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Strategies for Developing Agile Crisis Management Capabilities

Arne Norlander Ph.D., LtCol (Ret.)
arne.norlander@norsecon.se

Founder & CEO, NORSECON – Senior Member, IEEE –
Independent Expert, European Commission
Stockholm, Sweden

Abstract — In Crisis Management Operations (CMO), operational characteristics are highly dynamic and non-linear; minor events, decisions and actions may have serious and irreversible consequences for the entire mission. A central part of managing these challenges is recognizing and accepting complexity as a driver of these critical mission characteristics, and by developing a Multi-Domain Operations (MDO) perspective at the individual, team and organizational levels. Additionally, success in CMO requires highly capable Mission Understanding (MU), with the abilities of perception and interpretation of a particular situation to provide the situational awareness, context, insight, foresight and task knowledge required for effective decision-making and action. Finally, the turbulent environment in which these units operate stresses the need for Organizational Agility (OA), ensuring internal operations are matching the degree of turmoil in external environments, a principle known as requisite variety. This requires adaptive and versatile principles and concepts for Cross-Cultural Decision Making along with agile high-performance organizational structures.

1 Introduction

Crisis Management Operations (CMO) – be they Emergency Response, Military, Law Enforcement, Counter-Terrorism – comprise complex, laborious and dangerous tasks, performing successfully under challenging mission requirements [1]:

- Collaborating within and between different organizational cultures,
- Engaging and organizing people with different backgrounds, education and experience,
- Maintaining effectiveness and efficiency at the individual, team and organizational levels,
- Employing a Multi-Domain Operations (MDO) perspective, in the physical, virtual and social domains.

The MDO perspective is particularly important in Crisis Management: Beyond the conventional physical domain, the significance of the virtual and social domains, the operational effects that can be achieved in these domains, particularly the virtual sub-domains of cyberspace and information, have grown to the point where mission success is unlikely if operations in the non-physical domains are not properly managed and integrated with the operations in the physical domain. Operating in all three domains makes it far more difficult to understand cause and effect, to predict the countless effects that are likely to arise from alternative courses of action, and to synchronize actions.

Furthermore these three domains differ in the temporal dimension. Events in cyberspace can occur in fractions of a second, while events may unfold in the physical domain in minutes or hours, and in the social domain in days or weeks.

Additionally, success in CMO requires highly capable Mission Understanding (MU), based on an accurate perception and interpretation of the specific situation and circumstances in order to provide the context, insight and foresight required for effective decision-making, enabling a comprehensive appreciation of the situation [2].

Finally, the turbulent environment in which these units operate stresses the need for Organizational Agility (OA), requiring adaptive and versatile principles and concepts for Cross-Cultural Decision Making along with agile high-performance organizational and command structures [3].

2 Key Elements

According to Cannon-Bowers et al. [4], tactical decision making teams are faced with situations characterized by rapidly unfolding events, multiple plausible hypotheses, high information ambiguity, severe time pressure, and serious consequences for errors. To be able to adapt to these situations, team members must co-ordinate their

actions so that they can gather, process, integrate, and communicate information timely and effectively. This is particularly true in CMO where problems frequently are "wicked" [5; 6], with inherent difficulties to assess performance with a single correct answer or in situations where several individual decision makers must interact as a team. Building an agile and adaptive organization begins with recognizing and accepting the complexity and wickedness of the enterprise and its circumstances, and letting go of the idea that it can be tamed and controlled.

CMO requires extraordinary operational capabilities, depending on interaction and collaboration within and between different organizational cultures, between people with different backgrounds, education and experience, while maintaining effectiveness and efficiency. These problems are currently studied extensively in a multitude of organizations, and what all have in common is the need for a strategy and vision for developing these capabilities. We have devised a number of strategy elements that are necessary for establishing a framework for future Agile Capabilities development.

2.1 Approach

Agile capabilities are currently being studied extensively in a multitude of organizations: Government, military, businesses, healthcare, emergency response, education, and aid organizations to name a few.

Primary fields of study are: Complex Distributed Adaptive Systems, Cognitive Systems Engineering [7], Critical Skills of individual operators and teams, Mission Resource Management, Command and Contol [3], Leadership, Decision Making and Operational Performance.

