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Is expertise dangerous? A response to René Amalberti

In a previous *Industrial Safety Opinion Piece* (2021-03), René Amalberti argues that there could be a causal link between expertise, autonomy, risk-taking and accidents. In response, Jean Pariès puts forward a different point of view. In addition to challenging the causal link between expertise and accidents, and asserting the benefits of expertise for safety, he proposes that we can integrate super experts into organizations by using their meta-competencies and by relying on the workforce.

René Amalberti's latest *Opinion Piece*, entitled *Professionals, experts and super experts: an insight into rule-based safety and managed-based safety*, is a rich source of information, and gives a hint of the focus of the Foncsi's forthcoming strategic analysis. This initiative, which will be launched in June 2021, will study the link between rule-based safety and managed-based safety. And I cannot wait to begin the debate.

In this *Opinion Piece*, I focus on the question of expertise. First, I will take another look at the levels of expertise described by René Amalberti. Then, I will discuss and analyze the link he establishes between expertise and risk, and examine the conclusions he draws, in terms of the organizational management of expertise. In a future Opinion Piece, I will come back to the distinction between rule-based safety and managed-based safety.

The ongoing search for qualified, experienced, and well-trained operators…

Many companies have put in place a competency framework to manage their resources and ensure that their activities are efficient, reliable and safe. Competencies encompass the ability to use knowledge, know-how and skills in a given situation. They can be assessed by tests that lead to diplomas, qualifications and authorizations. A related concept, expertise, can also be the subject of organizational management. Expertise assumes that a person has certain competencies, but goes further, to include a wide breadth and depth of experience.

"Expertise assumes that a person has certain competencies, but goes further, to include a wide breadth and depth of experience."

René Amalberti refers to this notion of expertise. He distinguishes three levels: the 'professional', the 'super professional' (who I will call the 'expert'), and the 'super expert'. While it is clear that this categorization is an over-simplification compared to the complex gradations that are found in the industry, it has the merit of being generic and of making it possible to reflect on the relationship between expertise and risk. René Amalberti also refers to 'self-declared experts' or 'cowboys'. But, as he himself says, this somewhat pathological behavior exists at all of the other three levels.

Expertise: Warning! Danger ahead?

Fundamentally, René Amalberti tells those who are responsible for recruiting, building and maintaining competencies (notably those related to safety): be careful, capitalizing on experience and learning generates expertise. Clearly, this includes competencies, but it also extends to the special relationship that each

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profession has to risk, to the rules, to the hierarchy, and to colleagues. However, increased expertise goes hand-in-hand with a parallel increase in independence with respect to the rules, and greater risk taking. This trend is psychological, and while it is concomitant with the construction of expertise, it allows some 'cowboys' to go off the rails. The management of expertise is an ever-present challenge in the industry, because it shifts the balance between rule-based and managed-based safety: it drives greater deviation from the rules, and associated accidents. It must, therefore, be closely monitored by the organization.

René Amalberti expands on this process, and applies it to his three levels of expertise. At the level of 'professionals', "*the vast majority of operators continue to follow the rules*" and the balance between rule-based and managed safety is not threatened. At the next level, 'experts' are valued for their experience, but sometimes "*they can be a little unpredictable*". Most of the time, they follow the rules, but they can also generate their own, unofficial versions. Like off-piste skiers, they can sometimes deviate a little too far. Their over-reliance on their own expertise means that they can become trapped in a series of cognitive biases, and end up being more accident-prone than their less-expert colleagues. Finally, 'super experts' are the most problematic group. Their managers worry about their uncontrollable behavior and dangerous level of independence. In the industry, they should not be employed as trainers or managers, and their expertise should be confined to specialized departments, where they can be asked to intervene in exceptional situations.

To be honest, I do not share this model of systematic drift. It is true that we have all come across cowboys, but the fact that they exist makes an exception, not a rule. Instead, I would argue that, although the three underlying assumptions (*experts are less inclined to follow the rules; deviations increase risks; experts have more accidents*) appear to be common sense and reflect the experience of managers, they are so approximate that they are inaccurate. Let's look at each one in turn.

About 'depth' and 'interpretation'

"The organization expects them to have a greater level of autonomy."

