

Organizational Adaptive Capacity:
How Much, How Fast, and How Often

by

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USAWC CIVILIAN RESEARCH PROJECT

ORGANIZATIONAL ADAPTIVE CAPACITY: *HOW MUCH, HOW FAST, AND HOW OFTEN*

by

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ORGANIZATIONAL ADAPTIVE CAPACITY: *HOW MUCH, HOW FAST, AND HOW OFTEN*

INTRODUCTION

The current Army force structure debate may seem to have little to do with an atomic force microscope, but the operation of a seemingly esoteric scientific instrument captures much of what is missing from the debate and our doctrinal concept of adaptation. The general paradigm of defining a strategic threat and then determining a force structure to defeat that threat may work for the rhetoric of budget battles, yet it is a woefully inadequate concept for implementation in the unpredictable world the future is likely to provide. One might argue that the Army's force structure, considered here as the full Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel and Facilities (DOTMLPF) spectrum, was mismatched for every conflict of the last century with the exception of Desert Storm, although it may be argued that even there the logistics concept was ill-suited and inefficient.¹ In almost all conflicts, strategic to tactical circumstances demanded significant force structure changes ranging from large scale personnel and industrial mobilizations, development of new doctrine and tactics, to the expansion of special forces.² The only historical constant is the demand to adapt force structure to the difference between predicted and actual circumstances.

The question in defining a force structure then expands from how to counter a specific predicted threat to how we can build a force that rapidly adapts to the broadest range of unanticipated circumstances. There is no doubt that individual leaders, units and the Army as a whole have adapted how they conduct operations during the course

of the recent conflicts in Iraq and Afghanistan. Some change produced excellent results. Other changed behaviors violated the integrity of the Army and the United States. Recent literature and Army doctrine are filled with now rather vacuous demands for adaptiveness and articulations of traits in our personnel and organizations that are already inherent – they miss the complexity of the conceptual underpinnings of adaptation and their practical consequences.³ Individuals are by their very nature adaptive. So too are organizations. The question of adaptation in building force structure at the strategic to tactical level is more nuanced than reactive change to external threats. The deeper questions of organizational adaptation involve *how much change, how fast and how often*.

The answers to those questions are found in the concept of organizational adaptive capacity: the integration of DOTMLPF components that it is a function of organizational size, subject to various feedback loops, rates of change and time delays, and equilibrates between internal and external factors. The objective here is to synthesize the many intuitive and disparately articulated concepts of adaptation into a coherent, holistic model that provides a framework for determining how much, how fast and how often an organization can change. The lack of mechanistic understanding for how Army organizational change operates creates the possibility of uncontrolled, unpredicted, and ultimately passive change at the strategic, operational, and tactical levels. A number of conditions drive the need to increase organizational adaptive capacity: 1) cyclical budgetary constraints that place a downward pressure on DOTMLPF components; 2) the need to conduct multiple simultaneous operations; and, 3) protracted large scale operations that require deployment of a significant portion of

the force. The Army brigade combat team structure is used as a model organization to examine the adaptive capacity framework. With the brigade combat team as the fundamental modular unit of the Army, we should seek to increase the adaptive capacity of the BCT's themselves, not just the ability to plug-and-play them into higher echelons. One enabling concept to accomplish this is to expand the idea that every Soldier is a rifleman, to the more general concept that "Every Soldier is a Problem Solver." Artillery battalions functioning as maneuver units during Operation Iraqi Freedom demonstrated the power of this idea. The impact of the model on force structure, leadership, Army culture, and joint operations is addressed. Ultimately, this organizational adaptive capacity model is proposed for doctrinal adoption. We need to move from demanding adaptation to understanding and implementing it.

CHANGE MODELS AND ARMY DOCTRINE

Here, the driving question behind organizational change, adaptation, and innovation models is in determining how much and how quickly change can be implemented. An examination of recent literature on military adaptation might give the impression that adaptation in the Army is a new phenomenon and that there exists a need to suddenly become more adaptive, to become learning organizations. The implication seems to be that we were neither adapting, nor learning previously. Many authors have repeatedly invoked the "Adapt or Die" imperative.⁴ Today's Army, though, is dramatically different than that fielded during the American Revolution. Change has been ever present in the Army, while periods of rapid and significant change are often highlighted as revolutions or transformations.⁵ The imperatives to become adaptive

appear moot, especially in light of doctrinal, organizational, and technological changes since World War II. The Army is in a constant mode of change, only the rate of that change and the DOTMLPF components that undergo change varies. Some authors describe anecdotal tales, distilling adaptation to a list of requisite traits.⁶ Joint and Army doctrine now reflect the profusion of literature on organizational change and military adaptation. Despite the attention on Army adaptation and organizational change, both the literature and U.S. military doctrine do not adequately describe adaptive capacity, reflecting only a rudimentary understanding of organizational change.

