Measuring Innovations in Crisis Management

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ABSTRACT

Crisis management (CM) organizations regularly face the challenge to assess the potential impact of a change in their socio-technical setup. No matter if a new software, a new tool, a simple workflow or a broader organizational structure become available, CM organizations need to estimate the potential added value under a high degree of uncertainty. In general, the more reliable information about the new solution is available, the more informed the decisions are. One promising way in assessing the potential impact of new CM solutions can be found through its application in an as realistic as possible and an as secure as necessary setup. However, such artificial scenarios like simulation exercises hold the risk of measuring the performance of the solution itself rather than its contribution to the CM operation. In this paper we review the state of the art in measuring crisis management performance, discuss the results in the context of performance measurement in general and present a performance measurement approach supporting a structured assessment of innovative CM solutions applied within collaborative demonstration project.

Keywords

Performance measurement, crisis management, innovation.

INTRODUCTION

During CM operations even minor decisions can directly have a major impact on human lives. In consequence, CM organizations rely on proven and well known infrastructures, procedures and tools which are applied to run the operations. These circumstances lead to a relatively high tendency of reluctance towards any kind of change in the way how CM operations are planned, executed and evaluated. Decision makers in CM need to be very careful and require clear evidence before introducing new ways of how their operations are designed, planned and executed.

The probably most comprehensible way to reach decision-making reliability is the combination of external reputation (e.g. through well documented references of other organizations) with internal evaluations (e.g. through actual applications and testing of new solutions). Combining both elements, the internal and external perspectives, decision makers are able to get relevant data supporting certain decisions as well as to establish trust within the organizations towards the successful implementation of a new solution. Hence, CM organizations get in a better position to justify their decisions on appropriate data (evidence) as well as to ensure the required backing within the organization in order to support organizational change (organizational trust).

However, what if there are no appropriate external reputations CM organizations can refer to, for example because of different value systems between the commercial and humanitarian sector? When thinking of "innovation" in its original meaning ("Innovare" as "to change into something new") there probably should even be no clear reputations. This of course does not mean that the new solution is not allowed to have any experience at all. Even the contrary, CM organizations often experience companies pitching solutions which have quite acknowledged expertise but they can still be innovative for the CM domain. If we think about technological innovations, e.g. RFID chips to track and monitor relief goods or mobile applications as communication means, there is still the uncertainty whether one piece of technology being successful in one context has the same performance in another application domain (Coletti et al. 2017). One reason for the potential mismatch is not only that there are different application requirements but mainly that even a small technological change takes place in a broader socio-technical context which has to be elaborated first (Orlikowski 1993, Toyama 2004).

The internal reliability of a new solution, i.e. the provision of appropriate data proving the potential impact of the innovation, remains as an alternative to identify the innovation degree and measure potential impact. There are many elaborated and standardized approaches to measure attributes of specific artefacts like the sensitive analysis of a simulation run, the technological readiness level (TLR) of a software or the perceived usability of a tool. It can be questioned how such measures satisfy the need of CM organizations to make informed decisions about investments in changes of legacy infrastructures, procedures or tools. Thus, the research question of this paper is how the potential impact of a solution can be measured for the specific application domain of CM. Are there any generic performance measurement approaches available and if not, how could such approaches be designed in order to systematically identify and analyze relevant data?

In this paper we firstly present the results of a literature review on general performance measurement in crisis management. This step is necessary in order to first clarify whether and how CM performance and effectiveness can be measured. Based on these findings we discuss how objective- and process-oriented performance measurement in general can be identified in order to systemize and interrelate relevant metrics. Finally, we present a use case of an adjustable performance measurement architecture being deployed in an ongoing CM demonstration project.

LITERATURE REVIEW

Our literature analysis of publications dealing with performance measurement in crisis management within Scopus, the largest abstract and citation database for peer-reviewed literature[1], results in more than 500 hits. In order to gather an as broad as possible picture the following generic search string was applied: („performance measurement" OR effectiveness) AND („crisis management" OR „disaster relief"). Comparing the number of relevant sources per year, it becomes obvious that there is an ongoing increase of results starting in the early 2000s with a peak in 2006, which is two years after the major south East Asian tsunami disaster. Since then, publications have increased even more with a maximum of more than 50 sources in 2013 (see Figure 1).

