USE OF VISUALISED *WORK PROCESSES* AS AN ORGANISATIONAL TOOL TO ILLUSTRATE AND DISCUSS ROLES, RESPONSIBILITY, COLLABORATION AND RISK.

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SUMMARY

During work in well P-31A on Snorre A on the 28th of November 2004, a gas blow-out occurred on the seabed with subsequent gas on and under the facility. The gas flow was halted and the well was stabilized at 10:22 hours on the 29th of November 2004. On the 29th of November 2004, the PSA appointed an investigation group which has identified non-conformities and improvement areas. These can be categorized as follows:

- Lack of compliance with governing / controlling documents
- Inadequate understanding and implementation of risk assessments
- Inadequate management involvement and violation of well barrier requirements

Many of the non-conformities identified are in resemblance with results from a *Smarter together* research project. The project identified a need to improve the relations between work practice and steering documentation. The question at hand is what can be done to avoid this lack of compliance with steering documentation?

The paper's objective is to introduce the use of visualised *work processes* as an organisational tool to clarify roles, responsibility, collaboration and risk, in order to document and integrate *best practice* into the daily work life to obtain safe and efficient work practice.

In this paper we will introduce a four-stage method. The method has been developed during various projects with Hydro, Statoil and ConocoPhillips Norway (COPNO). We will also discuss and present results from projects involving these companies with regard to operational use of the four-stage method:

- Step 1: Create a rough visualised draft of the work process
  - The purpose of this step is to prepare a basis for the forthcoming discussions with regard to the work process and accompanying best practice. A rough draft of the work process is drawn and visualised, preferably in a flow scheme, illustrating roles and responsibilities.
- Step 2: Discuss the work process draft
  - In Step 1, the output is a rough draft of the work process modelled into a flow scheme. However, the draft is not necessarily the work process' best practice. It's important to include operational personnel in the process to verify the drafts. A discussion is needed to agree on and get a clarification and understanding of the roles and responsibilities for the personnel involved.
- Step 3: Work process risk analysis and qualification
  - In Step 2, the work processes have been adjusted to incorporate best practice; however it is important to perform a risk analysis to ensure that they have a positive effect on the total risk picture and conform to the steering documents.
  - Finally, the work processes need to be documented into an ICT system. In this way the work processes are more accessible and easier to upgrade and maintain. (This method does not cover the aspects of selecting and developing a software system. However, we have developed concept solutions for such an ICT system)
- Step 4: Integrate the work process in daily work practice
  - To achieve a full integration and use of the work processes as an organisational tool demands a lot from the involved personnel and the company's leaders. In fact, it is vital that the involved contribute in the preparation and elaboration of all the described steps. This gives a feeling of ownership to the work process and the organisational tool itself. This will motivate and encourage the operationalization of the organisational tool in use. The main challenge is to integrate the tool in everyday life.

1. INTRODUCTION

During work in well P-31A on Snorre A on the 28th of November 2004, a gas blow-out occurred on the seabed with subsequent gas on and under the facility [1]. Many of the personnel were evacuated by helicopter to nearby facilities. The emergency response team on board considered a full evacuation at three separate occasions. The flare continued to burn during parts of the incident and was a potential ignition source. The gas flow was halted and the well was stabilized at 10:22 hours on the 29th of November 2004.
On the 29th of November 2004, the PSA appointed an investigation group which has identified non-conformities and improvement areas. These can be categorized as follows:

- Lack of compliance with governing / controlling documents
- Inadequate understanding and implementation of risk assessments
- Inadequate management involvement and violation of well barrier requirements

The non-conformities occurred at several levels in the organization on land and on the facility. The investigation shows that the number of non-conformities and improvement areas are extensive. There is nothing that would indicate that the incident was a result of chance circumstances.
The PSA characterizes this incident as one of the most serious to occur on the Norwegian shelf. This is based on the potential of the incident. Subsequent to the incident, Statoil was given and accepted a penalty of NOK 80 million [2].

Many of the non-conformities identified in [1] are in resemblance with results from *Smarter together* research projects [3]. These projects, amongst other findings, show that a lack of compliance with governing and controlling documents (from now on called steering documents) has been detected. The fundamental idea with steering documents is to clarify what the organisation has decided to do and / or what affects what to do [4]. The question at hand is what can be done to avoid this lack of compliance with steering documentation?