Organizational Change Models. While not intended as a definitive review of organizational change models, examination of some of the most significant work reveals the lack of conceptual development of adaptive capacity. Much of the literature falls into one of two broad categories: one describes the conditions for change, and the other describes various methodologies for implementing change. Barry Posen's *Sources of Military Doctrine* indicates that large organizations such as the Army inherently resist change, seeking instead a familiar stasis.⁷ The increased size, complexity, and longevity of such organizations implies that innovation rarely initiates from within, but rather requires some exogenous condition such as the fear of failure or defeat to drive change.⁸ The need to establish war fighting core competencies through repetitive training and operations leads militaries to eschew exploration in favor of routines.⁹ Barry Posen goes on to suggest that military innovation manifests from the tension between civil and military organizations and accelerates during conditions of external conflict where civilian leadership prevails.¹⁰ Stephen Rosen, on the other hand, suggests that intraservice conflict precipitates innovation and is rarely responsive to

specific external threats, where change only occurs over the course of a new generation of officers rising through the ranks.¹¹ The systems dynamics approach moves beyond the examination of causal conditions of change and looks at the interconnection of the organizational system with its constituent parts and their relationship to external factors.¹²

Once external conditions establish the imperative for change, numerous authors describe various organizational change models in the context of the conditions and steps for implementing change. Edgar Schein's organizational culture model places the need for change in tension with efforts to maintain a balanced system.¹³ An organization's past experience in solving problems via external adaptation and internal integration are deemed valid and appropriate to teach new members of the organization as the "correct way to perceive, think and feel in relation to those problems."¹⁴ John Kotter's 8-step model provides a pathway for implementing organizational change.¹⁵ Qualitative descriptions of organizational culture and learning and multi-step implementation models general fail to answer the question of how much can an organization change? How quickly can it change? How often can or should it change?

Military Change Doctrine. Given the notational complexity and mathematical nature of systems dynamics, military literature and doctrine seem to focus more on the conditions for change with attendant lists of desired individual and organizational traits and behaviors. The intuitive elements of capacity and rate of change are dispersed throughout doctrine but are not embodied in a single model or framework. For instance Army Doctrinal Publication (ADP) 3.0, *Operations*, has 57 references to the idea of adaptation, yet never once discusses the concept of adaptive capacity and the

questions regarding how much organizations *can* change, and how fast and how often.¹⁶ ADP 6-22, *Army Leadership*, similarly fails to include these concepts, even with its 105 references to adaptation.¹⁷ ADP 6-22 defines adaptability as “An effective change in behavior in response to an altered situation,” however, what constitutes an “effective change,” how that change is manifested, or how significant the “altered situation” needs to be to trigger a change is unclear.¹⁸ Joint Publication 3-0, *Joint Operations*, and Joint Publication 5-0, *Joint Operation Planning*, likewise do not address adaptive capacity.¹⁹ While the concept of adaptation and organizational change have been extensively treated over the last decade, much of that work falls into the categories of lauding adaptive successes or pedantic demands for more adaptation, as if the Army had never previously done so.²⁰ The effect of this buzzword triumphalism is to dilute both our conceptual understanding of the nature of organizational change and, more practically, our approach to building more adaptive force structure.

The closest to mechanistically describing adaptation is the incorporation of John Boyd’s orient, observe, decide, act (OODA) loop in the Capstone Concept for Joint Operations (although it is currently relegated to a simple endnote) and previous versions of ADP 6-0, *Mission Command*.²¹ As originally presented, this concept included multiple feedback loops, yet was simplified to a simple circle in the ADP. The OODA loop is a basic framework, but does not account for capacity for change and rate of change. Interestingly, even this basic concept of an adaptive model is no longer present in ADP 6-0.

Quite recently, though, the idea of “reversibility” emerged in the force structure debate and is included in the latest Army Posture Statement.²² The general idea

pertains to drawing down forces with the notion that the drawdown can simply be reversed to a scale-up should conditions require it. The concept as presented in the current debate implies that force structure is some monolithic entity whose direction can be instantaneously shifted. It seems to ignore that each DOTMLPF component changes at its own rate and has its own capacity for change as will be described further below.