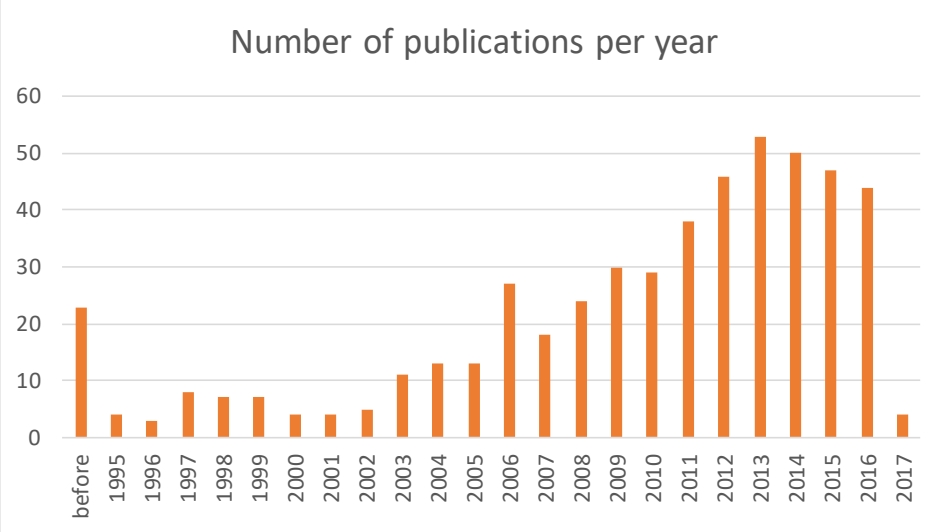

Figure 1: Number of publications per year

[1] https://www.elsevier.com/solutions/scopus

The found results stem from a wide variety of research areas, including Social Sciences, Business and Management, Engineering and Computer Science among the top ones (see Figure 2).

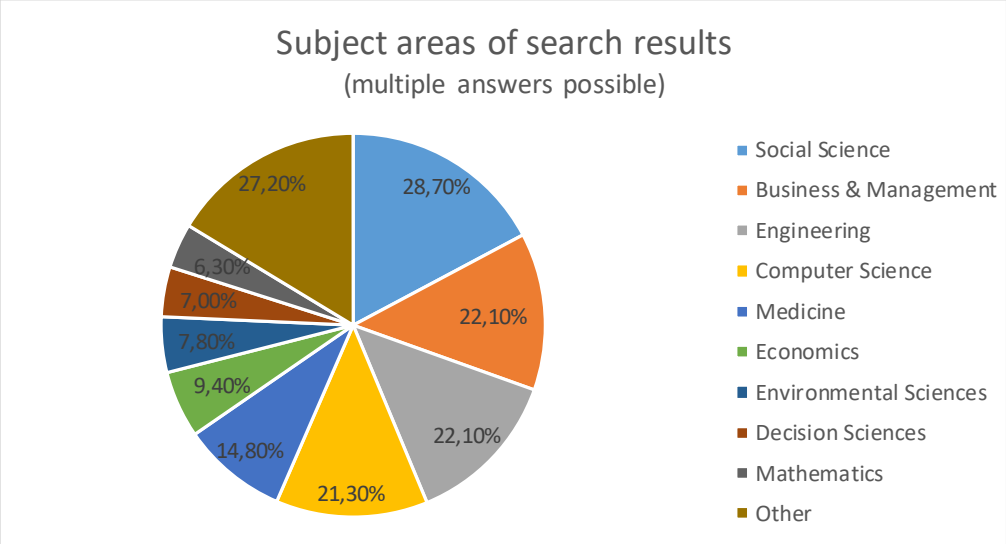

Figure 2: Subject areas of search results

However, when reviewing the first sources, it becomes apparent, that especially by including "effectiveness" in the search term, the search delivers many results which only measure the effectiveness of e.g. a model or an algorithm that has been developed. The actual CM performance and effectiveness is, in most cases, considered as an underlying assumption being directly related to the model or algorithm effectiveness. However, neglecting the measurement of operational applicability (relevance) significantly limits the conclusions regarding the potential impact of the investigated artifact. Having excluded the term "effectiveness", the search only leads to 14 results. The excluded sources are not necessarily concerned with the performance measurement of crisis management itself but rather try to provide a solution to a problem and aim at measuring the effectiveness of this specific solution – with a missing relation to the potential impact on CM effectiveness. Nonetheless, they are of interest, as even when giving statements about the effectiveness of one single model, algorithm etc. certain methods for doing so have to be developed or applied.

Considering only sources which deal with trial-related performance measurement by extending the search term, i.e. adding "AND experiment OR trial" to it, leads to a significantly less amount of sources. Only 34 out of the over 500 publication satisfy the refined search term. While the yearly amount of publications shows similar behavior as the first search, the results of the refined search mostly stem from more technical research areas such as computer science or engineering (see Figure 3).

