Between noise and silence, engineering a dialog about work: Maintenance projects in a high-risk industry

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High reliability organizations are now subject to economic and industrial exigencies that they have to dovetail with the imperatives of safety and security. More than ever, their key preoccupation is to find the right combination between a high level of prescriptions and an ongoing series of contingencies. This intervention research has been conducted since 2013 in a high-risk industrial plant with problems of keeping the deadlines set for maintenance work and with tensions related to the quality of life at the workplace. What is remarkable about this case is that, despite a "culture of security" very attentive to coordinating operations, the firm has difficulty designing the conditions for a genuine dialog on workplace activities. To improve an organization's overall performance, it does not suffice to set up ever more arrangements for coordination. On the contrary, an overequipped communications can become counterproductive as work remains silent while communications make ever more noise. How to engineer opportunities for discussing work so as to address the many tensions running through high-reliability organizations?

The industrial site under study herein belongs to the category of high reliability organizations (HROs) where safety and security are the priority (ROBERTS 1990). This firm must deal with the increasing importance of industrial and business objectives, like other HROs (STARBUCK & FARJOUN 2005). As these requirements related to economic performance increase, they have to be related to the priorities of security at the plant and of safety for the personnel. This trend has not failed to bring pressure to bear on operational activities, in particular maintenance operations, which still have to be done at the same level of quality but within more tightly controlled deadlines (GENTIL & TILLEMENT 2015). The goal is to reduce the time when the plant is halted for maintenance and thus increase the time devoted to production.[1]

To address this new situation, the firm, fully aware of the need to coordinate operations so as to articulate reliability with economic performance, has chosen project management for steering maintenance operations. Over time, it has developed several arrangements as tools for communications about the planning of operational tasks so as to steer maintenance projects as closely

[1] This article has been translated from French by Noal Mellott (Omaha Beach, France). The translation into English has, with the editor's approval, completed a few bibliographical references.

as possible to what is actually happening in the field. These arrangements have multiplied the "spaces" of everyday communications between the project's staff and persons from the occupational groups involved in maintenance work. However they have not had the hoped-for effects: the problems related to the plant's performance have persisted (the duration of downtime being longer than planned); and tensions have arisen in recent years related to the quality of worklife.

In this context, the Direction of Human Resources, very quickly backed by the Direction of Industrial Operations, requested an intervention by our research team in 2013. Our study diagnosed the current situation and monitored the changes related to redesigning "spaces of communications" for the purpose of turning them into places for discussing work (DETCHESSAHAR 2013), where a maintenance project's global performance could be "constructed". The intent was to break free from the paradoxical situation induced by the communications arrangements deployed by the firm. There was still much "silence" about work, a topic that did not come up in the spaces opened as part of the firm's project management. Furthermore, communications were increasingly producing noise: the various meetings of coordination delivered an overabundance of information that the parties concerned deemed unreliable or even contradictory. Ultimately, the issue was to design, or engineer, spaces for a dialog on work (DETCHESSAHAR 2013, DETCHESSAHAR *et al*. 2015, ROCHA 2014, ROCHA *et al*. 2015, BONNEFOND 2016, MERCERON 2016, CLOT & GOLLAC 2014).

After reviewing the issues related to the articulation between "planned-for" and "coping" activities in high-risk organizations, we shall show how "spaces of discussion" on work can, under condition that they have been correctly engineered, become places for settling the concrete problems related to these two sorts of activities. After presenting our major empirical findings, we shall then, in conclusion, examine the difficulties of conducting meetings and designing places for discussing work.

Literature review

The firm under study herein is an HRO. What characterizes such organizations is the importance they assign to safety and security in order to be spared major accidents (ROBERTS 1990). HROs are subject to powerful, contradictory tensions (WILDAVSKY 1988) that make them dual (BOURRIER 1999) and paradoxical (JOURNÉ 1999 & 2003, DEKKER 2003) organizations. Their performance stems directly from their active management of these contradictions (JOURNÉ 2009). In the main, a very high level of planning and formal prescriptions has to be related to an ongoing stream of unforeseen events that require that the organization and work groups be capable of adjusting and improvising on the spot. The crux of the problem is to articulate two strategies based on opposite conceptions of the organization (JOURNÉ 2009): on the one side, a mechanistic vision for anticipating a "*regulated security*"; and on the other, an organic vision turned toward the system's resilience and "*managed security*" (DANIELLOU *et al*. 2010). "*Regulated security*" refers to an organization's capacity for anticipating events as best possible so as to avoid foreseeable breakdowns, whereas "*managed security*" refers to its capacity for coping with unforeseen events and contingencies. To avoid confusion for English-speakers, we shall refer respectively to "planned-for" and ""coping" activities.

