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NAVIGATING CAPABILITY-BASED PLANNING: THE BENEFITS, CHALLENGES, AND IMPLEMENTATION ESSENTIALS

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February 2024

Introduction

Capability-Based Planning (CBP) defines a framework that has an all-encompassing view of existing abilities and future needs for strategically deciding what is needed and how to effectively achieve it. Both business and government acquisition domains use CBP for financial success or to design a well-balanced defense system. The definitions understandably vary across these domains. This paper endeavors to consolidate these definitions to provide a comprehensive view of CBP, its potential, and practical implementation of its principles.

Capability-Based Planning (CBP) Terminology

What are Capabilities?

To fully comprehend CBP, we must first grasp the concept of capabilities. We found that definitions of capabilities in literature can be grouped into four categories: the description of objectives or high-level needs, operational outcomes, activities and processes, and the ability to produce or achieve some type of outcome. In the following paragraphs, we provide examples of the definitions from the literature by category.

The definitions in the first set collectively illustrate that capabilities represent objectives or high-level needs that form the fundamental basis of organizational planning and strategic decision making:

- "Functional approach to the articulation of broad requirements without necessarily specifying the resources that may be involved" [1]
- "Defined by an operational user and expressed in broad operational terms" [2] [3]
- "Foundation of defining the technical and operational requirements of the product or service produced by the project. Without the defined capabilities, those requirements have no reason for being" [4].

- "Consist of far more than just technology; in fact, technology underpins just one element– materiel–of a capability" [5]
- "Capabilities are not the same as features and functions; they enable demands to be met without the explicit specification of the solution" [6], [7], [8].
- "Capabilities provide the answer to the following question: to achieve our objectives, what capabilities must we possess?" [9], [6], [7], [8]. In other words, "to achieve our objectives," what must we be able to do? Capabilities include talent, expertise, materiel, capacity, among other things.

The next category of capability definitions is related to the above, but instead of objectives and needs, focuses on operational outcomes:

- "A description of the military operational output or outcome that a unit, force or organization is able (and usually constituted or organized) to deliver" [10]
- "Define the future effects needed for agencies to meet their mission and transform into a more agile and adaptable force" [11]
- "…the combination of military equipment, personnel, logistics support, training, resources, etc. that provides Defence with the ability to achieve its operational aims" [12]

The above two sets of definitions focus on the fact that capabilities should be high-level descriptions of success criteria or required needs, without specifying exactly what is needed to achieve them. This next set of definitions focuses on activities and processes, all from the business domain, and reminds organizations that their internal activities and processes should also be evaluated to meet success criteria:

- "… capabilities are formed through the coordination and integration of activities and processes and are the product of collective learning of individual assets" [13].
- "They are used to explore innovative new possibilities and deal with rapidly changing and uncertain conditions, and also to exploit current routines and perform repetitive processes when conditions are stable and predictable" [14].
- "Capabilities are collective and cross-functional–a small part of many people's jobs, not a large part of a few" [15].

While the first three categories of definitions focus on what can be changed or done, the last group of definitions focuses on the ability to produce or achieve some type of outcome rather than the outcome per se:

- "Ability to achieve a desired effect under specified standards and conditions through combinations of means and ways to perform a set of tasks" [16], [2], [3], [17], [18], [19]
- "Further defined as the ability to contribute to the achievement of a desired effect in a given environment within a specified time and the sustainment of that effect for a designated period" [10]
- "Wherewithal to complete a task or produce an effect within a set of specified performance standards and environmental conditions" [20]

- "The ability to achieve an objective in a military operation" [19]

The definitions encompass varying perspectives, emphasizing outcomes, the ability to achieve them, or internal organizational activities and processes. While these definitions may seem divergent, they collectively describe the essence of capabilities as high-level descriptions essential for fulfilling organizational or Department of Defense (DoD) objectives. These multifaceted definitions capture different dimensions that achieving a solution must encompass. We will further explore these facets as we synthesize the goals and definitions of CBP. The individual definitions then may represent a view from a time in the lifecycle, the viewer's role, or a stakeholder's value proposition.

