PSYCHOLINGUISTIC ANALYSIS OF OPERATIONAL COMMUNICATION (PART II): PRESCRIBED COMMUNICATION FOR RELIABILITY IN HIGH RISK INDUSTRIES

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ABSTRACT

A specific language of communication at work is developed by professionals particularly in high risk industries (such as energy production industries, aircraft companies and hospitals): this comes from the high level of technicality which is often at the root of these words. One of our previous studies demonstrated that this kind of standard usage of communication is reliable in specific contexts but can produce mistakes giving rise to undesirable events (such as deviations from prescription). One solution might be to change for a prescribed use of communication but then the question of the consecutive effects on the workers and work activities arises. Yet the literature is void of studies regarding the effect of such change on workers and work activities while Psycholinguistics might help towards this. Simulated and real operating working situations were observed for French nuclear reactor operators. Analyses were carried out from psycholinguistic and socio-psychological perspectives; this was based on observations, video-recordings and interviews. This was undertaken after the management demanded the substitution of the standard usage of communication by a prescribed use for reliability enhancement purposes. We showed that this implementation could have a negative impact on workers' professional identity and professional genre: reinforcement of the referential function of dialogue, disturbance of emotive and metalingual functions and additional cost from the cognitive economy standpoint. In parallel, safety results improved.

Keywords: Discourse analysis; operational communication; reliability; risk; prescription.

INTRODUCTION

In spite of the fact that psycholinguistic studies have been undertaken regarding communication and discourse analysis in the workplace (Limaye, 1992; Cameron & Webster, 2005; Roth, 2004), or regarding communication style (Dunkerley & Robinson, 2002; Chovanec, 2008), or even concerning prescribed or referential communication out of work context (Hupet & Chantraine, 1999; Harris & Bargiela-Chiappini, 2003; Hodges, 2007; Moore, 2008), the literature is void of studies focusing on operational communication between workers. In a previous study (Fauquet-Alekhine, 2017), we exposed the contribution of Psycholinguistics to fill this gap. We demonstrated how workers could be involved in the development of specific communication due to their industrial context: materials, process,

sciences to which the process refers, all that goes towards their operational communication and shapes their speech to indicate what they want to do, where they need to go, what they expect from each other… This previous study was carried out on one of the nineteen nuclear power plants of EDF SA in France; it reflected however the overall context of the fleet. We showed how expressions used in operational communication (defined as "communication regarding operations related to a work activity in the aim of performing a given task", p.87) were shortened by removing the syllables of particular words thus creating implicits and complying with an established standard usage of communication. We analyzed how these implicit forms could help workers to be more efficient involving addressees' implicatures (Grice, 1975 & 1989; Ephratt, 2012): exchanges were economised.

The aim of the present paper is to describe the way habits of a standard usage of communication were changed under prescribed communication and to analyse consequences with the help of psycholinguistic and socio-psychological approaches.

METHODS AND MATERIALS

The study was undertaken out with the operations teams at French nuclear power plants in the framework of a longitudinal study over two years. The work was carried out on one of the nineteen nuclear power plants of EDF SA.

It was conducted during a period of change of operational communication: the national head management of the company had decided to implement a prescribed use of communication in place of the standard usage of communication. This standard usage of communication (fully described in our previous work: Fauquet-Alekhine, 2017:93 and in Fauquet-Alekhine & Pehuet, 2016:75) had been in use for more than twenty years by workers. This was undertaken through a national action plan with the aim of making the activities more reliable.
The material used for the present study was acquired from real operating situations in the field and from simulated operating situations during training sessions on full scale nuclear reactor simulators. They were supplemented by worker, manager and trainer interviews.
The method consisted of two parts. The first part was an analysis aiming at obtaining a clear description of the changes implemented for operational communication with regards to what was planned in terms of prescription. The second part was an analysis of the consequences of the implementation of the prescribed use of communication for the workers from the cognitive economy standpoint, and in the light of the functions associated with language and of the socio-psychological approach described hereafter. As a complement, we applied syllable counts as an indicator of the perceived cognitive load by locutors as done, argued and discussed in the previous study (Fauquet-Alekhine, 2017: 95) and as done by others (Clemmer, 1980; Kowal et al., 1997; Kormos & Denes, 2004; Temperly, 2009; Peter, 2012). The way syllables were counted followed phonotactic rules based on a syllabification in the line of the findings and conclusions of the well-known specialist for French language, Jacques Mehler (Melher et al., 1981; Cutler et al., 1983).