1.1 Objective of paper

The paper's objective is to introduce the use of visualised *work processes* as an organisational tool to clarify roles, responsibility, collaboration and risk, in order to document and integrate *best practice* into the daily work life to obtain safe and efficient work practice.

In the following pages we will introduce a four-stage method. The method has been developed during various projects with Hydro, Statoil and ConocoPhillips Norway (COPNO). We will also discuss and present results from projects involving these companies with regard to operational use of the four-stage method.

2 BACKGROUND

Firstly, it is necessary to find out what the challenge with steering documentation is. A Smarter together research project identified a need to improve the relations between work practice and steering documentation [5].
SINTEF has through industrial projects experienced some drawbacks within the use of steering documentation:

- It is often a lack of systematism regarding steering documentation, which further often makes it difficult to find procedural requirements
- Often numerous procedures regulate the same work process. It may cause confusion.
- The amount of steering documentation and the level of detail make it difficult to see the totality of the work tasks
- There are too many details on a steering level. Many procedures are plain work descriptions and a lot of time is used to address the non-conformance of these. The respect for steering documentation is often absent.
- The procedures are not user-friendly. The chosen language is complex and in resemblance with legal language, and little to the point. The various users therefore find it difficult to acquire the content of the steering documentation.

These defectives were and are, unfortunately, believed to pass for a large part of the petroleum industry. To cope with such challenges, Hydro initiated a project by the name of WPOS (**W**ork **P**rocess **O**riented **S**teering – APOS in Norwegian). The objective was to transform all the steering documentation into work processes

visualised by role-based flow-schemes and described by each work task's best practice and requirements. The fundamental idea was to make the steering documentation more accessible for both offshore and onshore personnel. Nevertheless, Hydro has faced challenges in this work, especially regarding the integration and use of the system, both offshore and onshore.

As being part of this project in an early phase we discovered together with Hydro several challenges and burdens to overcome, in order to succeed with this organisational tool. Together with Hydro we developed ideas and solutions to improve the system. Simultaneously, and later on, we have further developed these ideas and worked out a method to use work processes as an organisational tool to ensure the above mentioned challenges.

3 THEORY AND METHOD

In the following chapter a walk-through of the four-stage method will be introduced. Figure 1 illustrates the four-stage method as a work flow. When deciding which work processes to start up with, we recommend doing a Hazid analysis. By this all the main work tasks are analysed and prioritized concerning risk level. We then recommend starting up with the high risk work processes.

Figure 1: The four-stage work process flow

3.1 Step 1: Create a rough visualised draft of the work process

3.1.1 Objective:

The purpose of this step is to prepare a basis for the forthcoming discussions with regard to the work process and accompanying best practice. A rough draft of the work process is drawn and visualised, preferably in a flow-scheme, illustrating roles and responsibilities.

3.1.2 Description:

In order to model a realistic work process, it is important to understand the work process at hand. This necessitates the need for experts. By expert (i.e. procedure owner) we mean a person with an overview of the entire process, not just parts of it. If it is possible, it is an advantage to involve multiple experts.

Nevertheless, experts tend to need assistance to recall an entire work process. Therefore it is an advantage to use a facilitator to help the process by asking relevant questions. A selection of case based questions / interrogatives may be an advantage as support. It is important that all the documentation is acquired and understood in advance, by both the facilitator and the expert. By this, the facilitator can ensure the integrity of the modelled work process.

3.1.3 Constraints and prerequisites:

For this step you will need:

- Facilitator(s) – ea. QHSE employee / external coach
- Work process / procedure expert(s)
- Procedure(s) covering the entire work process
- Tools for visualisation (i.e. computer with software)

3.2 Step 2: Discuss the work process draft

3.2.1 Objective:

In Step 1, the output is a rough draft of the work process modelled into a flow-scheme. However, the draft is not necessarily the work process' best practice. It's important to include operational personnel in the process to verify the drafts. A discussion is needed to agree on and get a clarification and understanding of the roles and responsibilities for the personnel involved.

3.2.2 Description:

The personnel involved with the work process are needed to ensure a good work through of the draft / model. The facilitator has two main tasks in this step. Firstly, to lead the meeting (control the communication and ask questions) and secondly, to visualise / record the work process. Gathering several of personnel in a room can represent a communication challenge. It's important that the facilitator takes control and acts as a moderator. Depending on the experience and skill of the facilitator, an additional facilitator controlling and documenting the flow scheme on the big screen may be needed.