The (sensitive) question of properly articulating planned-for and coping activities is becoming more complicated because of the awesomely rising standards of performance — industrial, economic and financial — assigned to high-risk organizations (STARBUCK & FARJOUN 2005). This new situation has led to adopting project management with its philosophy of reconciling the sometimes contradictory objectives related to quality, costs and deadlines. In some cases (as Starbuck and Farjoun have shown at NASA), projects, based on "*the mantra of better, faster, cheaper*", seek outright to do more with fewer resources. This entails doing away with all the slacks that allow for the reflexivity, adaptation and learning that underlie the coping necessary for "managed security". These authors have seen this as the direct cause of the space shuttle accidents, Challenger (1996) and Columbia (2001), and, in general, as a threat to HROs.

At the juncture of what is planned-for and what is coped-with, of foreseen prescriptions and the real events to be handled as they happen, several studies have drawn attention to the work of organizing and coordinating to manage contingencies (TERSSAC & LALANDE 2002, STRAUSS 1992). Working thus means improvising solutions, inventing new ways of doing, of settling problems. These "settlements" are based on a communicational dynamics (GROSJEAN & LACOSTE 1999) in the form of "dialogs" or "discussions" where the concerned parties talk about the tensions and contradictions encountered and where they define together the ways to resolve them. Several studies in the managerial sciences have inquired into the way an organization can deploy communications so as to articulate planned-for and coping activities (DETCHESSAHAR 2003, GENTIL 2012).

These dialogs and discussions are not at all spontaneous or natural. With the help of managerial tools (lean manufacturing) that promote operational excellence and the autonomy of wage-earners (UGHETTO 2012), actual work activities have ended up becoming "*invisible*" to the organization and its management (GOMEZ 2013). Studies have described the risks inherent in organizations where "*silence*" surrounds these activities (MORISSON & MILIKEN 2000, ROCHA *et al*. 2015) or where there is an overabundance of contradictory messages, which have the effect of "*cacophony*" (RIVIERE 2006). In the latter case, the personnel, though very involved in their work, are placed in the situation of being unable to correctly manage the requirements imposed on their activities. Furthermore, they have a hard time knowing what is expected of them. This affects the quality of worklife (CLOT 2010, ASQUIN *et al*. 2007).

Despite the increasing requirements related to production and business, what characterizes the firm we have studied is its close attention to operational activities. This is typical of HROs: given their corporate culture with its priorities of security and safety, such companies are extremely attentive to concrete operations in the field (WEICK & SUTCLIFFE 2007). Well aware of the current state of tension at the workplace, this firm has tried to work out arrangements for coordinating operations so as to boost global performance. But owing to problems related to industrial performance and the quality of worklife, the firm, we must admit, has encountered difficulties in organizing discussions or dialogs about work-related activities.

It thus turned out to be necessary to give thought to the organizational and managerial conditions for a genuine discussion of work-related activities and to the arrangements made for them — what we have called "spaces of discussion" (DETCHESSAHAR 2003, DETCHESSAHAR & JOURNÉ 2011, ROCHA *et al*. 2015), a reflexive setup for making "*all the arrangements, compromises and 'tinkered' solutions implied by the incompleteness of prescriptions and the irreducibly erratic nature of concrete activities*" (DETCHESSAHAR 2013). In an HRO, this discussion space is the place where concrete problems are solved, where planned-for and the coping activities are related to the priorities of security and safety. Whether or not discussion spaces accomplish this articulation (similar to a "*work of organization*" TERSSAC & LALANDE 2002) depends on how they have been designed and how they are conducted. Not every meeting is a discussion space. Engineering is needed to clearly set parameters: attendees, the frequency, forms of managerial leadership and connections with the rest of the firm (DETCHESSAHAR 2013). This article addresses this sensitive question of engineering spaces for discussing work-related activities in an HRO.

Methodology

The case under study

The subject of this research is an industrial firm, an HRO with several production units. This firm employs nearly 1400 wage-earners and works with approximately 450 subcontractors for everyday operations at its plants. Each year, when the factory has to halt one or more production units for maintenance, the number of subcontractors doubles. Maintenance work is organized on the site in the form of projects called "maintenance breaks", which involve a slue of services and functions.

Each maintenance break is headed by a project team with a project leader and the heads of subprojects, who pilot maintenance activities involving several occupational categories. Depending on the sort of operation to be conducted, maintenance projects involve various trades and crafts (electricity, plumbing, logistics, etc.) coordinated by the service overseeing installations. Various functions exist in these occupationally based work groups: the head (*chargé d'affaires*) of each work group organizes maintenance operations (risk analysis, procedures, etc.) and coordinates interventions. During the maintenance break, these work group heads are assigned a team of persons in charge of surveillance, whose role is to control the work done during interventions so as to forestall problems stemming from the poor quality of maintenance. In effect, personnel from outside the firm under their worksite foreman perform most maintenance interventions.

Phases of research

Concerned about the questions related to the quality of worklife that have arisen out of the current organization of maintenance breaks, the company's Direction of Human Resources, along with the Direction of Industry, requested this study. Since these breaks are frequently prolonged, the pace of work has become too intense, unbearable in the long run. The plant under study proposed itself for a pilot study that would find "*simple responses relatively easy to test*" (in the words of the plant's director) and propose a methodology for replicating the study at other locations. This research-intervention by four researchers, still under way, has three phases.

