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Bridging Research and Practice: The Challenge of 'Normal Operations' Studies

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The article will present some possible explanations of the difficulty to bridge research and practice in the domain of risk management. A first block of reasons has to do with the very content of the analyses themselves. Of great importance is also the time chosen for them to be carried out. The second argument will bring to the foreground the difficulty for a lot of fruitful research to permeate into management spheres. One way to reconcile experts, scholars and decision makers may come from new attention devoted to organisational design and formal structures. This calls for the study of *normal operations* as opposed to relying too exclusively on accident cases and crisis situations. We believe that this perspective can help us improve our level of understanding of complex organisations, because it focuses on the duality of organisational life: the dark side and the bright side, always tightly coupled.

> 'Errors and accidents are not particular, separable phenomena, but must be studied as being the effect of normal, adaptive behaviour drifting toward the boundaries of acceptable performance. Studies of accident cases and of normal functioning of the systems are therefore necessary.' (Svedung & Rasmussen, 1996: 3)

> 'Understanding how organisational structure and behaviour can effect the likelihood of agency failure is a concern not only to NASA; it is an issue that is becoming relevant to a wide array of public agencies.' (Heimann, 1997: 1)

Introduction: the 'normal' and the 'pathological'

I will draw on 10 years of experience of extensive fieldwork in high risk industries. I have been studying how organisational factors were contributing to the violation/compliance with rules. I used maintenance activities in nuclear power plants, both in France and in the United States, as a case study. I am currently interested in several research questions, among which are the following: the study of the sociological foundations of organisational reliability and the conditions under which organisational reforms and changes are decided and implemented in high risk industries.

In this article, the question under study is the following: why is it difficult and often frustrating to close the gap between analyses and action? Why is it still difficult to draw lessons from crisis in order to implement organisational changes? Several reasons often combined contribute to a situation that so far leaves all parties generally dissatisfied.

A first block of reasons has to do with the very nature of the studies that are carried out. Not only their contents present some specificity, but also often the very time chosen for them to be carried out inside organisations greatly influence the ability/inability to achieve successful reforms. A second aspect has to do with the analyst's position itself. Experts rarely have the opportunity to directly implement organisational reforms suggested by their research or recommendations. Moreover their recommendations are seldom framed in terms of organisational design. Liabilities and externalities of organisational choices are rarely focal points in their study. An informed discussion of alternatives is usually skipped. Hence, organisational reforms that generally follow a major crisis are often limited in their scope. I will develop these two points in the first section of the article.

In the second section, I will examine some of the reasons behind this relative ineffectiveness. I argue that a sensible strategy – more costly at the beginning but cost effective in the long run – would be to adopt a change in perspective: the accident remains the exception, it is the 'normal' functioning that requires closer scrutiny. Moreover as stressed by Vaughan recalling Durkheim's central message:

> '[...] the conditions of the normal are the preconditions of the pathological, the same

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> characteristics of a system that produce the bright side will regularly provoke the dark side from time to time.' (1999: 274)

Hence, if reconstructing a series of causal factors after the event is a much needed task, we must also devote energy and resources to detect adverse trends in order to prevent accidents from happening (Hale, Wilpert & Freitag, 1997). Yet, even though detection of early signs is on many research and institutional agendas, resources are scarce and inadequate to tackle this kind of problem. This task is more and more pressing as it appears that deliberate misconduct and systematic organisational delinquency are rare compared to pervasive and irresistible patterns of normalisation of deviance (Vaughan, 1996; 1999). As Vaughan explains in her detailed story of the Challenger disaster, the launch decision cannot be satisfactorily explained by the triumph of managers' concerns over engineers' fears in the midst of political, economical and production pressures leading to a cost/safety trade-off.

