# ARE BEST PRACTICES REALLY BEST PRACTICE?

*X. QUAYZIN**

**Invensys Rail, PO Box 79, Pew Hill, Chippenham, SN15 1JD, United Kingdom, xavier.quayzin@invensysrail.com*

**Keywords:** Best practice, code of practice, safety, limitations, innovation.

## Abstract

In the safety critical industry, best practices are often used as a justification to assure that a risk is properly managed. The reliance on best practices seems to have become a best practice in itself. However, best practices present limitations that could lead to a more hazardous situation than initially thought. This paper identifies five limitations of best practices and reflects on their consequences on safety management. Before concluding that best practices are a sound starting point for any safety analysis one should always challenge their applicability and relevance in this particular situation and not hesitate to challenge them in order to continue to innovate.

## 1 Introduction

The Common Safety Method (CSM) [3] is a new European legislation which is applicable to the railway industry. This regulation differs from the other railway regulation (EN 50126 [4], EN 50128 [5], EN 50129 [6], and IEC 61508 [2]) in the fact that the CSM relies heavily on the use of codes of practices while the other regulations didn't mention them. Codes of practices are recognised and codified best practices. This paper assesses five limitations of best practices which are standardisation, bounded rationality, limited validity, limited life, and hindrance to innovation. Then, it discusses the impact of these limitations on a safety management system.

It concludes that best practices or code of practices present serious limitations which should lead to everyone challenging their use before using them and should not be an excuse not to innovate and finding better practices.

## 2 First limitation: standardisation

Despite the fact that many standards refer to best practices, it is difficult to find an agreed definition of best practice. Best practice could be defined as one right and best way of doing something. It is something that has worked in the past and by reproducing it, we think that we can achieve the same outcomes. It is defined in Oxford dictionary as "*commercial or professional procedures that are accepted or prescribed as being correct or most effective*". Practices that achieve a good outcome but not necessarily the best or best practices used outside their normal use can be regarded as good practices or reasonable practices. Thus, the best of the good practices can be considered to be the best practice. As a consequence, limitation of good practices should extend to best practices. Another notion use widely in standards and regulation is code of practice. Code of practice is defined in the Oxford dictionary as "a set of standards that members of a particular profession agree to follow in their work", in the Yellow book [11] as "a statement of best practice whose use is not mandated by the issuing authority". The CSM [3] defines code of practice by referring to widely acknowledge, relevant and publicly available practice. As we can see, best practice and code of practice have some strong commonality, and the content of this paper can be considered to be applicable to both.

Relying on best practice leads to a standardised approach. However standardisation and re-use is only possible when the situation is identical. For example, figure 1 from the Yellow Book [11] illustrates this for good practices. It describes the different approaches to risk decisions with technology based defined as "*decisions for risks that are well understood, uncontroversial and with low severity of consequences*" and values based defined as "*decisions where there is significant novelty, public concern or potential for catastrophic consequences*".

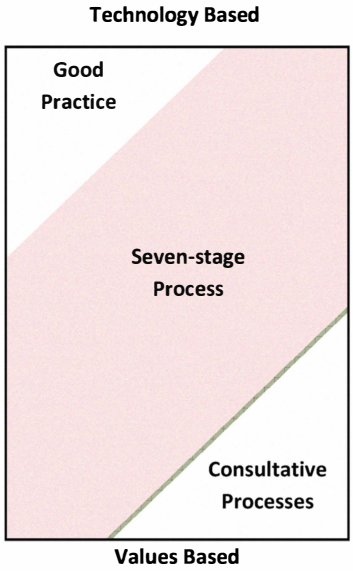


Figure 1: Approaches to different risk decisions (from Yellow Book [11] Vol. 2 p 88 fig. 8-4)

This shows that good practices, and by extension best practices, are only applicable if the systems to which they are applied are completely identical or that the differences are not relevant and that they can't be used for novel applications. As we will see with the next limitation, when an individual applies something that he/she considers standard, he/she won't challenge it and will apply it blindly, not realising the impact of the variation in the systems and their potential impact on safety.

## 3 Second limitation: bounded rationality

Our basic instinct is to learn and repeat behaviour that helps survival and we are therefore comforted to stay in what we know works. Bounded rationality can mislead us to a false sense of safety when using best practices. This is often due to the fact that the environment, system conditions but also the culture and regulatory systems are not always clearly defined in best practices.

A distorted perception of risk can be seen as negative but also could be seen as a positive outcome of a situation. For example, would you prefer to receive 28p a day or £100 per year? Most people will prefer to receive the £100 [8] despite the fact it is exactly the same. Gardner explains these distortions with 3 rules [7] based on the work of Kahneman and Tversky on bounded rationality:

1- The anchoring rule or anchoring and adjustment heuristic. When we make a guess, our instinct will be to start with the latest information heard and adjust from there. However the adjustment is often insufficient and people tend to provide an answer biased toward the initial value;

2- The rule of typical things or representative heuristic. We make intuitive judgement based on what we perceive is typical. For example: It always rains in Britain, so what is the likelihood of rain tomorrow in Britain? Very high. Kahneman and Tversky said that this rule *"generally favors outcomes that make good stories or good hypotheses"* ([8], p52);

3- The example rule or availability heuristic. The easier it is to recall something, the more likely it must be. This rule is very important in understanding our perception of risk. For example, we remember plane accidents more easily than car accidents as they have a high number of deaths and huge media coverage.