Modeling Communication

In our previous study (Fauquet-Alekhine, 2017), the standard usage of communication was analysed in the light of Vygotsky's work ("Thought and language", 1934/1986, chap VII) considering the shortened formulations implemented within communication at work as part of an operating language elaborated as a mode of action (Malinowski, 1923; Korta, 2008). To better understand and characterize this mode of action, we used the functions associated with language highlighted by several models which were suggested to explain communication

(Shanon and Weaver, 1949; Jakobson, 1960; Anzieu, 1975; Anzieu & Martin, 1990). These functions are:

- Emotive function (or expressive function) associated to the addresser permits him/her to express his/her attitude regarding the object of the topic.
- Conative function refers to the effect the addresser wants to have on the addressee.
- Phatic function concerns contact and maintaining contact between interlocutors (maintaining this contact using terms such as "hello?", "sorry?").
- Metalingual function (or metacommunication function) concerns the message being exchanged; it happens when the interlocutors verify that they are talking about the same thing.
- Referential function (or denotative function) concerns context and develops a dependence of the meaning of the message in context.

Poetic function concerns the form of the message.
In the present study, the same approach was used to analyze the prescribed use of communication. This allowed us to draw a comparative analysis between the standard usage of communication and the prescribed use of communication.

Socio-Psychological Approach of Operational Communication
The socio-psychological approach of operational communication changes was undertaken according to the French school of Psychology led by Professor Clot who introduced the concepts of professional style and professional genre (1999; and Clot & Faita, 2000). "Genre" was defined as a social entity in which the values that regulate the work activity in a tacit manner are shared. Therefore the professional genre cannot be fixed if it has to be effective in all the situations encountered by the workers: it must be re-visited, re-questioned permanently to be adapted to the context of work activities which also varies (Fauquet, 2006). In our previous study (Fauquet-Alekhine, 2017), we showed that operational communication at work was sized and shaped by professional style and genre and in return contributed towards sizing and shaping the professional style and genre.

As a consequence, we made the assumption that the change of operational communication could have a significant impact on the professional style and genre and vice-versa. Therefore, our analysis investigated this field.

RESULTS

Implementing the Prescribed Use of Communication: General Observations
In 2006, the company head office decided to put a Human Performance Program in place on all nineteen of the nuclear sites in France. This program came from studies made in numerous industries, in France and abroad (especially in Anglo-Saxon countries), and had been fostered by studies such as the one introduced here, and others (Colas, 2001; Fauquet, 2007; Rousseau, 2008; Theurier, 2010; Fauquet-Alekhine, 2012a, 2012b; 2017).

In 2007, the Human Performance Program urged the workers of the nuclear sites to make their interventions more reliable by using six Human Performance tools (HP tools), called "reliability practices". One of the reliability practices concerned exchanges between workers during their work activity, named "reliable communication" in the company and called "3-way communication" in USA: interlocutor INT1 enunciates an utterance, interlocutor INT2 repeats the utterance, and interlocutor INT1 confirms or rectifies it. The prescribed use of communication became mandatory according to organizational requirements for any form of operational communication (defined above in section Introduction).

To enhance the dynamic of the deployment beyond that of the management, role-model workers were identified and specially trained. They were people whose technical competencies were recognised by their colleagues and who had been seen to have accepted reliability practices very quickly. These chosen role-models were capable of helping or advising their colleagues on the topic. The role-models were involved in a local network, which allowed them to share their experience and knowledge, difficulties and solutions. However, they explained that they were exposed to several difficulties: insufficient support from their line managers, aggressiveness from some of their colleagues (mainly experienced workers) and (perhaps as a consequence) sometimes a form of shame when speaking of HP tools despites having been trained for this.