> 'The explanation of the Challenger launch is a story of how people who worked together developed patterns that blinded them to the consequences of their actions. It is not only about the development of norms but also about the incremental expansion of normative boundaries: how small changes – new behaviours that were slight deviations from the normal course of events – gradually became the norm, providing a basis for accepting additional deviance. No rules were violated; there was no intent to do harm.' (Vaughan, 1996: 409)

Some scholars have demonstrated that major accidents and major crisis had organisational precursors (Perrow, 1984; Reason, 1987; Setbon, 1993; Svedung and Rasmussen, 1998; Weick, 1993; Vaughan, 1996). The very design of the organisation itself, the patterns of interaction with its political and regulatory environment, and its members' strategies usually explain a great deal of the embedded weaknesses.

Yet, as Reason (1990) pointed out, the opportunity for an accident to happen is a long shot. Some scholars even argue that it might not be so easy to prove that a combination of vulnerabilities and organisational weaknesses will provoke an accident (Amalberti, 1996). The 'big one' is in essence unpredictable and the result of an unprecedented combination of factors that no one could have anticipated. Errors, violations and near misses will not necessarily built into an accident.

The debate is far from being settled. Developing 'normal operations' studies may contribute to its maturation.

Shortcomings of 'after the event' analyses

Setting the stage

Most of the arguments presented in this section are not new and have been carefully documented (Carroll, 1995; Rasmussen, 1989; Rasmussen & Svedung, 1998). Yet, it seems that little has changed and progress is slow as attested by a recent series of seminars organised in Paris by C.N.R.S. (Centre National de la Recherche Scientifique) devoted to the question of post incident, post accident feedback experience and organisational learning strategies in complex systems, including high-hazards organisations. Experiences, shared during the seminar, both in private and state-operated organisations – such as transportation systems (SNCF, RATP, AIR FRANCE); nuclear operator (EDF); chemicals production (ELF Atochem; Rhône-Poulenc); networks management (France Telecom); civil protection (fire workers services); sanitary organisations – and organisations concerned with the regulation of such risks all led to the same observations (Bourdeaux & Gilbert, 1999):

a) organisational learning processes and feedback from past experience are difficult to institutionalise;
b) organisational structures to do it are at best experimental, more likely just starting or too isolated (Lagadec, 2001);
c) financial resources and human capital are lacking often because political determination is fluctuating and uncertain on the returns of such efforts;
d) moreover the methodology to implement such a knowledge capitalisation is often relying too heavily on databases, which become an end in itself (Lagadec, 1992);
e) finally, it has been stressed that a contradiction was under development between post incident or post accident formal procedure of organisational learning and judicial investigation. Both types of investigation are using similar materials: documents, memos, traces of all sorts like parts, databases, interviews. Hence, some organisations are now calling a halt to their interest in formal procedures of organisational learning in order to prevent justice to use these against the company.

Organisations tend to be overly reactive rather than proactive

Another shortcoming has to do with the fact that organisations tend to be reactive: managers are willing to learn something about their organisations once they have experienced an accident or a serious incident (Paries, 1999). It is therefore extremely difficult to get access and

resources to study and analyse a system that is currently displaying only green lights on all records. Diverting resources when everything goes well (or seems to go well) is not popular, and may be interpreted as ill omen.

So far regular and systematic assessments of how organisational reliability is fostered in nuclear power plants or chemical plants, for example, do not exist. ISO certification and quality assurance management systems are mere substitutes.

The irresistible attractiveness of a good story

Scholars have also abundantly documented the drawbacks of relying too heavily on findings collected after an accident or a serious incident (Turner, 1978). Members of the organisation will irresistibly try to build a story on how and why it happened. Signs or facts that contradict the story in the making will tend to be ignored or overly challenged. Signs or facts that confirm the story in the making will be incorporated with little or no counter-examination (Rochlin, 1996; Vaughan, 1996; Weick, 1993). As Rasmussen explains:

> 'There is a tendency to see what you expect to find.' (Rasmussen, 1989: 369)

Moreover organisational life is such that it favours research of the guilty over research of the most plausible explanation. As a result any organisational reform decided and designed according to an accident investigation findings is subject to the same biases.