As a result when faced with a new problem, we will have a tendency to try to apply a practice that we know delivered a positive outcome previously without necessarily realising it. Bounded rationality biases our decision making and leads us to reply in the same way again. Thus, we are naturally inclined to use best practices without a critical view which in safety could lead to an increase of the level of risk.

## 4 Third limitation: limited validity

Best practices are derived from a limited number of case studies or from the experience of a number of operators. The process of defining a best practice can be linked to comparative research based on inductive analysis of case studies. However in academic research, it is commonly accepted that the conclusion and models identified by comparative research based on inductive analysis of case studies have limited validity and should not be used to develop general rules [1].

To reinforce this point, the statistical validity of best practices is rarely assessed. If you want to demonstrate a failure rate of a system of 10e-8 per hour with a confidence level using the traditional manner in which confidence levels are calculated using the chi-square distribution, as expressed in equation 1 [10] where the numerator is a value taken from a chi-square table with "CL" being the confidence level and "r" the number of failures, and "t" is the number of system hours.

$$\lambda = \chi^2(1 - CL, 2r + 2) / 2t \qquad (1)$$

Table 1 provides the number of hours (and years) required without a fault and with one unit to demonstrate a failure rate of 10e-8 per hour. Assuming that you have a large number of similar systems operating, you might be able to demonstrate this level in the life time of the system. In addition before concluding that the practice can be categorised as best practice, you should also conduct a sensitivity analysis to demonstrate that the practice you are identifying is the main influencing factor on the result (highest correlation). Thus, the argument "we've done it like that for the last 40 years and never had a problem" may be sufficient to demonstrate that the probability of an accident is extremely low if hundreds of similar systems are in service but it is not sufficient to demonstrate that this level of safety is correlated to the "way things are done" and that it doesn't exist in another way which could lead to a lower risk.

| *Confidence level (CL)* | *Nb of hours (t)* | *Nb of years* |
|---|---|---|
| 50% | 69,314,719 | 7,913 |
| 90% | 230,258,509 | 26,285 |
| 95% | 299,573,227 | 34,198 |
| 99% | 460,517,019 | 52,570 |

Table 1: Number of hours and years required without a fault and with one unit to demonstrate a failure of 10E-8 /h

## 5 Fourth Limitation: limited life

Directly linked to the third limitation, a best practice is a best practice as long as we haven't found a better one.

A best practice can reach the end of its lifespan and be replaced by a better practice as a result of two predominant

factors. Firstly, when sufficient empirical data is captured to demonstrate that in fact the best practice doesn't really achieve the best possible outcome. For example, drink driving wasn't an issue a few decades ago and was even encouraged in some advertisements from the 1930's (see figure 2).

Secondly, when a new technology emerges, the way of doing things is automatically challenged. For example, the progress made in Computer Aided Design has allowed architects and engineers to design buildings with completely new shapes that were not even thinkable a few decades ago. Thus, time and progress in our environment creates opportunities to define new ways of doing things which challenges existing best practices. Relying on best practices is by default limiting ourselves to the way of the past and might stop us from following better practice.


Figure 2: Advertisement from October 1935 in L'Illustation newspaper [English translation: "Never hit the road after a good meal without a glass of Cointreau liqueur"]

## 6 Fifth Limitation: hindrance to innovation

As explained in the previous limitations, best practices encourage us to do more of the same and by doing so, promote a kind of status quo. Therefore, reliance on best practices can hinder innovation. This is a concern as innovation is essential to improve risk management and to improve further the level of risk, but also, to make our industry competitive [9].

As explained previously, best practices are the standardisation and codification of thoughts that worked in the past and practices that we want to reproduce systematically. Innovation is the opposite, it is finding new ways, recognising that things will change in the future and that better ways will emerge. Best practices look at the past while innovation is preoccupied by the future. It is therefore apparent that over reliance on best practices, hinders innovation. Recently, the McNulty report [9] made this point very clear. It identifies that "*standards were often used as an excuse for not thinking "outside the box";*" (p 180), *"... standards undermines innovation*;" (p 187). In standards, the report includes best practices.

In addition, a consensus between a number of stakeholders is required to guarantee the validity of a best practice. But consensus also means negotiations and compromises which in turn mean that the best practice ends up as being acceptable, and not necessarily "the best". In the past, this kind of common agreement leads industries to their death as they were agreeing on what they thought was the best way of going forward but not recognising that a technology leap had taken place at the same time and it was necessary to change.