ADAPTIVE CAPACITY

Adaptive Capacity Theory. So how does an atomic force microscope (AFM) relate to organizational change and force structure? An AFM provides a topographic image of nano-scale objects by tapping a probe across a small sample surface. The probe responds to various feedback loops and gains where the user manipulates these parameters to optimize a particular image. The first feedback loop is look-ahead gain responding to an anticipated topology at some future location. The second is proportional gain responding to the instantaneous conditions, and the third feedback loop is integral gain responding to some defined past history. The probe response is constrained by the physics of the instrument system.²³ It can only tap up to a maximum frequency, translate up to a fixed rate, and respond to the sample so much in a specific period of time. Ultimately the final image quality is a function of the balance of feedback gains relative to a particular sample type.

In much the same way as an atomic force microscope, biological systems, from the individual Soldier level up through strategic, are bound by constraints to the rate and extent of change. An individual or organization's ability to change, i.e. how much

change, how fast, and how often, is bound by certain limits and is interrelated with the outside world. In the simplest case, adaptation is the ability to change due to an environmental condition. The concept of adaptive capacity, whose origins derive from biology, is the extent to which a system can change in response to an environmental change. It is the ability to prepare for and mitigate the negative consequences of a particular stress to the system.²⁴ In a broad biological sense, adaptation confers the ability of organisms to deal with environmental change such that they can survive and reproduce.²⁵ The general manner in which this adaptiveness is achieved is through genetic variation such that a certain percentage of a population will survive an environmental stress and reproduce a subsequent generation that will also possess its own genetic diversity.²⁶ The mechanism for achieving population diversity is via a genetic mutation rate, or error rate, in replicating the DNA genetic code. Adaptive capacity may also result from learned behaviors that enable the ability to cope with environmental stresses.²⁷ Increasing that genetic and behavioral diversity, as well as population size, is the primary means of increasing adaptive capacity. The resultant environmental perturbation resilience is akin to the resilience described in ADP 6-22, *Army Leadership*.

A key difference between a biological system and the Army is that resilience through the failure and elimination of a certain percentage of the population is not the desired mechanism in the Army. In reality, though, the Army does respond to selection pressures through the elimination of less fit elements. Budgetary pressures result in the elimination of less critical acquisition programs. Personnel reductions result in the elimination of less critical units. On the battlefield, units less effective than the enemy

are eliminated. The failure aspect of adaptation may not be desired, but it is in fact an operating principle. The elimination of a certain element of a population that cannot survive an environmental change is similar to Schumpeter's "creative destruction."²⁸ This creative destruction continually destroys the system, or subsets thereof, replacing it with a new order. This process may be temporally rapid or evolutionary.

Yet the Army, or any other human system, possesses characteristics that distinguish it from purely physical or biological ones. These are foresight, communication, and technology.²⁹ These human characteristics confer the ability to influence the environment with anticipatory and proactive means, learn, remember and transfer experiences, and amplify environmental interactions from the sub-atomic to solar system scales. Human systems couple these abilities to their inherent genetic and behavioral diversity resulting in a far larger adaptive capacity than found in purely physical or biological ones.

The challenge for the Army is how to maximize its adaptive capacity within a framework that presents the inherent limitations of any system in terms of maximal rate and extent of adaptation, where that capacity is a coupled set of diversity, size, and behaviors. Militaries tend to value conformity and become heavily invested in particular ways of conducting warfare, both in terms of doctrine and materiel, with attendant cultures and interests that develop around them.³⁰ With the cost of failure so catastrophically high, militaries tend to favor time-tested methodologies,³¹ leading to the possibility of a "competency trap" in which it is difficult to depart from previous successes.³² Innovation and adaptation, then, tend to arise only when driven by external conditions of impending failure.³³ Militaries do not naturally seek to greatly

expand their own diversity of units, equipment, and ideas. Rather, quantity has been an implicit metric of adaptive capacity, i.e. total budgetary allotment, total personnel force structure, and the number of brigade combat teams. Given the current national financial pressures and the time required to increase the various quantitative elements of the force, the Army must seek to increase its adaptive capacity via the other means of diversity and behaviors before external conditions demand it.

Adaptive Capacity Model. From biology adaptive capacity is developed through diversity, population size, and behaviors. The adaptive capacity of biological and physical systems is constrained to maximal rates and extents of change. Whether it is an atomic force microscope, a chemical reaction, a car, or an infantry brigade, any system has a defined quantity of available energy and change comes at the cost of energy, and further, changes can only occur at up to a defined maximum rate.³⁴ The same is true of individuals and organizations. This adaptive capacity framework has a number of implications for organizational change in the Army. 1) Adaptive capacity in the Army derives from the DOTMLPF spectrum. 2) Feedback loop mechanisms determine the rate of change where leaders ultimately decide the balance of feedback loops and, therefore, how much, how fast, and how often to respond to that feedback. These feedback loops are nested between various organizational levels and are associated with rates of change and time delays. 3) Adaptive capacity is a function of organizational size such that larger organizations tend to adapt more slowly than smaller organizations, but over time are able to exhibit a greater magnitude of change. 4) Adaptive capacity is a dynamic balance between internal and external factors such that adaptive capacity may be increased with external inputs. 5) Ideas are the means of

creating a new free energy space – an idea can make available organizational free energy that was previously sequestered through organization structure, roles, and routine.³⁵