Amnesia

This latest argument must be linked to some scholars' findings on the difficulty for actors to reflect on their experience after a serious incident or even after an accident (Duclos, 1991). Hence, data collected right after an accident may not be as informative as it could be, preventing the analyst from proposing sensible recommendation for an organisational reform in the end. Major events and fatal accidents may not be so easy to think and learn about especially for first line actors, in a state of shock, more willing to forget than to revive difficult moments. As time passing, members of the organisation do succeed in their determination to forget serious incidents. The culpability and the possibility of judicial pursuits are great barrier to thorough data-collection.

For example, in her encompassing study of the blood transfusion from the first ages throughout the ordeal of the syphilis contamination and more recently the AIDS contamination, jurist Marie-Angèle Hermitte (1996) describes at length the inability and unwillingness of the French medical community to reflect on its practice and criteria of judgement. The medical community used with success the following argument and blinded itself efficiently: it cannot bare the responsibility of the 'blood affair' – hence prison should not be an option for physicists known to have been first line actors in the decision to postpone the introduction of the Abbott test – because this in itself constitutes a major danger for the medical research as it may impede further R&D for any new drug. As Hermitte puts it:

> 'The superficial analysis that the medical community has made of what the Law in general has produced in this affair shows that there has been no lessons learned: some biomedical sectors continue to function exactly on the same sinister alliance – between politicians, high administration, the Industry and an expertise which fails to be independent.' (Hermitte, 1996: 473)

This example illustrates that organisational learning cannot take place efficiently when leading actors in the community are opposing it through deliberate (consciously or unconsciously) cognitive blindness. Chances that organisational reform can be implemented are limited.

Drawing again on Hermitte's study, she details the process by which the blood transfusion system had censored another terrible affair: the syphilis contamination. Learning from this experience could have prevented the transfusion authorities from relying too heavily on voluntary (unpaid) donation. Yet, there has been no link made between the syphilis contamination and the one from AIDS. The question remains why?

The problematic use of databases

Aware of this first series of shortcomings mentioned above, experts are now turning to a category of events, such as near misses and reported violations. They believe this category of events to be less disturbing for actors, therefore more prone to learning strategies. This focus on near misses and near accidents brings to the foreground fascinating objects: databases or event report systems. French engineers are especially keen of such tools. Various communities have endless discussions about databases, their design, access, degree of detail and real use that decision-makers can actually make of them (Paries, 1999). After having being presented as a promising avenue, the wind has changed: they are now described as elephants giving birth to mice.

It is argued that databases are often confused with the process itself of knowledge capitalisation. As if displaying databases was sufficient to claim that one was concerned about feedback

experience. More worrying is also the fact that for many, feedback experience ought to concentrate (and shall remain) on technical issues, feeding ever-growing technical databases.

Finally, often those who are collecting and treating data are not managers in charge of taking decisions on an organisational change or more broadly on organisational matters. Unfortunately these difficulties and shortcomings will persist unless more attention is paid to the kind of information that is actually needed in order to improve knowledge of crucial organisational patterns.

Regulatory bodies seem to lack proper methodology to tackle organisational problems

High-risk organisations and their regulators have the obligation – due to the risks involved in their activities – to institutionalise more carefully their learning strategies. For example, Nuclear Power Plants or Airlines have various tools and formal procedures to trace safety records and minor events, including 'human and organisational factors' aspects. Their regulatory bodies have the responsibility to trend and control their overall level of security and safety. Yet, there is some evidence that regulatory work and notably safety evaluation made by regulators encounter difficulties of various kinds, not to mention the lack of resources as attested by the recent AZF accident in Toulouse.

There has been report of adversarial relationships in the German nuclear industry, which prevent both parties to develop a minimum of trust and confidence (Becker, 1998; Wilpert, Fahlbruch, Miller, Baggen & Gans, 1998). In the American nuclear industry, adverse consequences on safety of a too detailed regulation on safety records have also been pointed out (Nichols & Wildavsky, 1987; Wildavsky, 1989). In France, regulators and nuclear operators have often being accused of collusion and cover up because of a too closed relationship (Jaspers, 1990; Lepage, 1998).