Observations in simulated operating situations provided two important findings illustrating the difficulties in implementing such reliability practices. One is linked to attitude and behaviour, and one to the learning process. Regarding attitude and behaviour, it was observed particularly during the first year, mainly with experienced workers, demonstrations of ill will at the beginning of the training sessions: they said "*I am here because I am forced to be; I don't really see what your practices will change*" or "*It is stupid to say 'correct'* [closing expression required for 3-way communication] *every time; I will say what I want*". A little more than a year later, these attitudes and behaviours had disappeared. Regarding the learning process, observations of training sessions showed that trainees needed a transient period of at least one to three hours to stop thinking about the way they had to apply the prescription for their exchange before it became fluent. This is still observed when training newcomers.

Prescribed "Reliable Communication": Analysis from Observations

As written in the previous section, "reliable communication" was prescribed in the company thus expecting interlocutor INT1 to enunciate an utterance, interlocutor INT2 to repeat the request and interlocutor INT1 to confirm (saying "correct") or rectify it. This prescribed use of communication had vocation to take the place notably of the standard usage of communication presented above, and to engage those who did not use any standard of communication to apply the prescribed use of communication.

Its use was expected for work on equipment of the nuclear installation, particularly during activities involving routines. Shortened formulations had to be banished in these cases.

Most of the words and expressions usually added in the exchanges were eliminated as far as was possible if not linked to the object of the conversation or to the related action and, consequently, they were no longer allowed. However, one part of this category of added expressions in the speech did not vanish: politeness redundancies; additional words such as "good morning, hello, please, thanks…" were kept in the exchanges.

Interviews showed that workers were upset by the fact that the standard usage of communication which they perceived as "their own professional language" was highlighted as "bad professional know-how" while it had proved, according to some of them, its efficiency for tens of years. Evidence for this as far as they were concerned was that they had not been the cause of any accident during their professional lives.

Young newcomers to the company accepted reliable communication much more easily (and HP tools in general) than experienced workers when being trained at the company trade academy before joining their teams.

Qualitative Assessment of Exchanges

Sample 1 below gives an example of utterance #1 in its shortened version illustrating what is the standard usage of communication. This sample is a prototypical utterance of what was observed in the previous study (Fauquet-Alekhine, 2017) regarding the analysis and characterization of the standard usage of communication.

This shortened formulation of utterance #1 is to be compared with the following sample 2 which is utterance #1 in its complete formulation as expected by prescribed communication. Sample 2 therefore presents a prototypical illustration of utterance #1 without applying the shortening process of the standard usage of communication when observed in the field using the prescribed use of communication.

The samples 1 and 2 below are related to the case of a pilot of reactor #1 who had encountered a problem for which he sent a field worker to check the equipment.

Shortened utterance #1.

(1) Tranche 1 s'il-te-plait, j'ai un soucis sur RIS mon pote. Au refoulement de la 1PO [yn-pe-o]. J'aimerais que tu ailles voir sur place si la 59VP [sɛ̃kãt-nəf-ve-pe] est bien ouverte.

Reactor 1 please, I have a problem on RIS buddy. In the pushing back of the 1PO [wʌn-pi-o]. I would like that you go there and check whether the 59VP [fifti-nain-vi-pi] is properly opened.

It is necessary to understand here that the pilot asked for a control of the opened position of 1RIS059VP valve located downstream from the 1RIS001PO pump (the way equipment is labelled is fully described in Fauquet-Alekhine, 2017:93). Complete formulation would give sample 2:

Complete utterance #1.

(2) Tranche 1 s'il-te-plait, j'ai un soucis sur le système RIS mon pote. Au refoulement de la pompe 1RIS001PO [yn-ris-zero-zero-yn-pe-o]. J'aimerais que tu ailles voir sur place si la vanne 1RIS059VP [yn-ris-zero-sɛ̃kãt-nəf-ve-pe] est bien ouverte.

Reactor 1 please, I have a problem on the system RIS buddy, in the pushing back of the 1RIS001PO [wʌn-ris-zero-zero-wʌn-pi-o] pump. I would like that you go there and check whether the 1RIS059VP [wʌn-ris-zero-fifti-nain-vi-pi] valve is properly opened.

However, workers did not use to speaking with isolated utterances. Utterances were part of an exchange involving at least two interlocutors INT1 and INT2.