First of all, it cannot be said that "*the vast majority [of professionals] continue to follow the rules*". This is the largest group, and all studies show that it is responsible for the vast majority of deviations. For example, in the domain of aviation, the LOSA (*Line Operation Safety A*udit) demonstrates, unsurprisingly, that every flight can be associated with a deviation from procedures, and that 'violations' (conscious and known deviations) constitute the majority (54%) of these anomalies. As for 'experts' and 'super experts' – unless there is documentary evidence to the contrary that I have overlooked – I think that the extent of their compliance is comparable, or even better than that of professionals (not excluding the cowboys who make up the tail end of the distribution). On the other hand, in general, a much smaller proportion of their work is prescribed as they have greater operational responsibility, and their tasks are more difficult to specify. And it is exactly because of this that the organization expects them to have a greater level of autonomy: i.e. less need for supervision, a deeper understanding of the fundamentals, and a richer operational mental model that allows them to 'interpret' the rules from a more in-depth, insightful perspective. Here, I deliberately use the word 'interpret' and not 'deviate', and 'depth' rather than 'breadth'. This is because I am thinking of 'interpret' in the sense of interpreting a musical score: the interpretation is a variant that makes sense. It is because the expert is, first and foremost, willing and able to play the music as it is written in the score, without making any mistakes, that he or she can introduce variations that express their own perception of the meaning in a given context. By preventing musicians expressing their creativity will we avoid them playing wrong notes? At a minimum, we should clearly distinguish between the two.

I think that there is far more room for progress if we design rules and procedures that are tailored to the person's level of expertise, and are consistent with the degree of independence that the organization genuinely – rather than claims to – expect from its experts. In particular, by adopting an appropriate level of granularity and the right level of abstraction in the means-ends hierarchy.

Useful deviations with no significant impact on safety

Although commonly understood as a 'fact', the idea that operator violations generate risk is often more a matter of projected beliefs than objective findings. In the domain of safety, Taylorism finds its way in through the back door. In the LOSA report referred to above, only 2% of voluntary deviations were deemed to pose a risk to flight safety, compared with 69% of errors related to knowledge – therefore, linked to a lack of expertise. These results invalidate the thesis that 'deviations' go hand-in-hand with additional risks. On the contrary, they show that when expertise is consistent with the task, and there is a strong safety culture, risk that is associated with intentional, useful modifications to the workflow is kept under control. The 'good' violinist does not make more mistakes when he or she increases the vibrato. Risk is, above all, due to a lack of expertise.

"When expertise is consistent with the task, and there is a strong safety culture, risk that is associated with intentional, useful modifications to the workflow is kept under control."

Where can we find comparable, observational data on the proportion of voluntary and routine deviations (not associated with accidents) that are considered to pose a risk to safety, in areas other than aviation? If we cannot find any, then we are simply making an assertion! Going further, I suggest that we measure and monitor these numbers, as they are a very good indicator of whether the balance between initiative-based and compliance-based safety is set correctly.

In practice, the current representation of a causal link between safety violations and risk is rather binary. On the one hand, we have the cowboys, of whom René Amalberti says that "*most will perpetrate incidents and accidents*"; on the other, we have generalized and 'normalized' deviance, popularized by Diane Vaughan as the root cause of the Challenger shuttle accident. I do not, in any way, seek to deny the existence of these two phenomena, but I am wary of their explanatory value with respect to accidents. Over the past century, proponents of the popular '*accident proneness theory*' have devoted a great deal of research to identifying accident-prone psychological profiles. Why were some employees involved in two or three accidents during their careers, while the vast majority were involved in none at all? Such studies were more or less abandoned after it became apparent that the 'discovered' profile changed with almost every study and, above all, that there was probably nothing to explain: the individual accident frequency distribution was mostly consistent with a Poisson (i.e., a purely random) distribution. Because, contrary to what you might think, chance is not egalitarian…

What is the role of the 'normalization of deviance' in all this?

Turning to Challenger, and the normalization of deviance, we now know that the decision to launch well outside the predefined minimum temperature limits for booster O-rings had almost nothing to do with a drift in practices and technical decision-making processes. The decision was taken against the advice of experts, it was taken by NASA's senior executives who were concerned about their image and faltering budgetary support from Congress. We could say that, in this case, cowboys did indeed play a part, but at another level… The normalization of deviance does exist at NASA, as elsewhere, and always will, because it reflects mechanisms that are in place to adapt practices to system change, and lessons learned from past experience. A lot of time passes before any formal changes are made to standards, during which time their practical interpretation changes, just as jurisprudence modulates the court's interpretation of legislation. The idea that finding a deviation – especially a 'normalized' one could, in itself, be the 'cause' of an accident is very naïve, and typically reflects a retrospection bias.

