SAFETY PERFORMANCE INDICATORS SYSTEM (SPIS)
A METHODOLOGICAL FRAMEWORK FOR SAFETY INDICTORS CONCEPTION.

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Abstract

Managing high risk systems is closely tied to the ability of continuously reviewing the potential gap between managers' representations of their system's strengths and weaknesses with its actual state. This gap can result from both natural systemic evolutions and the very consequences of previous decisions adopted and implemented. The deployment of performance assessment and reviewing to overcome, or at least reduce, this gap becomes therefore a key step of every safety management policy.

Process Safety Indicators (PSI) are widely used to achieve performance assessment thanks to their synthetic and action oriented characters. However, they also bring simplifications and reduction of reality's complexity which may become misleading for decision makers. It is therefore of upmost importance to ensure these PSI conception or selection results from a rationalized and contextually grounded approach. This paper suggests a new methodology for conceiving/selecting context adapted PSI. It differs from existing approaches in the sense that it does not assume a predefined theoretical safety model; it rather invites organizations to explore their own vision of safety so to deduce out of it the adapted PSI. The way these indicators are used is also discussed by acknowledging the need to move from a posture where achieved performances are simply compared to predefined norms to a more investigative process where performances assessed are used as basis for discussion so to achieve collective learning and trigger required changes.

This paper is organized in four sections. After introducing the importance of performance assessment in safety management, the second section presents and discusses the set of funding hypotheses behind the methodological choices of the SPIS methodology. The thrd section will then be further detail the SPIS methodology before discussing in the last section the foreseen developments.

I. INTRODUCTION

Performance evaluation is a key step in every safety management process. It provides decision makers with key insights on whether the process safety policies decided are (i) actually implemented and (ii) producing expected results. In doing so, it helps reducing the gaps between the reality of everyday practices and the representations one manager may construct of this reality. Amongst the variety of safety performance evaluation tools, indicators are one of the most widely implemented thanks to their synthetic and action oriented characters. However, these very qualities can also become their highest limitations. Actually, instead of leading decision makers towards a better understanding of their policies' strengths and weaknesses, their synthetic character can convey dangerous reductions of the reality's complexity as well as hindering some key aspects of safety that should deserve further efforts. This has been the case for BP Texas city accident (2005) where safety indicators revealed few weeks before the catastrophe how much the very same plant performed 30% better than the average of US refineries safety scores.

With respect to the above, the rationalization of safety performance indicators conception and selection becomes a key aspect of safety management. It is therefore not a surprise that one may find in literature a large number of methodologies supporting such a rationalization. To cite a few: CCPS (2011), Dual assurance approach (HSE, 2006), Tripod-Delta (Hudson, Reason, Wagenaar, bentley, Primrose, & Visser, 1994), Risk based indicators (Oien, 2001) or REWI (Oien, Massaiu, & Tinmannsvik, 2012). A rapid review of these approaches reveals a common pattern. Actually, every methodology takes as it departure point a very strong set of hypotheses with regard to the safety model[1] to be considered and then tries to deduce indicators out of it. Thereby, adopting one of these methods necessarily entails adopting the underlying safety model. Thus, the method proposed by Oien (2001) requires that you have already adopted a QRA (Quantitative Risk Assessment) Model; Dual Assurance and Tripod-Delta demand that you have adopted Reason's model (1997), the CCPS model implicates the adoption of a pyramidal model, while REWI requires placing resilience at the centre of one's view of safety. However, the safety models adopted by organisations are rarely, if ever, entirely faithful to a specific theoretical model. They are rather mixed models developed over time in response to regulatory, cultural and technical changes that are specific to each organisation. In such a context, adopting one of these methods comes down to closing one organisation's vision into a reductive space. For example, it is very common in the context of the French regulatory framework that organisations adopt

[1] We define the safety model as the set of levers a manager believes required to control the safety of his system. Practically, this points to the set of organizational processes a manager puts in place to ensure the safe functioning of the system. Performing risk assessment, learning from incidents, managing impacts of changes on safety or maintenance of safety barriers are examples of organizational processes composing a safety model.

risk analysis based on event trees and safety management systems (SMS) as the basis of their safety model. In this case, none of the aforementioned methods allows the translation of such a safety model into adapted process safety indicators.