Sample 3 is a prototypical example of exchanges using the standard usage of communication as practiced by workers on NPPs for more than twenty years and observed in the previous study (Fauquet-Alekhine, 2017). Sample 3 is to be compared with the following sample 4 which is a prototypical illustration of exchanges observed in the field using the prescribed use of communication: it uses "3 way communication" with the prescribed formulation of the need reformulating exchange #1.

French exchange #1 using standard usage of communication.

(3) INT1: Sur RIS tranche 1, mon gars, tu peux débrancher le 125 [sã-vɛ̃t-sɛ̃k] de la 1PO [yn-pe-o], s'il te plaît.

For RIS unit 1, man, I would like you to switch off the 125 [wʌn-hʌndrəd-twenti-faiv] of the 1PO [wʌn-pi-o], please.

INT2: D'accord, allons-y.
Ok, let's go.

French exchange #1 using prescribed use of communication.

(4) INT1: Tu peux débrancher le 125 [sã-vɛ̃t-sɛ̃k] Volts de la 1RIS001PO [yn-ris-zero-zero-yn-pe-o], s'il te plaît mon gars.

I would like you to switch off the 125 [wʌn-hʌndrəd-twenti-faiv] Volts of the 1RIS001PO [wʌn-ris-zero-zero-wʌn-pi-o], please man.

INT2: Tu me demandes de débrancher le 125 [sã-vɛ̃t-sɛ̃k] Volts de la 1RIS001PO [yn-ris-zero-zero-yn-pe-o].

You are asking me to switch off the 125 [wʌn-hʌndrəd-twenti-faiv] Volts of the 1RIS001PO [wʌn-ris-zero-zero-wʌn-pi-o].

INT1: *Correct*.
Correct.

The prototypic sample 4 could sometimes be observed (rarely) in an extended form or refined form, a complete formulation of the need, as illustrated by sample 5 written on the basis of exchange #1.

(5) INT1: Sur le système RIS, tranche 1, mon gars. Tu peux débrancher le disjoncteur 125 [sã-vɛ̃t-sɛ̃k] Volts de la cellule d'alimentation de la pompe 1RIS001PO [yn-ris-zero-zero-yn-pe-o], s'il te plaît.

On the system RIS in reactor 1, man. I would like you to switch off the circuit breaker 125 [wʌn-hʌndrəd-twenti-faiv] Volts of the feeding cell of the 1RIS001PO pump [wʌn-ris-zero-zero-wʌn-pi-o], please.

INT2: Tu me demandes de débrancher le disjoncteur 125 [sã-vɛ̃t-sɛ̃k] Volts de la cellule d'alimentation de la pompe 1RIS001PO [yn-ris-zero-zero-yn-pe-o].

You are asking me to switch off the circuit breaker 125 [wʌn-hʌndrəd-twenti-faiv] Volts of the feeding cell of the 1RIS001PO pump [wʌn-ris-zero-zero-wʌn-pi-o].

INT1: Correct.
Correct.

When comparing exchange samples 3 and 4 in terms of length, we obtained a significant difference for the formulation used by French workers. A gain was calculated using syllable counts as an indicator of the perceived cognitive load: it represents the reduced rate of syllables with the used formulation of the standard usage of communication compared to the complete formulation. It is noted as G_{short} referring to the gain for shortened formulation. The gain is positive if the use of another formulation rather than the complete one economises some syllables. In parallel, it was interesting to calculate the increase induced by the prescribed use of communication compared to the shortened one. It was noted as I_{prescr}.
Calculation was only made for French utterances since only the French ones were to be considered. Here, when referring to the ratio of number of syllables per utterance for comparison, it is important to bear in mind that the study is based on a language specific to the French nuclear industry.

Table 1. Syllable comparison for shortened, complete and refined French exchange #1