2.2 An Agile Organization

Dyer and Shafer [8] investigated how organizations hold competitive advantage on the marketplace, and they suggested that Dynamic Organizations (DO) compete through organizational and marketplace agility and point at Strategic Human Resource Management (SHRM) as a central success factor. They stated that "Marketplace agility requires that employees at all levels engage in proactive, adaptive, and generative behaviors, bolstered by a supportive mindset" and they identified four critical success factors of agile organizations:

- Reading the market, intended as the ability to scan the external environment, locate and analyze emerging developments, and quickly turn the resulting information into actionable decisions.
- Mobilizing rapid response, as the capacity to quickly and easily make decisions and translate these decisions into action. In some cases, this involves little more than making a series of relatively small-scale accommodations to evolving customer needs or competitors' initiatives. In others, it involves making major adjustments in product or service offerings or essential business processes. In either case, the key to success seems to lie in two factors: mindset and resource mobility.
- Exploiting temporary advantage, which refers to the capacity to quickly and easily enter new markets and to deliver competitively priced products or services to these markets as long as, but not longer than, they remain the most attractive options on the horizon.
- Embedding organizational learning, as the creation, adaptation, and replication of knowledge to improve organizational performance. The authors refer to two types of learning: adaptive, or single loop, and generative, or double loop.

These principal success factors are essential to meet the demands of maintaining competitive advantage. The authors developed a model of how these organizational competencies are developed, introducing a criterion that is key to the issue of sustainability: agile organizational capability.
Dyer's and Schafer's [9] suggested model of agile organizational capability proposes the systemic interaction of key components, of which people are but one, with a relatively stable inner core and a constantly moving frame that consists of reconfigurable components. Dyer & Shafer suggested that the inner core, almost paradoxically, thanks to its stability provides the energy that allows constant change, because it is grounded in an expansive vision that incorporates adaptability, exploiting opportunities and coping with change as key performance metrics. The outer ever-moving ring becomes the place where continuous evolution, experimentation, discovery and adaptation are operationalized. The model was designated the principal analytical framework in this study and depicted in Fig. 1.

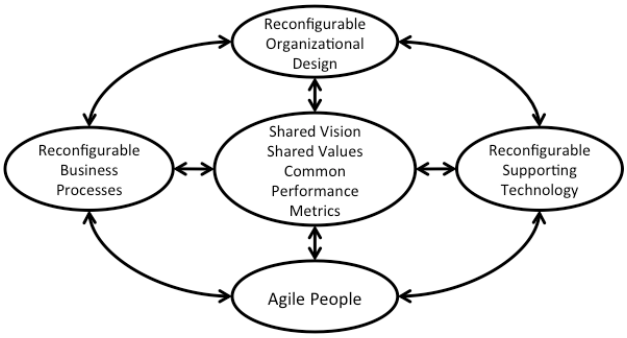

Fig. 1. A model of agile organizational capability. Adapted from Dyer & Shafer [9].

2.3 An Agile Mindset

An agile mindset represents adaptability to a variety of challenges and a readiness to act effectively and timely. It requires a global perspective with a focus on managing a wide range of interdependent situations and events, in remote, austere and hostile conditions [10; 11], and where

Volatile, Uncertain, Complex and Ambiguous (VUCA) [12] circumstances are the norm rather than the exception. Thus, performing difficult CMOs in a VUCA mission environment puts special demands on leadership:

Volatility is amplified by accelerating change, in a world in which social, cultural, and technological progress is exponentially increasing in ever-shorter intervals of time. In such an ecosystem, it is not enough to stay informed about the latest trends and data. Savvy leaders understand that there is now a mandate toward staying ahead of growth curves, and having the foresight to both know how to find breakthroughs to handle the inherent enterprise dynamics and, ultimately, create the future.

Uncertainty pushes leaders to demonstrate more agility and active engagement. In addition to technology driving the complexity of today's environment, societal, economic, environmental, and political drivers converge to create new challenges and, more importantly, new opportunities.

Progress in algorithmic technologies and cognitive systems [1; 7] enables a significant growth in the amount of information available for judgment and decision-making. Even the highest quality information will generally be associated with considerable uncertainty, ambiguity, inaccuracy and other deficiencies.