In addition, the very methodology used by regulators in order to evaluate the overall safety of high-risk organisations is also under question, especially at a time where 'organisational factors of safety' seem to be the talk of the town in many institutions (Baumont, Bourrier, & Frishneckt, 1998). Regulators are generally engineers with little or no background in organisation science. They are assisted by human factor specialists who are for the main part trained in psychology and ergonomics usually with a prior background in engineering sciences. Usually, none of them have the analytical tools or the methodology to aggressively tackle problems of organisational nature. Therefore, it seems that regulators are poorly equipped in order to understand crucial organisational routines and patterns on which organisation science has now a few clues.

Too little experience sharing across industries, administrations, regulators, countries

Finally, there is a lack of experience sharing across organisations, administrations and institutions, as if each case (airline industry, nuclear power plants, chemical plants, off-shore platforms) was so specific that generalisation or use of common concepts ought to be discouraged. As a result, there are too few contexts where knowledge is freely exchanged and great difficulty to draw lessons from one specific case to another one. On this aspect the research community seems more advanced and on the eve of offering transversal conceptualisation (Bourrier, 2001).

The missing link

Improving collective understanding of organisational vulnerabilities is also partly impeached by the fact that academic concepts do not permeate easily managers' spheres. One way to reconcile both parties might come from new attention devoted to organisational design.

From Research to Decision

Research agendas in the domain of risk and safety management are dynamic as attested by the variety of research programs and findings on issues like organisational reliability (Roberts, 1993; La Porte & Consolini, 1991; Rochlin, 1994), sense-making in organisations (Weick, 1995), safety management (Hale & Baram, 1998), system safety (Fahlbruch & Wilpert, 1999), normalisation of deviance (Vaughan, 1996, 1999), to only cite a few.

While practitioners are reluctant to draw more general lessons, some scholars are taken the opposite stand. Their effort is of crucial importance if one wants to go beyond a catalogue of specificities. They are advocating that some types of problems regarding high-risk organisations can and should be jointly considered. Perrow was the first one to unify the category of high-hazards industries. The high reliability organisation group also believes that a unified category of high reliability organisations does exist (See special issue of *JCCM*, Vol. 4, No. 2, 1994). Yet, this wealth of research is barely known to decision makers in these high-hazard organisations. Despite their impact in the organisation science literature (and the controversies they feed), most of these concepts and their discussions are unfamiliar to a wider

community of managers and practitioners who surely could find some inspiration and use of these notions.

To take a recent example, in the line of earlier work initiated by Landau (1969), Heimann (1997), comparing the Challenger accident and the Food and Drug Administration's procedures to market (or fail to market) new drugs for AIDS patients, proposed to study their degree of structural redundancy in order to explain administrative error of type I (launching when it was unsafe to do it, which provokes the loss of the mission) and error of type II (no decision to launch when it was safe to do it which provokes a waste of resources). Based on his study of the design of crucial organisational units, such as the 'Launch Decision Structure' in the case of NASA and the 'approval procedures' in the case of FDA, he could show us how NASA under financial pressures changed its 'Launch Decision Structure', from a serial system (A, B, C and D had to sign off a specific procedure before it could be examined at a higher level in the hierarchy), to a parallel one (A, B, C, D were perfect substitutes and either one could sign the procedure without the others' permission, in order to expedite things). Heimann explains that this change of structure mirrors a change in the risk, NASA wanted to avoid the most. After Apollo 13, NASA feared an agency failure of type I. It changed gradually in the middle of the eighties into a fear of an agency failure of type II (waste of resources) and changed its organisational design accordingly.

It is obvious that this kind of research is highly relevant to any attempt made at improving an organisation's overall level of safety.

Yet, there is a difficulty to transpose those concepts and perspectives at a more practical level. Moreover, even if managers were aware of such notions and willing to make use of them in their organisational context, how concretely would they have to proceed?