3.2.3 Constraints and prerequisites:

For this step you need:

- The work process on a big screen, so everyone present get a good view
- A facilitator to control the communication between the involved personnel and ask questions
- A facilitator to facilitate the flow-scheme on the big screen
- All the personnel involved in the work process
- The expert from Step 1 (preferably the procedure owner)

3.3 Step 3: Work process risk analysis and qualification

3.3.1 Objective:

In Step 2, the work processes have been adjusted to incorporate best practice; however it is important to perform a risk analysis to ensure that they have a positive effect on the total risk picture and conform to the steering documents.

Finally, the work processes need to be documented into an ICT system. In this way the work processes are more accessible and easier to upgrade and maintain. (This method does not cover the aspects of selecting and developing a software system. However, we have developed concept solutions for such an ICT system)

3.3.2 Description:

We recommend using well-known risk analyses tools such as *Procedural Hazops*, *Task analysis* or *Human reliability analysis*[5, 6, 7, 8] These tools, which can be performed both quantitatively and qualitatively, cover the impact of human behaviour and potential of human errors. When performing these analyses it is recommended to use the same participants as in the earlier steps. By making the participants contribute to identifying the risk elements in their "own" work processes, the participants not only feel ownership to the final result, but they are also introduced to a way of thinking, and become more conscious to the concept of risk. The important mind shift is that instead of just concentrating on the task at hand, they also think why the task has to be done and the consequences of their actions (what-if learning). [10].

In addition, the use of expository animations, films, sketches, pictures and other multimedia to enrich the visualisation of the work processes is highly recommended. This can greatly enhance the users understanding of the work process and eventual consequences [11].

The table below is an example of how to design a risk analysis for data input to a work process system. By working through the work process step by step you get the desired input for the work process system / software.

Table 1. An example of how to design a risk analysis for data input to a work process system

Name	Why	Cue	How	Feedback	Error	Cause	Consequence	Risk	RRM
					1.	1.1			
						1.2			
						1.3			
					2.	2.1			
						2.2			
						2.3			
					3.	3.1			
						3.2			
						3.3			

Name: Simply the name of the work task to be performed. A work process consists of many work tasks.

Why: The personnel need to know why to perform a work task to fully understand the work process. This makes the personnel ready to handle unknown situations, due to their underlying knowledge of the work task.

Cue: Does anyone or the technology give signals / cues to the personnel so they understand when to perform a work task, or do they have to remember when to perform a work task? An absent of cues may result in the personnel forgetting the work task or execute it at the wrong point in time.

How: Explains how to perform the work task in detail – *Best Practice*

Feedback: Is there any feedback to the personnel, so they understand when they have accomplished a work task and are ready for a new one, or do they have to find out themselves? An absent of feedback may result in the personnel believing to have performed a work task without really have done it and start on a new work task that is dependent on the former.

Error: What kind of human related errors have been done in this work task over the years or is believed to may happen?

Cause: What was or could be the cause of these errors?

Consequence: Description of the possible consequences both on the personnel and the technology

Risk: A quantitative or qualitative risk measurement to see which human behaviours cause the greatest risk. (Risk = Probability x Consequence)

RRM (Risk Reducing Measures): What action can be done to reduce the risk when performing this work task?

3.3.3 Constraints and prerequisites:

For this step you need:

- A facilitator / team for carrying out risk assessments for the different work tasks.
- The personnel involved in the different work tasks
- A software for data input

3.4 Step 4: integrate the work process in daily work practice

3.4.1 Objective:

To achieve a full integration and use of the work processes as an organisational tool demands a lot from the involved personnel and the company's leaders. In fact, it is vital that the involved contribute in the preparation and elaboration of all the described steps. This gives a feeling of ownership to the work process and the organisational tool itself. This will motivate and encourage the operationalization of the organisational tool in use. The main challenge is to integrate the tool in everyday life.

3.4.2 Description:

In order to succeed with the implementation of the organisational tool it is recommended that the organisation think through several aspects.

- Important to inform the affected personnel about the tool
- Give adequate training in use of the system
- Leaders have to enforce the importance of compliance by good example and by continuous follow-up of personnel
- Adapt and include the organisational tool in the operational setting.

