HOW TO POPULARIZE BOW-TIE RISK ANALYSES WITHIN THE SNCF GROUP

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1. BACKGROUND

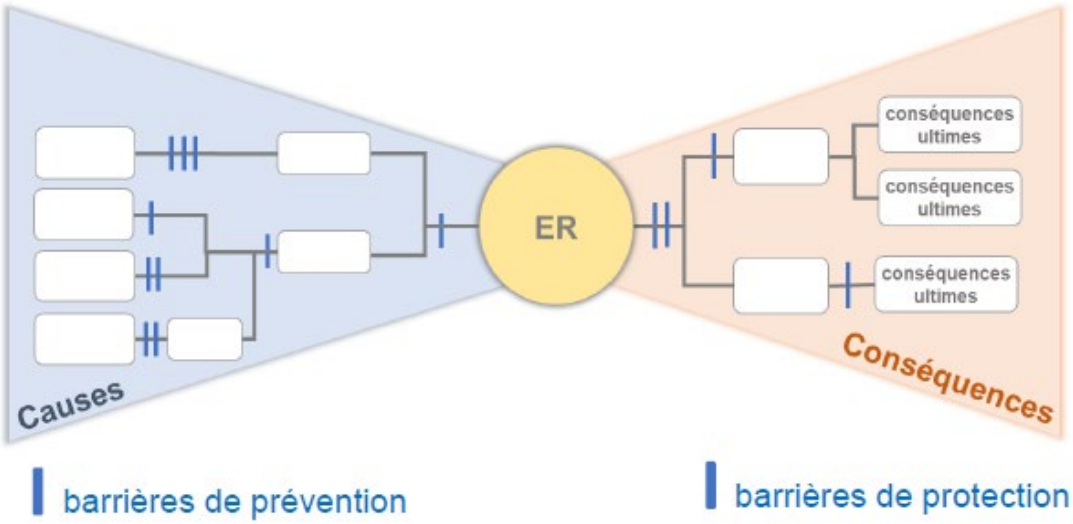
In 2016, SNCF launched a major safety program called PRISME (which stands for Proactivity, Risks, Interfaces, Simplification, Management & Equipment) to improve its overall safety performance.
As a baseline of this program, the company decided to improve its management of risk, introducing the "bowtie" methodology, in order to add a proactive approach to its reactive approach.

2. OBJECTIVE

The intention of this present paper is to present how SNCF Group managed to introduce and popularize Bowtie risk analyses within its organization. The different steps of the Bowtie project will be described and explained.

3. THE BOWTIE MODEL: CHOICE OF SNCF GROUP

Based on a visual scheme, the bowtie model can represent each of the major risks incurred by a company: the left side displays the possible root causes, in the centre the potential event (or top event), and on the right side the possible consequences. On each line connected to the centre, they may be barriers, either preventive (on the left) or protective (on the right).
For a given type of potential event, e.g. SPAD (Signal Passed At Danger), there is a theoretical bowtie model with all possible causes/consequences associated with the event.



The Bowtie model is a graphical model which:

- can be used for many purposes: safety event analysis, risk assessment, risk awareness training, audit preparation, etc…
- enables gathering and visual presentation of data from various incidents of a similar type;
- is already used by other railway companies and many other industries such as oil and gas, chemical sector, aviation, etc…

For these reasons, SNCF has decided to adopt this risk model for the Group.

4. AMBITION AND RESOURCES

SNCF started "from scratch" and aimed to introduce and develop the use of the bowtie method across their 140 000+ employees group. At the end of 2017, the Group Executive Committee decided to make it a part of the 4-year global "risk-based management" project.

In April 2018, a dedicated risk project team was born under the name of "Plateau risques". It gathered 20 people from various companies and divisions of the SNCF Group and other industries, into a multi-skilled team - to illustrate this, the project team leader came from civil aviation. The project budget was to be paid for by SNCF companies and divisions following a simple allocation key. The bowtie project was only one task of this team. It was also tasked to develop a new IT system at the group level, to collect safety incidents and associated root causes that were previously stored across many different databases depending on the company and the type of incident (eg operational incident vs technical component failure).

5. METHODS

5.1. "WHAT DO WE NEED ? "

The Risk Team decided to start the Project with an audit. It was performed at various levels of the organization, due to the conviction that safety involved all but a few actors within the group. The aim of the audit was to identify operational needs in terms of risk management, but also the needs of the top management.

