Training simulations: the complementarities of clinical approach and regulation approach

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Abstract

We aim to illustrate the provision of the analysis of activity according to the regulations approach, as a supplement to the clinical approach of working activity.
This illustration is accomplished on the piloting of nuclear reactors. The clinical material is acquired from simulated situations on full scale simulator of nuclear reactor, and from analyses of events of industrial exploitation.

The event analysis of nuclear power plant of Chinon puts in an obvious place specific characteristic for some events presenting a gap between realized work and expected task, including some cases presenting a specific typography. This characteristic results in the fact that the gap occurs because the control, although it is accomplished, does not allow to avoid this gap, due to an unsuitable object of control, or because it was not accomplished by the operator at good level: a kind of skip control phenomenon. Everything seems to take place as though the operator had wanted to control only a part of the activity, assuming that the whole activity would then be validated.

At first, the approach of the analysis of activity according to regulations (Faverges, 1972 ; Leplat, 2006) has been used. It allowed to break down, on cognitive plan, the basic mechanisms occurring during the realization of activity. We noted that in the case of activities based on the skill of the operator (see model of Rassmussen, 1994), he approaches activity by defining for himself one or several objectives and achieves them according to one or several final controls.

In term of regulation, we shall say that for control, the operator uses a comparative module to confront acquired results and expected ones. If comparison is satisfactory, task is ended. If it is not, the operator re-injects this result into the curl to make an analysis, to redefine objectives, then to compare the new acquired results and expected ones.

According to efficiency research, the operator implements secondary curls, with each their secondary objectives and their secondary comparative module.
But it can also bring problems : the analysis of working activities for nuclear safety events (Fauquet, 2004, 2006) shows that the operator can have tendency to validate task as a whole on the basis of a secondary comparative module, and not on the basis of the main comparative module. Everything takes place as though, in situation, he forgot the main objective of the task and focused only on secondary curls, which can be seen as subordinate cognitive regulations.

The analysis has led to suggest to training trainers and to work analysts to treat this problem by identifying the secondary objective and make the operators think about the reasons that led them to identify such an objective. This can be done through a collective analysis supported by the clinical analysis of working activity as developed by Fauquet (2006), notably by leaning on the capacity of the analyst to grab dialogic residues (Scheller, 2001) as a mean of feeding of professional controversy, and grabbing the agreed in speech for the re - question. This helps operators to understand the skip control phenomenon and to adjust their control for further activities.

1. Introduction

The aim of this study is to illustrate the provision of the analysis of activity according to the regulations approach, as a supplement to the clinical approach of work activity.

This illustration is accomplished on the piloting of nuclear reactors. Considering needs for the present study in terms of observations and debriefings, and taking into account the industrial constrains of work, the clinical material is acquired from simulated situations on full scale simulator of nuclear reactor, and from analyses of events of industrial exploitation. By operating event, it is necessary to understand a gap between realized work and expected task. Any gap detected leads to a treatment (Fauquet, 2004, 2006) and is assessed according to the International Nuclear Event Scale (INES). Quasi entirety is classified at level 0 (« no importance from the point of view of safety »). The treatment of gaps with weak

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stakes (minor events) allows to forestall the case of gaps with strong stakes (significant events).

The event analysis of nuclear power plant of Chinon puts in an obvious place specific characteristic for some events presenting a gap between realized work and expected task, including some cases presenting a specific typology. This characteristic results in the fact that the gap occurs because the control, although it is accomplished, does not allow to avoid this gap, due to an unsuitable object of control, or because it was not accomplished by the operator at good level: a kind of skip control phenomenon. Everything seems to take place as though the operator had wanted to control only a part of the activity, assuming that the whole activity would then be validated.

The simplest case is the following: the operator wants to start a pump. For it, he must turn and push a button.
The operator goes up to the button, turns it, pushes it, and makes sure finally that the button is definitely in the expected final position. He validates so the good execution of his task realization by checking the position of the button without proving that the pump is really crossed of the state « off » in the state « on ». This may seem amazing to read it on a paper but that settles as a reality in work situation, as work activity registers in a field of numerous and various constrains.
This simple situation finds analogies in various circumstances. For instance, the operator must put in a series of electrical cells to supply pumps. Inactive cells are pointed out by specific green tags, put down on each of them.
The operator, operating mode in hand, accomplishes this activity on cells through repetitive way, going from a row to another and from a group of rows to another one. It checks « connected cells » on his operating procedure; but in order to do that, he leans on recovered tags which he puts down on the floor in front of him. But for some of them, the connection is not real. However, according to the operator, activity is finally sold off and satisfactory since he has got all his tags.
As for the previous example, the operator validates an activity on a control which is not performed at good level; here, it is the recovered tags instead of the action on the cells.
On the basis of the well-known postulate of the psychodynamic offering that any behavior has obviously a sense (Dejours et al, 1994) and therefore that every person accomplishes a gesture or an action for a reason that is justified for himself, it appeared to us essential to try to understand the mechanisms which produce such results, to transform them, within the aim to reduce occurrence of events presenting this skip control characteristic.

2-Method

At first, we present the type of activities or tasks kept for the study; then we present how the approaches allow first an understanding of situation, then an analysis of this one with the aim of solutions elaboration.

