Engineering resilience in a prison's performance management system

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ABSTRACT

While organisations are becoming more complex than ever, their applied performance management (PM) systems are still based on the conventional PM approach, derived from the need for control and accountability. On the other hand, turbulent changes, growing interdependencies across organisations, and increasing uncertainty have created challenges beyond the boundaries of traditional approaches. This study explores how principles and methods from the resilience engineering (RE) field can be applied to improve organisations' adaptive capacity in the sense that they anticipate, recognise, adapt to and absorb external or internal disturbances. By discussing features of different components of PM systems and ideas in RE, we provide a framework that links the elements of a PM system and the main features of RE at the cultural, strategic, and operational levels. The approach is instantiated and validated in the context of correctional service institutes, focusing on both security threats and related safety implications for staff and other inmates. We use a Norwegian prison as a case study and apply the proposed framework to assess the institute's resilience potentials.

1. Introduction

Growing complexity, overcrowded institutions, cultural changes, and technological advances promote constant changes in modern organisations. These elements create a perfect storm of uncertainty and fast-moving competitive market requirements that creates contradictory goals to ensure expected performance (Dekker, 2015, p. 108). Organisations' performance is traditionally managed using Performance Management (PM) systems, i.e. interconnected set of tools used to develop skill and capabilities, drive overall organisational performance, and measure and improve the effectiveness of different activities (HBR, 2017, p.1). An underlying assumption in the conventional PM systems is that different functions in an organisation are tractable, and data is available to predict future performance (Hollnagel, 2011). Nonetheless, dynamic structural changes, irregular working conditions, limited predictability create a turbulent working environment that makes questionable the proposed assumptions (Goessling-Reisemann and Their, 2019). These challenges require dedicated holistic management systems capable of dealing with dynamicity and uncertainty that go beyond strategic planning and diagnostic controls fully built on a sense of predictability. Thus, these new PM systems should incorporate resilience-based thinking (Chuang, Ou, & Ma, 2020; Thekdi & Aven, 2019). Resilience offers the capacity to sustain changes and helps an organisation to survive even when its PM system has lost all vitality (Tangenes & Steen, 2017; Valikangas, 2010). As such, the efforts for its engineering (as for resilience engineering, RE) have been acknowledged to be suitable for managing risk proactively, in light of the system's complexity and variability in system's performance (Patriarca, Bergström, Di Gravio, & Costantino, 2018).

This paper takes a closer look at resilience in the context of PM and studies a common staging area for a unified approach on managing performance in dynamic organisations. Based on the fundamental ideas behind the PM system on the one hand, and the essential features of RE on the other, we develop an integrated resilience performance management (RPM) framework. The proposed RPM encompasses three phases: anticipation and preparation (focuses on strategy formulation and implementation as well as risk and resilience analysis); monitoring and situational assessment alongside the response activities in day-to-day operation (includes activities involved with core organisation's objectives); and proactive learning. Through its three phases, the RPM framework allows exploring an organisation's resilience potentials operating in a turbulent working environment.

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Such challenging operating conditions are daily faced by (e.g.) correctional service institutes. Prisons involve many defendants and inmates, sometimes with the potential of violence and criminal acts, and thus being exposed to joint security and safety issues. In the context of a high-security prison with high-risk prisoners, whose risk and need profiles are complex and diverse (UNODC, 2015), managing resilience potentials enhance "authorities" capability to govern prison effectively. For these reasons, correctional service institutes constitute a valid testbed for the proposed RPM framework, as documented in the suggested case study of a Norwegian prison (referred hereafter as "Prison A").

This work's contribution to the existing literature is threefold: (i) by linking RE to the instrumentalism of PM, we seek to contribute to the increased practical relevance of the RE concept in a security context. We aim to propose (ii) a structure to understand and analyse the related features of PM and resilience in a unified approach, which connects the fields of strategic management and safety management. In this way, this work could be seen as an interdisciplinary research endeavour. As a case study research, we illustrate (iii) how a broader PM system might enhance adaptive capacity in the prison system.

The remainder of the paper is organised as follows. Section 2 briefly presents the theoretical background for this study, from core concepts of RE towards a review of the main ideas in the PM system. Section 3 presents our suggested RPM framework. Through a methodological enquiry in Section 4, based on the Resilience Analysis Grid (RAG), we analyse resilience potentials through the lens of our suggested RPM framework. Then, in Section 5, we discuss how the proposed approach might enhance managing performance in prison. Finally, Section 6 concludes and provides recommendations for further research.

2. Background information

This study's theoretical background and main considerations include insights from seminal works on performance management literature and core ideas in the resilience engineering field.

This section also briefly presents some of the contextual elements related to our case study, a Norwegian prison, referred to as Prison A.

2.1. Resilience and resilience engineering

In recent years, the concept of resilience has been given considerable attention among safety scholars. Woods (2015) provides a broad typology of resilience concepts, classified into four categories, as follow:

- Rebound: resilience as bouncing back from distress and return to equilibrium;
- Robustness: Improved system's robustness expands the set of disturbances the system in question effectively can handle.
- Opposite of brittleness: resilience as the graceful extensibility when an unexpected event challenges boundary; how to extend adaptive capacity in the face of surprise?
- Architectures for sustained adaptability: resilience as network architectures that can sustain the ability to adapt to future surprises as emerging situation.

This typology underlines different ways to describe resilience, depending on which research stream we consider. While this typology is very useful to categorise the application of resilience as a concept in the reality of resilience-based policies, we commonly are confronted with a mixture of various conceptual approaches. For instance, in the safety management field, resilience is described as "the ability of a system to adjust its functioning before or following changes and disturbances so

that it can sustain operations after a major mishap or in the presence of continuous change" (Hollnagel, 2011, p. 12). In the crisis management field, resilience is "the capacity of the system to quickly resume critical functions that were affected by a shock to the system" (Boin & Lodge, 2016, p. 293). As we see in these definitions, there are somehow compatible concepts. Both highlight the importance of preparedness, flexibility (being able to adapt), and readiness to respond to surprises (absorb changes and resume critical functions). Within the school of RE, bringing resilience in a system means engineering adaptive capacities, via the adoption of some peculiar abilities, as linked to the so-called four cornerstones of resilience (Hollnagel, 2009):

- Knowing what has happened, that is, how *to **learn*** (L) from experience.
- Knowing what to expect; that is, how *to **anticipate*** (A) future potential changes.
- Knowing what to do, that is, how *to **respond*** (R) to regular and irregular disturbances.
- Knowing what to look for, that is, how *to **monitor*** (M) that which is, or can become, a threat in the near term.

