Chapter 10
The Unsung Virtues of Ambiguity in Subcontracted Work

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Abstract Academic literature deems ambiguity must be eliminated or pushed outside these organizations, since it is considered to weaken risk management. Based on a qualitative study, this chapter demonstrates that ambiguity can offer a powerful means to facilitate coordination between stakeholders involved in preparing and carrying out complex and hazardous activities. This assumes that ambiguity is accepted and managed rather than eliminated. To turn ambiguity into an advantage, it is important to be able to discuss multiple interpretations, choose 'the best one' and negotiate or create new ones in order to produce a shared frame of reference that is appropriate to the situation. Management systems can be designed to support these discussions of multiple interpretations ahead of work being carried out. We show that ambiguity is managed 'cold', *outside* the process of action, and *during* action, depending on the quality of interactions between the relevant stakeholders and the soft skills employed by those involved.

Keywords Subcontracting · Ambiguity · Uncertainty · Coordination · Action strategies

10.1 Introduction

It is commonly held that subcontracting risks jeopardizing industrial safety (Hopkins 1999; Thébaud-Mony 2000). The reasons proposed for this include the assertion that subcontracted work can be a source of uncertainty and ambiguity regarding individual responsibilities, coordination and communication between stakeholders.

In a bid to improve safety and reliability, including from a human and organizational perspective, industries that involve hazardous activities traditionally tend

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to minimize subcontracting. The academic literature refers to a 'strategy, of anticipation' (Wildavsky 1988), 'regulated safety' (Daniellou et al. 2008) or the 'Safety 1 model' and deems uncertainty and ambiguity to be significant problems which must be eliminated or pushed outside these organizations, since they have an adverse effect on the quality of decisions, introduce conflict and, ultimately, are considered to weaken risk management.

Although they are often linked, uncertainty and ambiguity are, by nature, very different and in fact conflicting. It is therefore worth making a distinction between the two concepts. Uncertainty is the product of a lack of information, while ambiguity stems from too much, leading to an excess of possible interpretations. Where ambiguity is present, a discussion of the conflicting interpretations relating to a challenging issue is called for. Uncertainty, on the other hand, requires a search for additional information, particularly regarding rules and formal procedures. While more rules and procedures reduce uncertainty, they result in more ambiguity. Every rule needs to be interpreted (Weber 1922) if it is to lead to effective action.

Ambiguity is characterized by excess information from a variety of sources, demanding multiple, often contradictory or diverging interpretations. This creates confusion (Weick 1995). The features of an ambiguous situation are as follows: the nature of the problem is not sufficiently clear; the quality of the information is problematic; there are conflicting interpretations of the same data; conflicting goals are set by multiple managers; time and attention are lacking; contradictions and paradoxes emerge; it is difficult to establish a clear understanding of the relationship between cause and effect; and the allocation of roles and responsibilities is unclear (McCaskey 1982).

This chapter aims to demonstrate that ambiguity can, in certain circumstances, offer a powerful means to facilitate coordination between stakeholders involved in preparing and carrying out complex and hazardous activities that have been subcontracted. This assumes that ambiguity is accepted and managed rather than eliminated. We will focus our analysis on radiographic inspection and the challenges of radiation protection during maintenance activities and combine micro-analyses (at the team level) with a macro-organizational and inter-organizational approach to managing ambiguity.

10.2 Subcontracting and Ambiguity

The subcontracting relationship is inherently ambiguous because it creates tension between the need for cooperation and the conflicting interests involved in all activities covered by the contract. There is greater ambiguity within the genuine intent and commitment of the subcontractor than there is within the more traditional setting of work carried out solely by employees of the instructing party.

