

Marine Corps Adaptive Maintenance Enterprise

Alternative Strategies

27 April 2018

v0.6

(Final Draft)

Table of Contents

1	ADAPTIVE PLANNING	1
1.1	MANAGING INNOVATION	2
1.2	RAPID SUSTAINMENT	3
2	ADAPTIVE MAINTENANCE	5
2.1	MC-AMx COMPONENTS	6
2.2	ROLE INTERACTION THREAD	8
2.2.1	<i>Manage Advanced Systems</i>	9
2.2.2	<i>Manage Life-cycles</i>	9
2.2.3	<i>Manage Commitment</i>	10
2.3	PROCESS INTERACTIONS	10
2.3.1	<i>Continuous ELMP Improvements</i>	11
2.3.2	<i>Enhanced EGEM</i>	12
2.3.3	<i>Maintenance Innovation Process</i>	14
2.3.4	<i>Maintenance Innovation Sustainment Funding Line</i>	15
3	ADAPTIVE PLANNING	16
3.1	DIGITAL INTERACTIONS	17
3.1.1	<i>Condition-based Maintenance Plus</i>	18
3.1.2	<i>Blockchain for Maintenance</i>	19
3.1.3	<i>Social Exchange Network</i>	20
4	ADAPTIVE KNOWLEDGE MANAGEMENT	21
4.1	KM SYSTEM FOR MAINTENANCE	21
4.1.1	<i>Operational Factors</i>	22
4.1.2	<i>Anthropometric Data</i>	23
4.1.3	<i>Maintenance Lessons Learned Data</i>	23
4.1.4	<i>Automated Discrepancy Reporting</i>	24
4.1.5	<i>Consolidated Deficiencies Reporting</i>	24
4.1.6	<i>Training and Proficiencies Data</i>	24
4.1.7	<i>Digitalized Maintenance Allocation</i>	25
4.1.8	<i>Digitalized Compliance</i>	25
4.1.9	<i>RCMA Data</i>	25
4.2	PRODUCT LIFE-CYCLE MANAGEMENT	26
4.2.1	<i>Technical Data Packages</i>	27
4.2.2	<i>On-board Sensors Data</i>	27
4.2.3	<i>System Configuration Data</i>	27
4.2.4	<i>System Test Data</i>	28
4.2.5	<i>Video/Audio Data</i>	28
5	THE DATA-DRIVEN ENTERPRISE	29

1 Adaptive Planning

Since the emergence of civilization, successful war-fighting strategy depends upon the optimization of both a cost-effective and a wide-ranging ability to deliver supplies sustaining the war-fighter. Even still, modern military strategy seeks at once to preserve the robustness of one's own logistics chain while disrupting that of the adversary. As an extension of the national economy, the breadth of logistics support finds natural constraint, mirroring that of nation's economic autonomy. Given this threshold, the obligation of a government to provide global logistics support competes with an ever-pressing responsibility of being everywhere and at-once capable of responding powerfully to threat. How, then, to maintain strategic advantage in a constrained economy?

Within the US Department of Defense (DoD), the need for integrated supply-chain management is both a necessary objective and a perpetual obstacle to achieving optimal global war-fighting advantage. Particularly in times of peace, the DoD must continue to grow its global capability—keeping pace with potential threats—while decreasing its national burden. Assuming rates of taxation remain steady, Congress must distribute finite funds throughout competing government agencies, while each branch must operate at increased capacity despite its funding allocations. This makes for an interesting problem: how can defense agencies know how and where to distribute their resources in order to excel in meeting their Title 10 obligations? Further, how can a service's knowledge of its capabilities and capacity be harnessed as strategic decision-support anticipating the needs of the future fighting forces?