Complexity compels leaders to remain focused on what's next. To gain greater visibility about the future requires an instrument for building resilience, adaptability, and opportunity through recognition of emerging patterns.

The number and diversity of the entities required to respond, the set of operational sub-domains in which they operate, the interdependencies between and among operations in these domains and the effects they create, all pose significant operational challenges is yet to be fully identified and appreciated.

Ambiguity raises a number of leadership, trust and agency concerns regarding the needs, characteristics, interdependencies, and abilities of the involved humans, artifacts and joint systems. Ambiguity forces leaders to cope with poorly structured and imprecise knowledge, by employing a diversity of problem solving activities. In some cases the results are interpreted and converted into physical control signals to control and influence some physical process. In other cases the results are implemented as policy or directives, containing plans, orders, tactics, techniques and procedures for other Human or Non-human Intelligent Collaborators (NICs) [13] to follow.

Building an agile Crisis Management organization requires a major shift to a mindset that permeates policy, attitudes and activities throughout the enterprise and is characterized by

- Cognizance – Evidence-based, developed from both research, development and innovation with sufficient breadth and depth that coalesces into knowledge;
- Competencies – Based on quality, productivity and innovation;
- Context – Operational experience, domain understanding and an effects-focused value perspective;
- Creativity – Challenging established thought patterns and solves complex problems through adaptability and flexibility.

This change must be instilled at the individual, team and organisational levels, utilizing the new mindset as an enabler of agile and adaptive behavior. Otherwise, the implementation of new methods, procedures, technologies or organisational structures will not be sustainable.

2.4 Agile Operational Capabilities: Drivers

In many business domains, industry or government, civilian or military, it is widely acknowledged that in capabilities development, the principal drivers of evolution reciprocate between scientific progress and operational experience. Science advances theory, providing options for analysis and development. Theory advances technology, providing opportunities for future capabilities. Operational experience advances the state of the practice, improving adaptability and generating strategies for managing change in missions and environments. This experience can be formalized into requirements for future capabilities, through an evidence-based, scientific analytical framework.

A balanced combination of efficient, versatile and available capability characteristics will ensure delivery of required operational effects wherever and whenever necessary (Fig. 2).

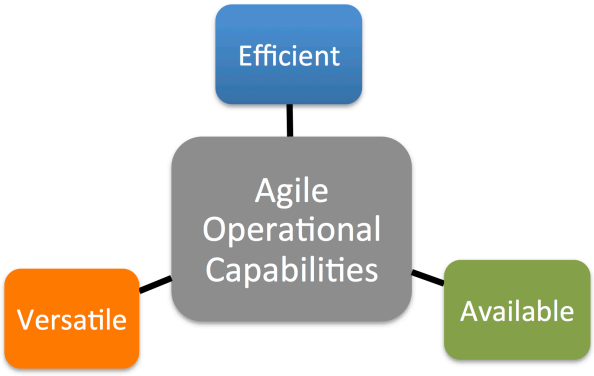

Fig. 2: Agile operational capability characteristics.

Efficiency defines the possibilities to both develop and train crisis management units as well as to deploy and support them in theatre with optimal resource utilization.

Versatility defines the possibilities to operate in all dimensions and operational levels of risk. Most operations include an, at times, unpredictable mix of offensive, defensive and stabilizing elements.

Availability defines the possibilities to deploy units at the right time and to carry out operational activities during the time required with regard to policy and operational objectives.

2.5 Developing Agile Capabilities: Architecture

A crucial factor in achievement of the objectives in capability development is that all actors and partners can be consolidated into an architecture that is:

1. Generic – represents all relevant capabilities,
2. Scalable – across all capability categories (or business areas) and organizational levels,
3. Shared – accepted and used by all actors and stakeholders.

Each one of the three components of the agile capability architecture introduced above is constituted by the following sub-structures [14], necessary to be able to advance the development of the agile CMO force and its essential operational capabilities:

2.5.1 Efficiency

Mission tailored

1. Modular mission capability packages, comprising adaptive mission training, organization and equipment. Readily available and rapidly configurable capabilities, prepared mission planning options.
2. Flexibility, systematic analysis and evaluation are crucial to be able to adapt effects in the operational environment in order to minimize use of force and collateral damage.
3. Risk awareness: To take deliberate risks within the operational framework and dynamically adapt the unit's level of efficiency and protection for the task.