What is Capability-Based Planning (CBP)?

Just as there are varied definitions of capabilities to describe their multifaceted dimensions, so CBP definitions categorize into a few groups, each addressing a different perspective. CBP's definitions span from cross-organizational to organizational planning for a complete set of required capabilities, as well as use of scenarios and stories to predict future needs and to assess how current and future capabilities would meet them. CBP provides a flexible framework that allows governments and organizations to strategically identify objectives that will make them and/or what they produce successful.

Several countries' governments (e.g., United States, Canada, and Australia) started to use CBP to "design an appropriate [military] force," one that is "postured to adequately deal with the challenges of the future" [20]. Instead of focusing on who an adversary might be, where a war might occur, or how an adversary might fight [5], [17], [21], [22], the "goal is to plan for robust, flexible forces, capable of meeting a wide variety of threats, rather than an 'optimal' force for a narrow set of threats" [18]. The "objective is to develop a flexible, adaptable, robust, and sustainable (i.e., technically manageable and financially affordable) force structure postured to address all the challenges associated with a nation's strategic defense and security environment, considering budgets and uncertainty" [20]. With CBP, governments and defense departments evaluate "the development and evolution of capabilities, rather than specific programs or function" [23], to go "from programs to portfolios of capabilities" [16], [22], and "determine an efficient and effective mix of military forces" [20]. The capability serves as a goal that enables us to decide whether a specific technology or process supports achieving that goal [20]. In summary, CBP underscores the significance of cultivating adaptable military capabilities to address future challenges in national defense by transcending the limitations of specific defense organizations, military services, programs, or functions.

While the following quotes pertain directly to commercial enterprises, their relevance can extend to governments, cross-organizational, or other diverse settings. CBP "is not a schedule, it's not a list of features, it's not a project management plan. It's the map to the destination of a full set of capabilities needed to transform the business from legacy applications to Enterprise Resource Planning (ERP) based operations" [4]. With CBP, "[a]n organization's planning, investments and delivery are aligned to provide the business capabilities that will deliver strategic success" [24], [25], [26], [8]. In summary, for both governments and commercial organizations, "[t]he key idea is to start from what needs to be done and work back to an affordable force that can do it. This is fundamentally different from

starting with what you have and working out how to improve it (or keep as much of it as possible if facing cuts)" [27], [28].

The above definitions of CBP suggest that governments and organizations need to look at their capabilities and goals from the widest or highest level that is relevant versus having a narrow focus for strategic success. The next set of definitions express the planning aspect of CBP's framework–while maintaining high-level generalizability to allow for innovative solutions. The most referenced definition of CBP comes from Paul Davis:

> *Capabilities-based planning is planning, under uncertainty, to provide capabilities suitable for a wide range of modern-day challenges and circumstances, while working within an economic framework [9].*

Essentially, CBP must "confront–rather than discount–uncertainty, to express risk in meaningful terms, and to weigh costs and benefits simultaneously" [29]. Uncertainty stems from two sources: both the scenarios that describe the needed capabilities and the "details of assumptions in those scenarios" [29]. Additionally, CBP should consider a diverse "range of competitive options and trade-offs before making the choices necessitated by a budget [29]. In other words, CBP focuses on goals and outcomes and encourages innovation [1], [16], [30], [31], [32] by "moving away from determining equipment solutions prematurely" [31], [1], [19], [30]. This "provides a means to compare different options for achieving the same capability" [31]. Hence, it is not CBP's goal to "engineer planning processes to a fine level of detail, but rather to design an effective decision-support mechanism for regular, rigorous integration of planning process outputs" [5]. To support this high-level, generalizable framework, CBP "starts with a top-down definition through scenarios, case studies, or use cases" without eliciting detailed requirements [4], [25].

Therefore, to make strategically successful decisions, governments and organizations must evaluate their ideal and existing capabilities at the highest and widest view possible, while refraining from making decisions that can overlook uncertainty, risk, and budget constraints. The generalizability of the CBP framework corresponds the generalizable definitions of capabilities. CBP and planning at the capabilities level aim to offer a holistic and flexible perspective while ensuring success.