During the first phase from July 2013 till February 2014, data were collected, mainly via interviews and observations. During the latter, the intent was to observe the organizational dynamics, in particular, how the project and work teams managed contingencies and disturbances as a function of organizational constraints. This called for various methods of observation (JOURNÉ 2005):

- the observation of the places likely to be discussion spaces, *e.g.*, the offices of the project's steering committee (a vast open space), the control room, or the office where subcontractors come for clearances to access the site;
- the observation of the meetings (of twelve types), daily or weekly, foreseen by the "project schedule"; and
- the monitoring of twelve persons in different positions (members of the project team or of the occupationally based work groups). In addition, 33 interviews were conducted with individuals from all categories, including outside contractors.

Our initial diagnosis was then presented and discussed during four feedback sessions at the plant with: the project team, the executive committee, the study's steering committee (formed by the work group and project heads) and an operational work group. We intended to work with them on an action plan in response to the various points raised in the diagnosis.

The second phase consisted of work sessions with the study's steering committee and the operational work group on the following topics: circulating information and managing the unforeseen. We analyzed the existing discussion spaces (whether or not they were useful for managing unforeseen events and finding solutions) and identified the actual channels through which information circulates (up- and downstream from these spaces).

During the third phase (still under way) of our intervention, researchers have taken a back seat but still have close contacts with persons at the plant in order to monitor the adoption of the proposals formulated during the second phase and the outcome of implementing them. In parallel, following a feedback session at the firm's headquarters, our study's findings are being shared with personnel from the firm's R&D service for the purpose of formulating proposals for the firm's other plants.

Herein, we have dwelled on the diagnosis while leaving aside the phase of intervention.

The diagnosis

The plant under study considers the circulation of information and, in general, control over communications to be a key to the success of maintenance break projects. Having spent much effort on this question, the firm has set up several arrangements for coordination for making it easier to articulate planning and the management of unforeseeable events. These efforts have not had the hoped-for effects however: the persons involved in such projects still seem to have difficulty obtaining accurate information on the progress of maintenance operations, which are a "black box".

Let us now describe the coordination arrangements made to facilitate communications between the project team and work groups of operatives. We shall show how these arrangements have produced silence about the activities under way but while generating what amounts to noise from the firm's viewpoint and leading to mechanisms of compensation for handling this situation.

Articulating planned-for and coping activities

Each maintenance break project is prepared months ahead, since the plant will be halted during the break. During the preparatory phase, the maintenance operations are planned and organized that will be performed during the break: participants, tools, spare parts, authorizations, etc. Risk assessments are made; and potential technical contingencies, foreseen in order to adapt the procedures for fending them off. This preparation is part of the maintenance project's planned-for security. Many persons at the plant felt that this phase is the key to performance. In the words of a project head, "*The essential element during a break? Preparation! Everything has to be foreseen.*"

During actual maintenance however, many contingencies crop up, demand additional interventions… and unsettle the plans made during the preparatory phase. According to a person in Human Resources at company headquarters, "*Between preparing the maintenance break and the first day, I saw people lose their composure. The very first minute, the agenda prepared over a six-month period fell through. The determination to have full control and the energy spent… for that! Everything had to be reinvented and revamped in real time.*" This happens when, for example, a problem (something broke or would not run) arises during maintenance work or when someone discovers an anomaly in the installation. The unforeseen might also spring from demands from "*the national*" for interventions above and beyond what was initially prescribed.

Since contingencies are unforeseeable by definition, reactions to them have to be thought out in real time. The planned-for activities often have to be reorganized. In a system with many points of interdependence, managing contingencies means weighing the priorities of work groups against the project's objectives: the availability of installations, costs, quality of work life. This must be done while guaranteeing the safety and security of installations by, for example, postponing or canceling one maintenance operation for the sake of another deemed more urgent, mobilizing the operatives who are on call in order to be able to stick to the deadline (an action that runs up costs and can, if repeated, have an impact on the quality of worklife), etc.

A project's performance is thus based on the capacity of teams for managing contingencies and articulating them with the interventions planned during the preparatory phase. Several arrangements have been designed to articulate these two aspects at the plant. First of all, the professionalization of the project team (made up of the project leader and subproject heads). This team, which pilots the project, has an overall view of the plans and of critical activities involving various occupationally-based work groups. This professionalization was supposed to make it easier to weigh choices and coordinate interventions when reorganizing planned-for activities. Secondly, no fewer than twenty meetings (daily or weekly) were scheduled to articulate planned-for and coping activities, plans and contingencies, the planning and actual operations. The major meetings were supposed to improve coordination between the project team and work groups (Table 1). Besides these meetings, several other arrangements were to facilitate this articulation by circulating information up from maintenance activities to the project team. For one thing, the heads of work groups have to fill information in a monitor for tracking the progress of interventions. For another, a procedure of alert messaging — set up specifically for coping with contingencies — requires work groups to inform the project team of any lag of more than thirty minutes that affects plans.