This is not to say that best practices are not useful. Quite the opposite in fact as best practices are essential in the innovation process in mapping the current knowledge and to avoid reinventing the wheel. However, they are the foundation for innovation and by challenging them and trying to do things completely differently innovative ways can be found.

## 7 Discussion

As noted in the introduction, standards such as the EN 50126 [4], EN 50128 [5], EN 50129 [6], and IEC 61508 [2] don't mention code of practices or best practices. Others like the CSM [3] or Yellow book [11] use this notion. However in different ways as the Yellow Book clearly states some of the limitations of the use of best practices while the CSM is much vaguer on that topic. It also seems that the notion of best practice / code of practice are very qualitative notions without a commonly agreed definition. More importantly, it wasn't possible to identify a standard or guideline on how to recognise a practice as best practice. It seems that anyone who can demonstrate qualitatively that a practice was used successively in number of cases and finds a few experts to agree with them can elevate the practice as best practice. This leads anyone that uses the best practice to believe that the risk is low (2nd limitation) despite the limited statistical value of best practice (3rd limitation).

Due to the 4th limitation, this best practice will become obsolete. This could be that an accident has shown the limitation of the practice or possibly that a new practice has emerged. The problem is: how do you know that what was once considered to be a best practice is no longer the case? If the best practice has been challenged as a result of an accident, it becomes common knowledge. But if not, it is only through publications and conferences that you hear about it. However, due to the concerns expressed on how a practice can be defined as best practice (4th limitation in particular), the same can apply to "new" best practice but also to the reason why the best practice is no longer one. Thus, you might think that if a practice is published in a standard, it is safe to consider it as a valid best practice. But, if you consider that it can take more than a year to update a standard [9], the best practice could be out of date by the time it is published.

The weak definition of how we identify a best practice, but also of how we identify and communicate that it is no longer

a best practice are serious issues that should be addressed. Especially as some standards, such as the CSM [3], call for applying code of practices, which as we have explained earlier are often assimilated with best practices, to demonstrate the safety of a system. In addition, this combined with the pressure for cost reduction across all industries encourages the use of best practices as standardisation is seen as a way of reducing the burden of the acceptance / safety cost. However, innovation is a much more efficient way of reducing cost in the long term in a changing environment but also a bit of blue water can give a competitive edge in a mature industry. It is why it is important to continue to innovate and to challenge best practices.

This is not all negative as best practices that are used carefully in a balanced way can deliver cost savings and streamline the acceptance process. But to achieve that we need to get better at the way in which we use best practices. In a way, the way in which we define and use best practices should be more codified than the practices themselves. This would help people to think about what they are doing, challenging the existing way, and hopefully unlocking innovation.

## 8 Conclusion

Best practices present significant limitations which are standardisation, bounded rationality, limited validity, limited life, and hindrance to innovation. However, best practices are a sound starting point for any safety analysis but one should always challenge their applicability and relevance to the particular situation and the fact that they really are the best should always be justified.

Best practices should be viewed as mapping the current mind set, what we have learnt from the past. They are the foundation for innovation and by challenging them and trying to do things completely differently we can find innovative ways of doing things.

Finally, this paper leaves two key questions open for further investigation: how do you define that a practice is a best practice?, and how do you know that a best practice is no longer the best practice?

Thus, are best practices really best practice? If we are aware of the limitations of best practices and become more efficient and open minded in our approach to define and use these best practices. It is possible to say that relying on best practices or code of practice can become a best practice.

## Acknowledgements

The views expressed in this paper should be understood as the personal opinions of the author, and should not be taken as those of Invensys Rail.

## References

[1] A. Bryman, E., Bell, *Business research methods*, 2nd edition, Oxford: Oxford university press (2007)

[2] BS IEC 61508, *Functional Safety of electrical/electronic/programmable electronic safety related Systems*.

[3] Commission Regulation (EC) No 352/2009 of 24 April 2009 on the *adoption of a common safety method on risk evaluation and assessmen*t as referred to in Article 6(3)(a) of Directive 2004/49/EC of the European Parliament and of the Council.

[4] EN 50126:1999, *Railway applications. The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS). Basic requirements and generic process.*

[5] EN 50128:2001, *Railway application. Communications, signalling and processing systems. Software for railway control and protection systems*.

[6] EN 50129:2003, *Railway applications. Communication, signalling and processing systems. Safety related electronic systems for signalling.*

[7] D. Gardner, *Risk*, London: Virgin Books (2009)

[8] P. Lunn, *Basic Instincts, Human Nature and the New Economics*, London: Marshall Cavendish (2008).

[9] McNulty report, *Realising the Potential of GB Rail - Final Independent Report of the Rail Value for Money Study - Detailed Report – Vol 2* (2011).

[10] RIAC, *Reliability Modelling - The RIAC guide to Reliability Prediction, Assessment and Estimation* (2010).

[11] RSSB: ISBN: 978-0-9551435-2-6, *Engineering Safety Management: Fundamentals and Guidance* (The Yellow Book) Issue 4.