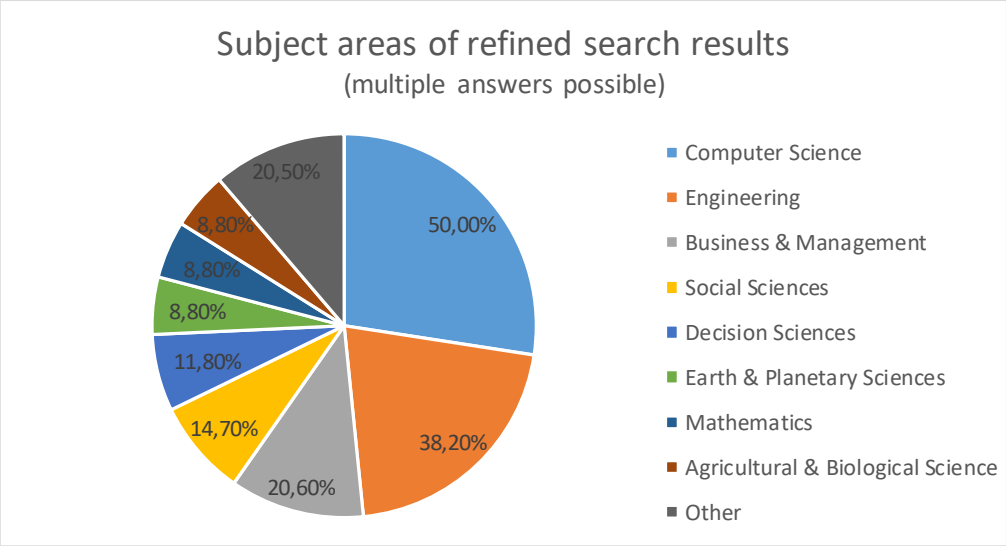

Figure 3: Subject areas of refined search results

Reflecting the overall results, it can be concluded that the area of performance measurement is highly multi-disciplinary. In order to showcase the huge range of the identified approaches, rooted both in positivistic and interpretivist domains, an exemplary selection will be reviewed in the following sub-paragraph.

Insights from the literature review

Schulz and Heigh (2009) present a logistics performance measurement approach on the case of a Development Indicator Tool which has been developed with the International Federation of Red Cross and Red Crescent Societies (IFRC). The project was initiated by the Logistics and Resource Mobilization Department (LRMD) of the IFRC that defined a logistics strategy which required concrete scores of response levels to be achieved when delivering relief supplies. In order to achieve this aim, a descriptive approach is utilized, starting from explicating the strategic change which has been initiated by the LRMD and targets the establishment of regional instead of central supply chains through the formation of regional logistics units (RLUs). Schulz and Heigh (2009) conclude that the design and implementation process for performance measurement systems must be kept simple and requires ongoing improvement and development by the RLUs. Thereby it is essential to involve tool users and administrators besides developers at early stage to achieve an acceptance towards its introduction and make all stakeholders getting familiar with it. Co-creation and mutual understanding of the involved parties is perceived as a key success factor. In this context, support from organizations' management is of particular importance. Furthermore, the key action behind performance measurement is seen in analyzing the needs for development, which is revealed by the actions' impact on defined target scores. In case of the LRMD the system for instance is supposed to become an efficient web-based application to replace data interchange via email. Driven by simplicity, the case at LRMD is moreover supposed to foster the emergence of research contributions that provide conceptual and practical insights of system development and improvement in the context of humanitarian logistics.

Rongier et al. (2013) developed a method that supports decision making in real-time during response and further at its implementation to demonstrate how performance indicators support crisis response management and the collaboration of stakeholders. The authors present a four-step procedure for CM PMS, applied in a case study at the French Red Cross. For that purpose, a web-based prototype of the PMS was developed and tested in practice. Therefore, the tools requirements and characteristics are further listed, and its pages and database illustrated before a conclusion is drawn. The identified KPIs are structured along the dimensions *efficiency*, *relevance*, *expectations*, *satisfaction*, *agility*, and *impact*. Due to the focus on a PMS dashboard the actual measurements were identified in the literature and covered for example logistical areas like response times defined as "cycle times" (p. 1098) or response quantities (p. 1100). The actual PMS was presented for the first time in Rongier et al. (2010), which was also identified by our literature search. The underlying research methodology involved the same practitioner organization as the (2013) paper, however it was related to a specific earthquake scenario.

Owen et al. (2016) investigate the challenges faced by representatives on the strategic level of emergency management and to elaborate on their relevance for tactical front-line operations and political compliance. The

analyzed data is retrieved from a former study on emergency management and the method includes both surveys and interviews with representatives from 36 Australian organizations of the respective branch. In contrary to Rongier et al. (2013) the authors conclude "that before we can propose any revision of measures to assess emergency management performance, we need to understand the interaction between underlying values base and the tensions inherent in carrying out emergency management work." (p. 186).