Accordingly, The SPIS method proposed in this paper suggests disclosing the safety vision developed by each organisation from predefined, theoretical and sometimes external models. Instead, it proposes to give tools to organisations in order to help them question their own model so to deduce the appropriate performance indicators. Indicators will thus be serving safety and not the inverse. To do so, this paper will firstly explicit some key hypotheses on which the approach relies before discussing its main steps as well as the foreseen developments.

II. KEY HYPOTHESIS OF THE SPIS APPROACH

We will discuss in the following three key hypotheses that structured our reflection and oriented the resulting methodological choices presented in section III.

II.A- What do we mean by *safety* in Safety Performance Indicators?

Despite the extreme variety of definitions of the notion of safety, we can distinguish two main research streams and understanding of the notion of safety. The first considers safety as the absence of danger (EPSC, 1996) or maintaining risks below a level considered to be acceptable (ICAO, 2006). Paradoxically, safety is defined here as an absence rather than a presence, more precisely, the absence of events susceptible of harming the stakes or the implementation of a quality control system allowing the maintenance of these events at an acceptable level of intensity and likelihood.

This view is predominant in risk management practices. It is the basis of frameworks for risk assessment which seek to identify all of the (technical or human) failures and their combinations that can lead to the occurrence of an accident sequence so that later one might consider preventing this sequence by putting into place safety barriers. Finally, these barriers are managed over time to ensure the maintenance of their performance.

Such a vision is:

- analytical in the sense that risk systems are broken down into distinct technical components and human activities before analyzing their possible modes of failure;
- centered on the notion of failure, which differentiates operations and behaviors that meet standards from those who "violate" them. Consequently, rules or standards violations are systematically interpreted as threats to safety.
- highly dependent on the ability to cover exhaustively the different possibilities of failure. Failures or combinations of failures which are not identified are not managed.

The second stream goes beyond the visible aspects of safety (being the absence of accidents) and questions the mechanisms which combination allows the system to remain within acceptable limits of functioning. Weick (1987) describes safety as a "dynamic non-event". While we see here again the idea of safety as an absence of events, the accent is placed on the variability of previous conditions having led to the absence of accidental sequences. Thus, this absence is not the result of continuous conformity to a norm; it's rather a group of evolving mechanisms of which the combinations here remained within acceptable limits. Going further, Hollnagel (2006) defines safety as a product of the ability of people to adapt to the variability of their operatory conditions. Regarding the inability of norms and standards to foresee the complexity of the conditions in which activities are conducted and decisions made, operators and decision makers in high risk systems must adapt their behaviour to the variability of real conditions. It is no longer only failures that need to be identified; it is also the interpretative and adaptive abilities deployed by man to manage daily situations that need to be favoured.

This second vision indicates the possibilities of accidents that are not due to specific failures, but to the variability of individual performances which, at a given moment, can combine in such a way as to generate an accident.

In our case, without denying the contributions of the first vision of safety discussed above, SIPS will be focused on discussing and monitoring the dynamics leading to build safety. Two major arguments favor this position. The first is that when it comes to measuring performance, it is both more convenient and relevant to measure something that exists (dynamics leading to build safety) than something that is absent. Secondly, putting the focus on the very mechanisms lying behind the actual safety performance provides decision makers with leading capabilities to both reinforce the good practices and correct/counter the vulnerabilities that may contribute, in specific conditions, to the major accident occurrence.

II.B- What do we mean by Performance in Safety Performance Indicators?

All management tools, including safety performance indicators, cannot claim to exhaustively represent reality for it is too rich and complex. More modestly, they should serve firstly for collective learning (Lorino, 1995) (Hatchuel, 2000) by creating collective dynamics and motivation for common action within an organization. Safety performance indicators must follow this logic. Thus, rather than limiting the use of indicators to a comparison between evaluated performance and predefined objectives, they should be the key into a continuous cycle of diagnosis and learning that recognizes the complexity of reality and the necessity of constantly adapting our knowledge and practices.

Diagnosis actually implies to implement the necessary organisational abilities to communicate, exchange and collectively interpret the information given by the indicators. Thus, these should serve more as sources allowing the initiation of a continuous, competent and renewed debate on safety rather than the only representative image of the state of the system.