In this paper, we use LARM as an acronym for these criteria. While learning "emphasise the search for brittleness, gaps in understanding underlying elements in Work as Done and Work as Imagined, tradeoffs and re-prioritisations" (Provan, Woods, Dekker, & Rae, 2020), anticipation is about preparing a range of alternatives about the future operating conditions. Exploring these scenarios enhances the organisation's adaptive capacity to respond to such situations. In studying a system's resilience, we focus on resilience within a PM system at an organisational level (i.e., prison management). A Resilient PM is defined as a PM system that ensures the capability of exploring the system's capacity to be prepared for, cope with, and recover from any sorts of security threats and their impacts, exploiting opportunities to build a desirable future through proactive learning.

Regarding the system's capabilities, resilience can be intended as something the system does. In terms of resourcefulness and redundancy (the availability of substitutable elements to resources), a resilient organisation proves to be capable of withstanding unexpected events and utilising the opportunity to improve organisational performance. A resilient organisation should also be able to respond to day-to-day demands and events and those that are unexpected and are beyond the scope of plans and procedures. For a prison system, this may refer to (e. g.) the availability of infrastructure services to provide custodial services that maintain safety (public and prisoner) securely. Whenever the system is under stress (e.g. a hostage scenario), resilience is shown in response to emerging threats and how it can recover from its initial stress without major drawbacks (remove the potential victims from the hazardous area).

2.2. Performance management systems

One of the originating definitions of PM is provided by Anthony (1965) as "the process by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of organisational objectives." Simons (1995) narrows this definition down to formal controls, includes both formulation and implementation, intended and emergent strategy, to maintain organisational activities. Ferreira and Otley (2009, p. 264) refer to the PM system as a formal and informal mechanism - to formulate and implement the strategy process. They identify a wide range of activities that build this mechanism, including planning, analysing, measuring - facilitating goal achievement

and organisational learning and change. Ferreira and Otley's approach to PM acknowledges the coexistence of intended and emergent strategy, assimilating organisational learning with change. This coexistence is relevant for the scope of this paper, as it shared the intention of exploring PM in light of organisational culture and emergent resilient behaviours. All these definitions are, explicitly or implicitly, related to strategy content and process, planning activities, various kinds of controls, and/or reward and compensation.

In an attempt to recuperate the boundaries in traditional performance measurement tools, which are mostly based on financial measures, Kaplan & Norton (1992) developed the so-called balanced scorecard (BSC). BSC is a multidimensional PM tool, used worldwide in different sectors over the past decades. Based on four areas of financial performance, customer knowledge, internal processes, and learning and growth, BSC aims at balancing financial and non-financial, short-term, and long-term strategic objectives in an organisation. The cause-effect chains between identified strategic objectives illustrate in a strategy map. The BSC application enables an organisation to translate its strategy into a set of Critical Success Factors (CSF), and assess them through a comprehensive set of measures, referred to as Key Performance Indicator (KPI). However, despite its benefits, BSC has been largely criticised. For instance, Norreklit (2000) questions the validity of the cause-effect link in BSC. She argues that as the model is static, it does not match the requirements in the changing environment based on a management control system. As the BSC focuses mainly on strategy implementation, it overlooks the system's complexity, uncertainties, cultural context, and working environment. Nørreklit et al. (2018) identify two other main challenges in applying BSC: the implementation problem and executive power and authority. More to the point, Nielsen et al. (2017) argue that value creation in organisations is embedded in disruptive business models and has a dynamic nature. The authors identify different challenges in applying the BSC approach, including the level of abstraction, weaknesses relating to guidance, poor benchmarking possibilities, and lack of an appropriate decision-making support. Likewise, Thekdi and Aven (2016) point to other main challenges in the application of traditional PM systems, including:

- overreliance on historical data to predict future performance
- overemphasis on performance to meet objectives and compliance, which can undermine actual process improvement
- low (but growing) emphasis on non-financial metrics, as evidenced by the socio-economic and sustainability requirements

From a holistic view, in the conceptualisation of PM, as a set of dynamic subsystems, we need a functional approach to explore the organisational capability of anticipating internal and external changes, to respond effectively and timely to them. This approach can be used as a basis to extract factors contributing to successful operations.

2.3. Correctional service institutes as complex organisations

A correctional institute consists of several living units, administrational offices, and rehabilitation programs, where they are jointly acting together in a limited community. These institutions primarily aim to ensure remand by (e.g.) retribution, incapacitation, and rehabilitation activities. The growing application of advanced technological solutions (e.g., sophisticated scanning and detection devices and new computer programs), the changing nature of crime and the increasing interdependency between different parts of prison management systems often make these facilities complex and vulnerable. On an outer scale, the operational envelope breaks up physical altercations, cell extraction,

and firefighting. Moreover, correctional officers have to enforce prison's rules. These activities are critical because interruptions might contribute to deficient performance, affecting both personnel, inmates, and society's safety and security.

On the one hand, dealing with complexity goes beyond the scope of the predefined performance procedures, as day-to-day activities are involved with both occupational and organisational stressors, requiring prison officers to cope with danger, uncertainty, and unpredictability. On the other, in reality, we face situations where the complexity and dynamics seem to be inescapable. Conducting operations in this context addresses a dynamic socio-technical working environment involving interdependencies between its functional units.

Maintaining systems functionality in such a working environment urges collective sense-making, team decision-making, synchronisation and coordination. It requires applying innovative management practices that enhance the capacity to make discontinuous discoveries and gain insights from day-to-day activities and deal with challenging dynamic circumstances. A potential solution here is improving resilience in the performance management system. Resilience and its engineering in the PM system improve adaptation and improvisation capacity to respond to expected and unexpected events and manage disruptions.

Acknowledging the challenges a correctional service institute faces in everyday work, the next section presents a holistic PM system as a unified approach to PM and resilience engineering.

3. The conceptual RPM framework

Section 2.2 pointed to some of the boundaries of the traditional PM system. The focus area in the conventional approaches is on managerial control, yet it lacks focus on resilience potentials. To deal with these challenges, we developed an RPM framework that links different components of the PM system to RE in three stages (Fig. 1). The first stage focuses on essential activities related to anticipation and preparation to support the core business in planning resource allocation and coordination in day-to-day operations. The second stage focuses on monitoring and response activities: monitoring addressing the critical issues in system behaviours; response is concerned with the actual action. Despite this conceptual difference, both are part of a day-to-day operation, which is the focus of the second stage. Stage three seeks impulses to strategy adjustments/modifications to increase the organisation's adaptive capacity through proactive learning. An organisation's ability to act resiliently depends on its organisational culture, strategy formation, and PM systems, and the interaction of the three stages mentioned above. This is the core idea behind the proposed RPM framework (cf. Fig. 1).