The work conducted by Wang (2012) is intended to provide guidance for organizational performance (OP) during crisis through the design and development of a measurement framework that supports organizations in linking their OP with their strategies, technical systems and crisis management objectives. This is motivated by the identified need to derive improvement measures mitigating future incidents. In order to draw linkages across the organizations' performance, strategy, objectives and technical systems, multi-dimensional frameworks are needed. Following a literature analysis Wang (2012) compiled a set of performance indicators in the areas *information dissemination, involvement of top management in CM tasks, cooperation with stakeholders, financial measures, stakeholders' confidence in the sustainability of an organization, documentation, and time for making specified improvements* (p. 679). The author acknowledges the limitation of the generalizability of the framework due to the diversity of CM organizations and recommends further investigations of "(…) operational variables for a specific business context for empirical validation purposes" (p. 684).

One major conclusion of the sources is that the performance measurement of disaster relief operations is a difficult task requiring context-specific adjustments due to various challenges which can be classified in four categories (Abrahamsson et al. 2010):

1. *Evaluation based on value judgement:* Any evaluation needs to be based on certain values, i.e. in order to be capable of assessing how successful an operation has been there need to be values which define what is supposed to be successful. At least implicitly, these values, which can also be understood or formulated as objectives of an operation, will always be based on subjective opinion and personal beliefs.
2. *Complexity of crisis situations:* The high complexity of crisis situations significantly affects the way, a relief operation can be analyzed, understood and evaluated. High dependencies and complicated relationships between actors as well as causal ones lead to great difficulties when trying to understand what happened as well as why it happened.
3. *Questionable validity of information:* When evaluating an operation, this evaluation has to be based on information about how the course of events during the operation. Often such information is gained by conducting interviews etc. and rarely based on e.g. ongoing data collection. Consequently, there is always the question how reliable humans are as a source of information and therefore how valid the information is on which an evaluation is based upon (in terms of generalizability of specific results).
4. *Limiting operation conditions:* Every disaster relief operation can have negative effects or outcomes, which simply could not have been prevented, independently of how successful the operation has been. Any immediate and unavoidable casualties caused by the crisis should not be included into the evaluation of an operation. For example, the number of injured people is not relevant for the evaluation while the time until they receive help is. Overall, it can be difficult to distinguish between the evaluation of the operation's performance itself and the analysis of what might have happened under different circumstances.

In general, these challenges make it difficult if not impossible to establish a generic performance measurement approach for crisis management in general, and in the context of measuring CM innovation in particular. What CM effectiveness is depends on many variables like the observed time frame, the type of CM entity, its organizational level or the specific crisis situation. Hence, the results of the literature analysis suggest that dedicated iterative and systematic procedures are necessary in order to develop appropriate performance measurement approaches being able to give insights of specific solutions on the CM performance. Owen et al. (2016) also concludes that before suggesting measures to assess crisis management, it is necessary to understand the complex and often intertwined challenges and relationships of crisis management and its actors. Only after making sense of the interaction between the underlying value base and the events and actions of an operation, methods to measure and evaluate the performance of it can be developed (Owen et al. 2016).

Overall, the literature analysis show that the high variety in scenarios, tasks, stakeholders etc. related to disasters, results in a lack of generic performance indicators - especially when evaluating and measuring CM innovations. The results of the identified papers can be very useful for the development of specific performance measurement project as the documented results might be fitting to the high variety of potential cases (e.g. an open set of performance indicators for the area of humanitarian logistics can be utilized for specific cases, see

Widera and Hellingrath 2011). However, it appears to be necessary to develop a structured approach supporting the case-based identification of:

- Specific CM objectives and values (e.g. evacuation of an area or the setup and maintenance of an internally displaced persons camp)
- Clear systematization of the relief operation (e.g. responsibilities or specific processes and workflows)
- Appropriate research methods covering both quantitative and qualitative data gathering and analysis techniques (e.g. sensitivity analysis of simulation results in combination with focus groups of potential simulation applicants in CM organizations)
- Differentiation of the investigated objects (e.g. controllable vs. uncontrollable variables or operation specific phenomena vs. solution-specific perspective).

In the next paragraph we briefly introduce different considerations and existing approaches in the area of performance measurement in order to be used for the measurement of CM innovations.