DOTMLPF Adaptive Capacity. With the idea that adaptive capacity derives from a combination of size, diversity, and behaviors and is bounded by certain limits, what then establishes adaptive capacity in the Army? The Joint Capabilities Integration and Development System (JCIDS) defines the materiel and non-materiel solution space for the Department of Defense as the DOTMLPF spectrum.³⁶ The integrated components of DOTMLPF form the basis of adaptive capacity in the Army. They are individually and collectively the means to anticipate and respond to changes in the external environment – they are the means to provide diversity, size and behaviors for adaptive capacity. As shown in Figure 1, each DOTMLPF component contributes to adaptive capacity and is interrelated with all of the other components such that a change in one affects all of the others to some degree. The basis for adaptive capacity has been alternatively described as organizational dimensions consisting of structure, culture, human resources, weapons systems, doctrine and networking,³⁷ but these are regarded as analogs or subsets of the DOTMLPF spectrum.

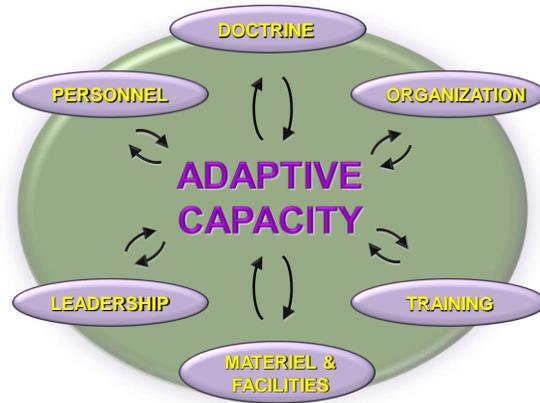
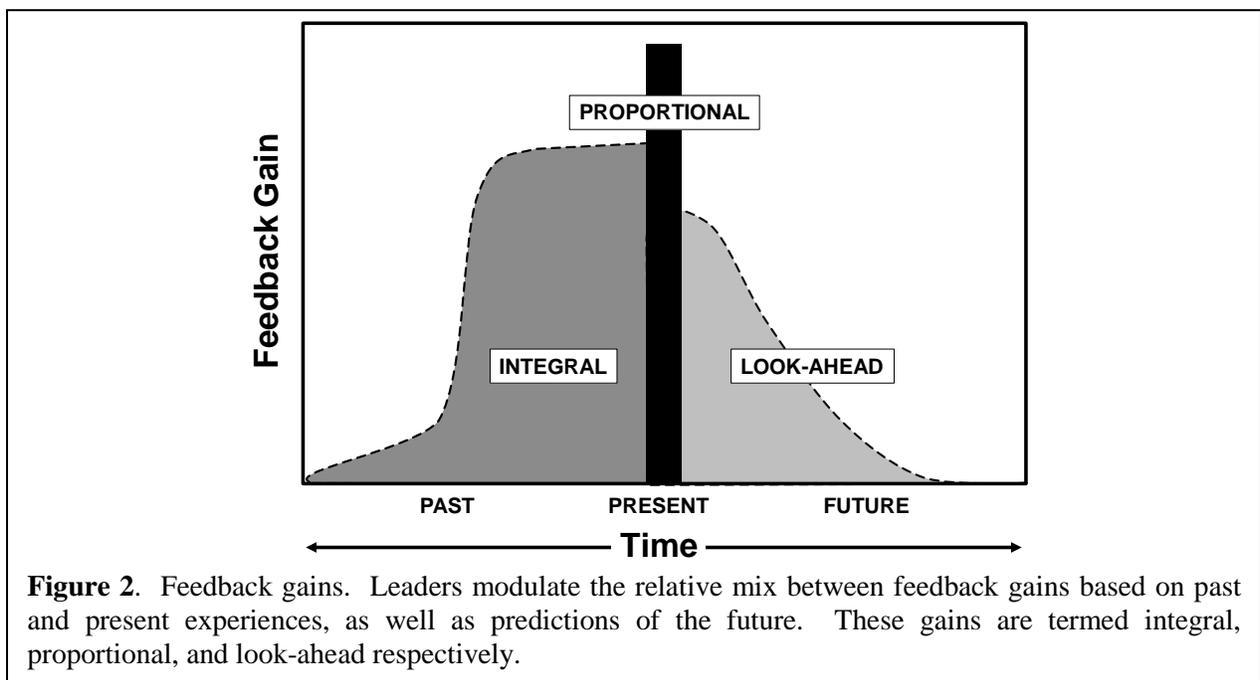


Figure 1. Adaptive capacity in the Army is the integration of the full Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel and Facilities (DOTMLPF) spectrum, where each component is interrelated to all of the others.