Overequipped communications risk covering up the silence about work

The firm has set up a slue of arrangements that are supposed to boost communication at the workplace and help articulate the management of unforeseen events with the foreseen plans. We observed that the personnel, on the project team or in the occupationally based work groups, spent much time in meetings, on the telephone, filling in forms, etc. Nonetheless, everyone, regardless of his/her position, mentioned how hard it was to obtain "reliable" information about how maintenance operations at the plant are advancing. According to a project team member, "*In terms of the energy and time spent finding information, for me, we're not … [he grimaced]*". For the personnel, maintenance

Table 1:

The principal scheduled meetings

Type of meeting	*At*	*Attended by*	*Objectives and conduct of the meeting*
Audioconferences	8:00 A.M. & 6:00 P.M.	The director and project leader, along with the service directors (occupationally based work groups)	IN THE MORNING: information on the priorities that will then be transmitted during the meeting of the project's steering team. IN THE EVENING: feedback on the day, readjustment of priorities, risk assessment (short-, mid- and long-term).
Meeting: "requests for interventions"	8:45 A.M.	Heads of subprojects and of work groups, a person from the installation's control center	Listing of all unforeseen events that happened the previous day or during the night in order to organize the necessary maintenance operations: distribution of requests for interventions among the work groups, the scheduling of interventions.
The project team's steering meeting	9:00 A.M.	The project team and work group correspondents (approximately twenty persons)	— The project leader presents priorities for the day (based on a critical path analysis), thus making the planning visible to all participants. — The subproject heads explain the implications of these priorities to the occupationally based work groups. — The work group correspondents are then asked about the critical points that, identified by the project team, are related to the plans and priorities set for the day.
Meeting on planning	16:45 P.M.	The project team	Information on whether plans have been realized and determination of the tasks to be assigned priority for the next 24 hours. These tasks will then be communicated to all services.

operations are still a black box. How to explain this paradox: on the one hand, an "overequipment" for communications at the workplace and, on the other hand, the personnel's feeling that silence still cloaks operational activities?

Coordination arrangements miss out concrete activities

We also observed that few of the meetings and other arrangements for coordination at the workplace actually extended to operational activities. The project team's steering meeting illustrates this, as a work group correspondent said, "*What's said in the meeting is turned toward planning. We only talk about what is critical.*" As shown in Table 1, this meeting brings together the project team (including subproject heads) and "correspondents" from the occupationally based work groups. Attendees at these steering meetings are urged not to speak unless necessary and then to be compendious. A memo posted for all to see in the meeting room recalls the rules of communication: "*I will refrain from complaining about recurrent off-topics.*" For the sake of efficiency and reliability, communications are tightly formatted. The meeting starts with the project leader presenting the relevant indicators and then the priorities and critical operations for the day. The subproject heads then take the floor to explain the implications of these priorities. The work group correspondents finally have the turn to speak but only to directly answer questions on a given problem or priority. Therefore, "*the steering meeting is not a place for settling problems*" (a head of service). Problems are, as we shall see, handled during the *ad hoc* meetings that bring together the persons concerned in the field.

Overall, the organization and conduct of these meetings left the work group correspondents with bad feelings. These correspondents may take the floor only when "*questioned*" or "*required*" to do so by the project team. In such cases, they often do not have the answer to the precise question asked, since they do not have direct contacts with maintenance operations. The fact that persons from the field are not asked to these meetings hampers coordination, since no one is able to report on the actual state of maintenance operations and on the problems related to the priorities set for the day.

These meetings are not just places for pooling information; they also set in motion deeper social and symbolic processes involving recognition, confidence and group dynamics. Persons presumably closer to actual operations, such as work group heads, were

upset about being excluded from these meetings: "*The work group heads feel excluded. In their shoes, I'd feel frustrated too […] Before, they used to go to the steering meetings. It's gratifying, in the presence of the project leader*" (a service director). As a consequence, they were not always willing to share their information with work group correspondents, as one correspondent lamented, "*We are faced with information being held back.*" This reinforces even more the phenomenon already described: these correspondents are not capable of answering the questions they are asked during these meetings and are publically singled out. This leaves them with the feeling that their qualifications and legitimacy are not recognized.

Arrangements hamper or even prevent coordination in the black box

Although operatives from the field were not asked to the steering meetings, doubt was often cast on their knowledge of actual activities and their ability to convey this knowledge to the project team. The interpretations of the project team and work groups diverged about this point.

For the project team, the work group correspondents, who are supposed to report on the progress of maintenance interventions, do not spend enough time "*in the field*". The project team also suspects that they do not always share and defend the project's deadline requirements and, therefore, have little reason to communicate eventual delays in the planning, lest deadline requirements take priority over other objectives.