Learning implies to share information given by the indicators and their exchange between different hierarchical levels. For this exchange to take place, it is important that everyone can speak openly based on his competency and seeks margins of progress rather than the designation of possible guilty parties. It is also about accepting the possibility of changing practices when these prove to be inopportune. This involves changing indicators when these prove to be less adapted to the situation's evolution, less accepted or less used than expected. If learning takes place in a satisfactory fashion, it is even foreseeable to have to change indicators regularly to keep up with the evolution of collective thinking and to continue to enrich it.

II.C- What do we mean by Indicators in Safety Performance Indicators?

The SPIS method proposes to implement a system of indicators. The term *system* referring to a group of coordinated elements aimed at a predefined objective; the concept of indicator system implies that the indicators only have meaning when they are considered together and their values are intersected and analysed in order to meet the objective of collective learning.

Thus, rather than simply comparing values given by indicators against predefined objectives (management by numbers), the SPIS method suggests using indicators as tools for an organised investigation of the complexity of mechanisms underlying safety. Just as a doctor puts together several indicators to judge the overall state of a patient, and asks, if necessary, for more specific and in depth tests; safety indicators will serve to construct an overall representation of the state of the high risk system and reveal axes for improvement or elements requiring more in depth investigation through other complementary tools (audits, diagnostics, etc.).

Now that our key working hypotheses have been made explicit, the next section will introduce the SPIS methodology.

III. THE SAFETY PERFORMANCE INDICATORS SYSTEM (SPIS) METHODOLOGY

The SPIS method is organised according to the loop detailed in Figure 1. Two major phases are to be distinguished:

- *Phase 1* aims to define what should be the object of safety performance indicators. In other words, one seeks to answer the question "what should be measured?" For that, it is necessary to explore, or at least to make explicit, the safety model adopted by the organisation as well as other decision-making expectations associated with the implementation of this model.
- Once the objects to be measured have been defined, *phase 2* defines the tools or metrics to be used to best approach the identified objects to be measured. Here we seek to answer the question "How to measure?"

Finally, the (internal) changes of the organisation and its (external) environment must be considered in the context of a continuous cycle of revision and updating of indicators. For this method to function and constantly adapt to changes in the organisation, a working group must centralise the design process of the SPIS and monitor its evolution over time.

It is worth noticing that the suggested methodology is not linear. Rather, it represents a cycle in which the SPIS learns, evolves and adapts to the natural evolution of the risk system.