3.1. The anticipation and preparation stage

This stage aims to adequately predict the potential changes in future operating conditions and increase preparedness to respond to critical changes in day-to-day operation. It consists of the following steps. First, strategy formulation, founded on goal setting and determining performance scope. Strategy formulation should address organisational goals and identify the necessary resources to ensure goal achievement. Various types of analysis could be applied to this end, for instance, risk and vulnerability analysis and resilience analysis. Whereas vulnerability analysis studies the organisation's PM system given a specific event, resilience analysis explores the extent of the system's capacity to operate following any type of disturbances and raises the question of whether critical functions and operations can be sustained (Steen, & Aven, 2011). These two types of analysis provide valuable insights about threat
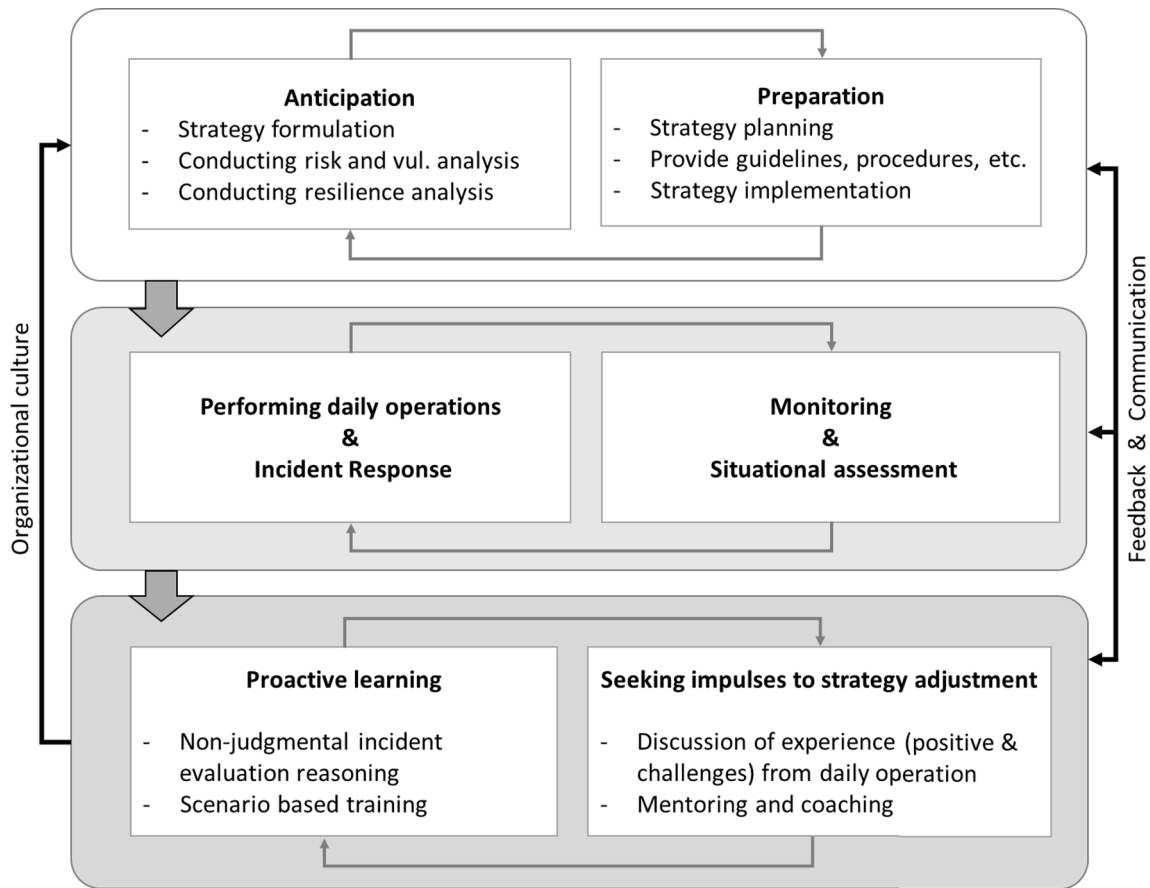
Fig. 1. Resilient Performance Management (RPM) framework for performance management centered in resilience engineering.

elements, uncertainty factors, and the system's vulnerability, as well as its strengths. These insights enhance authorities' ability to plan strategically (next step) by drawing their attention to identifying factors that affect the PM system's resilience potentials, i.e. resilience influence factors (RIFs).

Keeping up with changes across the organisational scales and preparing a strategic plan to deal with uncertainties, risks, and opportunities ahead depend on plans' flexibility. It also relies on the extent of collaboration between stockholders involved in its implementation. The result of strategic planning is a "plan" for taking actions that shape organisational performance. Policies, procedures, guidelines are a potentially benign by-product of strategy planning. While RIFs provide direction for plans, plans need to be implemented; otherwise, they have no value. Implementation is about resource allocation, mobilisation, and priority, while prioritisation is a matter of making a balance at the full length of goal tradeoffs.

3.2. The monitoring and response stage

The second stage in RPM (Fig. 1) covers the monitoring and response activities. By monitoring the system's performance, we sought to identify forms of unanticipated changes and challenges and figure out how the prison system is capable of dealing with them. Focusing on developments, threats, and opportunities increase the ability to monitor changes and prepare prison's authorities to deal with unexpected events

in advance and respond effectively when they occur. The ability to monitor depends on having appropriate methods, systems, and routines to detect changes. It entails a profound situational assessment (SA), i.e., a deep understating of the dynamic environment in everyday operations and making sense of the situation. An insightful SA will stimulate a well-developed situational awareness, which in turn enhances the ability to adjust response repertoire to unexpected changes continuously (Nyssen, 2011). Information processing is at the heart of SA, which depends on cognitive capabilities to evaluate options and making judgments under turbulent circumstances (Dekker, 2015). However, SA has its limitation. For instance, it may undermine uncertainty factors that are not formally recognised and described, particularly those rising from beyond the formal boundaries of an organisation (Ferreira & Bellini, 2018) or internal variability and dynamics, external drivers, and shocks (Park et al., 2013). Procedures, routines, discipline, available technologies, and warning systems, on the one hand, the staff's analytical ability, shape the monitoring aspect of in PM system.

Moreover, an organisation's attention structure affects top-managers and the staff's attention to changes through so-called attention regulators. One important regulator is the "rules of the game" (Ocasio, 1997), which relates to organisational culture, formal and informal principles of action, interaction, and interpretation that guide organisational behaviour in the security context. While SA provides direction to act, the effective actions depend on the collaboration- as a cross-organisation effort, coordination, shared decision making, and implementation of

decisions. Resourcefulness, the thoroughness of protocols and plans (first stage), and the extent of improvisation and autonomy are factors that influence the response process. In the response process, the resilient potential is about being able to deal with any deviations, including unexpected ones. Two critical aspects of resilience in the response are the capability of improvisation and robustness of coordination. The following set of requirements in planning for a joint response activity (Klein, Feltovich, Bradshaw, & Woods, 2005) matter greatly for the robustness of coordination: commitment to some degree of goal alignment; inter-predictability; and the choreography of the joint effort. Choreography concentrates on the phases of the activity and "influenced by the opportunities the parties have *to signal to each other and to use coordination devices*." These requirements highlight at least two critical issues. First, they have to be able to send a signal to each other, which means receiving alerts and comprehending and acting on them. Second, having some sorts of shared communication platform as a coordination device to share situational assessment.

