
Future Development Areas for Safety Performance Measurement

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ABSTRACT

Several studies have shown that safety management and culture are linked to safety performance, but the role of safety performance measurement is unclear. At best, performance measurement is an important management tool. However, the use of performance information in safety management is often inefficient. There is a need for an overview of the development areas that are essential in achieving the safety benefits of performance measurement. This study aims to identify the status of safety performance measurement in industrial companies, proposing future research and development areas for safety performance measurement. The study was conducted as a multiple case study involving seven companies from different industries. The results show that the participating industrial companies' safety performance measurement status was developed. Future development efforts should highlight the supportive practices and structures of performance measurement, essentially leadership and management. This study structures future development areas for safety performance measurement and supports organizations in better utilizing measurement information in their safety work.

Keywords: Safety management, Safety culture, Safety performance, Performance measurement, Maturity analysis

INTRODUCTION

Several studies have shown that safety management and culture are linked to safety performance (e.g., Carder and Ragan, 2003; Fernanadez Muniz et al., 2009; Stemm et al., 2019; Vinodkumar and Bhasi, 2009). Safety performance measurement can support improving safety performance but can also be inefficient or even harmful. At best, performance measurement can successfully support managers in reaching their performance goals. Measurement can provide feedback on past and current performance and enable predictions for the future (Woods et al., 2015).

The studies on safety performance measurement have been limited to the selection and implementation of a set of indicators, but a system-oriented perspective is often missing (Øien et al., 2011; Peñaloza et al., 2020). Much of the research focus has still been on measurement design, though the more general performance measurement literature has moved toward the challenges and practices of using performance measurements (Granco-Santos et al., 2012; Nudurupati et al., 2011). Concurrently, there are few studies overviewing the status of research and practice in safety performance measurement. Hence, a structured overview of this topic is needed.

The current study approaches this gap through maturity analysis and multiple case studies. Maturity models are used to measure the level of safety performance measurement and safety culture in an organization (cf. Gonçalves Filho and Waterson, 2018; Jääskeläinen et al., 2019; Pirhonen et al., 2021). They allow for the assessment of the current situation and identification of development needs (Becker et al., 2009). Safety performance measurement is expected to relate to safety performance, but the path toward good safety performance through measurement and management is still mostly unclear. In addition to deficient measures, the use of performance information in safety management is often inefficient (Jääskeläinen et al., 2020). The current study also explores the importance of commitment and culture supporting performance measurement and its use.

MATERIALS AND METHODS

The present study utilizes a mixed methods approach and synthesizes the results of a large research project (Jääskeläinen et al., 2021). The study was conducted as a multiple case study involving seven companies from different industries, such as the metal, food, forest, and chemical processing industries, industrial services, infrastructure, and house construction.

The methods included a literature review, surveys, interviews, and workshops. A recently developed safety performance measurement maturity model (Jääskeläinen et al., 2019; 2020) and safety culture maturity model (Pirhonen, 2021; Tappura et al., in press) were used for analysis. In these maturity models, the evaluation is done through written statements on the levels of practices in different criteria. For example, in the case of ‘Proactive nature of occupational safety performance measurement’ the respondents were asked to make a choice from these four alternatives: 1 = “Measurement focuses on serious incidents”; 2 = “Measurement also records minor incidents which do not lead to employee absences or costs”; 3 = “Measurement also takes note of factors predicting occupational safety”; 4 = Measurement focuses on factors predicting occupational safety”. The related survey tools are described in detail in their respective articles. The interviews and workshops were carried out to review and elaborate on the survey results. Four companies participated in the safety performance maturity analysis survey submitted to 458 managers and experts (172 responses, response rate of 38%), and two companies participated in the safety culture maturity analysis survey submitted to all the 1109 employees in these companies (289 responses, response rate of 26%). All the companies participated in the interviews and workshops. The survey data were descriptively (based on averages on a scale of 1-4 including all responses in a single evaluated criteria) and statistically analyzed. The qualitative data were thematically analyzed and connected to the survey results.

RESULTS

The results of the safety performance maturity analysis showed that the four the participating industrial companies’ safety performance measurement status was rather developed (see Table 1). Of the evaluated three main areas of

Table 1. Average scores for safety performance measurement maturity.

Area of performance management	Criterion	Average (1–4)	
Performance measurement practices	Proactive nature of occupational safety performance measurement	2.95	
	Balanced approach to the measurement of occupational safety-related costs	2.04	
	Links between occupational safety performance measurement objects	2.67	
	Reliability of occupational safety-related performance information	3.23	
	Process for reviewing and updating occupational safety performance indicators	2.94	
	Information systems in gathering occupational safety-related performance information	2.72	
	Information systems in reporting incidents with bearing on occupational safety	3.76	
	Availability of occupational safety-related performance information in managerial work	3.08	
	Commitment and culture	The role of employees in gathering occupational safety-related performance information	3.08
		Employee commitment to occupational safety performance measurement	2.44
Managerial support for occupational safety performance measurement		2.84	
Resources for occupational safety performance measurement		2.30	
Use of performance measurement	Use of performance information in planning occupational safety issues	2.49	
	Defining action plans related to occupational safety	2.47	
	Communicating occupational safety-related performance information to managers	3.01	
	Occupational safety-related performance information and rewarding	2.49	
	Development of occupational safety competencies	2.04	
	Use of occupational safety performance measurement at different levels	2.16	
	Benchmarking and occupational safety-related performance information	2.33	
	Use of performance information in occupational safety management of supply chains	2.06	

performance management maturity, the current measurement practices received higher average scores, while the use of performance information and commitment and culture related to performance measurement were widely at the lower level. The employees did not feel that measurement was useful, possibly because of the limitations in the actual use of measurement. Measurement information was being used in the identification of risks and safety development targets, and the use of measurement in rewarding and benchmarking was limited.