The Adaptive Planning and Execution (APEX) framework recommends an adaptive system's approach to Joint operations planning. An integral component of this planning is the ability to depict accurately Joint logistics functions and performance. This approach to adaptive decision-support facilitates a top-down demand for reliable information, affecting operational- and tactical-level alignment of planning and decision-making to strategic-level initiatives. The systems view of total defense supply-chain performance not only establishes a descriptive baseline for its joint logistics-chain, it sets a precedent for tracking this performance over time, thus enabling the maturation of a future predictive and prescriptive analytic capability across the DoD. In the face of increased budget constraint, quantifiable goals trickle-down from the strategic-level throughout the entire joint enterprise, ensuring the better alignment of resources to the combatant commanders' needs.

In assessing Logistics-chain performance along key performance indicators, the DoD itself emerges as the visionary leader, advocating for optimal performance in supporting its customer, the Combatant Commander. This approach lends itself as a powerful opportunity for the DoD to optimize its capacities and capabilities despite economic constraint, and to "lighten the load" of unproductive, unnecessary and cumbersome information silos. This top-down demand for data provides a powerful standard by which each service may assess organization-level decisions to maintain, consolidate, or archive legacy information systems. Likewise, local decisions to integrate emerging technological innovations may be assessed quantitatively against the performance needs of the joint supply chain. Particularly significant for organizations attempting to leverage data as an enterprise asset, a systems approach to performance improvement sends a direct and specific demand for data, information technologies, and systems portfolios, all oriented to a specific objective: *ready the war-fighter.*

1.1 Managing Innovation

In the *2018 Summary of the National Defense Strategy*, Defense Secretary Mattis defines today's most pressing threat as one of competing long-term strategies. To gain advantage within this competitive space, America's strategic approach must leverage emerging technological innovations and cross-agency, cross-sector, inter-national, information exchange, it must also increase the resiliency and performance of its lethal force. Increasing *mass* is certainly one key component leading to increased lethality; however, in addition to size, the present competitive space further requires the modernization of key capabilities, the evolution of operational concepts, and the continuous cultivation and integration of new knowledge. Imperative to our national strategic posture, the defense department, its agencies, and their organizations must operate as an adaptive system – the management of innovation emerges as an essential process shaping future war-fighting advantage.

While it is well-acknowledged that organizations must be innovative in order to compete against an accelerating pace of change, the organizational imperative to defend against risk itself stands as a barrier to the necessity of bureaucratic disruption. Yet, organizations *must* manage systematic innovation if they are to withstand the entropic tendency towards bureaucratic decay. Innovation, as with "Big Data", often falls victim to the bias that assumes it is always good. Bandwagon pressures irrationally influence organizations who must justify either their legitimacy, or their competitive advantage. The more ambiguous the benefit of a particular innovation, the greater the pressure to conform to collective behavior; the greater the number who adopt, the greater the bandwagon pressure. The adaptive enterprise negotiates these diametrically opposing forces by purposefully managing change.

Within innovation-oriented cultures, the word "process" tends to receive a bad rap, often juxtaposed as an antithesis of "innovation". However, innovation *is* the process of putting new knowledge to work. Whereas industrial processes push information in only one direction – out – innovative processes form iterative feedback loops that continuously pull new knowledge into the push chain. Where process seems to undermine innovation, here we are sure to find a closed, waterfall push chain rather than an adaptive learning cycle. For the innovative organization, process *is* the nervous system by which its people, data and technologies all integrate as a coherent, learning ecosystem. Information courses unhindered, throughout.

Within the service branches, leaders recognize the need to innovate. However, for want of quantifiable national-strategic guidance, many service-level initiatives approach technological modernization of the logistics-chain and its supporting processes in a disjointed effort. All recognize the need to support the entire DoD with quality data; all focus on their own optimizations. By defining the required metrics supporting a holistic view of the joint services as an integrated logistics-chain, the Secretary of Defense provides both a unified vision and the quantitative incentives, which help to mitigate irrational pressures to adopt technologies. Instead, the decision to innovate becomes an expression of DoD adaptive performance.