Feedback Loops. With adaptive capacity established by the integrated sum of DOTMLPF components, the magnitude and rate of adaptation within the limits of that capacity are controlled by various feedback loops. As previously discussed, these include integral, proportional, and look-ahead gains corresponding to past, present and future time scales. Leaders ultimately decide what priority, or gain, to assign to each timescale. Figure 2 shows a qualitative mix of these various gains. As an organization senses its environment for the differences between its desired and actual state, these gain levels determine an organization’s magnitude of response based on past, present and future factors. The relative mix of gains is likely to be different at various organizational levels. For instance, a tactical element conducting combat operations may assign a higher priority on immediate, current conditions, while a higher relative past and future gain would be expected at the strategic level. Bureaucratization and organizational complexity would also drive a high relative integral or past experience gain at the strategic level. Further, the timescales considered for past and future gain

levels are likely to vary between organization levels. Tactical units may consider the future out to timescale of hours or days, whereas the strategic level may look out decades. The same is true of timescales in the past. The mixture of gains at each organizational level are interrelated in that adaptive cycles are nested such that smaller organizations are able to adapt more rapidly than higher level organizations and adaptations at any level will influence the cycles of all of the others.³⁸



The consequence of feedback gains on adaptive capacity lies in the rate and frequency of change. If for the sake of argument, an organization had zero feedback gain for all time scales, then external factors would not cause leaders to make any adaptations. At the other end of the spectrum, if feedback gains were set at maximal values for current events, then adaptations would be driven like the daily fluctuations of the stock market. The most critical aspect of feedback gains is that they are established

implicitly or explicitly by leaders. In many ways the DTOMLPF products themselves influence the relative mix of feedback gains at all organizational levels. The optimal mix of gains depends on the level of the organization and is decided upon by the organization's leader. The prioritization on past, present, or future factors will determine how sensitive an organization is to external or internal factors, how much and how often it will change in response to those factors.

Rates of Change and Time Delays. The concepts of adaptive capacity, rate of change, and time lags is shown in Figure 3. The limits of internal change, or DTOMLPF based adaptive capacity are shown with red horizontal lines. A system may adjust its state anywhere between those limits but does not have the capacity to adapt beyond them without any external inputs. Considered another way, adaptive capacity sets the limits to the amount of external stress an organization can accommodate and still be functioning. From the onset of an environmental change that impact the organization, there will be an identification or sensor lag time. The system change from an initial to target state is not instantaneous. This might be due to the time from sensor acquisition to leader understanding. A subsequent decision lag ensues as leaders consider courses of action. Finally, once a decision is made, the various feedback gains modulate an organization's response to the environmental stress in moving from its initial state to a final state.

The organization's rate of change is reflected in the slope of the curve in Figure 3, showing the amount of internal system change per unit of time. This curve is the characteristic S-curve or logistic curve.³⁹ The initial response exhibits a slight time delay that could be a function of dissemination of orders, marshalling of resources, or

movement. The internal change then increases rapidly as the organization responds to positive feedback loops. As the organization approaches its target state, it begins to respond to negative feedback loops. For an ideal instantaneous response, the organization change curve would proceed vertically from the decision point to the target state, requiring no time. In reality, instantaneous changes do not occur, but exist as the ideal in agility, or rapid adaptation.⁴⁰