10.2.1 Ambiguity is Inevitable

Ambiguity is a factor in any organization engaged in hazardous activities (March et al. 1976). The theory of social regulation highlights the ambiguity of 'control rules', which introduce both constraints and appeals for cooperation (De Terssac 2003; Reynaud 1989). Such rules are often intrinsically ambiguous: they express a set of requirements, procedures and rules, but they often—whether consciously and deliberately or not—contain gaps, omissions, contradictions and errors. This opens up a certain amount of space for interpretation—room for manoeuvre which will be filled by 'independent rules', reflecting the ingenuity and critical distance of operational stakeholders. The effectiveness of the rules then depends on the investment of individuals in coming up with rules that enable work to be done and organizational solutions.

Ambiguity appears to be the natural downside of rules and a structural feature of organizations, stemming from the process of developing and disseminating rules which are valid but in competition with each other.

10.2.2 Ambiguity as a Resource for Hazardous Activities

The theoretical trends around 'high reliability organizations', organizational 'resilience', 'managed safety' or 'Safety 2' emphasize the need for capacity building on responding to unforeseen events. This involves more 'reflexivity' and 'sense-making' at all levels of an organization, from the individual to teams, from the instructing party's organization to relationships with subcontractors.

In the workplace, stakeholders use ambiguity to highlight the challenges they face in their work as a result of the constraints imposed by rules and operating procedures which can appear to them to be contradictory or incoherent in the way they coexist or overlap. Ambiguity allows them to justify the trade-offs they are driven to make and to draw on their professional expertise to make up for the shortcomings of the rules (Lot 2008), and in doing so, to help ensure the safe management of workplace situations.

To turn ambiguity into an advantage, it is important to be able to discuss multiple interpretations, choose 'the best one', and negotiate or create new ones in order to produce a shared frame of reference that is appropriate to the situation. Management systems can be designed to support these discussions of multiple interpretations ahead of work being carried out.

10.3 Empirical Approaches to Managing Ambiguity

Broadly speaking, there are two phases in which ambiguity is managed, and these call for different approaches. Ambiguity is managed 'cold', *outside* the process of action, during the preparation phase. It is also managed *during* action, when it depends on the quality of interactions between the relevant stakeholders and the soft skills employed by those involved.

10.3.1 Creating Meaning and Developing Action Strategies Prior to Intervention: The Radiographic Inspection Unit

Non-destructive testing involves checking the condition of existing welds on a facility's circuits. It is regulated by both external factors and internal factors, focused on the radiographic inspection process, with a dedicated frame of reference. Close collaboration with a specialist risk prevention service is required due to the radiation hazards. This activity, which involves a number of interfaces and is subject to the vagaries of scheduling, presents challenges in coordinating across the different levels of the organization and leads to the regular updating of risk prevention documents (marking plans and inspection permits). Given these factors, the instructing party has put in place a specific and prescribed structure. This structure, the radiographic inspection unit, leads coordination and inspection validation meetings.

The unit has been given authority over this activity to ensure comprehensive risk management. Reporting to the instructing party (outage project, trade or Risk Prevention Team), it is responsible for establishing links between the various stakeholders, acting as a single gateway for any queries regarding radiographic inspections, managing the production of risk analyses and inspection files during the preparation phase, ensuring that the risks of activities being conducted simultaneously and impact on schedules have been taken into account, including radiographic inspections in the relevant project schedule and supervising their implementation. Daily meetings are held to bring together representatives from the instructing party and the subcontractors and ensure coordination between them. These offer an opportunity to work together to identify and establish countermeasures and to update them as required.

The meetings are held at 2 pm and are attended by the site manager from a maintenance company, two managers from the companies carrying out the radiographic inspection, the project manager responsible for radiographic inspections on behalf of the instructing party, the Risk Prevention Team assistant responsible for radiographic inspections and the coordinator. An A4 list of contact details for members of the radiographic inspection unit and the radiographic inspection schedule is distributed to participants. The permits scheduled for the evening are then presented.

The first relates to inspections of the steam generator. It is presented by the radiographic inspection site manager from the subcontracting company, who warns that:

"*The permit needs to be reviewed, because the exposure time noted in the grid is not correct*". The project manager comments on the marking to "*make sure that the access points have been properly closed off, because it's not easy to see them*". Once the various opinions have been expressed, the coordinator ensures that collective agreement is reached, then updates and validates the documents.