Implementing Capability-Based Planning (CBP)

CBP Benefits

The benefits and advantages of the high-level and generalizable framework CBP provides are that CBP

- enables Department of Defense (DoD) "leaders to better understand joint capability gaps, redundancies, and opportunities, providing a foundation for cross-capability tradeoffs" [16].

- has the "power to create an agency that can better adjust to new threats, eliminate stove pipes, and increase both inter- and intra-agency information sharing" [11], maximizing the effectiveness of resources [29].
- "centers on the acquisition of a family-of-systems or system-of-systems that enables operations across one or more missions" [33], [17].
- "will be shown to be capable of defining what capabilities are needed for government, industry, and societal responses to a broad range of contingencies" [1].
- "allows decision makers to consider both the likelihood of the scenario occurring and any consequences of failure. It additionally permits calculations in terms of tradeoffs among Measures of Effectiveness (MOEs) (e.g., accuracy versus collateral damage versus probability of kill with one weapon) [34]. The analysis of these measurements and calculations in turn "enhances the quality of information available to defense decision makers and defense capability developers" [11], [16], [31].
- "encourages innovation through moving away from determining equipment solutions prematurely" [31], [30], [1] and "also allows for competition among solutions" [19].
- enables "an enterprise to develop and evolve its critical capabilities in a highly complex and dynamic environment to bring superior value to its customers" [23]. This previous statement can also be extended to governments and national defenses: CBP enables a government "to develop and evolve its critical capabilities in a highly complex and dynamic environment to bring superior value to its" nation [23].

CBP Challenges

CBP, while a valuable strategic approach, faces various criticisms and challenges that must be addressed. One of the "most difficult parts of" CBP is to account for uncertainty [10]. As previously mentioned, there are two sources of uncertainty–the scenarios that describe the needed capabilities and the "details of assumptions in those scenarios" [29]. The challenge is to identify "a greater variety of scenarios" and to "effectively address the many possible scenarios and variations" [16]. We need to not only predict or account for "adversary actions, but also responses from other nations, including allies and friends" [16]. We must realize that "[i]nput-output relationships in military operations are highly complex, highly context dependent, and most military resources (people, equipment, systems, etc.) are capable of multiple functions that create different kinds of effects" [5]. We also must remember, uncertainty is a feature, not a bug, of CBP, although it does need to be appropriately addressed for successful implementation. Current "endeavors so far are laudable, but improvements are necessary to enhance the timeliness, responsiveness, and completeness of DoD's scenario databases" [16]. Additionally, while stakeholders need to discuss the "critical uncertainties that will drive the scenario vector" [35], the exact meaning of this is never provided [10]. CBP "lacks the detailed analysis required to deal with the current realities of real future threats" [36]. Essentially, CBP is a high-level framework that leaves the details at a more concrete level abstract. The challenge is to understand and manage the evolving uncertainties.

In addition to accounting for uncertainties, risks, and tradeoffs, organizations and governments also need to "incorporate fiscal constraints" in CBP and "there has only been limited guidance to date on when and how such factors should be included" in future planning" [16]. An "[i]nherent challenge involved in implementing a CBP process: need for estimates on a consistent basis, including costs for force elements that may not yet exist" [31]. One can begin to understand the complexity involved in evaluating future scenarios and the capabilities needed to address them. This leads to another challenge of "prioritiz[ing] of decisions, [and] deciding the relative merit of requirement element and the relative importance of projects" [28].

Another challenge is the "need for a common CBP language to improve the community's ability to collaborate on and compare analyses" [16], [18], [28]. As explained and demonstrated in this paper, not only do multiple agencies and stakeholders need to collaborate to implement CBP, but a wide range of definitions for capabilities and CBP exists. However, the complexity makes the "construction of stable capability taxonomies inherently difficult" [5]. Finally, there is concern that CBP may be viewed as a one-size-fits-all solution, leading to potential issues in different contexts [28]. Thus, while CBP offers a valuable framework for strategic planning, addressing these criticisms and challenges is essential to ensure its effectiveness and adaptability in a dynamic and uncertain environment.