After months of audit, 3 major needs were identified:

- help to develop operational **staff risk awareness**

- help people to perform **efficient safety event analyses**, especially by allowing them to share the same vision of a given type of event

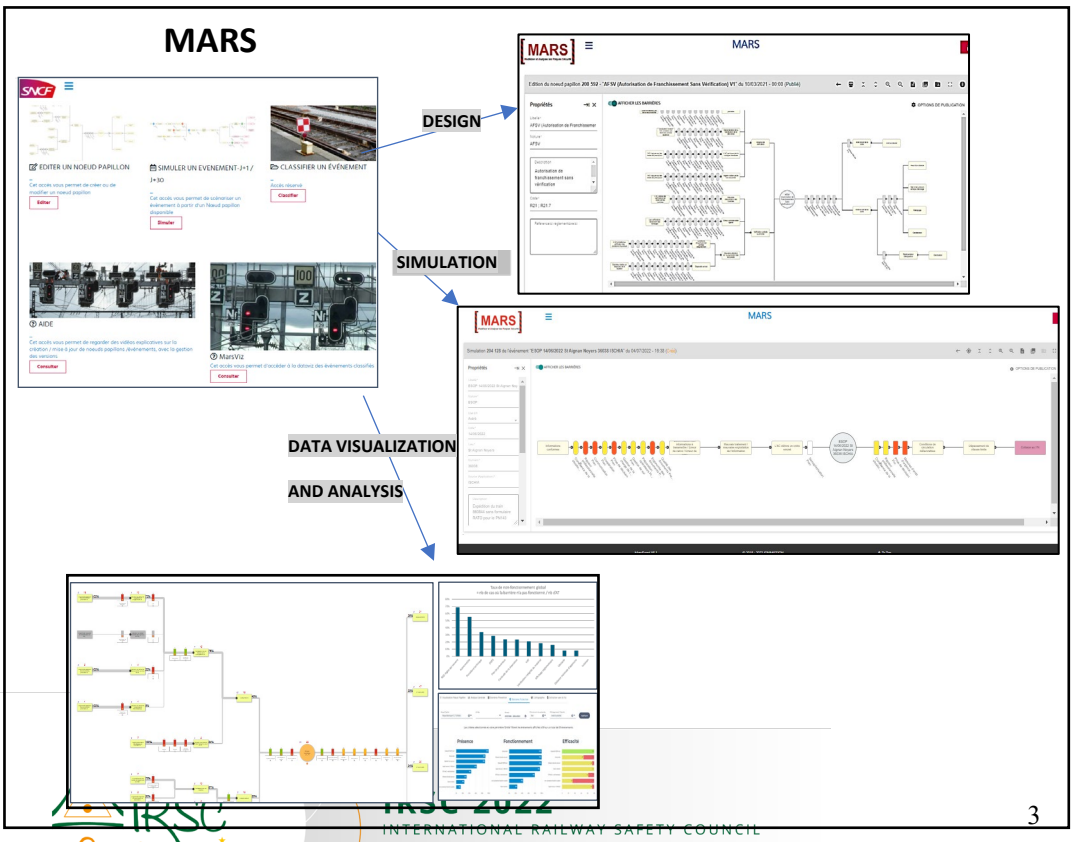
- build a **quantitative method** to prevent accidents and to manage risks, through a "proactive" process using the bowtie data.

5.2. A DEDICATED IT TOOL FOR BOWTIES: MARS

In terms of IT support for the bowtie method, the classical "make or buy" question was assessed. For various reasons, the SNCF Group decided to build its own IT tool called MARS (for "Modélisation et Analyse des Risques Sécurité": Safety Risks Modelling and Analysis).

At the end of 2018, the first component ("MARS Event") was built. It was created to design bowties but also help analyse safety events and create event scenarios.

In a second phase, MARS was upgraded for data visualization and analysis ("MARS Viz")..



5.3. BUILDING A "BOWTIE LIBRARY"

The project team decided to build a common collection of bowtie schemes, to be used by various companies and divisions within the SNCF group. To build this library, they had to identify the major risks. It had been decided in 2016 at a group level that occupational health and safety had to be given the same priority as railway operations safety. Thus, the library was to include bowtie models for both families of risks.

To start with, the project team proposed a list of risks, many of which were common to various SNCF companies and branches. The list was prioritized by the companies and the work could begin.

For each risk (eg SPAD, or electrical shock), the project team gathered ad hoc expert groups and organized their work to have the risk description created, tested, approved and implemented in MARS.

Today, the SNCF Group owns a library of 28 bowtie schemes (7 health and safety risks, 21 railway operations safety risks).

5.4.CHANGE MANAGEMENT

Introducing a new IT system always needs appropriate change management attention, but popularizing bowtie analyses was an especially complicated challenge.

Group-wide, People had to be convinced by the new risk-based safety approach, and of the value in them inputing data into a new software system,.