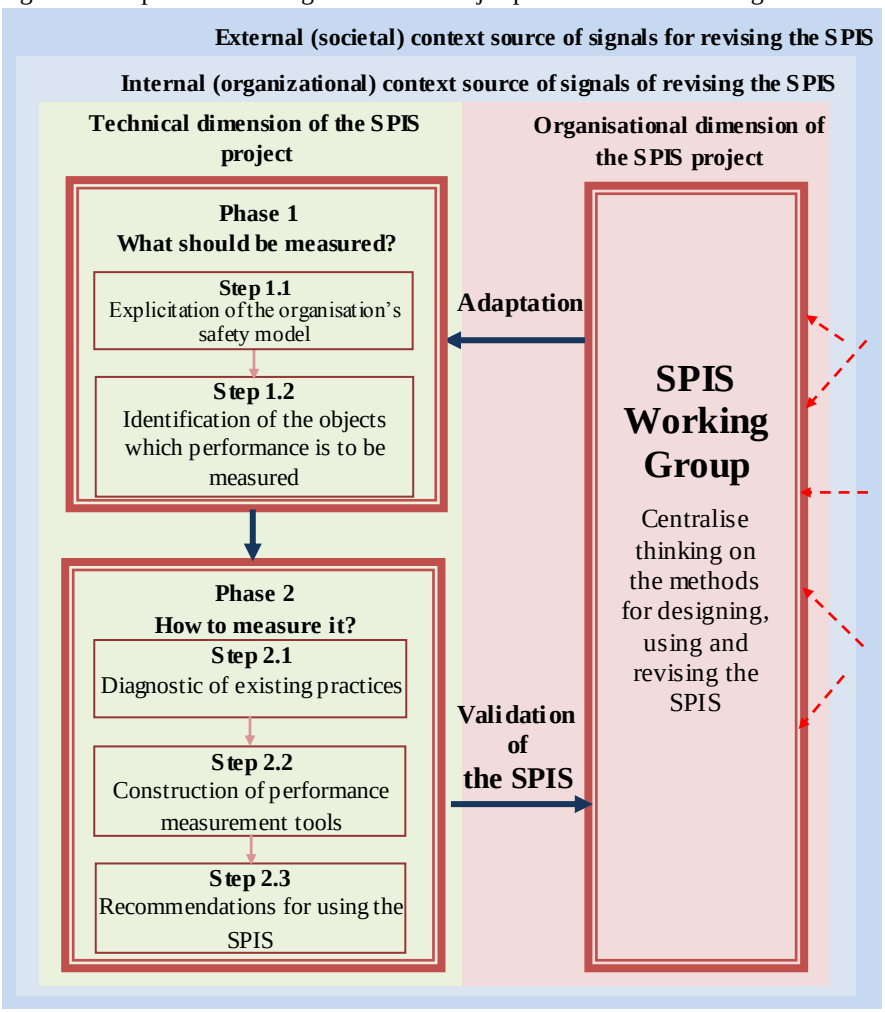

Fig.1. SPIS methodology diagram

III.1- SPIS working group

Because the SPIS must be grounded in an optic of **continual learning**, the proposed method does not come to an end once a system of indicators is suggested. A SPIS can be valid at one given moment of the life of the organisation but will have to evolve with it if one hopes for it to remain pertinent. Consequently, the proposed method does not only aim at proposing an appropriate SPIS for an organisation; it is also concerned with the methods of its revision over time.

A necessary prerequisite to this method is therefore the creation of a SPIS working group of which the first mission is to centralize thinking on the methods for designing, using and revising the SPIS within the organisation. This overall mission may be broken down into three activities:

- *Design* and *revise*. To assure that the SPIS will be effectively used and appropriated by the different concerned hierarchical levels, it is important that these be represented and their positions taken into account. The working group must therefore be the place for a cooperative construction of the technical and organisational orientations that are the basis of the SPIS.
- *Communicate* internally in order to explain the bearing of the SPIS on the organisation's safety performance. This will grant the SPIS the best chances of being accepted by the actors in the system and thus make it one of the elements influencing their daily attitudes concerning safety. More specifically, it is important to ensure, and if necessary, to seek the constant support of top management for the SPIS project.
- *Gather* constantly internal and external signals concerning the necessity of revising the SPIS. Amongst internal signals, we can cite: difficulties of using feedback from the personnel, reorganisations, evolution of the organisation's activities and the associated risks, revision by top management of the safety model, etc.

  As for external signals: new technical benchmarks, evolution of good practices, evolution of regulations, specific demands by inspection authorities, etc.

Overall, the WG must be a designated place for discussing the manner in which the SPIS is understood and used by the entirety of the organisation's actors, the forces it shows and the necessary adjustments. It is within this group that learning should take place, which will then be shared.

III.2- Phase 1: What should be measured?

Phase 1 breaks down into two distinct steps:

- Explanation of the organisation's safety model.
- Identification of needs for performance measures.

III.2.1. Step 1.1: Explicitation of the organization's safety model

The organisation's safety model is foundation of the SPIS in so far as it indicates the aspects of the system that need to be monitored over time to manage safety. It is highly probable that the organisation has a pre-existing safety model. Nevertheless, management's official or stated model may not reflect the reality of daily practices and behaviour. The first step is thus the occasion to discuss internally, with representatives of different safety actors, not the official model but rather the one that is practiced in reality. Consequently, this first step aims at reminding/confirming/explaining the safety model which best reflects real practices and the organisation's objectives.

In doing this, one need to remember there is not one unique "correct" model that is adaptable to the variety of industrial practices and systems in the chemical process industry. Each organisation defines one that is best able to reflect its identity and culture while best serving the safety objectives it has defined. In numerous cases, the model is already clearly established even if differences of opinion concerning the practical methods for its application subsist. In this case, one should take advantage of the development of the SPIS to improve the practical application of the model already decided upon.

When this model has not already been clearly defined and established, the working group must help the organisation to examine its safety practices. In order to do so, it can refer to the theoretical models described in literature as theoretical reference points that participants might compare with their actual practices in order to better understand them. The questions described below can serve as themes for discussion during these exchanges:

- Do you see safety as the absence of risk or is it more than that?
- What do you consider to be daily safety management?
- Do you associate your safety practices to one particular theoretical model? If yes, which one?
- Do you think that your current safety model should evolve? If so, what modifications should be made?