Little consideration for crucial organisational patterns

As mentioned above, applicability of the concepts may well be under question, as much as managers' willingness to pay attention to notions from the research community. Indeed it becomes trivial to note that major reorganisations and big organisational reshuffling happen with very limited knowledge on the functioning of the organisation, which will be subject to major rehabilitation. As Heimann explains:

> '... structure does affect the ability of agencies to perform reliably. For that reason, agency reorganisations should be carefully considered before implementation.' (Heimann, 1997: 176)

I have myself explained how a change in French labour legislation[1] and the obligation that follows for EDF to forbid mixed maintenance teams (contractors/EDF foreman), associated with the obligation for EDF to set up independent job controllers (as required by the 'arrêté qualité of 1984') – that should not be part of the execution team – considerably changed the power relations on nuclear power plants job sites. EDF foremen, who were used to be not only all-powerful but also all-knowledgeable, progressively lost their status because they lost control on most of the job sites These changes had considerable impact on the way maintenance jobs were carried out in the field. Notably it changed the information structure. As a result, the disturbance of social relations greatly impacts the social construction of reliability. Yet, hardly any research or thinking had been made on the possible implications of such a modification of resource allocation and actors' strategies. Such a crucial reallocation was decided with no anticipation whatsoever on its concrete implications for day-to-day work (Bourrier, 1998a; Bourrier, 1999).

Organisational design: the blind spot

In this lack of permeability between spheres, scholars are also 'at fault', with a few exceptions (Heimann, 1997; Setbon, 1993; Vaughan, 1996).

This is for example the case with the work of Michel Setbon (Setbon, 1993), who studied the French blood contamination disaster. He carefully explained how and why the system as a mix of private and public interests with antagonistic world visions could not listen to marginal whistle blowers. The latter were not legitimate in the medical institution they were belonging to: they were young (under and around 30) and they were working on sexually transmitted diseases, which, at the time were considered lousy doctoral dissertation subjects and low priority by the medical establishment. Setbon – as Vaughan has done for the *Challenger* disaster – does not give much credit to the organisational deliberate delinquency hypothesis in this affair. He rather argues that the design of the socio-political blood transfusion system was unable to manage a major uncertainty coming from the donors' edge.

Considering the European tradition, this lack of interest for organisational design seems explicitly rooted in one of the most robust conventional wisdom in social science: formal organisation and procedures are doomed to be violated. Hence, one should not pay too much attention to organisational design, because it does not give the key to the very functioning of any organisation.

To the contrary, I believe it is of crucial importance to pay attention to structure, i.e. to

the institutional resources and constraints that groups and individual use in trying to attain their goals. Structures are not limited to negative constraints on actions; they can also enable actors in a positive way. In fact, they do both simultaneously, since a pattern of action excludes certain possibilities and allow others. One person's enabling structure may be another's constraining structure.

I will not advocate that one should desert the minute study of soft adaptations of rules and procedures to the benefit of organisational design. My point is rather to stress that both points of view should be considered, because they are impossible to disentangle. Moreover in order to effectively improve the level of organisational reliability, attention given to formal design is a possible way out. In order to do so, on should focus on design once a good deal of time has been spent studying the way actors do (or do not) violate rules and procedures during normal operations. In addition, attention given to organisational design must intervene before it is frozen by the choice of a specific technology.

Some social scientists recently confessed that they were tired of 'fire-fighter type' of interventions inside dis-functioning organisations, whose coupling between technology and organisation is already locked up, yet discovered to be inadequate. They would rather comment on the liabilities of choices and suggest modifications or alternatives before everything is decided with no possible return (La Porte & Keller, 1995).

The study of normal operations: a promising avenue

A classic opposition

In practice, the now classic opposition between normal accident theory and high reliability theory which has been very stimulating in the field may also have delayed much needed efforts towards the understanding of such high-risks systems under normal conditions (Rijpma, 1997; Hopkins, 1999).