3.3. The proactive learning stage

The third phase of RPM consists of activities related to proactive learning. It is a dynamic process with an explicit emphasis on creation, retention and transfer of knowledge (Argote, 2012). It links to information processing and training (Stern, 1997; Weick, 2016; Steen, 2019) and aims to improve knowledge about the operational context, working environment, strength, and brittleness day-to-day operations. It might also confirm the usefulness of existing knowledge and provide a deeper understanding of existing practice (Braut & Njå, 2013). The learning source could be discussing experiences from a day-to-day operation, evaluation- reasoning, incident analysis, scenario-based training,
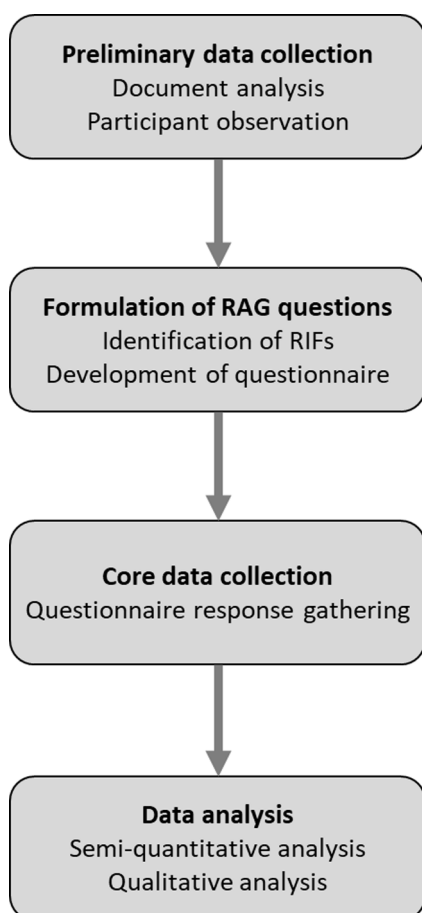

Fig. 2. Methodological design for RPM framework implementation.

mentoring, and coaching.

As an integrative PM tool, adequate "institutional memory", i.e., having some sort of system to maintain and share the organisational experience available to current decision-makers and staffs, contributes to learning through the provision of comprehensive, relevant, and timely information sharing. On the one hand, lessons might cause the strategies (stage 1) to emerge after learning from experience and sense-making processes. On the other hand, an interaction between diagnostic and interactive controls contributes to balancing the tension between unlimited opportunities and limited management attention, alongside between implementation of the planned strategy (stage 1) and strategy adjustment (Simons, 1995, p. 153).

4. Research methodology

Based on the theoretical framework described in Section 3, Fig. 2 summarises the proposed research methodology to implement an actual resilience-based PM system. As a potential tool for practical implementation, we applied the Resilience Analysis Grid (RAG) (Hollnagel, 2011). RAG is here considered suitable to incorporate the RE key elements (LARM) and conduct an overall assessment of the prison's resilience level, once resilience influence factors (RIFs) have been identified. The RAG analysis is carried out in Prison A.

4.1. STEP 1: Preliminary data collection

Since an organisation's resilience potentials are strictly context-dependent, it becomes necessary to explore the system at hand and customise the traditional RAG questions in light of the specific analysis.

Prison A is a high-security prison on the Norwegian scale that ranges from open facilities to high security and maximum security. Prison A is medium-sized with a capacity for 80 – 100 inmates of all categories (e.g., sentenced and custody inmates). It has approximately 100 persons with different responsibilities, including management and administrative, operational, and support roles. Note that further details on the institution are reserved for security policy reasons and anonymisation agreement.

The job generally requires the ability to perform the following duties of Norwegian correctional service as follow:

- ensure proper execution of remand and prison sentences concerning the security of all citizens.
- prevent recidivism by enabling the offenders, through their initiatives, to change their criminal behaviour.
- perform its primary functions, including retribution, deterrence, incapacitation, and rehabilitation.

Staff also monitor inmates and provide a report. Staff apply different sorts of human, organisational and technical means and methods to

Table 1
Documents used in this study.

Document	Focus area	References
Annual Report	To gain an understanding of the operational goal, the overall strategy and plan for correctional service	(KDI, 2019a)
Risk assessment	To get a picture of how risk is defined, which criteria are applied to assess risk factors and which measure is recommended to reduce the identified risk.	(KDI, 2019b)
Hearing: NOU 2016: 19	To figure out how the Norwegian legislation guides the general expectations about the future's threat picture in terms of requirements and regulations.	(NOU, 2016)
Report on organisational reform	To assert how the new organisation of criminal care – affects management capacity and quality.	(KDI, 2018)

perform their duties. Correctional officers are often assigned to patrol particular areas of the prison during their shifts and make sure that the inmates do not carry or produce drugs, weapons, and other forbidden in prison. Still, some prisoners will regularly try to smuggle in and conceal these illicit items. Correctional officers inspect prisoners, visitors, and physical spaces for contraband. If contraband is found, those who are responsible for the items are held accountable. Prisoners may be subject to discipline, and visitors can be prosecuted. Inmates often outnumber officers, so they must watch out for themselves and their co-workers, especially when handling tense situations. This broad aspect of different tasks points out the complexity and ranging of operational width and demands to the professional conduct of a prison officer, as well as managing performance thorough the whole organisation (Prison A).

The data collection relied on multiple data sources to ensure a comprehensive and detailed information picture. From a qualitative perspective, we used both document analysis and ethnographic research. More specifically, we conducted an in-depth exploratory documental study to understand the context of the day-to-day operation in prison, the compliance requirement, legal issues. Table 1 summarises the main documents adopted in this phase.

The knowledge gathered through document analysis has been complemented with the results of ethnographic research. According to Yin (1994), the ethnographies approach requires that the researcher "involves a field-based study long enough to surface people's everyday norms, rituals, and routines in detail" (p. 17). As an ethnographer in the prison's context, one of the co-authors in this paper has more than 20 years of working experience in Norwegian correctional service institutions. He had various roles, from serving in the restrictive prison department as an officer, operational manager, and different project work on emergency planning. His observation through a "systematic description of the events, behaviours, and artefacts of a social setting" (Marshall & Rossman, 1999, p.79) in prison provided us with a unique opportunity to understand the working environment, to translate our empirical findings through the lens of a prison's context.

4.2. STEP 2: Formulation of the RAG questions

The concepts that emerged from the qualitative analysis have been then used to generate a questionnaire, inspired by the RAG's structure. In this regard, we sought to identify which factors affect the resilience capacities in the prison's management system, i.e. resilience influence factors (RIFs), as detailed in Table 2.

Following the identification of the RIFs, for each of these factors, we formulated a statement that allowed for further scoring their extent. Then for RIF- statements, a list of questions was proposed, as fully detailed in Appendix A.