For work groups, the meaning and bounds of the "*project group*" are not unanimously agreed upon: does this phrase refer to the project leader and subproject heads? Or to everyone (members of the project team and of the work groups) who shares a common set of objectives? We observed that the work groups did not seem as concerned as the project team about deadlines. We heard a member of the installation's steering committee ask the project leader, "*Where are you with 'your' criticism?*" During an interview, a work group correspondent explained, "*I give priority, from an operational viewpoint, to […] security and quality […] The planning is 'icing on the cake'!*" Consequently, the project team has a "*lack of confidence*" in the work groups and is wary of the information it receives about the progress of maintenance work. In the words of a subproject head: "*I'm fooled by the communication! We don't see things in reality.*"

Admitting that they have difficulty obtaining information about actual interventions, the work group correspondents emphasized the impediments they have to overcome. Since they have no hierarchical authority over the persons in charge of surveillance,[2] who are supposed to be their "*eyes in the field*", they do not always manage to identify the right contacts for the day. They are not informed of the agenda of these persons (are they absent? in training?…).

Paradoxically, despite the time spent and the many arrangements designed for this purpose, coordination — on the one hand, of the project team with work groups and, on the other hand, of work groups with each other — does not seem to have been thought out for the scheduling of meetings. Scheduling is at the project/work group interface, but no time is set aside for meetings in the black box of actual operations. Where is the time for coordination between the work group heads, the persons in charge of surveillance (or their leader) and the persons who actually make interventions (in-house or third-party technicians)? How to organize the work groups to prepare the project team's steering meetings (attended by work group correspondents) and to relay important information back from these meetings to the field?

Work group heads mentioned the difficulty of freeing time — from the many meetings and other communication procedures that supposedly facilitate coordination — so as to be able to visit the maintenance worksite and thus obtain information about underway operations! The "*pollution*" of too many contacts with demands for information (the many meetings, phone calls, etc.) was severely criticized in the field. In the words of work group heads: "*We have an organization that keeps us from working*" and "*We're hardly in the field […] There're a lot of people working around us who keep us from working.*" In the words of heads of services: "*The work group heads are permanently disturbed because the process is complicated*" and "*There might be four persons who ask the same question in a 10-minute period!*" The persons involved at the level of the work groups see their day shaped by the schedule of the meetings that they are obliged to attend or for which they are repeatedly asked to transmit information — time that they cannot devote to exchanges about actual maintenance operations.

The managerial tools designed at the plant have similar effects. The work group heads do not always have the time to communicate on the state of operations by using these tools — especially when several maintenance operations are under way at once. In their words: "*We just can't do it*" and "*There's not enough time.*" The alert messaging procedure to be used in case of delays is frequently bypassed. As a head of service pointed out, "*The alert, you do it once you've solved the problem, because you get too many calls otherwise, when you send the alert.*" Work group heads feel that the project team is asking for too much information. One of them said, "*The project [team], they'ld like to have the information before we've finished, before starting. We manage a lot more information than the subproject heads, who only manage critical activities*"; and according to heads of services, "*A number of us think so, the project demands too much information*" and "*The project [leader] calls to feel reassured.*"

Ultimately, the persons concerned at the level of the work groups face a paradoxical situation: the arrangements made to further communication are obstructing communication about actual maintenance

[2] The head of the technical team has authority over the technicians in charge of surveillance, including those assigned to the project's service — even if the head himself is not part of this service and is unaware of the requirements and pressures related to this assignment.

work. This overly equipped process of communication (several meetings and tools) produces noise, or cacophony, that, far from opening the black box of actual maintenance operations, leaves, on the contrary, these activities in a deep state of silence.

Mechanisms of compensation with deviant effects

To open this black box and better steer the project, cope with contingencies and coordinate activities thanks to reliable information about operations in the field, several efforts have been made, as shown in Figure 1. These improvements have usually been effective for managing maintenance operations, but the persons concerned saw them as "*mechanisms of compensation*" that make up for the poor quality of the information transmitted from the field. They sometimes even called them "*stopgaps*", a word suggesting dissatisfaction with these mechanisms and their effects.

We distinguished four such mechanisms:

- The STETHOSCOPE refers to the coordinating functions for creating bonds between the project team and work groups. An example is the introduction of work group correspondents shortly before our arrival at the plant. The intent was to obtain information about work group activities. However these go-betweens are never in the field they are supposed to represent; and they often do not have the called-for qualifications or knowledge.
- NFILTRATORS is our term for the more recent coordinating functions for direct contact with maintenance sites. Created to serve as the "*the project's eyes in the field*", these positions (*e.g.*, "operational coordinator") are constantly in contact with the grassroots and are supposedly the entry points for conveying the project's daily priorities.
- he PROBE is our term for the project team's daily incursions at maintenance sites for the purpose of "*going to take a look, locally*". Members of the project team thus step outside their assignments and circumvent the formal channels of communication (via work group heads or correspondents).
- he CONVOCATION refers to the meetings that the project team organizes directly with subcontractors (without going through work group heads or correspondents) for the purpose of settling problems firsthand with the parties concerned. *Ad hoc* meetings (as a followup to a project steering meeting) might occur for settling problems. Though efficient for coping with the unforeseen, such meetings short-circuit the other parties concerned.