Safety performance measurement is still more about collecting the indicator data than being a genuine driver of development activities. Turning data into action is challenging for many companies. The representatives of the studied companies noted that the resources for doing analysis based on information are limited, so the use of performance information is not systematic and does not meet the needs for designing means for improving safety. Limitations also exist in the design of performance measurement. For example, accounting for the indirect cost impacts of safety was deficient. Both the survey and interview studies also revealed that most of the measures were lagging ones, even though the desire for designing leading measures was high. Statistical analysis showed that the level of safety performance was most essentially driven by the culture and commitment toward performance measurement in the organization. In the interviews, the need for safety culture measurement was emphasized.

The interview study revealed that the studied Finnish firms had very similar safety performance measures, even though they represent different industries. Most measures were found to provide objective information on undesired events. More subjective evaluation approaches that would be useful in the identification of means for preventing harm were not widely used. An overall picture of the drivers of good or bad safety is lacking because measurement concentrates only on a few separate elements in safety performance. Moreover, these elements appeared at random; that is, they were related to those aspects that are easy to measure but less relevant in improving safety performance. For example, the measures for safety culture were missing. The current study identified a need to use safety performance maps (Haapavirta, 2021; Jääskeläinen et al., 2021) in evaluating the coverage of current measurements and identifying the relevant objects for measurement.

Because of the observed importance of the safety culture and missing tools for measuring it, a safety culture maturity model was designed and tested in two companies (see Pirhonen et al., 2021; Tappura et al., in press). The results of the safety culture maturity analysis showed that the two participating companies' safety culture status was also rather advanced (see Table 2). However, our analysis indicated considerable differences in safety culture perceptions within the companies and respondent groups. Top management had a more positive perception of safety culture than the other respondent groups did. The results showed that there was still room for development regarding the overall safety culture maturity in both organizations. The observed overall safety culture score was slightly below 3, in which scores 3 and 4 typically represented a more proactive attitude toward safety.

Table 2. Average scores for safety culture maturity.

Safety culture theme	Average (1–4)
Communication	2.78
Training	2.43
Organizational learning	2.93
Management & supervisor commitment	2.90
Employee commitment & involvement	2.74

Of the evaluated five main safety culture themes, the training theme scored the lowest. Within the theme, the items “training of supervisors” and “training systematization” had the lowest scores. The employee commitment and involvement theme had the second lowest safety culture level. The lowest-scoring items were “employees’ actions for safety” and “working under pressure.” Hence, the employees were found to participate in safety development mostly through incident reporting and rarely intervened when others took shortcuts at the expense of safety.

DISCUSSION

Although the overall picture of the status of safety performance measurement was found to be relatively positive, several challenges and objects for development were identified in more detailed areas, such as commitment to performance measurement and the practices for using performance measurement information. Overall, limited resources are available for developing safety performance measurement and supportive structures and practices.

Developing a supportive culture for measurement and better use practices for measurement data could further support the development of safety performance. Moreover, proactive measurement was highly desired, but the evaluated measurement practices were not yet genuinely proactive. One explanation for these observed challenges in designing new leading measures may be that the practices, processes, and systems for data gathering and analysis do not satisfy the needs of novel measures. This may explain the challenges in implementing the ideas (such as leading indicator definitions) presented in the literature and putting them into practice. More resources and dedication to measurement issues are needed from safety professionals for designing measures and supervisors and managers for implementing practices for using measurement information. Safety organizations typically have thin resources that are used to address daily challenges and activities, with very limited time left for development required by performance measurement. However, a lack of time and resources is also a challenge for developing performance measurement more widely in organizations. The results suggest that everything depends on successful leadership and management, resulting in performance measurement supporting the specific needs of organizations. Mapping the path toward good safety performance is proposed as a starting point for designing a measurement system that can support the needs of individual companies.

As a means of proactive measurement, the safety culture maturity analysis is suggested. It provides information on the present state of safety culture and possible ways to improve it (Goncalves Filho and Waterson, 2018). However, treating safety cultures as uniform across organizational levels may conceal important issues. In line with Taras et al. (2009) and Tear et al. (2020), all organizational levels should be included in analyses, and the results should be analyzed separately. Nevertheless, this aspect remains underexplored in the safety culture literature.

Further research should pay attention to how the factors affecting safety performance differ between different contexts. Here, the safety performance map approach could be used (Haapavirta, 2020). In line with Hale et al. (2010) and Veltri et al. (2013), the current study found that the possible differences are not necessarily industry specific but more related to other contextual factors, such as locational and cultural differences. Visualization techniques supporting performance measurement have gained some interest in the literature (Jääskeläinen and Roitto, 2016), but more research on this topic in the context of a safety performance measurement is needed. For example, the structure of visualizations could be built on the idea of a safety performance map. Studies on safety performance measurement design should also focus on the organizational level, especially large organizations that require attention to operative level measurement. Furthermore, the topic of supply chain safety performance measurement was observed as increasingly important, and its status was found to be relatively low. Further research on the topic of a supportive culture surrounding safety performance measurement and using practices of measurement is suggested because these were found to be crucial in materializing the potential benefits of performance measurement. The successful use of performance measurement requires that it be clearly related to processes and practices of safety management and leadership.

Some of the identified measurement challenges include the limitations in data gathering that do not require research but are well-resourced development efforts in companies. There is also a need to pay attention in implementing safety performance measures of academic publications (e.g., Zwetsloot et al. 2020) because they seem to not be widely used in practice. Related training is also needed for safety experts and is essential for the users of measures, that is, managers and supervisors. Furthermore, the commitment of operative employees requires that they understand the purpose and logic of safety performance measurement.

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