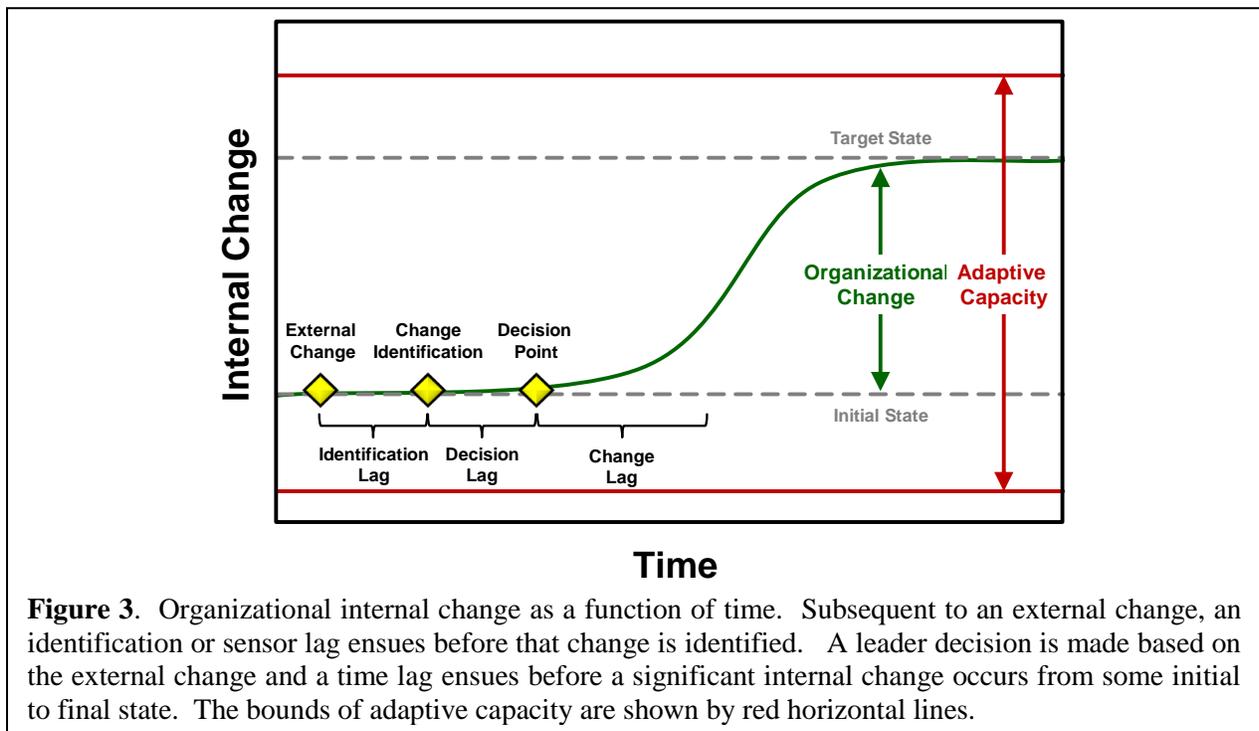


Figure 3. Organizational internal change as a function of time. Subsequent to an external change, an identification or sensor lag ensues before that change is identified. A leader decision is made based on the external change and a time lag ensues before a significant internal change occurs from some initial to final state. The bounds of adaptive capacity are shown by red horizontal lines.

Adaptive Capacity as a Function of Organizational Size. As might be expected, adaptive capacity should be a function of size. Generally, adaptive capacity is proportional with organizational size with the maximum rate of change inversely proportional with that size. That is the larger the system, given sufficient time, the larger its capacity to buffer the effects of external change. The larger and more complex the

system is, however, the slower the possible rate of change. This concept is shown in Figure 4. With strategic, operational, and tactical echelons serving as proxy measures of relative organizational size, it is seen that the tactical level is able to respond to a change most rapidly to an external change, shown with the highest increasing slope, but the magnitude of the change from an initial to target state is the smallest. At the other extreme, the strategic level is able to respond the greatest in magnitude, but requires a longer period of time to manifest the change as seen by a smaller slope. As an example, a maneuver company can rapidly change its organization by reassigning squads internally, whereas the Army at the strategic level requires far more time to adjust the total number and composition of its brigades. The company change may be faster in time, but it is far smaller in magnitude. As shown in Figure 5, when an organization is able to free internal energy or is open to external inputs, it may increase its adaptive capacity over time.