The firm set up and institutionalized the first two of these four to make up for the difficulty of seeing inside the black box. These arrangements have, however, proven lacking, either because the positions (in the case of the stethoscope) created are not in contact with maintenance activities or because the "infiltrators", though having such contacts, are not part of the formal channels of coordination. As a consequence, the two other responses (the probe and convocation) were worked out, this time with the parties concerned.

Since they involve persons in the field (worksite foremen) and persons in decision-making (project team members), some of these mechanisms have improved the quality of the decisions made thanks to more

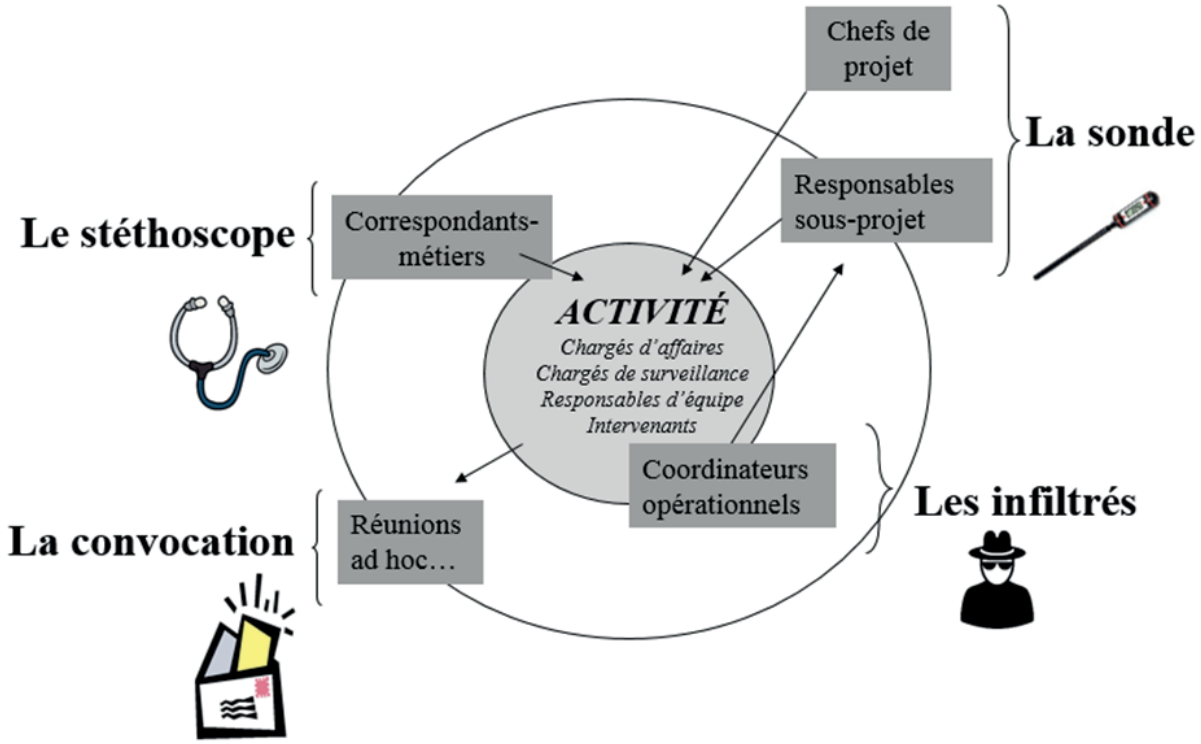

Figure 1: Four arrangements for coordination: "Mechanisms of compensation" at the worksite.

reliable information. They have, in various persons' opinions (even in the work groups), proven their worth. Solutions for coping with unforeseen contingencies are co-constructed by taking various requirements into account (deadlines, technical limitations, etc.). Through these mechanisms, persons from the field play a fundamental role. They do not just inform decision-makers about reality at the maintenance site but also propose solutions.

The work groups or subcontractors sharply criticize some of these mechanisms for their pernicious effects on the performance of the system as a whole. Though undeniably affecting the system's capacity for "*driving up production*", these mechanisms introduce considerable complications, make the organization fragile, create tensions and carry risks for long-run performance.