The answers to these questions and the discussions that they evoke are not intended to reach conformity with predefined theoretical models. They should rather help the organisation to analyse the reality of its practices and representations concerning safety. More practically, it is expected that participants reach a description of the organization's safety model that is:

- Realistic in so far as it reflects safety practices on-the-ground.
- Shared as much as possible by the entirety of the members of the working group. The more the model is shared, the more the SPIS that results from it will be legitimate and applied.

III.2.2. Step 1.2: Identification of the objects which performance is to be measured

Once the organisation's safety model has been defined, one must extract the items whose performance will need to be measured in the SPIS framework. The items in question can be of very diverse natures: technical systems, managerial processes, individual attitudes, organisational factors, etc.

We should note that all the objects identified by a safety model cannot be treated by indicators due to their complexity. For certain objects, the question is to know if it is preferable to measure them by the SPIS or by questionnaires, audits or organisational diagnostics.

In order to sort out the objects that are both relevant with regard to the safety model adopted and measurable with indicators, we suggest the following stages:

a. *Extract from the model the objects requiring performance measurement*
   Identify exhaustively, out of the safety model, every element (object) of which performance variability can affect the system's safety.
b. *Examine the possibility of monitoring the performance of these objects in terms of organizational resources.*
   The complexity of high risk systems can quickly render very long the list of objects requiring performance monitoring. Consequently, tradeoffs will have to take place as to the priorities to be adopted and those that the organisation cannot assume for lack of resources. Traceability of this arbitration is important in so far as dimensions of safety performance abandoned at this level could be reconsidered during updating or revision of the SPIS.
c. *Evaluate the possibility of measuring them in the context of the SPIS.*
   Indicators are not always the most appropriate tools for measuring the performance of the identified objects. For example, measuring individual attitudes concerning safety is more easily performed by questionnaires or self-evaluations; the quality of safety communication between teams is also an object that is difficult to measure by indicators.
   Consequently, one must determine amongst the considered objects those requiring performance monitoring, those that can be approached by a SPIS and those requiring complementary approaches, such as questionnaires, audits or diagnostics.
d. *Validate the list of items to be measured with management*.
   This may require several series of discussions before coming to a common decision.

With respect to these different stages, the working group should be able to identify:

- List of objects (activities, processes, technical systems, etc.) of which performance monitoring is judged to be necessary with respect to the adopted safety model.
- List of objects that cannot be undertaken due to the level of available resources[2].
- List of objects that should be considered by tools other than an SPIS.
- List of objects of which the performance will be considered by the SPIS. This last list will be the key input of the forthcoming phase 2.

III.3- Phase 2: How to measure it?

This phase includes the following three steps:

- Diagnostic of existing practices.
- Development/selection of indicators
- SPIS implementation

III.3.1. Step 2.1: Diagnostic of existing practices.

The first source of knowledge and good practices is the organisation itself. Very often, in an informal manner, numerous actors develop and use their own indicators, orienting their daily activities and streamlining their decisions. Accordingly, a first line of work should focus on exploring in addition to formal practices, the already existing informal practices[3] acting as identified measurement. This also means to explore, in existing practices, those that may hinder the appropriation of the SPIS. Indeed, introducing new indicators can enter into conflict with formal or informal practices, which are already well in place into the organisation's regular work routines. We shall designate in the following these practices as negative incentives to the use of the SPIS. These can be of varied natures. For example, not taking into account safety performance in individual

[2] The objects in this category are not destined to be left out of consideration of the SPIS. They will be included when there are greater resources or when the SPIS becomes more efficient through experience and learning that the organisation will acquire over time.

[3] In the context of human and organisational factors the notion of "informal practices" can include a very large range of attitudes and actions. In the present case, we speak of informal practices only to define informal indicators used individually or collectively by personnel to develop a representation of the situation.

evaluations, and the associated financial bonuses could incite personnel to set aside the SPIS or even manipulate it so that it does not conflict with their individual financial objectives.

The working group composition is decisive at this step. The participants' knowledge of the existing practices at different organisational levels and the individual attitudes of their colleagues will be the principal sources of information.
In order for this information to be successfully exchanged, discussed and used, two key factors are necessary:

- *The representativeness* in the working group of the variety of persons and hierarchical positions impacted by the introduction or modification of the SPIS.
- *Freedom of speech* allowing informal practices to be shared within the working group even if they are in conflict with formal procedures.

