated Operations. However, this focus must be balanced with technology in order achieve the most optimal work processes, which will give all parties safer and better decisions faster. A balanced PTO interaction will contribute to increased quality in the decision and execution phases, which in the end also will lead to added value.

The 2007 GapGemini/ Petoro IO readiness assessment concluded that Statoil is one of the leading IO companies on the NCS with regards to collaboration, governance, communication, change management, focused learning, multidisciplinary teams and process management. This illustrates that our focus on people and organizational aspects, in conjunction with technology, has resulted in significant progress.

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