The second relates to the inspection in the machine room and is presented by the manager of another subcontracting company, who talks about the first page of the inspection permit, and states the job number, the location, the source used, and the gammagraph, then explains that the inspection will be carried out with a collimator. He then reminds everyone that an announcement will be made by megaphone to tell people to clear the operating area. The inspection zone will be surrounded by two thicknesses of lead. Finally, the control room will be informed so that it can issue an audible warning at the beginning of the inspection. The 'comments' box on the permit sets out the following three points, which are standard for all inspection permits: a meeting point in the control room and a pre-job briefing prior to the inspection, confirmation of the return of the source using a radiation survey meter and the employment of error-reduction practices. It also adds the following: "Lift to be locked using the special key, small 'radiographic inspection' notices to be put up for the levels that are closed off". The manager of the subcontracting company then discusses the scope of the inspection. "*It will be carried out on three levels. There are more than ten access points, outside the controlled area. The marking plan is not reliable. There is no lift. The exposure time is higher than 30 min. We are working night shifts and there is local interference. We have a total of 40, which is below the site threshold of 45, but since we're working in the machine room, this inspection presents specific risks*". He then talked about the marking plan, which was revised following a field visit during the morning. "*There is some scaffolding that has been erected since the last visit two days ago, so this needs to be marked*". Once the various opinions have been expressed, the coordinator ensures that collective agreement is reached, then updates and validates the documents.

To facilitate a joint effort to identify and establish countermeasures, and to update them as required, the unit brought both sides together, with technical representatives and site managers from the supplier side, risk specialists (safety officers) and members of the outage project for maintenance. By analysing these meetings, we can learn a number of lessons.

These meetings **'produce' a regulatory document**: the inspection file, comprising a signed inspection permit, validated marking plan and shared scope, which is required for implementation of the activity. Beyond the inspection permit document itself, however, it is the process of developing it on the basis of debates, discussion and complementary perspectives that really matters and gives the decision its strength. By making use of formal mechanisms like the marking plan, risk analysis, etc., the **unit serves as a 'discussion space'** (Detchassahar 2013). This helps to regulate the activity and allows stakeholders to work together to identify the appropriate responses to changes affecting the environment, schedule and resources. The inspecting party's recognition and consideration of the expertise contributed by the subcontractors, who have a more detailed understanding of the activity, facilitate

collective agreement. Such agreements between professionals with different interests are based on sharing perspectives. They contribute to 'negotiated order' (Strauss 1963) and are essential in cases where predictions prove to be at odds with the reality of events.

The coordinator allows the various participants to share their views and knowledge and ensures that no one is excluded from the discussions. The aggregated knowledge produces collective decisions in the form of the solutions clearly set out in the inspection permit. It is an organizational mechanism that promotes **links between representatives of the professionals** involved in the work and their joint capacity to identify risks and develop the appropriate responses as a team. The different functions, each of which understands some part of the situations being addressed and how to resolve them, are all involved in developing a new action strategy. The coordinator's more limited technical expertise means that he or she is obliged to quickly bring out and aggregate participants' knowledge to develop robust, consensual strategies that are appropriate to the situation. The coordinator acts as the interface between several complementary professional practices, drawing on his or her skills in communicating, coordinating and bringing together different perspectives (Chanal 2000).

Soft skills are used to facilitate the emergence and adoption of collective consensus. This involves ensuring that people are heard and promoting discussion and the aggregation of individual knowledge, while avoiding arriving at a limited understanding of the problem and its impact. The coordinator assumes the role of a leader and facilitator to clarify problems and enable everyone to offer their opinion on the origins and impact of the activity. The coordinator then aggregates the knowledge and summarizes the discussions, allowing other participants to jump back in. This ultimately results in the development of a consensus-based action and risk management strategy, which is clearly set out in an official regulatory document (the inspection permit).

