

# Implementation of “What-, How- and Why-Learning” in Offshore Drilling Planning

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## Abstract

The paper presents the theoretical background for, and implementation of “What, How, and Why Learning” in Offshore Drilling Planning. These principles were derived from a model of company socialization of newcomers, and applied to improve safety and efficiency. Besides enhanced structure and information richness in the program, the new planning model also utilized more hands-on offshore knowledge-in-action than traditionally. Concurrent to the implementation of the re-designed program there were observed significantly improved drilling rates and reduced injury rates.

## 1. Introduction

A major feature of the action research project “Smarter Together” [1] was a series of search conferences held onboard the Coastal Express. Each conference spanned over two full working days at sea<sup>1</sup>. The participants were diverse batches of personnel involved in offshore drilling operations in the North-Sea. Yet, given the project’s main goal of increasing safety and efficiency in drilling operations, most participants represented offshore communities of practice. However, the mix of staff within each batch varied in accordance with the operational challenge in focus. The main feature of the cruises was a mixture of structured and open group processes, and theory/research-based presentations from the researchers/moderators.

In “Smarter Together” both the notion of safety and efficiency as contradictory, and the traditional “attitude change” perspective on increased safety, were

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<sup>1</sup> Hence, the conferences were labeled “Knowledge Cruises”.

challenged. This was done by addressing knowledge and learning processes at multiple interfaces<sup>2</sup> within the three major parties within “Snorre Drilling Team”; the operator company Norsk Hydro, the drilling contractor Prosafe Drilling Services, and the main service company Baker Hughes Inteq.

Thus, the objective of this paper is to present and discuss the effects of a Knowledge Management approach to safety and efficiency in offshore drilling. This is done through investigating the case of improved and redesigned drilling programs – a direct effect a “Smarter Together Knowledge Cruise”. Research questions are:

- What is the relationship between learning- and knowledge theory and the quality of the revised Planning Process?
- What direct effects emerged from the revised process and Program?
- What indirect effects emerged from the revised process and Program?

## **2. Safety and efficiency enhancement through knowledge management**

Opposed to what seems to be a common perception, safety and efficiency are not inevitably negatively correlated. As formulated in one of “Smarter Together’s” leading hypothesis, these entities could be seen as parallel indications of work quality. Subsequently, safety and efficiency could both be seen as dependent of the amount and quality of individual and organizational learning. This being behavioral change produced by the creation, utilization, or transfer of information, knowledge and experience within or between people working together.

More commonly, especially regarding safety, the subject is approached extracted from daily work practice, highlighted in propaganda-like attitude change campaigns. This even if this model has not proven itself as particularly effective in producing significant and durable behavioral change in favor of safety. Firstly, it has frequently been shown that it is behavior that creates attitudes, not the opposite. Secondly, attitude change campaigns are often too vague, e.g. “Safety first”, failing in addressing both the *cognitive* and the *emotional components* of established attitudes. Thirdly, attitude change campaigns are mainly individually orientated, despite the fact that the level of safety (as well as efficiency) is more related to collective behavioral patterns and performance [2]. Lastly, this approach makes safety easily perceived as something *estranged* from work quality – easily perceived as an additional load.

### **2.1. What-, how-, and why- learning**

The socialization of novices into company culture, becoming “experts”, has been described to take place in three distinctive stages [3]. These are the *what-*, *how-*, and *why-stages*, categorized by their typical learning outcomes, i.e. the employee’s

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<sup>2</sup> Between individuals, groups and companies, offshore, onshore and in the offshore – onshore axis.

functional level of knowledge. Interestingly, this model has several common features of Rasmussen's [4] model of *rule based-*, *skill based-* and *knowledge based* behavior. Even if originally intended to describe the transition from newcomer to fully socialized into the company culture, this model offers an interesting perspective on how to promote safety and efficiency through enhanced learning.

In the first stage, the novice is dominated by declarative<sup>3</sup> knowledge [5]. He knows *what* work process (es) he is to participate in, superficially what his tasks are and what tools are to be used. However he does not know how to act safely and efficiently upon these knowledge structures. In this stage the behavior is slow, inefficient and characterized by errors (which may lead to unsafe situations). This is primarily caused by the shortage of domain-specific knowledge-in-action. Thus, when behaving, he is often forced to rely on assumptions based on imperfectly generalized knowledge from other domains or experiences. The information processes producing this behavior, are on a highly conscious level.