The approach of the analysis of activity according to regulations (Faverges, 1972; Leplat, 2006) has been used. It allowed to break down, on cognitive plan, the basic mechanisms occurring during the realization of activity.

3. Analysis

We noted that in the case of activities based on the skill of the operator (see model of Rassmussen, 1994), s/he approaches activity by defining for her/himself one or several objectives and achieves them according to one or several final controls.

We envisaged a model, exposed thereafter and inspired by Leplat's work (2006), giving an account of clinical cases displayed above.

The objectives that the operator defines himself follow the analysis that s/he makes for the situation. These redefined objectives are elaborated through numerous parameters; for instance: constraints, tolerances, research of compromise between potential aims and various subjective motives. Motives call a subjective rationality here (Dejours et al., 1994) while the previous parameters are recovering from a cognitive-instrumental rationality. The first one is centered on task, the second on subject (the man at work). Subjective motives can be: support one's health, having good relations at job, ameliorating competences, optimizing workload, searching a promotion, for instance.
To assess the objectives defined by the task are reached, the operator accomplishes a control.

In term of regulation, we shall say that s/he uses a comparative module to confront acquired results and expected ones. If comparison is satisfactory, task is assessed ended. If it is not, the operator re-injects this result into the loop to make an analysis, to redefine objectives, then to compare the new acquired results and expected ones.
And, considering the subjective motives of which he is led to take into account, the operator implements secondary loops, with each their secondary objectives and their secondary comparative module. They allow the operator to be more efficient in action and to reduce the mental load linked to a given basic task according to the principle of cognitive economy (Allport, 1904; Kongovi et al., 2002).
These simplified cognitive regulations, increasing effectiveness, can also bring problems. It is precisely case in the clinical material recalled above.

The analysis of work activities for nuclear safety events (Fauquet, 2004, 2006) shows that the operator can have tendency to validate task as a whole on the basis of a secondary comparative module, and not on the basis of the main comparative module. Everything takes place as though, in situation, s/he forgot the main objective of the task and focused only on secondary loops, which can be seen as subordinate cognitive regulations.

The metaregulation (Leplat, 2006), the role of which is to regulate passage from the main regulation to a subordinate regulation (or secondary loop) to another, is summoned at the beginning of activity, but not at the end. So, task is sold off on an unsuitable comparison, since final main result is never compared with main objective.

For the operator, there is sliding of objective (from the principal to the secondary), sliding of loops of regulation without return (from the main to the subordinate), with focusing on this cognitive subordinate regulation to the detriment of the first one.

4. Treatment

After debate between analysts and simulator trainers further to the observation of several clinical cases as mentioned above, question settled of how to lead the trainees to understand, by themselves, mechanisms offered by this model.
Discreet steps are the following:

- in simulated situation, the trainers identify cases such as those named above for which control takes place only on the secondary objective (example: stopping of a pump and control only of the position of the button),
- in debriefing of simulation session, it is asked to the operators to tell the chronology of event,
- with the help of the trainers, the operators highlight the action relating to a secondary objective (example: turn and push the button),
- the trainers request to the operators to answer questions as such : "what made you turn the button?", to help the operator to come back to the main objective,
- trainers ask if final control has definitely been accomplished at good level related to the previous answers,
- then trainers explain simply the sliding of objective which took place, by saying that the operators accomplished a final control as though he had forgotten for which aim they performed this activity.

The operators are finally led to think what they could make on further situations to avoid this kind of problem.
At this step of discussion, the provision of the clinical analysis of working activity has all its gain. Because if the approach according to regulations is a remarkable mean to question the sequence of an activity in a rational way, it stops however to question on the basis of an explicative model.

Answers to questions must be then searched in opened up for possible discussion between actors of the situation of this question setting. It is there that the clinical analysis of activity intervenes as developed by Fauquet (2006), notably by leaning on the capacity of the analyst to grab dialogic residues (Scheller, 2001) as a mean of feeding of professional controversy, and grabbing the agreed in speech for the re-question.

The way of secondary objective to the main objective of activity is hired, then finished. On conceptual standpoint, the aim of trainers is to know how to bring the operators from the subordinate cognitive regulation back to the main regulation.

The trainers reactivate therefore during debriefing the metaregulation necessary for this transition, which did not take place in situation.

5. Conclusion

The electricity production by nuclear industry implements a system of detection and treatment of operating events in constant evolution: the aim is to ameliorate continuously exploitation and safety of installations.

For the treatment of events presenting specific characteristic, we have proposed an oriented debriefing analysis of the work activity.
Those events are polluted by skip control phenomenon due to an unsuitable object of control.

Using regulation approach, we have pointed out how the operators accomplish their activity through regulation loops, a main one with secondary ones (called subordinate cognitive regulations), each of them having their main (resp. secondary) objective, and their main (resp. secondary) result.
Moving from one loop to another proceeds of a metaregulation that does not operate at the end of the loops.

The analysis has led to suggest to trainers and to work analysts to deal with this problem by identifying the secondary objective and make the operators think about the reasons that led them to identify such an objective. This is done through a collective analysis supported by the clinical analysis of working activity. This helps operators to understand the skip control phenomenon and to adjust their control for further activities.

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