Hybrid response

1. Effects-based response that creates a favorable environment for the continued operation, prevents risk exposure and violence escalation, and minimizes the duration of the mission.
2. Graded effects, where methods and means are adapted to current objectives and circumstances, requiring an appropriate combination of forces, effectors and systems. A good understanding of the situation gives more opportunities to choose the means necessary to attain the right effect.
3. Creating physical, virtual, and social effects are to be considered as an option at all stages. Information Operations and indirect and unconventional methods contribute to a pervasive effect.

Public and managerial support

1. Success in agile CMOs is dependent on the mindset, trust and commitment from both government and non-government bodies, authorities and organizations, requiring extensive political-strategic coordination.
2. Managers and leaders need to include the necessary harmonization arrangements between and among independent actors operating in the same or different domains.
3. Public support and clear political directives must foster a shared sense of purpose, and a unifying culture across business areas and operational domains.

2.5.2 Versatility

Multi-Domain

1. Multi-functional and multi-national interaction towards a common objective. Understanding and managing the situation's driving forces in the physical, virtual and social domains.
2. Understanding of one's own role in the overall campaign, along with all other actors and stakeholders. Working with temporary and fluctuating coalition partners and networks.
3. Adapting methods and procedures for planning and execution in all of the physical, virtual and social operational domains.

Comprehensive Operational Awareness

1. An all-encompassing mission cognizance, applying leadership based on knowledge of and attention to prevalent cultural norms and values. An ability to translate this cognizance into action that is effective and acceptable, and build and foster trust between people, cultures and organizations.
2. Ensuring a balanced competency, authority and responsibility to ensure broad acceptance and support for the CMO. Mission-tailored approaches and a broad knowledge base are essential when the operation is time-, safety- and resource-critical, before, during and after an operation.
3. Highly capable Mission Understanding (MU), with the ability to perceive and interpret the mission-

specific situation to provide the Situational Awareness (SA), context, insight, foresight and task knowledge required for effective decision-making and action.

Evolutionary

1. Ability to perceive, understand and deal with change requirements under time-critical conditions. This enables development during ongoing operations through mission adaptability against variations in environment, mission, organization and resource availability.
2. Analysis of performance and conclusions of experiences from ongoing and completed campaigns are translated into action. There is a major need to link information with experiential context in ways such that it generates knowledge useful for evaluation, scrutiny and selection.
3. Unexpected irregular threats and events are tackled through critical thinking, comprehensive analysis, tests and experiments, with involvement of industry and suppliers, to improve efficiency and compress the lead-time from problem discovery to solution implementation.

2.5.3 Availability

Strategic deployability

1. Strategic air, sea, land and virtual mobility is secured by the coalition, with both civilian and military partners. All resources are adapted to physical and virtual strategic reach without previous modification.
2. Crisis management forces have high strategic availability, and force readiness is harmonized with international command arrangements and standards.
3. The crisis management force is part of a multifunctional, multi-organizational enterprise, providing support and sustainment through a balanced mix of national, coalition and third-party solutions.

Balanced resource utilization

1. The crisis management force identifies needs and necessary changes aided by intelligence, forecasting and decision support functions. The force adapts its asset availability over time and through changes between alternate missions and tasks.
2. The force concentrates on core activities and tasks and prioritizes and conserves its own resources. The force coordinates the use of exclusive resources with coalition partners and other actors.
3. The force secures a mission-tailored logistics chain through harmonization and optimization of organization and procedures.

High initial effect

1. The crisis management force has a readiness for immediate action following entry in theatre. Initial entry and effect is not dependent on local support to secure effectiveness should rapid and unexpected unfolding of events occur. The force utilizes all available means for tactical access for rapid action and wide-ranging effects.
2. The force and all its components are adequately trained and prepared before entering the area of operations. The force utilizes an effective combination of both lighter and heavier units to ensure a comprehensive initial effect.
3. Crisis Management Operations require early and comprehensive access to adequate intelligence as a basis for balanced risk assessment and choice of effectors.