To produce a lethal fighting force, the defense department must organize for innovation. It must intentionally manage for change through the continuous assessment of and adaptation to the competitive environment. Continuous iterations of bottom-up information cultivation must purposefully and continually shake bureaucratic ossification. Operational management must consolidate so as to directly support war-fighter readiness. Data, people and processes must integrate as a dynamic, living knowledge-integration system. Finally, information must autonomously orient in anticipation of the question: *what do we need to be ready?*

1.2 Rapid Sustainment

The Marine Corps requires an immediate, adaptive capability supporting robust and continuous innovation aligned to each deployment cycle. Using the analogy of the NASCAR race-cycle tied to the USMC deployment-cycle, the projects under the Rapid Sustainment and Development Initiative demonstrate that incorporating a networked, collaborative framework into the USMC organization supports capability life-cycle sustainment, data-driven decision-making and a sustainable capacity for rapid, continuous innovation. By releasing solution prototypes aligned to each next-deployment, the Marine Corps increases both its readiness and its adaptability. The actions of generating and testing new knowledge quantifiably refines requirements for rapid acquisition, which not only benefits all service branches, it lends significantly to sustained global war-fighting advantage.

As an adaptive enterprise, Hendrick Motorsports (HMS) orients its business processes around one objective: *to win*. To this unified purpose, Hendrick evolves its heightened capacity to sense and respond to unknowable change in variable environments. Several key characteristics highlight Hendrick's capacities supporting proactive life-cycle sustainment of their race capabilities. First, HMS supports direct communication between engineers, maintainers, drivers and team leaders. Second, data-system integration across the organization enables the collaborative networking of information at all planning levels. Hendrick's capacities both for robust modeling and simulation, and for continuous innovation depend upon the integration of mass aggregates of disparate information through a single cloud-based platform. Third, HMS centers its culture around one motto: *win each race*.

Much like Hendrick Motorsports, the US Marine Corps must sense and respond to rapidly shifting factors in variable environments. Unlike HMS, however, the USMC requires life-cycle management for a larger density of in-service ground equipment than does Hendrick. Additionally, the USMC lacks a direct communication channel connecting integrating end-user requirements into logistics and technical capabilities. To communicate lessons learned, operators and maintainers must submit ideas and requests either locally, up the formal chain-of-command, or at Headquarters for maturation through the Defense Acquisition System. Whereas Hendricks maintains a process of continuous innovation and life-cycle sustainment, the USMC system responds to end-user and strategic requirements at a much slower pace — instead of sustainment through robust design, potential Marine Corps solutions require multiple years to mature, if they are approved at all.

Even with the milestone short-cuts within the integrated Defense Acquisition System that allow for the rapid procurement of existing capabilities from industry, the delivery of capabilities to the deployed war-fighter significantly fail to meet USMC needs for both relevance and timeliness. Furthermore, the lack of networked knowledge throughout the organization encourages a culture of domination, where communities are fragmented and improvement efforts, isolated. Through a collateral business process of robust and continuous sustainment, the USMC will generate an internal ability to rapidly transform war-fighter requirements into immediate capabilities, while also supporting existing capabilities over time. Further, by releasing solution prototypes in alignment with each next-deployment, the Marine Corps will generate tested knowledge to inform the joint-capability acquisition of capabilities supporting all of the Defense service branches.

Like Hendrick Motorsports, the Marine Corps must rally around a single focus aligned to the organization's strategy: *be a force in readiness*. Furthermore, the practices that apply to Hendrick Motorsports lend themselves as a corresponding model for USMC management of in-service ground equipment. To evolve its capacity to sense and respond, the Marine Corps must shift its industrial-model constraints of an efficiency-oriented organization and emerge as an adaptive enterprise, better able to respond to unanticipated change. To do this, the Corps must evolve innovation-supporting business processes that not only support robust and continuous innovation, but also protect against fragmentation, insularity and domination.