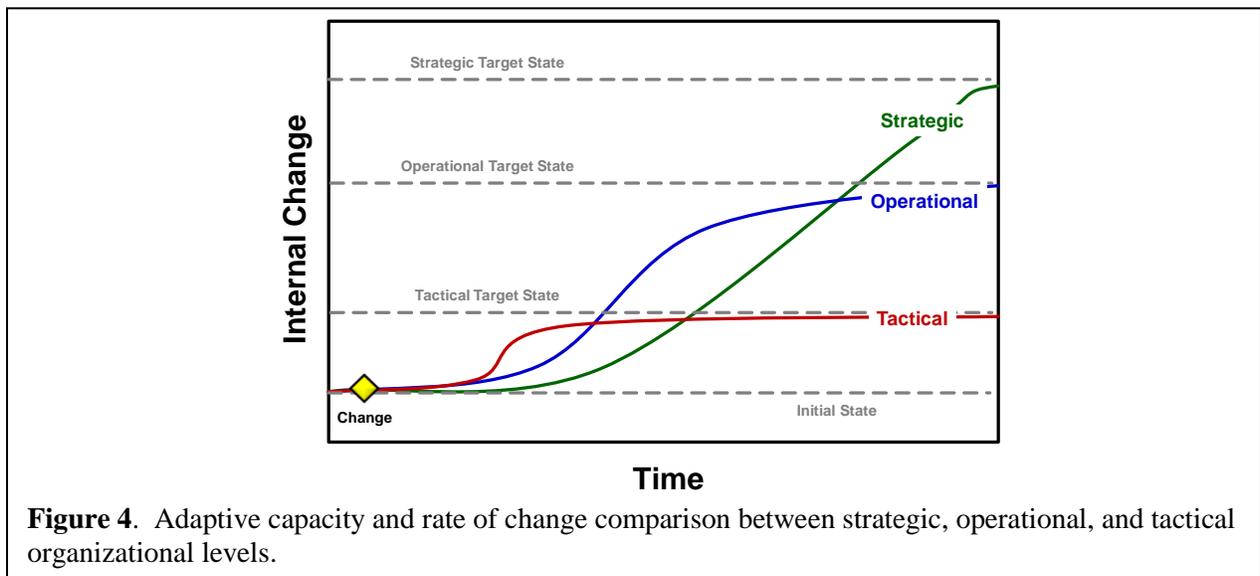
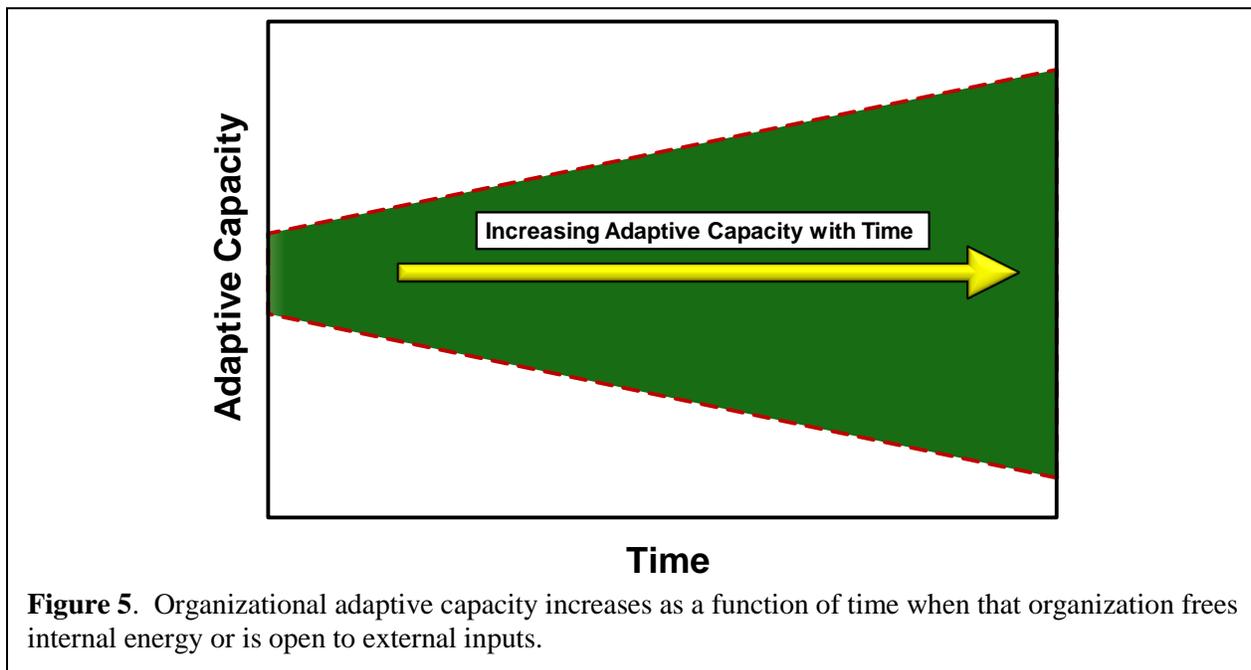


Figure 4. Adaptive capacity and rate of change comparison between strategic, operational, and tactical organizational levels.