First of all, these additional arrangements and mechanisms of compensation strongly disorganize the worksite. The requests made directly by project team members (phone calls, visits by the "bosses", etc.) interrupt and disturb the conduct of maintenance operations. The project team's decision to give priority to a given maintenance site while skirting around formal channels of communication also generates tensions as, for instance, when interventions normally undertaken in time are made to fall behind schedule. We observed several shifts in tasks that tend to facilitate the work of subcontractors (*e.g.*, find a spare part for them, find a time slot for rescheduling an urgent task despite an official, "incompressible" deadline of 48 hours, etc.). Since the project team has leverage for facilitating the maintenance work of subcontractors or in-house personnel, direct contacts between these persons and the project team are to the detriment of the work group heads and correspondents, who are the official contacts. The latter pointed out that "*the subcontractor plays on that a lot.*"

Secondly, since the circulation of information has been disorganized, these arrangements make communication channels unreliable. Contradictory information passes up through the channels, and no one knows which piece of information is right. According to a project leader, "*Everyone's running after the ball.*" As a consequence, the project team's decisions are not always adapted to the requirements of actual maintenance operations. The work groups feel that the project team focuses on managing critical events and on respecting deadlines while flouting the requirements (technical or logistic, available resources, contingencies, etc.) related to their work. They thus have to deal with decisions not adapted to the worksite. This sometimes places them in difficulty when, for instance, they receive a demand "*requiring*" an intervention to be performed by operatives on call whenever no one is on call (since everyone has already put in the maximum number of hours allowed under the law).

These mechanisms of compensation ultimately lead to fatigue and frustration for everyone in a maintenance break project. In the words of a work group head: "*I'm fed up! There's no longer a balance between work and family life. […] Every day, the hours are impossible!*"; and of a work group correspondent: "*We're exhausted, we need to know it's going to change!*" They also lead to unreasonable variations in the length of the workday for members of the project team. The team, exhausted, suffers from a lack of recognition of its work, which increasingly consists of stopgaps and shifts in tasks that are, by definition, invisible in the formal organization of work. This affects the attractiveness of the formally defined positions (in particular the position of project leader) and thus abets a vicious circle. Given the shortage of project leaders, the current ones are being asked to prepare or pilot ever more projects over the year, and they are being worn out. The balance between the phase of preparation and the very intensive phase of interventions has been replaced with an uninterrupted succession of very intense phases as the belated end of one maintenance break overlaps with the start of preparatory work on another.

In conclusion, although these mechanisms of compensation enable the project team to obtain better information about maintenance operations, they are a major source of disorganization. This increases the organizational noise and jeopardizes a project's overall performance. These mechanisms are "*stopgaps*", since they do nothing but make up for the lack of thought about how to engineer a discussion on work-related activities.

The difficulty of designing and conducting discussion spaces

Despite the major effort made to set up several communication "spaces" in the firm, the design of such arrangements (*e.g.*., the scheduling of meetings) has several engineering defects: *a)* the existing spaces do not focus on the right topics; *b)* they do not bring together persons in contact with actual maintenance operations; *c)* the way of conducting discussions does not foster a dialog; and *d)* these "spaces" are not adequately connected to each other. For these reasons, they not serve as spaces for discussing work.

Discussion spaces do not focus on the right topics

As shown, the "communication spaces" in the current organization are not primarily intended for discussing actual operations or work itself. They mainly concentrate on prescriptions, the planning (and following it) and critical tasks. Actual operations during maintenance breaks are still a black box for the persons in need of information.

The core preoccupation is with planning and following what has been planned for; but even on these two points, participants do not share the same meaning. Whereas project teams only have eyes for so-called critical tasks, maintenance work groups never see these tasks as the principal issue. For the work groups, contingencies have to be made to fit in with the ongoing progress of hundreds of everyday tasks that are not (yet) critical but have to be done in time to keep them from becoming critical.

Furthermore, the question of coordinating the occupationally based work groups — a key question for actual maintenance operations — is not addressed in any of the existing spaces for communication, which have all been designed in relation to plans for the project.

Finally, participants in a maintenance break project know that the real problems are handled outside official meetings and channels, which are of limited utility for effective coordination.

Discussion spaces do not bring together persons in contact with operations in the field

For actual maintenance operations to serve as the grounds for exchanges that boost coordination, the persons present in the existing communication spaces have to have direct contacts with these operations. However only the project leader, subproject heads, service heads and work group correspondents (and, sometimes, work group heads) are present, and they only see maintenance operations from a distance (without entering the black box). The only meetings for actually and efficiently coping with unforeseen events are the *ad hoc* meetings "convoked" with persons at the worksite. Under ordinary circumstances, the latter — who alone have exact information about the progress of maintenance operations — do not have leeway for coordinating activities.

Nor have the channels of information between the decision-making level and the field been well thought out. The proliferation of scheduled meetings keeps the persons associated with the work groups from having enough time to set up local discussion spaces where they could come in contact with their work teams and thus obtain information from the maintenance site. During project steering meetings, these persons lack the expected information and thus lose legitimacy in the eyes of the project team, who has the advantage of being better informed than the others about topics on the agenda. This situation inevitably creates discomfort among the correspondents and heads of work group, and strong feelings of a lack of recognition.

The conduct of meetings does not foster a dialog

The coordination meetings are places for recording the tasks accomplished and the anomalies detected and, too, spaces for descending communications, as the project team forcefully restates the priorities set. Our analysis of project steering meetings has shown how extremely hard it is to open a discussion. The style of communication during these meetings is mainly informative or even coercive, since the major phases in the planning and the requirements imposed on work groups are restated.