10.3.2 From Unit to Reality

Regardless of the quality of the compromise reached during the 'cold' phase, there is no guarantee that it will stand up to reality on the ground. Between this phase and implementation of the activity, the environment can change, resulting in new ambiguities to resolve. The unit's links to other parts of the organization and the strength of the relationships between stakeholders are what makes it possible to update the compromise.

The **unit is not isolated from the rest of the organization**. Formal meetings (outage meeting, daily meetings between the inspecting party and the subcontractors) help to lay the groundwork for discussion, establish and update a compromise and then disseminate the inspection permit. First of all, the unit is linked in advance to the outage management meeting, which validates activity implementation in accordance with the project schedule and prioritizes activities. Project managers and coordinators from the trades take part in this meeting. The information and decisions must

then be communicated to workers on the ground. This relies mainly on personal networks that can be used to identify changes in activities, clarify operational needs and tackle problems. While these networks are based on membership of a trade and a given level of the hierarchy, their stability over time is also key, supporting the sharing of information and experience, arrangements, assistance and more substantial mutual aid. As a result, between inspection meetings, **the work to jointly create this collective representation is continued by numerous networks**. Finally, the instructing party officially takes control of implementation once again and checks that the inspection permit matches reality on the ground. The marking plan described in the permit is checked by a supervisor, and then the stakeholders involved in plant operation validate and sign the permit, meaning that the activity can begin.

10.3.3 Management While the Activity is Ongoing: The Intervention of a Third Party

Regardless of their quality, the compromises reached during the preparation phase must be maintained until the start of implementation, when new ambiguities may arise. These processes require the assistance of a third party to update the strategies that have been prepared and extend the sensemaking processes. This will be illustrated using the example of conflict between risk analyses and the prevention plan.

Each site is unique in terms of technical factors, the risks posed and the countermeasures that need to be put in place, so a risk analysis specific to each activity is carried out during the preparation phase to establish appropriate management measures. Multiple activities can also take place in a single location, potentially transferring risks between the different interventions. To 'manage' this possibility, the organization has put in place a prevention plan that anticipates interference between sites and formalizes the protective measures required to mitigate the overlap. This is posted at the entrance to the premises.

However, the vagaries of production and slips in the schedule can undermine such risk management mechanisms. Activities which, during the preparation phase, were planned for different times can end up being scheduled for the same time and the same space, leading to contradictions between the protective measures set out in the risk analyses and those in the prevention plan. A risk analysis that is specific to an activity might, for example, stipulate certain risk management measures (clothing, measurements) that are not, however, recommended in the prevention plan for work in the area. The information and strategies contained in the documents are therefore contradictory, placing operational stakeholders in an ambiguous situation which they will need to resolve. When they meet, they consider the gap between the documents and reality, which means that, at the point of their intervention, they do not have a clear idea of what risks they actually face, how they can protect themselves from them or how to prioritize activities. To manage these contradictions, they ask an external third party to develop an appropriate action strategy. A risk prevention specialist will

then update the protective measures, or a member of the project team will prioritize the interventions. To enable this compromise to be reached, the relevant third parties have a presence on the ground, technical expertise which lends them their legitimacy and the required soft skills.

By enabling a response to be developed in situ by professionals, this organizational work helps to manage risk. The quality of interactions and success of the dialogue is dependent on the soft skills of those involved (Lot 2008). These skills include the ability to listen, an awareness of working conditions and tact (Goffman 1974). Empathy helps with understanding workers' expectations, achieving social recognition and leaving room for manoeuvre in difficult interactions where there is potential for conflict.

10.4 Conclusions

The structure of complex organizations generates ambiguity, with the control rules and the process by which they are developed, the ambivalence of managerial practices and the organization of work (with tension between centralization and decentralization) all contributing to embedding it in the organization. Rather than seeking to eliminate this inevitable ambiguity by introducing new rules (which will in fact only create more ambiguity), a more effective approach is to learn to manage it with the use of organizational structures.