3.4.3 Constraints and prerequisites:

In this step you will need:

- Leaders familiar with the software system
- A software system available at computers both onshore and offshore
- An arena for work process walk-throughs
- Feedback opportunities that are proven effective

4 RESULTS AND DISCUSSION

Parts of the method presented have been put to use in projects at several occasions. Anyhow, the entire method has still not been tried out in one designated project. Also, we have experienced that unlike approaches for the steps give different results. Here, we will introduce experiences we have had with use of the method.

Step 1: Create a rough visualised draft of the work process

We have experienced

- that personnel find it difficult to describe their own work-tasks in work processes they are involved in
- that personnel find it easier to describe other's work-tasks than their own
- that leadership is the most common role that is left out when making the role-based flow-schemes
- that the personnel involved in step 1 of the method often tend to lean on the steering documentation when visualising the work process and thereby realising the deficiencies of the steering documentation
- that working through step 1 of the method demands both time and resources
- that the personnel have unlike understanding of the work processes
- that the personnel involved in step 1 often wants a print-out of the work process to use in their daily work life

Step 2: Discuss the work process draft

For this step we have had two main experiences. Due to the difficulty of gathering all the personnel involved in the work processes for a discussion, we have experimented with sending out the rough draft for a review at first and then had an interview with everyone involved one by one after. They are both effective and give the wanted results. Nevertheless, the collaboration between the personnel is less when they are not gathered.

We have experienced

- when personnel are introduced to a rough draft of the work process, they find it easy to verify and make corrections to their own work-tasks
- that it's more time-consuming for the facilitator when the rough draft is sent out for review to the personnel involved, contra gathering the personnel to a meeting / work-through.
- that you get more lively discussions when the personnel involved are gathered for a discussion, rather when you interview the personnel involved one by one
- through group activities that it's evident that personnel have a different understanding of the various roles and responsibilities and that there is a need to clarify these roles and responsibilities in order to unify the workforce.

Step 3: Work process risk analysis and qualification

We have experienced

- that the steering documents don't have adequate data for input to the work-tasks best practice / risk analysis
- to describe best practice for a work process you need input from many and quite different steering documents

At the present time we have not had the opportunity to try out this aspect of the method to its full potential in any of our ongoing projects. However, we hope that this will be the case in the near future.

Step 4: Integrate the work process in daily work practice

The integration and use of work processes will tell if the system is a success or not. Through our projects we believe that the use of work processes has the highest benefit when being used by leaders both offshore and onshore. However, it is important that personnel involved in the work process are contributing when visualising and documenting best practice, so they are familiar with the system and easily can give feedback to the best practice.

We have experienced:

- from step 2 that personnel are more enthusiastic when they are involved and contribute to their own work practice. Further, the personnel feel ownership to the work processes and actually use them, because they know that "the information written down here is correct"
- that personnel onshore often are more familiar with the use of pc than personnel offshore, due to regularity
- that leaders offshore are getting more administrative duties that has to be solved using a computer
- When reading through a pc screen a human reads up to 40 % slower [11]. By interviewing participants in our projects, we have experienced that the combination of work flow schemes (boxes with print), a risk analytical build-up of the data input and the use of animations, films, sketches, pictures and other multimedia makes it easier for them to understand the information and to read through the work process.

At the present time we have not had the opportunity to try out this aspect of the method to its full potential in any of our ongoing projects. However, we hope that this will be the case in the near future.

5 CONCLUSIONS

We have experienced that there exist unlike understandings of how a work process is set to be done, even though everyone involved in the process apparently had agreed prior to the job. Further, when both time and resources are set aside to discuss specific work-tasks, we have experienced that the work through of a group process has been successful. The participants have got enthusiastic when they have got the feeling that "someone actually cares about my work practice". This has given the participants an ownership to the specific work processes, and at the same time given them an identical view on how the work process should be performed.

To succeed with this we have experienced that the arena for these discussions is important. We have tried both group processes and interviews. We see that the fellow-feeling a group process creates has positive spin-off effects.

In addition, we have experienced the need for a thought-through facilitator role. It's difficult to get the participants attention and get out their full potential before anyone has the ability to control the group process. Also, group processes demands, exponentially with the number of participants, more time and resources to perform. It's important that the facilitator has knowledge and a general understanding for the work process at hand.

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