PERFORMANCE MEASUREMENT

Following the literature review above, the identification of innovative and value adding solutions in CM can only be achieved through a context-dependent and specific measurement, analysis and adjustment of its exemplary application in a secure environment such as trials, serious games or exercises. For a supporting performance measurement approach there are several guidelines and elaborated concepts to be considered. As discussed above, each indicator might have a weighted importance for the overall CM performance of a single organization or a dedicated scenario, and that is the reason why the identification of key performance indicators (KPIs) might be useful. A systematization and categorization of potential KPIs prevents an isolated view and possible misinterpretation. However, because of the different actors involved in CM operations, different processes with specific objectives and relations need to be considered for the identification of relevant KPIs for an application.

The findings from the literature review described above offer a huge source of potentially appropriate indicators. They can be considered as an open set of CM KPIs. However, in order to ensure the relevance of the KPIs in particular CM applications, a specific set of KPIs needs to be developed for each application (or application context). Paramenter (2010) differentiates between result (e.g. number of evacuated persons) and performance indicators (e.g. time needed to evacuate) as well as key result indicators and KPIs. KPIs can be defined as business-oriented relevant and numeric information and represent a set of measures focusing on those aspects of organizational performance that are most critical for the current and future success of the organization (Paramenter 2010). Thus, the indicators can be related to different elements (like objectives or processes) and weighted by targeting specific goals (Reichmann 1990).

Thus, it might be concluded that each performance measurement application is specific and hardly transferable. However, there are some general aspects to be considered for the specific identification of KPIs. Schulz and High (2009) provided an overview of KPI requirements, which is presented in the following table.

Requirement	Short Description
Validity	Address the real performance drivers.
Relevance	Reveal decision relevant information.
Cardinality	Cover a wide range of key issues under consideration.
Completeness	Use additional metrics if not all relevant issues can be covered by only one.
Comparability	Allow intra- and inter-organizational comparisons as well as comparisons over time.
Compatibility	Input data for calculating the metrics should be available from the existing systems.
Cost and benefit	Development and continuous measuring costs have to be contrasted with the resulting benefits.

Table 1: KPI Requirements (Schulz and High 2009)

In addition, the following two points should be added: (1) manageability (Keller and Hellingrath 2007) and (2) adaptability (Preißler 2008). By considering the *manageability* of possible KPIs, more than just the reasonable

economic relationship between costs and benefits of measuring the KPI itself will be ensured. This is especially important when reflecting the today's technical opportunities to store huge amounts of data requiring advanced data analysis approaches, which are probably not covered in CM organizations as they are covering main core competencies. *Adaptable* KPIs enable a necessary flexibility, which can be caused by changing structures and processes. Thus, organizations using the selected KPIs do not have to invest in time consuming redefinitions of metrics.

As a final notice on requirements of KPIs, they should be constructed in a way that an assignment of measurement points to specific process steps is allowed. As VDI 4400 (2002) points out, existing data collection tools are able to document relevant processes by the identification of events in form of quantity and time data as each KPI should to be quantifiable. The following figure illustrates how measurement points can be assigned to processes within in an example of a distribution process model.

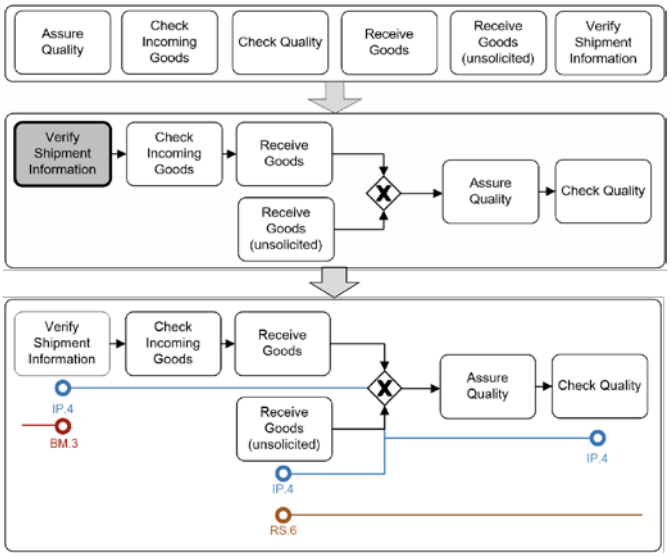

Figure 4: Assignment of KPIs in a humanitarian organization (Widera and Hellingrath 2016)

The figure depicts an exemplary representation of how warehousing tasks can be structured along a process using the BPMN standard. This logical structure visualizes an ideal flow of the sequence, e.g. the shipment information should be verified (grey box marking the starting event) before the delivery gets accepted. To each of such clearly defined processes specific measurement points can be assigned. Setting specific measurement points, concrete stages in process sequences are predefined in order to evaluate the performance executed within the tasks. The IP.4 KPIs represents the "Mean quality inspection costs per incoming goods item" and is an important performance driver in humanitarian logistics. Such a process orientation puts the organization in a position to analyze several tasks they have to deal with. The identified open set of KPIs can be found in Widera and Hellingrath (2011, pp. 1335-1336).