The size and complexity of the SNCF Group was obviously a problem, with several large companies – deeply reconfigured by a structural reform in January 2020 -, different levels of safety culture and very different traditions whether you are a driver, a signaller, a rolling stock or track maintenance operator…

A first critical factor was to build the right structure of committees, at different levels of the SNCF Group, to allow and make decisions all along the Risk Project. It was also a means to manage the change with the safety top and middle management of the group.

A second critical factor was obtained through the composition of the project team, gathering qualified people from all companies and divisions of the group, and through the multiple inter-company expert groups.

Those two elements helped to create a network of involved people which proved essential to progress together, learn from each other, and finally drive the change. Most of work was discussed, elaborated, **tested** with the different companies and business units of the group, and at different levels of the organisation. This allowed the Project Team to lead the project in a really collaborative way.

5.5 THE KEY SUCCESS FACTORS IN CHANGE MANAGEMENT

A kick off meeting explained the road map of the project and the target.

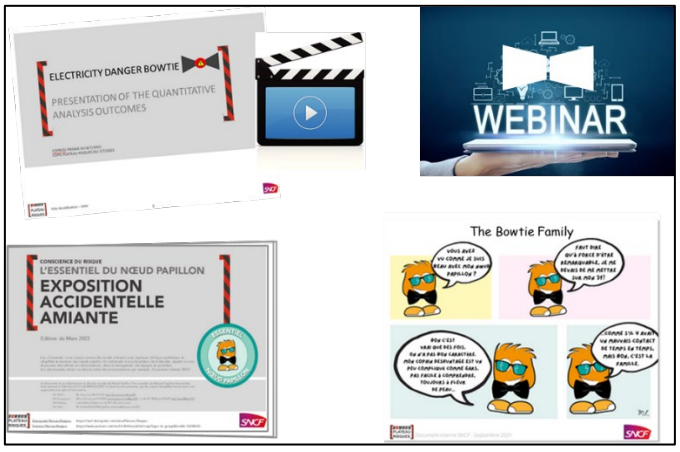
Training (methods and tools) was also a challenge in itself because of the different "use cases" and consequently "target" people for training envisaged by the different companies and divisions. Hence it was decided that the Project Team would train **trainers** from the companies, who were in turn to bring their new skills to end users within their companies.

The method first served for the use of bowties in event analysis. It was also used for development of risk awareness using the model. In September 2022 training begins to analyse bowtie's data, and to set up the safety proactive process.

Going forwards, recurrent training will be required in order to maintain the newly-acquired skills of the staff.

Internal communication. Alongside training, another critical element of the Bowtie Project was internal communication. A skilled communication expert joined the Risk Project Team in 2019. She has since then produced frequent mass communications, using internal media, booklets, movies, comics, and annual seminars. A Sharepoint site allows users to easily access this material.

Booklets were produced from 2020 to explain the whole project and for each new bowtie-scheme. They proved an efficient way to encourage and facilitate the use of the new bowtie-models.



6. RESULTS

From 2019, bowtie models began to be used for major incidents to represent causes and consequences, and to understand the efficiency of each barrier.
Using the same understanding – through the use of the same drawing - of an incident became essential to make different sectors of the group work together to improve safety. Today, more than 400 people used MARS software, for over 1000 simulations of event.

In 2020, SNCF started to issue and deliver booklets for the major types of potential incidents associated with a bowtie model. These were meant to encourage the use of the model and develop operational staff risk awareness. 21 such booklets are now available,

and have greatly helped to convince potential users of both the interest and feasibility of using bowties.

In 2021, the MARS software was further improved, and the first bowtie quantitative analysis were carried out by the Risk Team.

By 2022, SNCF companies training for proactive safety analysis using bowties is in progress.

A common project team, structured committees to prepare and take decisions, pragmatic training options, efficient internal communication with a simplified “pitch” and easy-to-use media such as booklets have been key to introduce and develop bowtie use in the SNCF Group. It is now used to study and present real incidents or near misses, to increase risk awareness among the operators and begins to allow proactive deductions on ways to improve safety.

7. CONCLUSION

Big challenge, large project, deep change of safety culture in the organization are some of the aspects of this introduction of bowties. Four main lessons could be:

- Sponsorship by the top management was essential, and allowed the allocation of money and human resources to the 4-year Risk Project Team.
- Beginning with the identification of the needs in staff was key to further meet those needs.
- Common work to build and test methods, and cooperative management proved efficient to deal with the large size of the SNCF group.
- Training and internal communication, with pragmatic solutions and products such as booklets made the acceptance of new methods smoother.

Keywords: Risk Management, Bowtie model, internal communication.