Joseph Maxwell (2009, p. 244– 245) provides a checklist that consists of seven-point criteria to ensure the validity of a questionnaire. We attempted to ensure the validity of this work following Maxwell's criteria:

- Having an intensive long-term participant field observation: (e.g., as an ethnographer).
- Having access to rich, detailed, and varied data provides a profound understanding of the activities in the natural setting of the field situations.
- Conducting respondent validation, where we shared our questionnaire with three different informants to obtain feedback about its comprehensibility.
- Searching for discrepant evidence and negative cases and modifying the conclusion by examining competing explanations by analysing our findings.
- Triangulation: collecting data from different sources.
- Quasi-statistics: application of simple numerical results that can be readily derived from the collected data, by application of RAG methodology.
- Comparing the research results explicitly through different settings, focus groups, or events, where we have reached our findings for two groups of our informants, prison officers and prison managers.

Moreover, to increase the internal validity, i.e., causality between data and results, "a well-considered set of actions" (Yin, 1994, p.41), in our analysis we applied the guidelines provided by Hollnagel (2011, p. 289-291) and other literature on RAG (Patriarca, Di Gravio, Costantino, Falegnami, & Bilotta, 2018; Falegnami et al., 2018; Hegde et al., 2015; Rodríguez, Lawson, & Butler, 2019).

4.3. STEP 3: Core data collection

Although we used the RAG-formulated statement as a roadmap to develop questions, survey questions were modified to align them with the context of this study. Concerning the external validity and providing a domain where the findings could be generalised (Yin, 1994, p. 31), our results are related to Prison A's context. Still, the comments and final remarks could be applied outside the study's context, as they are related to enhancing the adaptive capacity in general. Regarding reliability, we point to four issues. First, our application of RAG as an approach is comparable with its use in the other domains of study. Second, as mentioned earlier, one of the authors in this work had a role as a participant observatory in Prison A. This is a challenge for repeatable observations as it is highly context-dependent. At the same time, it enabled us to discuss our findings in the light of a prison context- in its real daily operation. The third point is the issue of transparency, i.e., "careful documentation and clarification of the research procedures" (Gibbert & Ruigrok, 2010). This point strengthens the credibility and trustworthiness of this work, as we present our protocol (Appendix A) and scorings for each LARM capacities to facilitate later research.

Table 2
List of Resilience Influence Factors (RIFs) for the RPM inspired by the case study in Prison A.

Learning	Anticipating	Monitoring	Responding
L1: Learning source & selection criteria	A1: Resources/ expertise	M1: List of indicators (thoroughness)	R1: Event list (thoroughness)
L2: Learning basis	A2: Frequency/ updating	M2: Relevance	R2: Background/ regulatory requirements
L3: Data collection & analysis	A3: Communication & info. sharing	M3: Indicator type (lead-lag)	R3: Response plan and its relevance to day-to-day operation
L4: Classification of lessons learned	A4: Assumptions/ sense-making	M4: Validity	R4: Threshold
L5: Frequency	A5: Time horizon	M5: Time horizon: using indicators	R5: Resourcefulness
L6: Resources/ organisational support	A6: Risk tolerance criteria	M6: Org. support: inspection, auditing, etc.	R6: Coordination
L7: Delay	A7: Predictions & quality assurance	M7: Analysis & feedback	R7: Readiness/ speed

Table 3
The total response rate from Prison A.

Informant	Sent	Response rate
Prison's officers	49	63% (31 received answers)
Prison's managers	15	67% (10 received answers)
Total number	64	64% (41 received answers)

Fourth, the data were collected and held anonymously, where we highly considered ethical issues. For instance, the informants were assured that none of their comments would have been cited directly in any document. Besides, comments which might point to the vulnerable area and security-related information were removed from the data. Our survey was sent to 64 individuals who had different roles in the Prison A, varied from the two levels of duty, including prison officers and the emergency and prison managers. Table 3 shows the total response rate.

The survey was mainly distributed by e-mail. Yet, some of the surveys were delivered as a printed document, in an envelope. We estimated that the responding process could be completed in about 30 min. Nonetheless, in the "any other comments" left at the end of the survey, we received comments, which prove how several respondents spent a longer time than expected elaborating on certain questions and helped us interpreting the results. In terms of measurement scales, we used the Likert type, with six divisions ranging from None (1); Very Low (2); Moderate Low (3); Moderate (4); High (5); Extremely High (6). The next section presents the main findings.

4.4. STEP 4: Analysing resilience potentials

The semi-quantitative analysis of the resilience potentials has been conducted in terms of the median values of each questionnaire item relying on the adopted Likert scale. Furthermore, for each item, a *t*-test analysis has been conducted to test the null hypothesis between groups (i.e. H_0: the mean scores by different groups of respondents to a questionnaire item is equal). The statistically significant comparisons (significance level, alpha = 0.1) have been emphasised in the qualitative interpretation of each resilience potential. A synthetic representation of the scores obtained by respondents has been included in Appendix B, using box-whiskers plots.

These abstract results are discussed further for each cornerstone in the following section.

5. Discussion

In this section, we discuss how implementing the proposed methodology can be helpful to manage the prison's performance and affect resource acquisition and allocation decisions. We provide some recommendations to improve the system's capacity as they could be beneficial for the decision-makers in light of each resilience potential (LARM).

5.1. Potential to learn

The rating in Fig. 3A indicates the level and scope of Prison A's dedication (in terms of organisational support and encouragement) to learning activities and the extent of using learned lessons to improve performance qualities. Fig. 3A reveals that the overall potential for learning is somehow at a low level. The resilience influence factor, L2, has received the lowest rating (see Appendix 2 for detail). Learning basis (L2) addresses which source of information/ events or activities drive learning. The direct question we asked for L2 was:

- How well the insight from why and how the day-to-day operation is successful (things that go right) provide learning, compared to learning from failures (things that go wrong), through the incident investigation?

The low score indicates that the learning source mainly derives from the incident investigation reports. Paying attention to the positive

aspects of incident response, successful day-to-day operation, developing non-judgmental response evaluation by shifting focus from "who" and "why" to "how" will enhance learning capacities in the prison system.

This result highlights that the learning process should be prioritised, either by formal education or short training programs. The other form of organisational support to enhance proactive learning is sharing experiences (positive aspects and challenges) and deployment of mentoring and coaching program. There is also a potential for improvement regarding L3 and L6, and L7. For instance, "Data collection (L3)" addresses the extent of having access to data and the ability to analyse and make sense of them. Concerning the dynamic reality of the prison context, from our data, we see a need for organisational support (L6) to increase knowledge and competence and to enhance skills in prison staff. The findings highlight that lessons learned from the day-to-day operation needs to be maintained and developed at the organisational level (L7). Although our two groups of informants' scores were somewhat diverse (prison managers and officers), we did not find any statistically significant difference between them.