In the last years a large amount of different performance measurement concepts have been provided within the scientific community. Keller and Hellingrath (2007) presented an overview of existing frameworks only for the area of logistics and supply chain management. The overview is illustrated in the table below:

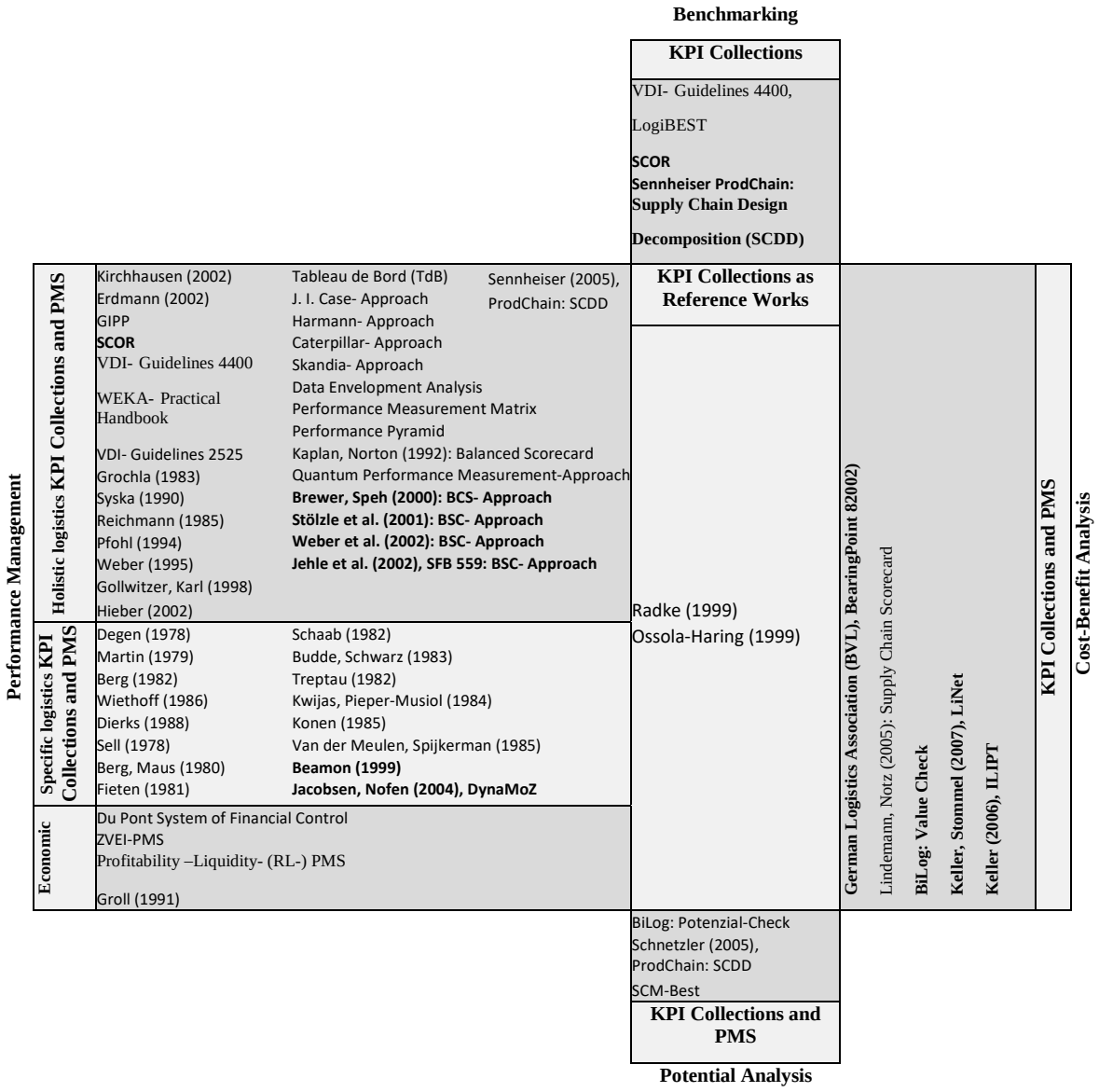

Table 2: Performance Measurement Concepts (Keller and Hellingrath 2007)

The overview of the performance measurement systems (PMS) listed in the table above is systemized by an orientation on the field of application. The following classifications were used: benchmarking, cost-benefit analysis, potential analysis as well as performance measurement divided into economic, specific logistics and holistic logistics PMS. Each inter-organizational PMS is listed in bold type.