Being exposed to informational and instructional materials and particularly by gaining work experiences, including both internal<sup>4</sup> and external<sup>5</sup> feedbacks, the novice then segues into the *how-stage*. In this stage the declarative knowledge (through an associative stage), transforms into procedural knowledge [6]. The knowledge has now taken the form of (increasingly) efficient behavior programs which are gradually honed into an increasing level of relevance, speed and accuracy. Additionally, the amount of conscious knowledge processing decreases, as the knowledge begins to be *internalized* [7] and automatized. The former novice now increasingly acts upon internally represented, personalized domain-specific and "tacit" knowledge [8]. However, the ability to perform flexible or explorative problem solving, as in successful improvisation, may not yet be present. To perform on such a level, other types of knowledge must be present. Knowing why a certain rule applies, and why it does not, is one component.

The *why-level* learning provides knowledge about why a certain behavior or procedure is optimally instrumental within certain contextual constraints. Unfortunately, even at quite high performance levels, reaching the *why-level* can be a cumbersome process. Particularly so, when novices lack guidance in shaping their behavioral procedures. Knowledge-in-action on this level embraces the rationale supporting organizational behavior, procedures, methods and the utilization of tools and technology. Such knowledge-in-action offers gleams of insights into unarticulated mental models and theories-in-use [9]. As such, the *whys* could also be a potent point of departure for questioning dysfunctional "corporate truths" which might be barriers to individual as well as organizational improvement. Of course, knowing the *whys* also adds a desirable level of meaning to work, as well as personal tasks and roles. Rationalization and articulation of *whys*, in addition to worker control and predictability prevents alienation, dysfunctional motivation, as well as promoting high general job satisfaction [10]. Moreover, by being exposed to ex. planners' *why-level* knowledge, tacit knowledge about the subject matter might

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<sup>3</sup> Descriptive or lexical knowledge.

<sup>6</sup> Experiences without interaction with others, signaling that the behavior was "right" or "wrong".

<sup>5</sup> This could be various types of interventions, i.e. "showing how", or "Let me tell you how I do this..." or rewards or punishments upon actual performance, given by colleagues or managers.

be triggered in the reader. This could not only promote new insight, but also evoke potentially crucial objections to the plan, or parts of it.

However, large proportions of the *whys* are implicit<sup>6</sup> in the well experienced employee. Thus, seniors often fail in communicating their *whys* to their colleagues. For the same reason, it is a common experience that the *whys* (and even the *hows*) can be quite obscure in both professionally and locally developed instructional materials<sup>7</sup>. Additionally, many companies do not have proper arenas and processes for externalization of such knowledge. A highly probable cause is insufficient knowledge about knowledge and learning among both managers and HR-officers across most industries. Hence, many fail in fully reaching the *why-stage*, and newcomers develop unnecessarily slow. Among the results are (s)low performance, high error-rates and shortcutting with potentially severe consequences for health and safety.

### **3. The improved drilling program preparation**

With this theoretical scope as point of departure, any information essential for successful work-performance and enhanced learning opportunities, should express the *whats*, *hows* and especially *whys*. Accordingly, the onshore operational management of “Snorre Drilling Team” decided that this principle could be utilized in the process of program preparation. This was done to give significant advantages especially in the execution of the drilling program - promoting both safety and efficiency throughout the operations.

The background for this was that the traditional preparation process produced inaccurate program and insufficient drilling operations, resulting in undesired levels of safety and efficiency. Partly this was seen as originating from insufficient involvement from the offshore personnel who actually perform the work. In fact, principally pure drilling contractor tasks were mentioned in a few lines, with little effort put into planning the jobs ahead of time. Additionally the programs were available offshore too close to operation onset – often too late for efficient work planning.

#### **3.1. The new Program layout**

The new program layout could in fact be viewed as three distinctively focused programs<sup>8</sup>. Yet, during this work, many shortcomings in the existing procedures system were identified and corrected. Thus, this action also produced additional positive effects concerning safety and efficiency.

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<sup>6</sup> Being both retained and processed under the level of consciousness, tacit knowledge produce behavior that is “self-explanatory” for the well experienced.

<sup>7</sup> In both cases, the authors is well experienced/experts, dominated by tacit knowledge in the subject matter.

<sup>8</sup> Information-wise, structure-wise, and user-wise.