Exchange type	Exchange sample
standard usage of communication sample 3	INT1: Sur• RIS• tranche• 1•, mon• gars•, tu• peux• dé•bran•cher• le• [sã•vẽt•sɛ̃k] de• la• [yn•pe•o] s'il• te• plaît. INT2: D'ac•cord• al•lons•y.
prescribed use of communication sample 4	INT1: Tu• peux• dé•bran•cher• le• [sã•vẽt•sɛ̃k] Volts• de• la• [yn•ris•ze•ro•ze•ro•yn•pe•o] s'il• te• plaît• mon• gars. INT2: Tu• me• de•man•des• de• dé•bran•cher• le• [sã•vẽt•sɛ̃k] Volts• de• la• [yn•ris•ze•ro•ze•ro•yn•pe•o]. INT1: Cor•rect.
refined prescribed use of communication sample 5	INT1: Sur• le• sys•tème• RIS•, tranche• 1•, mon• gars. Tu• peux• dé•bran•cher• le• dis•jonc•teur• [sã•vẽt•sɛ̃k] Volts• de• la• cel•lule• d'a•li•men•ta•tion• de• la• pompe• [yn•ris•ze•ro•ze•ro•yn•pe•o], s'il• te• plaît. INT2: Tu• me• de•man•des• de• dé•bran•cher• le• dis•jonc•teur• [sã•vẽt•sɛ̃k] Volts• de• la• cel•lule• d'a•li•men•ta•tion• de• la• pompe• [yn•ris•ze•ro•ze•ro•yn•pe•o]. INT1: Cor•rect.

Table 2. Comparison between sample 3 and sample 4 of the number of syllables for French exchange#1(shortened version of the standard usage of communication versus prescribed use of communication).

	standard usage of communication	prescribed use of communication	gain= (Np-Ns)/Np	increase= (Np-Ns)/Ns
French syllables	*Ns*=28	*Np*=53	G_{short}=+47.1%	I_{prescr}=+89.2%

Table 3. Comparison between sample 3 and sample 5 of the number of syllables for French exchange#1 (shortened version of the standard usage of communication versus refined prescribed use of communication).

	standard usage of communication	prescribed use of communication	gain= (Np-Ns)/Np	increase= (Np-Ns)/Ns
French syllables	*Ns*=28	*Np*=86	G_{short}=+67.4%	I_{prescr}=+207.1%

DISCUSSION

General Findings

Regarding the reliable mode of communication through the prescribed use of communication could not be immediate: the modalities of communication in work, such as the standard usage of communication exposed above and fully described in our previous study (Fauquet-Alekhine, 2017), had been inscribed in mind and in body for many years (see for example Dejours et al.,1994; Fauquet, 2008). In our previous study, we explained that the way workers communicated between themselves has a meaning and was a response to needs which we tried to understand. Thus, any request of application of another protocol of communication was confronted with established communication practices. In effect, this habitus (as described by Bourdieu, 1972: 282) was historically and socially constructed according to rigid norms.

Changing the workers' attitudes or behaviours was all the less easy as the workers were not aware that it could be a response to some of their needs. This was valid for reliable communication, but also for other reliability practices inscribed in the Human Performance Program.

Regarding reliable communication, we can illustrate difficulties through what some workers often said at the beginning of the deployment of the new standard of communication:

"we definitely want to make the reliable communication in this way, but what the guy is going to think when I ask him to repeat what I just said to him? He is going to think that I consider him as an absolute idiot."

Attitude and behavior observed in simulated operating situations in terms of demonstrations of ill will at the beginning of the training sessions vanished over time. No specific study has been carried out to understand the phenomenon. Only two assumptions are suggested, which might be consistent since shared by trainers, work analysts and managers: i) the massive recruitment of young people and the departure of retired workers reduced the proportion of experienced workers who were against reliability practices thus reducing overall opposition, ii) the constant commitment of the management and role models contributed to deconstruct this state of mind.

Politeness redundancies did not vanish from the exchanges. Several explanations may be suggested regarding this point. First, they are a kind of natural constituent of collaborative verbal interactions (Haugh, 2007): "An analysis of the ways in which 'politeness implicatures' arise in conversation indicates that they are not simply indirect meanings arising from recognition of speaker intentions by hearers, but rather arise from joint, collaborative interaction between speakers and hearers." Second, they may proceed from the conative function of language referring to the action that the addresser wants to have over the addressee: the addresser therefore would aim at providing positive emotions through politeness redundancies within the exchanges, consciously or not. As shown by Hopp et al. (2012) expressing positive emotions between interlocutors leads to a better quality of the issues.