5.2. Potential to anticipate

The rating indicates the extent of Prison A's effort to anticipate what may happen in the future. It includes changes in human, technology, political, and organisational concerns. Apparently, from Fig. 3B, one might conclude that the anticipation capacity in the prison system, at its best, is at a moderate level. The lowest score is given to the level of Resources/Expertise (A1). We found a significant difference between managers and officers' rating regarding A1, where managers were less optimistic. As a RIF, A1 addresses the following question:

- To what extent is sufficient and available expertise in the prison system to collect and interpret information/data about future trends/ threats?

The low score to A1 suggests that the current level of resources and expertise unmatched the need for anticipating threats. It includes prison's vulnerability exploitation, using advanced technology to (e.g.) smuggle illegal items, radicalisation, violent and disruptive behaviour, etc. The insights about what may happen in the future and prepare a plan to deal with the anticipated challenges, enhance resilience capacity in the prison system. Considering the overall context in which the prison operates (retribution, deterrence, incapacitation, and rehabilitation), authorities must decide which endeavours to prioritise in their strategy formation: what methodology/technology should be used that will have the most significant risk-reducing impact?

Nonetheless, a historical data-based approach would not be sufficient (particularly in our case) as it is unlikely to cover all the relevant events. Hollnagel (2011) agrees in saying that anticipating what may happen must go beyond the traditional risk assessment, considering both individual events and their possible combinations and their impacts. Failing to think ahead will inevitably leave a system, in our case prison authorities, unprepared and hence more vulnerable. To compensate for the lack of data, we need to adopt alternative approaches, such as Degree of Belief (DoB), brainstorming, and Delphi-type exercises. An important task is to be creative and develop scenarios that have not happened before (in the system at study) but plausible. Having the ability to anticipate risk events, in the long run, enhances prison authorities' capacity to be prepared and hence be less vulnerable.
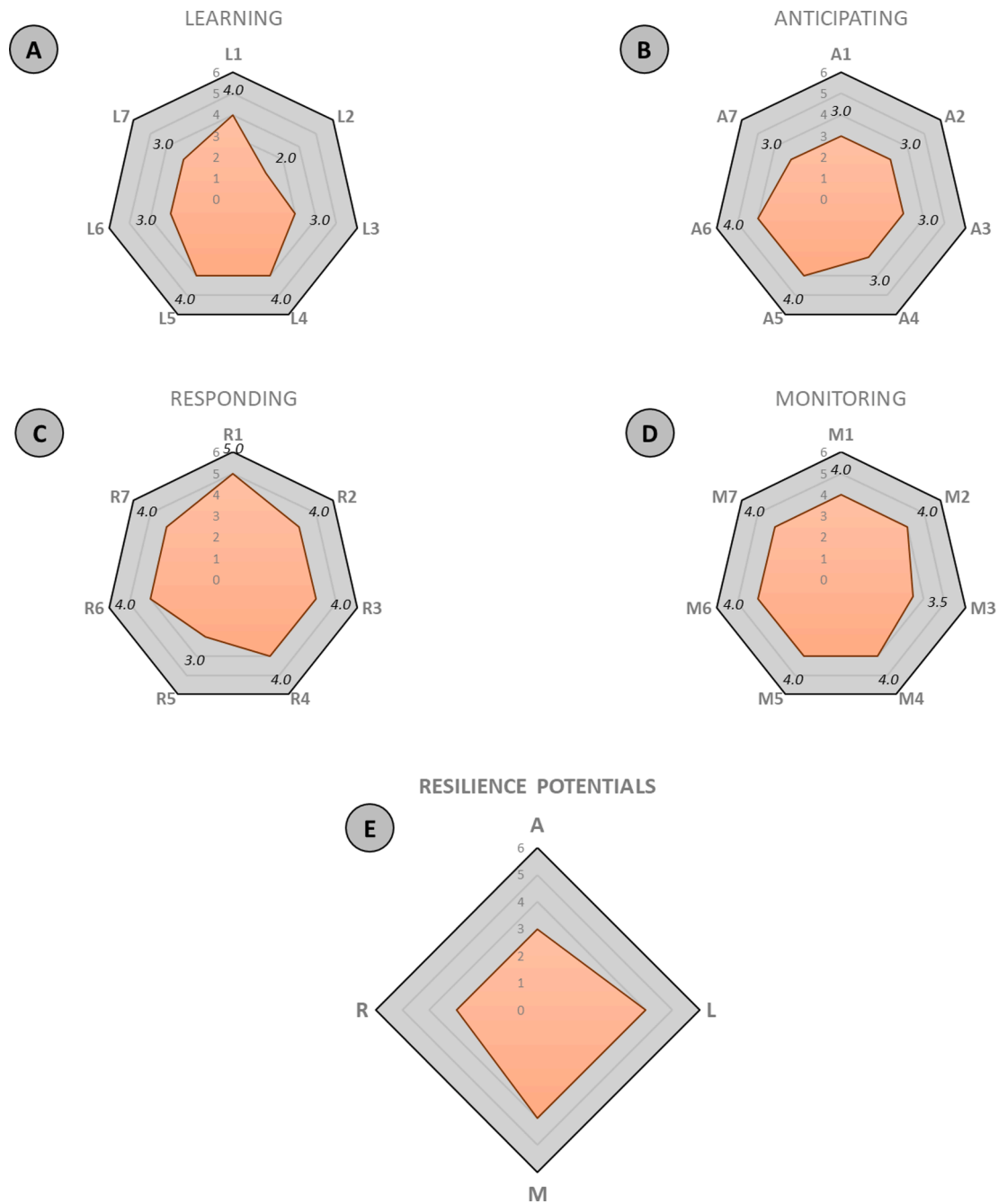
Fig. 3. Rating for the resilience potential for each cornerstone (LARM) and aggregated rating.

5.3. Potential to respond

The rating indicates the extent of Prison A's capacity to respond to day-to-day demands and respond to unexpected events. At first glance, Fig. 3C illustrates that the overall potential to respond is at the moderate-low level, with two exceptions for Resourcefulness (R5) which rated for very-low level and the Event list and its thoroughness (R1) that ranked as high level. The question raises regarding the high rating level of R5 is how prison authority can maintain this potential? The past success (highly rated resilience potential) should not be considered as a guarantee of future achievements (Dekker, Hollnagel, Woods, & Cook,

2008). As a RIF, R5 addresses the sufficiency and suitability of resource allocation to respond to the demands (people, technology, equipment, materials, financial, etc.). We asked the following question regarding R5:

- Are the qualities/ attitudes of the available resources adequate and fit to the demand side to respond to day-to-day operations and emergencies?

The low score indicates a lack of adequate resources. At the same time, it highlights that the existing resources need to increase their

qualifications to fit with demanding situations. Other important observations can be raised on R6, rated at the moderate-low level. To capture the extent and the quality of the coordination process in Prison A, we asked the following question:

- How well the interfaces for coordination between prison officers and administrative level in place and functioning?