This step is organised in the following manner:

1. Identify collectively a central group of actors concerned by the identified objects to be measured.
2. Assure that these people or their representatives are in line with the thinking of the working group. This can be obtained by timely interviews or by their integration in the WG.
3. Study the importance of each object to be measured for these persons and the manner that it influences their work on a daily basis.
4. List the already existing positive[4] practices and the conflicts that the introduction of the new object of measurement can bear.
5. Discuss, for each measurement object, the positive practices and the manner to valorise it on the one hand, and on the other hand, the possible existing negative incentives and the means to overcome them.

III.3.2. Step 2.2: Development/selection of indicators

Developing a system of indicators is the search of a subtle balance between two constraints. On the one hand, it is a question of covering, as much as possible, all of the facets of the objects that one hopes to measure, and on the other hand, to attempt to minimise the weight of the indicator for the organisation in terms of resources (time, information, solicitation of personnel, difficulty of interpretation, etc.).
As for the objective of coverage, we propose to study the following three dimensions or facets for each object:

- *Results or outcomes indicators* allow the appreciation of the number, quality and type of results associated with the measured object. Take as an illustration the object "*LFI process* [5] " The evaluation of results of such a process can be performed in different ways:
  - number of treated events or incidents,
  - number of suggested recommendations following the completion of an incident analysis,
  - percentage of recommendations that were applied,
  - number of similar incidents that recurred following the implementation of LFI recommendations, etc.
- *Functioning or activities indicators* send information as to the methods for executing the different steps making up the object. If we return to the example of LFI, the following functioning indicators may be considered:
  - number of declared incidents per year to appreciate the willingness of employees to declare events,
  - percentage of declared incidents fully treated to assess the levelof resources available for LFI,
  - variety of incidents treated, including those occurring in similar plants, etc.[6]
- *Ecosystem indicators* describe the more or less favourable nature of the technical and organisational context making up the ecosystem in which the object evolves. LFI, as rigorous as it may be, can be hindered from an unfavourable ecosystem, made up, for example, by a severe sanctioning policy discouraging incidents declaration by employees or poor consideration by top management of LFI recommendations.
  It is worth mentioning that ecosystem indicators point to strategic aspects of the life of the organisation of which impacts may go well beyond the considered systems, or even beyond safety (In that aspect, we are entirely in agreement with the vision developed by Reason (1997) in which strategic choices are described as those likely to have the most impact on the system's safety.

The second constraint (weight for the organisation) must be considered by the following parameters:

- Benefit as much as possible from formal and informal indicators that already exist in the organisation, even if this means generalising their usage or modifying some parameters.
- Favour simple indicators that require few resources to collect input data.
- If there are too many indicators per object, the working group can decide to select a sub-category of indicators and vary it regularly.

[4] With respect to safety.
[5] Learning From Incidents.
[6] Expanding LFI to incidents that have taken place on other sites of the same group or similar sites belonging to other companies contributes to the improvement of learning process quality.

We suggest weighing these two constraints according to the following procedure:

1. Identify for each object to be measured possible candidate indicators based on as broad of brainstorming as possible involving at least the members of the working group. Existing practices within or outside the organisation, individual thinking or scientific work are various sources to be considered.
2. With regard to each object, organise the candidate indicators according to their type (outcome, functioning, and ecosystem indicators). It is recommended to balance,[7] as much as possible these three categories or, at the least, to have an indicator per category.
3. Describe each of these indicators in order to understand which aspects are covered and which are not. For example, the number of inspections performed compared to the number foreseen allows one to know how well scheduling is respected, but not the quality of the inspections nor the pertinence of the implemented maintenance policy. One may find in Mazri et al (2012) a more detailed and systematic descriptive framework for indicators.
4. Choose, in respect to the strengths and weaknesses of each indicator, the combination that brings the best value with regard to coverage and resources consumption for the organisation. This combination can be revised regularly by the WG and also allow the successive consideration of different facets of the high risk system.
5. It may prove necessary to go back (phase 1) if an object to be measured proves to be, following experience, too difficult to be treated by indicators. The working group must update its choices in relation to changes in its knowledge of the methods of performance evaluation.
6. Validate the SPIS with top management. This occurs by the presentation, at the very least, of the following elements:
   - List of indicators making up the SPIS.
   - List of methodological choices made and their justifications.
   - Aspects of performance safety covered by the SPIS and those that are not.
   - Representation of the cost[8] for the organisation in terms of work time and investments.
   - Exchanges with top management can lead to revising the SPIS or even to reconsidering certain orientations adopted during earlier steps.