From a Perceived Cognitive Load Standpoint

It must be noted that the standard usage of communication had the effect of reducing the message issued to its most concise form. Samples 4 and 5 show that reliable communication according to the Human Performance Program does not allow it anymore: it requires a complete formulation of the functional labels, and moreover, requires them to be repeated, thus implying an increase of syllables of up to 90% for sample 4 (table II) and exceeding 200% (table III) if refined (sample 5). Both modalities of communication are in complete opposition regarding this point.

When compared with the prescribed use, analysis shows that the standard usage will always give about 50% gain due to the fact that more than half of the addresser's message is repeated by the addressee. From the perceived cognitive load standpoint, it is clear that the required effort is significant while the locutor, to be more efficient in action, tends to reduce the mental load linked to a given basic task according to the principle of cognitive economy (Allport, 1954; Fiske & Taylor, 1984; den Dikken, 2000) and thus reduces the number of syllables in oral exchanges.

From a Psycholinguistic Standpoint

According to the psycholinguistic model presented in the previous study (Fauquet-Alekhine, 2017), the prescribed use of communication reinforcing the referential function of the exchange by making the enunciation of the full functional label of each piece of equipment mandatory, the mismatch between the concept in INT1's mind and the concept in INT2's mind is not possible: a given signifier obviously leads to the same concept. This helps the associative chains of meanings to be effective and efficient by reducing the variability of the factors producing difference for the meaning perceived by each interlocutor.

The conative function is also a reinforced function but not the way the workers would like to do it. This is mainly due to the fact that the new standard does not respect the principle of cognitive economy and thus is not the natural way for the workers to speak. Nevertheless, despite the formulation of the exchange being fully described by formal requirements, observations showed that words and expressions were added related to the way the addresser reshaped the expected formulation in order to obtain what s/he expected from the addressee more easily. This proceeds from strategies by which locutors try to make their speech more effective and is related to the process of mitigation (Becker et al., 1989; Caffi, 1999). Specifically, the way the addresser might assert that what s/he is about to say could have a negative effect on the addressee involves the addresser in a mitigation process. The study of such strategies has already been carried out by others (see for example the study of illocutionary force done by Scher & Darley, 1997; Sbisa, 2001; Rockwell, 2007; Bocéréan et al. 2012; Thaler, 2012) and a complete paper will soon be published devoted to this kind of approach applied to our data.

The standardization disturbed the emotive function at the beginning: as mentioned in the section "Results", observations showed that workers needed a transient period of at least of one to three hours to stop thinking about the way they had to apply the prescription for their exchange before it became fluent. The phatic function was kept and closely linked to politeness. This will be analyzed in a future study.

The metalingual function involved in a standardization process lost its efficiency since all the words and expressions making its efficiency disappeared because they were no longer allowed. This initially contributed to making some workers think that the new standard decreased reliability whilst is claiming a gain in this field. Consequently, the new standard was not easily accepted as it was perceived not to reach the goal asserted.
The poetic function was lost as the shape of the message was fully determined by the standard.

Among all the psycholinguistic functions, the main one used for the process of change appeared to be the referential function: the establishment of the new standard was in fact a direct reinforcement of this function.

From a Socio-Psychological Standpoint
We have seen above that some of the functions appeared weakened because of their distance between what the worker would do naturally compared to what s/he had to do. The emotive function, the metalingual function and the poetic function were particularly concerned.

Beyond these aspects, the prescribed use of communication had an impact on the professional genre. Everything that had contributed towards making operational communication in its standard usage form so specific for the workers, contributing to the collective identity of the nuclear trades and appreciated for years by workers as a mark of experience, disappeared. The professional genre was affected in its transpersonal dimension as the standard usage of communication was now prohibited: what had been shared in and by the trade collectives (transpersonal aspect), accepted as it had been elaborated by workers for workers over tens of years within the professional tradition, and used as a way to recognize a peer or to be recognized as a peer, had to be seen as non-professional.

Accordingly, it is clear that the prescribed use of communication would not immediatly be welcomed by the teams; there was a non negligible probability for it to be rejected.

This finding was confirmed by the training results: as we mentioned in the section "Results", young newcomers to the company accepted the reliable communication much more easily since they had not yet been impregnated by the professional genre of the experienced generation of workers. The rejection was mainly observed in experienced workers.

Progress Assessment Based on the Above Discussion of Results

The knowledge of effectiveness of the HP program is assured at several levels.