It can be stated, that commercial enterprises are able to fall back on a wide range of established and proved PMS. They offer several advantages and disadvantages in order to fulfill organization-specific and inter-organizational requirements for performance measurement. Keller and Hellingrath (2007) conclude, that a general comparability of these different PMS is nearly impossible as each KPI contains differences in terms of classification, notation, definitions, calculations and applications. They propose to develop a holistic approach for performance measurement, which can be classified between the PMS investigated. The existing PMS and the developed framework cannot be discussed in detail in this work, but out to be deepened in further literature (Keller and Hellingrath 2007, Keller 2009). For the area of CM performance measurement approaches these findings suggest that there might be a good reason and a realistic chance to design and develop a generic PMS focusing on the identification of innovations in a secure (i.e. non-operational) context. For this purpose we present a use case of a demonstration project covering the area of innovations in crisis management. The main idea of the project is to develop a trial-oriented environment being able to identify major innovations in CM.

USE CASE: TRIAL-ORIENTED PERFORMANCE MEASUREMENT

In this chapter we present the performance measurement developed in the project "Driving Innovation in Crisis Management for European Resilience" (DRIVER+, www.driver-project.eu). The demonstration project addresses the challenge for CM organizations to assess and integrate new solutions, while coping with a rapidly changing infrastructure, evolving risks across cultural, administrative and national boundaries and engage with populations to enhance their resilience. The aim is to develop a Pan-European test-bed supporting the evaluation of CM solutions in realistic but secure environments in the face of their true benefits and for their overall suitability, before being adopted by CM practitioners. For this purpose a dedicated methodology was developed, which cannot be discussed in detail in this paper. The DRIVER+ methodology provides a structured approach of a CM innovation test-bed supporting the involved stakeholders to identify, design, plan execute and analyze relevant trials.

A key element of this methodology is the performance measurement architecture. The architecture is structured along performance measurement dimensions of DRIVER+ trials. It allows an explicit relation to tasks, processes and organization- or mission-specific targets. Because of the functional complexity of specific measurement "objects", the first step is to categorize them according to the DRIVER+ logic. The following figure illustrates the architecture of the DRIVER+ performance measurement dimensions.

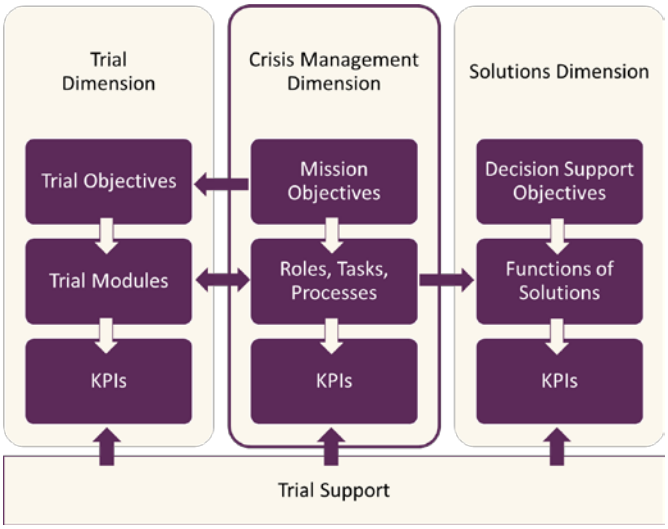

Figure 5: Performance Measurement Dimensions in DRIVER+ Experiments

The three dimensions include the trial dimension, the solution dimension and – as the core DRIVER+ dimension – the CM dimension. All three performance measurement dimensions are served by an overall performance measurement trial support, where all potentially relevant guidelines, recommendations, and trial data is collected, stored and processed (e.g. the actual KPI definition guidelines, generic KPIs, domain-specific KPIs or data storage policies).

(1) The *trial dimension* covers the perspective of the trial owner (i.e. the organization hosting a DRIVER+ trial) and measures all relevant data related to the predefined trial objectives. One example in case of a trial in the context of spontaneous volunteer management could be the question how many voluntary participants can be motivated to join a trial in order to fill sandbags needed to build a dike (KPI could be: *"participating volunteers/required volunteers"* or *"participating volunteer profile/representative volunteer profiles*"). The trial objectives are defined by the trial owner, but the main source are the CM practitioner needs and, hence, the objectives of the missions being "simulated" in a trial. In order to "operationalize" the trial objectives, trial modules are derived (e.g. communication and coordination of volunteers taking part in the trial). Within this module, the trial owner is able to define which processes are required to fulfil the objectives and assign specific weighting. This step contains an estimation of the effectiveness of each processes (with relation to the trial objectives). Once this task is done, the trial owner can apply the performance measurement guidelines to deduce specific and relevant KPIs.