The extent of having a common ground in understanding response plans, protocols/agreements, and formal autonomy to create ad-hoc solutions for emerging issues affects R6. Our findings point to a significant difference between officer and managers' points of view regarding Prison A's capability to respond, R2, R3, R5 and R6. For instance, the difference between managers and officers regarding coordination indicates that coordination quality at the front line does not match the level that the top-managers believed it to be. There might be two possible alternative explanations: First, top-managers do not make sense of the intensity of the responding process in an emerging situation, where staff needs more guidance and supervision; Second, the low score in coordination might be due to what Jones and Roelofsma (2000) point to as the "group dynamic", i.e. the social contextual and group decision biases, alongside with prison staffs' interaction, affect the quality of joint coordination, hence the resilience of response process. To deeply understand the coordination challenges, it is necessary to delve deeper and provide insights into the interrelationships between different operating-process roles. We need to understand the context of day-to-day activities and emerging situations. It might have involved multifaceted and multidimensional factors such as power structure, organisational culture, institutional complexity, etc. It was not in the scope of this paper to investigate these issues.

5.4. Potential to monitor

The rating indicates how well the Prison A's is capable of detecting changes (in prison's working environments) that may affect the system's ability to operate, regarding its four main functions, namely retribution, deterrence, incapacitation, and rehabilitation. Fig. 3D shows that the overall monitoring potential is at a moderate level, except for M3, which received a lower score. The Moderate-low score also calls for constant attention to an advanced system to collect and interpret information/data about future threats. Related to M3 (indicator type, in terms of lead-lag), the following question was asked in the survey:

- To what degree is the focus on lead indicators (proactive) compare to lag indicators (results)?

The moderate-low score for M3 signifies that the prison system's monitoring activities mostly rely on lag indicators, such as incident statistics and the number of events caused by inmates' violent behaviour. While lagging indicator provides insight into performance outcomes, the leading indicators are concerned with those underlying factors that might generate the desired results. The questions then to ask are: What processes should we employ to achieve higher levels of success? What sorts of competence and skills prison officers need to enable them to respond to an unexpected challenge that arises? How prison staffs improve their adaptive capacity to achieve the desired outcomes better? Accordingly, leading indicators could be related to organisational support (M6), developing strategy in enhancing multi-skilled staffs, or time horizon (M5). This latter ensures the capacity of looking for signs, making sufficient sense of them, and acting accordingly later in the response process.
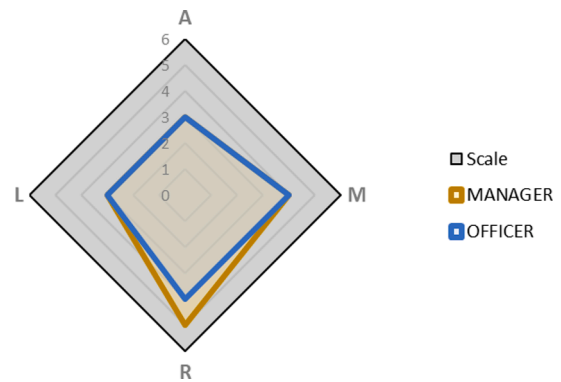

Fig. 4. Resilience potential- an aggregate rating of Prison A.

Our data displays some significant difference in rating from the two respondent's groups regarding M4 and how well the validity indicators are established regarding the required resources to current needs. We see that managers are more optimistic than officers in the front line. A possible explanation for this difference is that top-manager use the signals and information through indicators in their strategic planning process. Still, they do not necessarily give officers feedback on how that information was used and why indicators are relevant. It might also indicate a lack of effective cross-organisational communication in prison, or in general, an opaque monitoring process. This point highlights the need for more transparency, sharing information across prison systems, and increase focus on reporting feedback and strengthening the interactions between managers and officers.

Regardless of differences in these ratings, our data indicate that there is a need for improving the: organisational support (e.g., resource allocation, effective reporting channels, providing training activities to enhance cognitive ability of staff); presenting information in effective ways promptly; using technology to develop intelligent systems.

5.5. Aggregated resilience potentials

The following chart illustrates the overall rating of four resilience potentials (LARM) and their relationship, based on combining the scores for each subset of RIFs in the previous section.

Fig. 4 highlights the following issues: The overall ratings for learning, anticipating and monitoring potentials are at the moderate-low level (score-3). Managers are more comfortable and optimistic (higher scores) about the general response process (R1-R7), both to the day-to-day demand in normal operations or response to incidents, than officers. We have also found a significant difference between our two focus group (See Appendix B) regarding the potential to anticipate and monitor. One might wonder why? The answer could be related to the working environment, where officers at the front line- in direct everyday contact with inmates, experience more turbulent operations. Leaders and top-level managers have different concerns than front line officers, namely efficiency and the limited budget. This limitation might lessen the possibility to deploy more resources. This point raises a question on what is an adequate resource level. The answer to this question, however, depends entirely on managerial judgment and political concerns. After all, correctional service is not operating in the private sector; thus, its budget is covered from the national budget, where politicians decide how much money goes to whom. Nevertheless, it is crucial to understand that the low level of response readiness will downscale the resilience capacity of the prison system.

6. Final remarks

This work addressed how to enhance an organisation's resilience potentials through its performance management system. We highlighted several resilience influence factors (RIFs) at the strategic and operational level governing organisational performance. A fundamental challenge in analysing and characterising RIFs, particularly in socio-technical systems, is that we may not be able to find a strong argument for measuring RIFs, as they may have a qualitative nature. Yet, RIFs and their relative measuring indicators can be cautiously established based on the available knowledge and assumptions and consequently updated when needed. We are conscious that the scores obtained in the analysis are not necessarily an accurate estimation of the resilience capacity of the system due to the individual's interpretation and understanding of the question and the imposed equally weight to each RIF for the overall score. However, in line with (Hollnagel, 2011), we do believe that the semi-quantitative scoring is not in itself a measure of resilience. Rather, it is a process measure that shows the current potential for resilient performance regarding how well the system does on each of the four main capacities. To this extent, the proposed RPM could be used to model the effects of changes on the system and analyse evolving behaviours.

A resilient performance management system acknowledges this quest by emphasising "learning" and considers a set of qualitative and semi-quantitative methods to reflect this (lack of) knowledge. A crucial issue in this setting is to address uncertainties in the analysis process. On the one hand, our work aspires to shed light on and bring research attention to resilience, through performance management, in a security context. On the other, the proposed RPM framework constitutes a first staging area for a joint research effort, combining methods from modern safety science in the security context. Enlarging the scope of this paper, it could be possible to investigate further how culture, ethics, and leadership affect resilience potentials in correctional services operational settings. The interpretative dimension of this question calls for a line of research from an ethnographic and naturalistic perspective for knowledge provision, for which the current framework may provide a foundation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Questions for the resilience analysis Grid (RAG) application

Each question could have been answered via a Likert scale: None (1); Very Low(2); Moderate Low(3); Moderate(4); High (5); Extremely High (6).