As we know, for Perrow, systems like nuclear power plants, chemical plants are structurally designed to fail: the interaction between technology and division of work is hopeless in the long run. His sociology of accidents has greatly influenced the field: efforts to understand why these systems fail so rarely were considered useless since the question to ask was not why do they fail so rarely but why will they fail inevitably?

This critic is however not valid for high reliability theory, which concentrates its efforts of the normal operations of high-hazard organisations, such as air traffic control, nuclear power plant operations, Navy nuclear aircraft carrier (La Porte, Roberts, Rochlin, 1987; La Porte & Consolini, 1991; Rochlin, 1988). Yet, by identifying a given set of distinctive criteria for an organisation to be eligible as 'high reliability organisation', like a member of a selective club, scholars of the HRO group are falling under the reproach of normativism (Sagan, 1993; Bourrier, 1996)?

We believe that a more 'casual' view on high-risk organisations may contribute to the permeability of research questions into management's spheres, thus helping bridging research and practice.

High-risk organisations as 'normal organisations'

First of all, it seems more and more difficult to admit that an a-incidental workday does exist. We have briefly described why concentrating only on accidents or near accidents was not as rewarding as one would think. This calls for a methodology capable of such minute description of the way members of an organisation are changing, little by little, their world's visions, their mutual cognitive maps, confronted constantly with new, pressing, unusual situations. In Weick's wording, how do they 'make sense' of things that happen to them:

> 'In real-world practice, problems do not present themselves to the practitioners as givens. They must be constructed from the materials of problematic situations that are puzzling, troubling, and uncertain. In order to convert a problematic situation to a problem, a practitioner must do a certain kind of work. He must make sense of an uncertain situation that initially make no sense.' (Weick, 1995: 9)

One should adopt a broader perspective if one wants to embrace and apprehend organisational patterns in their systemic nature. This is the reason why it is of crucial importance to keep a constant bridge between micro and macro developments. This does not mean that this distinction should be carefully enforced. On the contrary, as much as there is a need to think the continuum of organisational behaviours' modes, there is also a need to depart from the classic distinction between macro and micro levels of analysis. In micro-developments, one can envision macro influences and vice versa.. For example the ability for maintainers to comply or to violate the procedures is not only linked to the very design of such procedures (as too many human factors specialists would like to believe), it is also linked to the possibility for their users to actually modify them officially at no cost in terms of delay on the job. This very possibility

in turn is influenced by the design of responsibilities in the organisation. Who is responsible for modifying procedures when they are not applicable? The users themselves or another group in the organisation? Is this group easy to contact and easy to work with or difficult to get in touch with? The very action of violating or complying is highly linked to the answers given to these questions (Bourrier, 1999).

We believe that the multiple requirements of such a methodology are able to fulfil many pending research questions, which are in urgent need of more fieldwork. This perspective is not new in social science. There are strong traditions of fieldwork in many countries. Yet, it seems that the issues of risks and crisis have too often called for specific analytical tools. In fact, it is our belief that high risk organisations should not be studied differently than any other organisations. They display as much power struggles, compartmentalisation, bureaucratisation and vicious circles as any others.

Finally, this perspective may also answer many practitioners' needs, confronted with times of uncertainty. The need is especially strong regarding the study of organisational factors and their impact on safety. It will also probably give more substance to concepts like latent failure conditions (Reason, 1990) or management wrongdoing (Vaughan, 1999), which in turn might find strong opposition from management spheres. It is time to realise that a bad organisational design and a bad division of tasks and responsibilities can be as fatal in the long run as a broken pipe. This does surely not imply that a 'good' organisational design exists. It only says that the externalities of any organisational design should be acknowledged and shared all the way through the organisation and its environment.

We believe it is the price to pay for more informed decisions regarding highly critical industries throughout the world.

Note

1. As amended by the regulation of July, 12th 1990, which governs contracting practices and the hiring of licit labour (sous traitance et prêt de main d'oeuvre licite), article L. 125-2 of the French labour code stipulates that contractors have to be directly supervised by their own foremen and not by EDFs.

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