(2) The CM dimension is, however, the *key performance measurement* area. In the context of one upcoming trial on the a chemical spill one exemplary KPI can be derived from the major objectives targeting the evacuation of affected population (e.g. *"number of evacuated persons/number of persons to be evacuated"*).The identification of CM objectives, described as mission objectives, is the foremost

place to indicate whether a change of a process, the application of a new technology or a training module has an impact on the CM performance. Besides, the CM objectives need to be understood as the determining element of experiment objectives and the decision support objectives. Due to the different relief situations, stakeholders and time horizons the measurement objects vary in terms of specific roles, tasks, and processes. The question if a particular performance is effective or not can only be evaluated once the involved actors including their responsibilities and practices are defined. These definitions have to be used to identify and configure the appropriate KPIs.

(3) Finally yet importantly, the solutions dimension must be measured in order to learn whether a particular piece of technology or a new process has the potential to drive innovation in CM. In the presented example it could be a solution supporting evacuation tasks through the interaction with citizens; here one objective or solution function could be to identify the location of evacuees through the application of drones (one related KPI could be *"time to locate evacuees with a drone/time to locate evacuees without a drone"*). The solutions objectives have always a relation to ease or support one particular task, decision problem or a process, even if this is only defined as a new standard operational procedure. Hence, the decision support objectives build the first starting point for evaluating the performance of a particular solution. These objectives need to be derived or at least have a direct relation to the CM objectives, in terms of a practical impact. The identified objectives can be used to extract specific solution functions which in turn can be used to derive appropriate KPIs. One important aspect here is, that the KPIs need to have a relation to the CM KPIs. To give an example, a high usability of a software might be absolutely irrelevant if the software itself has no contribution to the relevant CM performance (which does not mean, usability should not have to be measured, but its CM impact is key for the overall evaluation).

Having the three dimensions and its interrelations in mind, a clear and structured way allows to identify relevant KPIs being able to assess the *real impact of new solutions in CM*. This process is supported with generic rules of performance measurement approaches (as discussed above), procedural guidelines and recommendations. Evaluation examples can be found e.g. in Detzer et al. (2016), Havlik et al. (2016), van den Berg et al. (2016), Dubost et al. (2017).

Looking back at the initial problem on the lack of generic performance measurement approaches and the combination of the desire to support the identification of innovation for CM organizations focusing on the questions *how to measure and analyze* can be described as the main conclusion from both the literature review and our practical findings. Starting from a multi-dimensional framework (see Wang 2012) like the three-dimensional DRIVER+ approach, a structured and significant analysis of potential innovation impacts can be enabled in a relevant (practitioner-driven) and rigor manner. The suggested way is to follow predefined guidelines and steps identifying specific CM objectives and values (see also Schulz and Heigh 2009 and Owen et al. 2016), an as clear as possible systematization of the CM operation (see Rongier et al. 2013), the application of mixed-research approaches covering both quantitative and qualitative data gathering and analysis techniques (see Coletti et al. 2017) and a clear differentiation of the investigated objects (e.g. Wiel et al. 2010).

SUMMARY AND OUTLOOK

We have presented and discussed the state of the art on general performance measurement in crisis management based on a literature review. The findings show that the high variety in scenarios, tasks, stakeholders and interdependencies related to disasters, results in a lack of generic performance measurement approaches in the literature. In order to develop an appropriate measurement approach to evaluate CM innovations existing works in the area of performance measurement research were discussed. We presented a way how objective- and process-oriented performance measurement can be identified and developed in order to systemize and interrelate relevant metrics. Finally, we introduced a use case of an adjustable performance measurement architecture being deployed in an ongoing CM demonstration project DRIVER+.

The current state of the projects allows the conclusion of the applicability of the presented approach. It is especially the practitioners who are giving positive feedback when applying the performance measurement approach. Due to having a clear structure between and within the dimensions there definition of KPIs and the sense making of the gathered data allows the creation of (internal) evidence of the trialed solutions is eased significantly. Sophisticated data analysis approaches of certain artefacts (like flight or machine learning algorithms) become much more useful because of a dedicated relation to the specific KPIs of involved stakeholders.

However, the presented results reflect the conceptualization of the performance measurement approach and only first results of the development of the first trial taking place in June 2018. We have incorporated some results of preparatory trials (exemplary objectives and KPIs introduced in the last chapters), but in order to provide an

elaborated reflection on the application results it is necessary to incorporate further trials with other stakeholders and also to compare the gathered qualitative and quantitative data of the trial itself.

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