Anticipating	
A1: Resources/ expertise	To what extent is sufficient and available expertise in the prison system to collect and interpret information/data about future trends/ threats?
A2: Frequency/ updating	How often are the applied standards and procedures updated concerning internal and external changes (threats)?
A3: Communication & info. sharing	How well are the expectations of future changes and descriptions of possible events in your working environment is communicated in your department?
A4: Assumptions/ sense-making	How well the expectation about the changes (threat and opportunities) fits the complexity of the day-to-day operation?
A5: Time horizon	In what state does the organisation's plan flexible to adapt to future changes?
A6: Risk tolerance criteria	To what extent the criteria for risk tolerance in your department is sensible in a way that it provides a clear understanding of what is an acceptable risk or not?
A7: Predictions & quality assurance	How large an effort does the prison system put into what may happen (risk and opportunities) in the near future?
Monitoring	
M1: List of indicators (thoroughness)	How broad is the scope of indicators for identifying hazards in your unit?
M2: Relevance	To what extent is the list of indicators relevant for the current operational environment?
M3: Indicator type (lead-lag)	To what degree is the focus on lead indicators (proactive) compared to lag indicators (results)?
M4: Validity	For leading indicators, how well their validity is established regarding the required resources to current needs?
M5: Time horizon	To what extent is an appropriate time horizon between the interpretation of measurement (indicators) and its effect on the action plan?
M6: Org. support: inspection, auditing, etc.	To what scale the current system (managerial and technological) provide sufficient audit of the day-to-day operation?
M7: Analysis & feedback	To what extent are the results from different sorts of analysis communicated and used to prepare day-to-day activities?
Responding	
R1: Event list (thoroughness)	To what extent the list of events cover all types of updated eventualities for which you prepare and routinely practice the action plan?
R2: Background/ regulatory requirements	How well the working methods/ procedures, which you apply in your duties, are adapted to fit any kind of operations of your unit regarding the compliance requirement?
R3: Response plan	How well the response plan includes measures to ensure that the ability to respond is maintained in the form of practices, training activity, systems checks, etc.?
R4: Threshold	To what extent a functional balance between safety & productivity influence actions to be taken in day-to-day operation?
R5: Resourcefulness	Are the qualities/ attitudes of the available resources adequate and fit to the demand side to respond to day-to-day operations and emergencies?
R6: Coordination	How well the interfaces for coordination between prison officers and administrative level in place and functioning?
R7: Readiness/ speed	How quickly can a full mobilisation of all emergency response capacities be mobilised?
Learning	
L1: Learning source	To which extent, there is a predefined criterion (Severity, scope, value, etc.) of what events should be investigated as a basis for learning?
L2: Learning basis	How well the insight from why and how the day-to-day operation is successful (things that go right) provide learning, compared to learning from failures (things that go wrong), through the incident investigation?
L3: Data collection & analysis	To what extent the prison authorities provide support for data collection, analysis, and communication to increase learning?
L4: Classification of lessons learned	How well cases that are investigated are described and communicated across the organisation?
L5: Frequency	How well you attempt to learn continuously (in the daily operation), rather than driven by events and incidents?
L6: Resources/ org. support	Are the adequate resources allocated to collecting, analysing and disseminating information across the organisation (front line officers, supervisors, managers)?
L7: Delay	On which level what is acquired through learning in your day-to-day operation is maintained and developed at the organisational level?

Appendix B. Synthetic representations of the scores obtained by respondents have been included in Appendix B, using box-whiskers plots
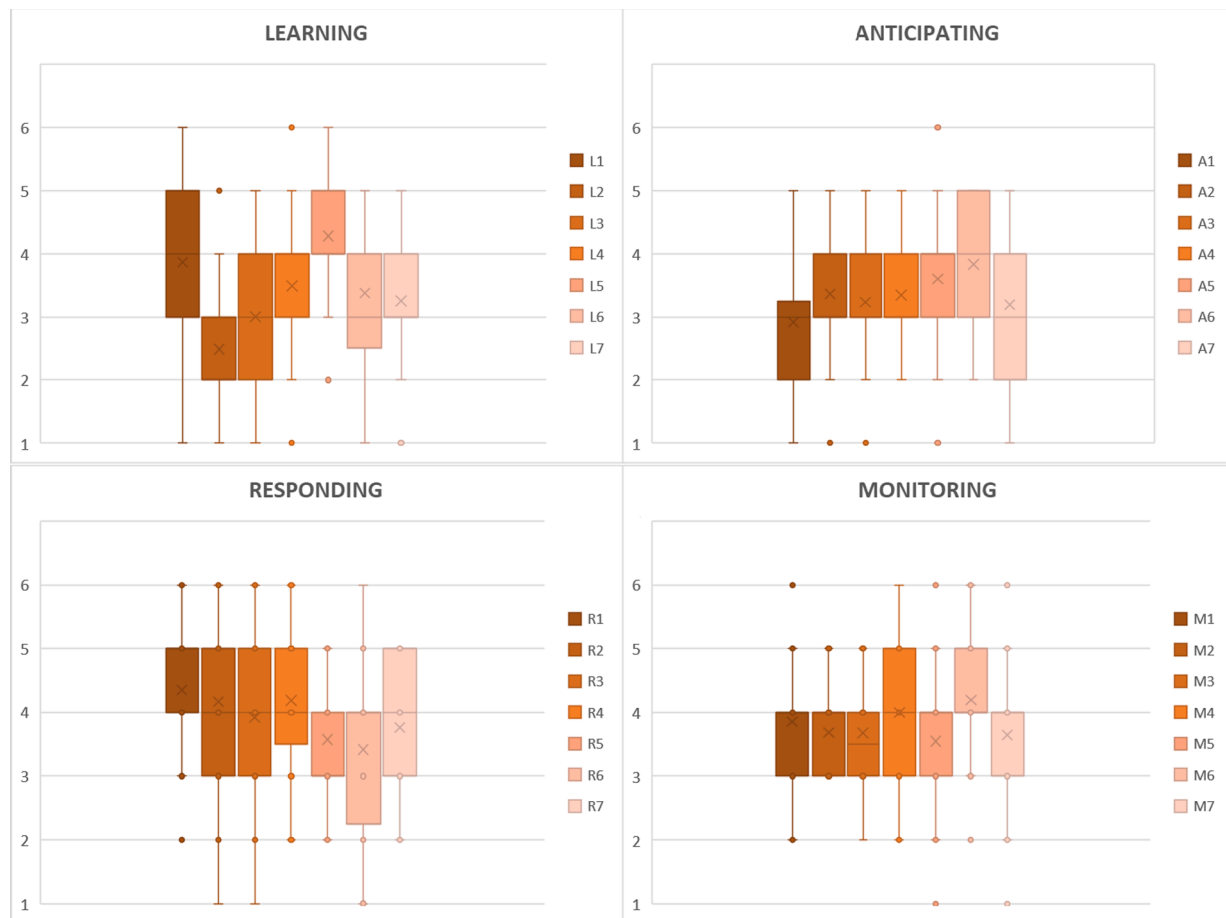
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