Discussion spaces are not interconnected

Much effort has been put into engineering the schedules of the no fewer than twenty meetings held daily that are supposed to allow for coordination. Not until our intervention however did this task of scheduling address questions about the rhythm of the meetings held in the occupationally based work groups, thus at the grassroots. Our research-intervention discovered that the staff has never formalized the scheduling of work group meetings: the few such meetings that did take place were not in time with the scheduling of project meetings. In brief, the plant made no clear, harmonized offer to the persons in contact with maintenance operations (work group heads, heads of surveillance, technicians, subcontractors). Under these conditions, it is not surprising that the lack of reliable, up-to-date information about progress in maintenance is still the organization's Achilles' heel, nor that strategies of compensation for making up for this lack have been adopted to obtain information from the field but… with the risk of noise.

This lack of engineering means that these arrangements have not been designed as genuine spaces of discussion about work, spaces where work groups have a voice. When it comes to actual operations, the plant is still hard of hearing. The means of coordination that have been set up to function more as spaces of information than places for settling problems. They are oriented more toward recalling the project's requirements and planning than toward sharing information and solving operational difficulties. True, the persons involved in maintenance break projects have invented, in the course of projects, mechanisms of compensation (sometimes efficient) for regularly obtaining missing information. Although some of these arrangements do tend toward a dialog for coordinating operations, they have several deviant effects. The number of channels of communication has been so multiplied that the organization now produces noise; and it is not always possible to discern the "right" piece of information. This forces project team members to resort to several information loops for verifying information via reiterated interactions that maintain the flow of quality information. Participants in the project wear out in the midst of this cacophony. Among persons in the work groups, whose identity and possibilities of action in the firm depend on control over the techniques, logistics and information related to maintenance operations, the dominant feelings are of abandonment and of subjugation to the project's "logic".

These mechanisms and arrangements force us to admit (and this is a finding of this research) that there are inefficient forms of "resilience" that both exhaust people and disorganize the system. This "forced" resilience (EYDIEUX *et al*. 2016) is not directly linked to contingencies. It is to be set down to the insufficiencies of an organization that has not devoted enough thought to the structures for a dialog so as to cope with contingencies and, thus, have a hold over operational activities. In effect, the organization misses out a discussion about work itself.

The reason for this deficient engineering of spaces of coordination is that it has mainly been designed by members of the project team who have failed to fully associate persons from the work groups. The industrialization of projects and the professionalization of the steering team have gone in hand with a modification of the plant's political equilibrium in favor of persons close to the project team, who have a special role as "controllers of time". The objective of planning

and scheduling has been the lodestar for designing the spaces of communication devoted to steering a project. It is, therefore, not surprising that the work groups' requirements and preoccupations are not well represented, nor that the schedules made for the project are an impediment to coordination within maintenance services.

Given this situation, our research team has been authorized, along with a group that brings together project leaders and subproject heads as well as persons from the work groups (work group heads, persons in charge of surveillance, and technicians), to re-engineer these spaces of coordination. This research program's steering committee has decided to redesign the arrangements for coordinating these two parties (for the first time together)! At stake is to open a metalevel discussion space for leading these persons to "*compare in a single place their heterogeneous logics and positions in order to work together*" (BEGUIN 2004).

Conclusion

In contrast with cases where the strategies of adaptation, "mechanisms of compensation" and informal arrangements are often hailed as useful tools for "oiling the machine", this case study has brought to light the deviant effects that such forms of resilience might have on an organization's overall performance when the latter is not, or is poorly, planned for. As this case shows, it does not suffice for an organization to be "*built of ongoing interrelating and dense interrelations*" (WEICK & ROBERTS 1993) in order to have a resilient strategy for coping with the irreducible incompleteness of the rules characteristic of planning strategies. As this case lets us clearly see, the multiplication of moments for collective work among employees does not suffice to produce a "*collective mind*" ((WEICK & ROBERTS 1993) nor to form a group of individuals who share common standards of quality, a common definition of a good job, and who are united owing to a high level of confidence (CAROLY 2010). This research has shown that the strategy of resilience itself must come out of a patient work of planning so as to choose participants, the topics for bringing them together and the forms of leadership, not to mention the connections between different spaces so as to ensure that the outcome of discussions is reconnected with actual operations (HENDRY & SEIDL 2003).

This case study leads us to call for a genuine engineering of spaces where work will come under discussion (DETCHESSAHAR 2011 & 2013). The questions raised by this engineering open toward a research program on the arrangements for conducing investigations in the field (JOURNÉ & RAULET-CROSET 2008) and fostering as best possible the processes tending toward a dialog. The aim is less to trigger "*logics of conformation*" than to prime an efficient process of exploration of what is new (MOISDON 2007). This calls for researchers to shed more light on the equipment likely to favor "*arenas of joint regulation*" (PARADEISE 2003), in other words, on the forms of organization of the "*work of organization*" (TERSSAC 2003).

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