3 Results and Discussion

A number of scenarios have been developed and studied, and lessons learned from current operations and situations act as examples of how these capabilities can be designed and implemented. Our theoretical advances and the experimental results validate that cognitive systems analysis of Crisis Management capabilities is a versatile and effective approach [7; 15]. Cognitive systems analysis facilitates:

1. Identification of limiting factors of a specific individual, unit, system, procedure or mission in CMO.
2. Assessment of the magnitude of influence of these factors on overall tactical performance.
3. Generation and implementation of solutions to improve insufficient capabilities and contribute to successful mission accomplishment.
4. Methodological support to analysis, development and evaluation of complex CMO.
5. Improving training programs for tactical decision making and resource management.

The strategic elements of development, described in Table 1, must be integrated with the three core capability principles of efficiency, versatility and availability.

To facilitate and support a balanced analysis, development, evaluation and assessment of Crisis Management Capabilities, a number of strategic elements have been defined [3]. When this architecture complex is operationalized into measurable evaluation criteria, organizations become able to employ more than one

operational approach, appreciate suitable approaches, and efficiently shift approaches when appropriate.

Table 1. Strategies for agile capability development.

Multiple Perspectives, Flexibly Managed	Multifunctional, multi-organizational and multinational interaction towards a common objective.
	Understanding of the situation's driving forces and of one's own role in the overall campaign, with all its stakeholders and resources.
	An ability to undertake missions and tasks in all environments, applying methods and procedures for planning and execution in the Endeavour Space.
	Working with temporary coalition partners in joint, interagency, multinational, public, and combined operations.
Trusted, Distributed, Cognitive Capabilities	Trusted capabilities, where human and artificial team and staff members are vital components of an "edge organization" where decision rights and autonomy are granted to local operators to effectively cope with situational complexity and dynamics.
	Distributed capabilities, with a high degree of "edge computing", i.e. local intelligence processing capability to provide data mining, data reduction, and reasoning from massive amounts of data.
	Cognitive capabilities, constituted by network-enabled information exchange, shared situational awareness, mission understanding and self-synchronization, when in a collective or coalition environment, to produce the intended effects.
Adaptation and Learning	Adaptation, including the ability to perceive, understand and deal with change requirements under time-, risk- and resource-critical conditions. This enables the force to develop during ongoing operations through its mission agility against variations in mission, environment, organisation and resource availability.
	Learning, including analysis of performance and experiences from ongoing and completed campaigns that are translated into action.
	Unexpected irregular threats and events are tackled through critical thinking, comprehensive analysis, rapid testing and experiments to improve efficiency and shorten the time from discovery to implementation.

The number and diversity of the entities required to respond in CMO, the set of operational sub-domains in which they operate, the interdependencies between and among operations in these domains and the effects they create, all pose significant challenges not yet fully anticipated nor appreciated.

4 Conclusions

Based upon an analysis of the empirical evidence from case studies, supported by organizational agility theory, we conclude that developing and implementing agile Crisis Management Capabilities, with its inherent competencies, methods, technologies, procedures and structures, depends heavily on adaptation, learning and collaboration, traits that are at the core of agile crisis management.

Management commitment is required, all the way through policy and doctrine to Tactics, Techniques and Procedures. Organizations need to be able to employ a Multi-Domain Operational approach, understanding when different approaches are appropriate, and to timely and efficiently transition between approaches. Organizational Culture is the personality of the organization, and needs to be based on flexibility, deliberate risk-taking, openness to change and tolerance for error (i.e. a learning culture), and we are advocating agility and adaptability as a guiding principle. An adaptive organization requires a philosophy of leadership comprising curiosity, learning, boldness and dynamism, where initiative is rewarded and the bar is set high towards excellence. An organization where there is no place for new ideas or constructive criticism is rigid, unadaptable and far from evolutionary, and thus doomed to failure.

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Author Biography

Dr. Arne Norlander (LtCol, Ret.) has over twenty years of experience as a leader and expert in strategic defence and government Research, Development & Innovation. He is Founder & CEO of NORSECON AB, a consulting firm in Science, Engineering, Innovation Policy and Technology Foresight. He is a Senior Member of IEEE and serves as an independent Research & Innovation Expert for the European Commission. More information on LinkedIn: www.linkedin.com/in/arnenorlander