III.3.3. Step 2.3: SPIS validation and implementation

Implementing a system of indicators is about building legitimacy and acceptation of a set of indicators for those that will use it (decision makers) and those who will be impacted by the decisions associated to it. A key mechanism of legitimacy and acceptation building remains the deployment of a participatory process that associate impacted parties before final decisions are taken. The WG composition suggested earlier in this paper is already a participatory framework that should allow the involvement of various levels (from top managers to operational) and departments within the organisation. However, this involvement may need to be expanded if former steps have uncovered new aspects that require new actors of the organisation to participate.

It is therefore highly recommended for a WG that has reached an agreement on the system of indicators to enter a participatory process where open discussions and revisions are still possible. At a practical level, we suggest the following procedure:

1. For each indicator, the WG must identify the actors within the organisation that will use it or those who will be impacted by it. These are the actors who must be consulted during this phase.
2. In a best case scenario, these actors are aware of the evolutions of the SPIS project and have made known their needs to support the decision made by their representatives in the working group or via other interviews held in step 2.1. If this was not the case or was only partially done, a work seminar could be envisioned in order to present the SPIS and discuss its methods and daily application.
3. Discuss with decision-makers the terms of use and interpretation of the SPIS. At this level, it is important to insist on the following aspects:
   - Methods and terms of indicators cross checking and associated interpretations. It is highly advisable to rely on practical cases.
   - Presentation of the limits of the SPIS and how it is complementary to other tools for evaluating performance such as organisational audits and diagnostics.

[7] For ecosystem indicators, it is reasonable to hope to identify common elements for different objects. For example, top management's commitment to respecting the safety/production balance or an adapted safety culture can be recurrent parameters in the development of favourable ecosystems for different indicators.

[8] This is not necessarily a monetary cost. It is rather noting, qualitatively or quantitatively, the consumption of resources required by the use of the SPIS.

- Offer the possibility of sharing their personal experiences and difficulties in regards to the use of the SPIS in the context of the working group.

Out of this process, WG members should expect the following objectives:

- At least, understanding by concerned decision-makers and working force of the methods for using the SPIS.
- At best, gaining the affiliation of all actors and the recognition of the interest of the SPIS to improve their daily safety management.

This last step ends what needs to be understood as a first implementation of the learning loop. With respect to the objectives of collective learning described in the first section of this paper, such a loop is expected to be deployed as so on as it members believe there is enough learning and improvement possibilities regarding the way the actual SPIS is running. Of course, such a decision is not only technical, it is also political in the sense that it should take into account the willingness of decision makers and the working force to regularly change these tools if they only started to feel comfortable using them.

IV. CONCLUSIONS AND PERSPECTIVES

Today, the literature concerning safety indicators embraces all high risk technologies and regroups a scale of tools widely used by safety managers. Thereby, it is no longer question of their pertinence but rather on their methods of use. These methods must, on the one hand, avoid enclosing safety into numbers, which would only be a caricature and, on the other hand, draw managers' attention to the true problems when these are hidden in the organisation's meandering in the daily wave of information.

With respect to these ambitious objectives, the SPIS methodology introduces what we believe a distinctive feature comparing to existing approaches being the questioning of the actual safety model developed by the organisation instead of imposing a theoretical one. In doing so, we expect to anchor the development of indicators in the real life of the organisation so to ensure that (i) they are used and do not become an additional document on the shelf and (ii) do not enclose the complexity of reality in a few numbers that will mislead decision makers.

The SPIS methodology has been deployed in various occasions within the French context. It provided interesting insights on the methodological choices adopted and on the way various actors within the organization react to them. If our hypothesis of the unique character of every organizational safety model has been confirmed, there are also several issues that still need operational feedback especially regarding the way indicators live and evolve on the long term within organizations.

We expect through this communication to extend the community of knowledge about this methodology and hopefully trigger new experimentations to generate more learning on the strengths and weaknesses of the suggested approach.

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