### 3.1.1 *The What-program*

The *what-program* was designed to give only the necessary information for the internal management, the partners and the authorities. Being a formal necessity, the program itself was just in accordance with the minimum requirement for what such a program should contain. However, the normal risk evaluation process was still an integral part of this process. All the same, in this way valuable time- and knowledge resources could be utilized in more crucial parts of the program preparation.

### 3.1.2 *The How-program*

The *how-program* was in fact an equivalent of the section guidelines issued prior to each section when drilling the wells. It gave details on how each part of the program should be executed, and either included the procedures, or referred to where the procedures could be found. When procedures were referred to, they were also checked prior to this to ensure that they were updated and relevant. A modified<sup>9</sup> well timing form was used to highlight the preparations prior to the job, which was responsible for ensuring the procedures are updated and in place, that the equipment check lists were in place, and that contingency plans were available.

It was considered that it was important that the contingencies were highlighted here, decision trees are worked through and presented, and details given as to what equipment/personnel were needed and where they were located. The well timing job details were then used to illustrate the results from the risk analysis process, where the colors green (low risk), yellow (medium risk) and red (high risk) were used to indicate what risk is connected to the individual activities in the well timing. Additionally, the need for *Safe Job Analysis* (SJA) was also highlighted, together with requirements for chemicals and discharge to the environment (checked against the discharge permit to ensure that the programs can be performed).

Personnel involved in the execution of the job offshore were involved with the preparation of the *how-program* so that operational experiences and considerations could be taken into account to improve job safety and efficiency. In fact, both the *what-* and *how program* was prepared by a team of personnel including Hydro, the drilling contractor (Prosafe) and all the involved service companies. A Norsk Hydro drilling/completion/intervention engineer led the team and coordinated the process.

### 3.1.3 *The Why-program*

In short, the *why-program* contained the critical aspects of the total program; the key activities for achieving the targets of the program were highlighted together, with critical safety aspects, such as requirements for SJA, deviations from governing documentation or regulations (including discharge permit deviations). The team leader on behalf of the drilling superintendent prepared this.

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<sup>9</sup> The activities were more broken down into details than traditionally.

### 3.1.4 The New Program Implementation

The process began shortly after the conclusions from the “Smarter Together”-cruises were available in the fall 2001. The improved planning process and programs were used successfully on the programs for all following drilling activities. The program was also utilized in activities that previously were started, but still could benefit from the method. The overall quality, and the degree of information of these programs also allowed for a more relevant and safe transfer to new wells with a high degree of similarity with those completed.

## 4. Results and Discussion

The new planning process with offshore personnel partaking in preparation of section guidelines, and Prosafe detail planning the pure contractor tasks (i.e. drilling riser, production riser, etc.), led to drilling and completing well under budget of the well 34/7 P15. In fact, this was the first complete “from drilling to completion-operation” that was performed according to the new program.

After the implementation of the new program preparation process, the Snorre Drilling Team achieved better drilling rates (p=8%), with a parallel drop in the injury rates (p=7%) [1]. Thus, at face value, this strongly supports the leading hypothesis of “Smarter Together” – enhanced learning, knowledge utilization and transfer, positively affects both safety and efficiency. Although the platform was our “laboratory”, this is action research. This means that many unknown 3. variables could have contributed to what seems to be a casual relationship between this action and the positive change in drilling performance.

Among the most potent alternative explanations for this phenomenon is of course the Hawthorne-effect. In fact, we have reports on positive change in behaviors, attitudes and communication between the partners offshore, even before the first realized actions could have produced any direct effects. Nevertheless, at least this demonstrates the positive psycho-social value of offering an arena where people can get to know each other better (both as individuals, as members of a team at work, and as holders of diverse, but complementary knowledge and experiences), even across company payrolls and hierarchies.

Nevertheless, this method of planning is still in use in Snorre Drilling Team, although in a slightly adjusted form. This is partly due to the change of Operator Company of the platform, and their governing documentations. The *what-, how- and why-program* is also presently applied in drilling operations on the Norsk Hydro operated Njord platform.

## 5. Conclusion

Regarding the ambiguity in the results presented above, drawing an absolute conclusion is not apt. However, producing organizational change is extremely difficult, and there is well known fact that a large proportion of such projects aiming at such change fail, some even make more damage than good. This has not

happened in this case, quite the contrary, even if this is difficult to prove scientifically. Be this, the Smarter Together-method has proven its strength, and does not fall short compared to the effects of more traditional ways of trying to enhance safety and efficiency in the Oil Industry.

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