The above-listed challenges can boil down to the need for the CBP framework's addressing capabilities alignment, trade-offs, tracking of uncertainty and risks, and mapping the goals hierarchy needs to be operationalized. For such a framework/model to be adopted by governments, the process would need to be "repeatable, driven by federal mandates, and compliant with the Joint Capability Integration and Development System (JCIDS)" [11]. JCIDS is the U.S. Government organization that applied CBP to identify capability gaps in its force structure. Of course, the framework/model would need to be compliant with any country's process/organization that is implementing the framework/model and CBP. The next section pulls the requirements for implementing CBP from literature to further build on this need for a generalizable but repeatable framework.

Requirements to Implement CBP

With CBP and its advantages and limitations identified, this section describes the requirements to implement CBP successfully. CBP needs "collaborative strategies" to succeed [28]. "Strategic planning requires working across accountability structures to align policies, plans, and programs. Many of the current threats are cross-jurisdictional or transnational in nature" [28]. This leads to the scope of the CBP process to be broad, requiring "the involvement of many stakeholders" [1], [28]. "Stakeholder involvement must be achieved early in the process as [stakeholders] generally control information, resources, and authority required to support CBP" [31]. It's important to remember that the outcomes of the CBP process are results of a series of decisions among stakeholders, and therefore "commitment to a strategy [is] more important than the agreement on every detail" [28]. The broad portfolio of capabilities views that CBP encourages "requires that groups of interdependent systems must regularly interact and work together as systems of systems to deliver desired capabilities" [2]. To accomplish this, systems engineers must be involved earlier in the "requirements and concept refinement process" of the CBP process [16].

When defining the goals for the CBP process, it is necessary to identify the "desired level of capability needed to achieve the stated objectives" [31]. "Capability goals should be developed on, among other considerations: defense priorities; partitions chosen; threat appreciation; scenarios used; impacts of future friendly and threat technology; affordability; risk; and concepts employed" [31]. The "portfolio-style assessment" of the CBP process must consider and account for "options at different levels of details. The portfolio-style assessments should assist in making decisions on trade-offs and should address various types of risk" [29].

The CBP processes requires for stakeholders to "think broadly about the entire scenario space of possibilities" [3], [22], [29]. "Scenarios provide the essential link between defense policy and capability objectives" [31]. While broad, high-level scenarios must be considered, considering specific scenarios helps with

- developing "realistic capability goals" [31]
- providing "context and a means to share assumptions" [28], [3] and therefore "facilitate communication" as it becomes "easier to compare options in a strategic-level framework if everyone has a fairly concrete mental image of what the evaluation cases are" [3]
- providing context for capability assessment [18] and identifying gaps associated with the mission area [19]
- "provid[ing] a way to test the concept against the breadth of the defense strategy" and "the spectrum of conditions to be considered" [19]
- "assess[ing] whether the capability at issue would merely be nice to have logically or would make a difference in plausible cases of concern [3]

Implementers of CBP also need a "framework to evaluate multiple performance indicators for capabilities and capability groups" [37] and "tools that enable visual understanding of dependencies across broad areas of interest" [16]. A common framework ("encompassing projections of risk, uncertainty, and preferences" [16]) would support collaborations and the portfolio of capabilities level of planning due to "consistency across services, Office of the Secretary of Defense (OSD), the Joint Staff, other agencies, and U.S. allies" [16]. The CBP framework or process needs to consistently "define capability goals and identify gaps" [38] as well as be "driven by federal mandates" [11]. Implementors also need a way to "grade the DoD's abilities in [their] assessment" that requires "defining a framework for measuring how good or bad we are" [19].