BRIGADE COMBAT TEAMS

Modular Concept. The factors that determine adaptive capacity and its limits should have a prominent place in the force structure debate, particularly in regard not only to the overall number and type of brigade combat teams, but also how those BCT's can maximize their adaptive capacity in order to respond to a broader range of threats in the shortest amount of time possible. If the DOTMLPF spectrum comprises adaptive capacity, the question becomes how to best modify or enhance those components to gain a maximal increase in adaptive capacity in a budget constrained environment. Most, if not all, of the DOTMLPF components are difficult to adjust on short time scales. Given that difficulty, rather than seeking to increase the quantity of a component through an external input (such as funding, authorization, or acquisition) another

approach is to increase the adaptive capacity with whatever the resident DOTMLPF composition may be at a given time, i.e. by freeing up already resident internal energy.

Our brigade combat teams specialize in performing different tasks ranging from combat, sustainment, intelligence, to maneuver enhancement.⁴¹ Within each of those organizations, there is an organizational force structure overhead paid in terms of administrative and enabling subordinate organizations. For instance subordinate administrative, maintenance, and communications units enable the primary mission of a BCT, but do not directly perform that mission. This results in low “tooth-to-tail” force ratios.⁴² The primary constraint on tactical adaptability and innovation is fixity on doctrinal roles and military occupation specialty training. The focus on repetition and routine decreases an organization’s inclination to innovate.⁴³ Based on the manner in which Soldiers are trained in military occupational specialties, when they are not used to perform their trained specialty, they are rarely diverted to performing the primary BCT task. A low level example of this would be a personnel clerk in an infantry combat brigade whose workload is complete is not likely to participate in a cordon and search mission. Strategically and operationally, there may be an excess of certain BCT types that are not required for a particular mission set and are not deployed at all.

One notable recent exception to this self-limiting specialization is the employment of Stryker brigade artillery battalions as maneuver elements during Operation Iraqi Freedom.⁴⁴ Artillery officers benefit from broad exposure to and coordination of fires from all maneuver branches and joint assets. Artillery gun sections are organizationally similar in nature to an infantry squad. These factors reduced the required change and minimized the required training time. The most enabling factor in artillery battalions’

success as a maneuver units, however, was a mentally flexible approach and *willingness* to perform combat roles outside of doctrinally defined tasks.⁴⁵ This increased adaptive capacity helped expand BCT commanders' maneuver personnel combat power by a full battalion. Looking beyond the experience of the past decade, the Army truly performed the full spectrum of operations. Given the expectation that all Soldiers are rifleman first, and that most Army organizations are built on the battalion/company/platoon/squad structure, there seems to be a much larger personnel pool available. For those non-combat operations, maneuver forces have been tasked to execute the "business end" of the missions. It seems a natural process to "down-select" from the role of an infantry unit to virtually any other mission, yet institutionally we appear reluctant to "up-select" other specialties to the business end of many operations. Consequently and anecdotally, a large personnel pool is sequestered by doctrine, training, and leadership.

RECOMMENDATIONS AND CONCLUSIONS

The model presented here defines adaptive capacity as constituted by the DOTMLPF spectrum, constrained by limitations, and subject to feedback loops that control the rate and extent of organizational change. Changing the adaptive capacity of individual DOTMLPF components is associated with long sensing, decision and execution time lags. The means to increase organizational adaptive capacity without external inputs is to free up DOTMLPF resources that are generally limited to facilitating narrowly defined roles and missions. The most mutable DOTMLPF component is personnel. The recommendations for the Army that follow from this analysis are:

- Doctrinally adopt the concept and model of adaptive capacity in order to increase leader awareness for the mechanistic underpinnings of organizational change.
- Adopt the concept that that every Soldier is a problem solver first, then a rifleman to foster the mindset that *anyone* can be asked to do *anything*.
- Expand the concept of brigade modularity to a broader modularity of role, task, mission for all organizational echelons.
- Incorporate leadership reaction course events for all echelons up to brigades during combat training center rotations.

The enabling concept of “every Soldier as a problem solver first,” with the idea that *anyone* can be asked to do *anything*, will psychologically prime Soldiers and leaders for more rapid, flexible change and mutability of roles and duties. While there may be Army cultural resistance to this notion, it is an idea that already operates, but primarily in combat arms branches. This concept should extend more broadly to all Army units, and might even be applied in a joint force context. This concept will increase the adaptive capacity of DOTMLPF Doctrine, Organization, Personnel, and Leadership components.

The strategic level development of force structure should aim at maximizing the adaptive capacity of its brigade combat teams across the DOTMLPF spectrum and use the “every Soldier is a problem solver” example of artillery units OIF experience as maneuver elements. The more general problem solving mindset applied to all Soldiers will enable greater adaptive capacity of BCT’s by expanding the pool of personnel for a broader mission set. This approach will generate greater adaptive capacity allowing for more change, more rapidly, and more often when required. If we can do this, we will have moved from demanding adaptation to understanding and developing it.

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