Beginners, lack of experience and risk

I am unaware of a study that would allow us to assert that experts or super experts do have, *de facto*, more accidents, especially if the context remains the same. Where there are any, statistics do not show that the actual accident frequency increases with the experience and expertise of operators. On the contrary, several studies in different professions (aviation, medicine, etc.) have shown that there is a high level of extra-risk in the first year of practice following qualification. René Amalberti himself produced a diagram illustrating this peak at between 100 and 500 hours of flight time, once a pilot is qualified on a particular aircraft. His remarkable explanation highlighted the complex mechanisms of initial adjustment and the empirical stabilization of confidence. These considerations led, in the 1994 report that followed the technical investigation into the Mont Sainte-Odile accident, to a recommendation to ban the pairing of two 'young' pilots on an aircraft. This recommendation is now included in the European EASA regulations. I do not know of any equivalent regulation that bans the pairing of "overly-expert" pilots. On the contrary, throughout the world, flight safety reveres experience. In practice, the most frequent risk-experience graph probably resembles the classic bathtub curve; the rise at the end of a professional career can be better-explained by outdated skills, rather than overconfidence linked to expertise.

"Several studies in different professions […] have shown that there is a high level of extra-risk in the first year of practice following qualification."

Experts have accidents too

The comparison with off-piste skiing teaches us that experts also have accidents. But, as they are more likely (or simply the only ones) to practice off-piste skiing, we have the impression that these accidents are due to their expertise. This reminds me of a discussion I had with French road safety experts. They said, "*You mustn't teach people how to handle their vehicle! Learning to drive on a race circuit is bad for safety! It encourages people to drive faster because they think they know how to do it. Not to mention the fact that statistically, rally drivers have more traffic accidents than the average driver*". But could it be the case that, before becoming 'experts', these rally drivers already had a different relationship to risk? For certain professions that require handling dynamic systems, there is a clear link between risk appetite and expertise. It is easier to develop expertise by 'liking' risk, provided you can survive it. And you accept more risk when being an expert, because you think – most often correctly – that you can manage it. But when we artificially cut such a circular relationship, we create an illusion of causality: it is expertise that leads to risk-taking.

"There is a clear link between risk appetite and expertise."

In reality (but this is basically what René Amalberti says) expertise includes meta-competences: the representation that experts have of their skills, their level of confidence, their ability to assess the internal and external risk linked to a given situation, their capacity to evaluate the situation. I see no reason why this should be systematically consistent with a drift towards over-confidence. On the contrary, I would argue that a real expert is able to be very lucid.

How should the organization manage expertise?

The arguments I outline above do not mean that expertise is not without its problems. It can be insufficient, inadequate, poorly or under-used, or associated with undesirable personal qualities. I therefore wholly agree with René Amalberti on one point: expertise requires good management and an organizational framework. This form of management already exists in all professions where there are dynamic, high-risk systems: airline pilots, train drivers, nuclear power plant operators, etc. It goes beyond programs to maintain technical skills, and covers the meta-competences mentioned above.

In these professions, there are training programs dedicated to managing the workforce as a resource. They go by various names (CRM, TRM, PACTE, etc.), and aim to calibrate risk models, confidence levels, and the safety culture of operators. Moreover, beyond these educational measures, high-safety organizations rely on the team itself (through briefings, debriefings, cross-checks, mutual monitoring, etc.) to calibrate, in real time, individual risk-taking and potentially risky deviations.

"High-safety organizations rely on the team itself […] to calibrate, in real time, individual risk-taking and potentially risky deviations."

Returning to aviation, more and more airlines are going further, and implementing *poor performer* programs to address weaknesses in expertise. These programs are intended for members of staff whose technical skills are no longer up-to-date, people with atypical personalities and specific psychological profiles, and people with addictions. Following the crash of Germanwings flight 4U9525 on March 24, 2015, caused by a suicidal co-pilot, these programs are now being extended to psychiatric conditions.

I believe that the deepening and widening of such practices could be a better way forward than organizational distrust of experts and super experts, which is translated into their exclusion from managerial or training roles.

In conclusion

Once again, René Amalberti asks some excellent questions: What is the link between expertise and operator autonomy? Between autonomy and safety? What is the role of expertise in risk management? His own answer is controversial, but these questions bring new life to the issue of the interaction between rules and sense-making in safety strategies and associated decisions, from the bottom to the top of the hierarchy. These difficult questions are fundamental to risk management and there is no consensus on the answers, either among the scientific community or in the field. They must, therefore, be the subject of an in-depth exploration, even if this means exaggerating any differences to clarify the argument, and collecting substantial amounts of data. I cannot wait for next June, when the Strategic Analysis Group begins its work.

FOR MORE INFORMATION:

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- Ladislaus Bortkiewicz's study on the distribution of horse-riding accidents in the cavalry: https://en.wikipedia.org/wiki/Ladislaus_Bortkiewicz
- And two remarkable Netflix series: "Chernobyl" and "Challenger: The Final Flight"

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