That of the managers, who check work activities in the field. The management's training on simulator is carried out so that the managers learn to observe, but also to perceive the difficulties that might be encountered during an intervention for the implementation of reliability practices.

That of the industrial plant: results are presented and discussed every one or two months in the pilot committee. That of the national level: an analysis of local and overall situation is carried out by experts several times a year, with evaluation of progress, and proposals of improvement by taking into account the experience feedback from other nuclear power plants.

We shall take two examples to objectify results obtained at national level:

At the national level, considering the whole fleet, the number of undesirable events due to non-application or ineffectual application of reliability practices has diminished by more than 70% between 2006 and 2012 and by more than 80% when extended to 2017.

These results which of course are not the consequence of the HP program only are particularly satisfactory as for the effectiveness of progress. However, they also objectify that a remaining margin for progress still exists, especially when considering a decrease less significant since 2012. Compared to these results, the local ones on the nuclear power plant of Chinon are very close.

According to our analysis, regarding 3-way communication, the stagnation of results since 2012 is due to the difficulties identified above through the psycholinguistic and socio-psychological standpoints, combined to two other factors that we shall soon expose. The difficulties identified above can be summarized as follow:

The reinforcement of the psycholinguistic referential function and, in parallel, the transformation or lessening of the conative, metalingual and poetic functions disturb what made the operational communication part of the professional genre. This causes a loss of reference between peers.

The standardization loads the operational communication according to the cognitive economy principle.

The two other factors which are combined with these difficulties concern HT tools in general, not only 3-way communication; they are:

The ineffectiveness of the role-models' leadership:

These workers were chosen for their technical skills and the recognition by their peers. For this aim, they need to find the opportunity to be in the field more like a trainer than a worker as part of the intervention team. But the organization of work activities does not take this need sufficiently into account: their managers ask them very few contributions as a role model. Thus, their place as a role model remains rather blurred.

The insufficient enhancement by the management:

Experience has shown that any project must take benefit of an enhancement by the management. Without that, the project has very little chance to reach the expected goal. Observations have brought the conclusion that the enhancement by the management is insufficient, leading to an imbalance from one profession to another. This is partly due to a

kind of fear felt by the management regarding HP tools which have been disclaimed by some workers for the reasons described above. The managers did not like to be perceived as not trusting the teams, or as wanting to change the rules of the trade. We met some managers who were speaking of HP tools to the workers without using the appropriate words; when we asked them which reasons led them adopting such a behaviour, they explained that it was easier like that: "*ça passe mieux*" ("It is more easily accepted like that").

CONCLUSIONS

Changing from a mode of "standard usage of communication" used in daily work activities, inscribed in mind and in body for years, to a mode of prescribed use of communication in order to reach a standard of reliable communication, cannot be immediate and might never be absolute.

We saw which subtleties the workers used in a traditional way in their exchanges in a previous study (Fauquet-Alekhine, 2017). The request to substitute the standard usage of communication by a prescribed use was thus confronted with practices established and incorporated throughout history, "tradition" of jobs in this industrial area. The means used to implement this mode of prescribed use of communication were and remain important. We have shown that implementing a prescribed use of communication to replace the standard usage to reach a higher level of reliability could affect workers' professional identity and the professional genre, mainly through the reinforcement of the referential function of dialogue, and the disturbance of emotive and metalingual functions. In addition, we objectified that it has a significant cost from a cognitive economy standpoint. An extended analysis of this change in management could be undertaken with benefits in the light of Prof & Walsh' approach (2007) studying mindset sustainability. Also, as suggested in section 4.3, the present study might be enriched by an analysis of the role and the importance of i)the use of the conative function within a process of mitigation, ii)politeness in operational communication when it is framed by a prescribed use of communication.

Satisfactory results nevertheless are proof of the changes in practices in terms of safety. However, if safety results are reinforced, a margin of progress still exists. At least, two questions can now deserve further study with a view to monitoring ongoing progress:
Since the mode of communication between workers is changing, shifting from a tradition to a prescription, how can this mode of prescribed "reliable communication" generate "misappropriations" of application?

How will future generations of workers apply this mode of prescribed "reliable communication" to their professional practices?

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