Estimation plays a crucial role in decision-making processes in the CBP framework since "the most effective and efficient options to satisfy the requirements" to fill capability gaps "are sought" [9], [7], [8], [30], [39]. Estimation is particularly vital when conducting an Analysis of Alternatives within CBP. Without estimates for the potential outcomes of each choice in the list of alternatives, it becomes impossible to determine which capabilities are best suited to meet mission needs or fulfill a business case. As Alleman emphasizes, credible decisions in the face of uncertainty rely on estimates [6]. Therefore, the accuracy and reliability of estimates are critical in ensuring that CBP can effectively inform decisions about which capabilities to pursue, aligning them with strategic objectives and mission requirements. To effectively utilize this approach, historical data on features, their attributes, actual effort, and durations are essential [40]. However, when dealing with software features, especially

in a diverse landscape of operating platforms and application domains, there is a need for some form of grouping or standardization to facilitate estimation.

Meaningful Measures

When it comes to making meaningful decisions in CBP, several measures are crucial to evaluate the effectiveness of a future or completed capability to help with the evaluation of possible solutions or determine the completeness and quality of a completed capability:

- Measures of Effectiveness (MOE): "Operational measures of success that are closely related to the achievements of the mission or operational objectives evaluated in the operational environment, under a specific set of conditions" [6], [34], [38], [41]. This measure allows analyzing trade-offs: "accuracy versus collateral damage versus probability of kill with one weapon" [34]. mo
- Measures of Performance (MOP): "Measures that characterize physical or functional attributes related to the system operation, measured or estimated under specific conditions" [6], [38], [41]. Another definition is a "measure of a system's performance expressed as speed, payload, range, time on station, frequency, or other distinctly quantifiable performance features" [42].
- Measure of Suitability (MOS): "A measure of an item's ability to be supported in its intended operational environment [41], [42]. "Operational suitability is the degree to which a system can be placed satisfactorily in field use with consideration given to availability, compatibility, transportability, interoperability, reliability, wartime usage rates, maintainability, safety, human systems integration, manpower supportability, logistics supportability, natural environmental effects and impacts, documentation, and training requirements" [41].
- Technical Performance Measures (TPM): "Attributes that determine how well a system or system element is satisfying or expected to satisfy a technical requirement or goal" [6].
- Key System Attributes (KSA): "is a system capability considered crucial in support of achieving a balanced solution approach to a Key Performance Parameter (KPP) (defined in the next bullet) or some other key performance attribute deemed necessary" [6], [41].
- Key Performance Parameters (KPP): "Key system capabilities that must be met in order for a system to deliver its operational goals" [6], [41].

Furthermore, Physical Percent Complete is a valuable measure that should increase effectiveness and performance while decreasing risk to enhance the probability of project success [43]. Additionally, there are specific measures like Measures of Force Effectiveness (MoFE) and Measures of C2 Effectiveness (MoCE) that focus on how a force performs its mission and the impact of command and control (C2) systems within the operational context, respectively [38]. Dimensional Parameters (DP) delve into the inherent properties and characteristics of physical C2 systems [38]. Each measure captures different aspects and qualities of capabilities and can be applied across different or several lifecycle stages. Collectively, these measures provide valuable insights for informed decision making in CBP.

Conclusion

Capability-Based Planning (CBP) is a multifaceted strategic approach that plays a critical role in helping organizations, including governments and commercial corporations, navigate an ever-changing landscape of challenges and uncertainties. This paper has explored the diverse terminology associated with capabilities and CBP, discussed the advantages and challenges of implementing CBP, and outlined the essential components needed for its successful implementation.

One key takeaway from this exploration is that the various definitions of "capability" provide a high-level understanding of what an organization or entity can achieve. The aspects of capability includes 1) high-level objectives to achieve, 2) the actual operational outcomes, 3) organizational activities and processes that enable flexible approaches to achieve an objective or operational outcome, and 4) organizational (or enterprise) ability to achieve an outcome. Capability transcends specific technologies or solutions and serve as the foundation for effective planning and decision-making. CBP thus offers a flexible framework that enables organizations to identify and prioritize objectives that will lead to success, all while considering the dynamic nature of the environment in which they operate.

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Legal Markings

This material is based upon work funded and supported by the Department of Defense under Contract No. FA8702-15-D-0002 with Carnegie Mellon University for the operation of the Software Engineering Institute, a federally funded research and development center.

DM23-1041

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