A structure that establishes times for discussion and brings stakeholders together at different stages of the process facilitates management of ambiguity, while structured organizational mechanisms that serve as discussion spaces foster the ability to work as a team, support debate between operational staff and provide opportunities for dialogue on protective measures and the prevention strategy.

The effectiveness of this structure depends on the technical skills of the stakeholders and above all on their ability to listen to each other and reach compromises on risk management mechanisms. Primarily, it provides a means for temporarily bypassing the strategic and political tensions between stakeholders, while the activity is underway. Despite the inherent asymmetry between them due to the instructing party's authority and its monitoring remit, the relationship between the inspecting party and subcontractor also requires cooperation, compromise and the pooling of knowledge and skills to effectively manage risks and complete the work. Instructing parties and subcontractors involved in the same work must therefore overcome the inevitable ambiguities and collaborate to develop a risk management strategy.

In the cases discussed, the nature of the relationship between the two parties has little bearing on the resolution of the problem and, we would suggest, there are two conditions here that contribute as much to risk management as the formal mechanisms. First, a focus on real-world activity allows participants to share their perspectives and work together to find solutions that help to manage risks. Disagreements and strategic tensions are temporarily put aside when professional activity is at the core of the discussion. Second, the quality and dynamic of the compromises

reached are supported by the leadership and communication skills of the various participants and the nature of their long-term relationship based on reciprocal trust. When these two conditions come together, the problem 'shifts': the power asymmetries described in some of the literature (Walter 2017) as an obstacle fade away in the face of business priorities that are common to both parties, provided that the discussion is organized (by mechanisms) and that those involved possess and make use of soft skills to transcend the positions of power between stakeholders for the duration of the interaction.

Ethics Statement The identity of individuals whose oral statements are reproduced in this chapter has been anonymized, and their informed consent was obtained. Ethics approval is not required for this type of study in France.

Bibliography

V. Chanal, Communauté de pratique et management par projet. Manage. **3**(1), 1–30 (2000)
M. Crozier, E. Friedberg, L'acteur et le système (Éditions du seuil, 1977)
F. Daniellou, I. Boissières, M. Simard, *Facteurs humains et organisationnels de la sécurité industrielle*. Les cahiers de la sécurité industrielle. FonCSI (2008)
E. Goffman, *Les rites d'interaction*, trad. franç. (Les Éditions de Minuit, Paris, 1974)
A. Hopkins, The limits of normal accident theory. Saf. Sci. **32**, 93–102 (1999)
N. Lot, *Genèse, usages et maintien de l'ambigüité dans l'organisation : l'exemple de la radioprotection* (Paris, Université Paris Dauphine, Thèse de sociologie, 2008)
J.G. March, J.P. Olsen, S. Christensen, *Ambiguity and Choice in Organizations* (University of Michigan, 1976)
M. McCaskey, *The Executive Challenge: Managing Change and Ambiguity* (Pitman Publishing, 1982)
J.-D. Reynaud, *Les règles du jeu. L'action collective et la régulation sociale* (Armand Colin, Paris, 1989)
A. Strauss, *La trame de la négociation* (L'Harmattan, Paris, 1963)
G. De Terssac (Ed.), *La théorie de la régulation sociale de Jean-Daniel Reynaud. Débats et prolongements* (La Découverte, Paris, 2003)
A. Thébaud-Mony, *L'industrie nucléaire. Sous-traitance et servitude* (Paris, Éditions INSERM, 2000)
M. Weber, *Economie et Société: Les catégories de la sociologie*, trad. fr. (Plon, 1922)
K.E. Weick, *Sensemaking in Organizations* (Sage Publications, London, 1995)
A. Wildavsky, Anticipation Versus Resilience, in *Searching for Safety*. (Transaction Publishers, Studies in Social Philosophy & Policy, 1988), pp. 77–103
J. Walter, Safety management at the frontier: Cooperation with contractors in oil and gas companies. Saf. Sci. **91**, 394–404 (2017)
M. Detchessahar, Faire face aux risques psycho-sociaux: quelques éléments d'un management par la discussion. Négociations. **19**(1), 57–80 (2013)