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In a future where U.S. adversaries may share comparable capabilities and technologies, military overmatch will be achieved through the accession, quality and training of its service members. The future lethality and resiliency of the U.S. military is directly and inextricably linked to human capital and how effectively the military services can recruit, develop, employ, and retain the force. Currently, the effectiveness of these processes is insufficient and must be modernized. Expanding the investment in data readiness, accessibility will lead to improved understanding and increased speed of decision-making. When fused with AI, the services can create a dynamic talent management model, that preserve the strategic advantage.

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FUTURE WARFARE PAPER


Dynamic Talent Management Model: Establishing the Framework for the Exploitation of Artificial Intelligence in Strategic Human Resourcing.

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FOR THE DEGREE OF MASTER OF MILITARY STUDIES

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INTRODUCTION

Since the mid-twentieth century, the United States has solidified its global military dominance while maintaining its strategic objectives and preserving international order. Meanwhile, rising peer competitors such as China and Russia have been investing in the means to surpass U.S. military capabilities and force employment options. Through the proliferation of emerging technologies, these power brokers are rapidly advancing their strategic interests and pose a growing threat to U.S. national security and overall global stability.¹ In a future where U.S. adversaries may share comparable capabilities and technologies, military overmatch will be achieved through the accession, quality and training of its service members.² Numerous historical examples demonstrate how the combination of the right individuals, with the right skills, at the right times have changed the course of a war and ultimately history. Some anecdotes may attribute these successes to chance. However, relying on chance is clearly unacceptable given the potential war scenarios the U.S. and its allies may face in the future.

Congress emphasized these concerns in the National Defense Authorization Act of 2018, stating “the current Joint Force must change to meet the threat of renewed great power competition;” further, it called for a “broad revision of talent management principles among the services to increase the lethality and adaptability of the force.”³ The “broad revision” Congress mandated requires qualitative change, not merely growing the force.⁴ It means maximizing military human capital by optimizing the recruitment, development, employment, and retention of the most talented and capable service members.⁵ This challenge must be viewed holistically. Future solutions must focus on applying limited resources at the inflection points where they will have the greatest effects.⁶

One such point is information, which the last Secretary of Defense (SecDef) momentarily designated as the seventh joint function.⁷ The availability of extensive information that is stored on antiquated government information technology (IT) networks is a trove of data that can be used by the military services to potentially optimize human capital. Yet, that data remains dormant and unsourced due to obsolete IT systems. Indeed, systems that just years ago served as the hallmark of bureaucratic efficiency now hinder data processing, disrupt information sharing, and impede analysis and decision-making throughout the Joint Force.⁸ Meanwhile, an ever-increasing abundance of raw data continues to consume valuable personnel time, cloud judgement, and disrupt momentum. This expanding data problem is not a result of human limitations, it is a consequence of bad design and requires reevaluation and reconfiguration.⁹ As the Chairman of the Joint Chiefs of Staff stressed, “military decision-making must exceed the speed of war [and the DoD must create innovations and implement] changes that speed the military’s ability to respond to rapidly changing situations.”¹⁰ Expanding the initial DoD investment in data readiness will create the necessary framework to exploit the capabilities of artificial intelligence, heighten military leaders’ ability to maximize talent management, and increase the speed of strategic human resource decision-making.

TALENT MANAGEMENT

“Armies do not win wars by means of a few bodies of super-soldiers but by the average quality of their standard units.”

Field Marshall William Joseph Slim¹¹

Talent management as a process or a method has multiple meanings depending upon the organizational level in which it is applied and is therefore often misunderstood or misused. At the enterprise-level of human resourcing, talent management refers to the anticipation of required human capital for an organization and the associated planning to meet those needs.¹² It is an art

and science that uses strategic human resource planning to improve the value of a particular business and/or military force to achieve its enduring purpose.¹³ For the Joint Force, the process begins with Force Design (5-15 years out), moves to Force Development (2-7 year range) and then Force Employment (0-3 execution). Within the individual military services, the foundation for successful institutional talent management is in force development. During this process planners identify and develop capabilities and the accompanied personnel structure required (when properly trained and equipped) to bring the concepts into fruition. Each identified and created personnel billet has a purpose and contributes to the success of a given mission. These established requirements are then balanced against the budget and new personnel end strength goals are calculated. The resulting manpower reduction creates military risk to the original design and must be mitigated by the quality of the military workforce. Understanding that this manpower deficit may continue to grow with a direct increase in operational demands levied on the DoD, the application of talent management to maximize human capital should become an integral component of the recruiting, accessions, manpower management, and retention processes within the individual military services.

Currently, only 17 percent of the U.S. population qualifies for military service, making recruitment more challenging. The military branches contend with the diminishing talent pool by making large investments up front to screen and recruit high-quality individuals that meet or exceed established military standards. However, unlike the civilian sector's focus on maximizing profit, the institutional investment in individual service members is not transactional or immediately visible. The initial investment in recruitment, training and education of a newly accessed service member is realized in the span of a contract or career. By virtue of accepting the contract, the service has made a commitment to the individual in the same vein as the individual

has committed to the service. Ultimately, the return on investment for the DoD is the combat power created by well-trained and prepared units/teams across the force. Holistically, the operational and administrative processes within each service must interconnect and mutually support one another to ultimately provide the best manned, trained, and equipped “combat-credible military force” attainable.¹⁴ How the military branches individually conduct institutional talent management directly affects the readiness and lethality of the Joint Force.¹⁵ When talent management is a fragmented process, practiced independently from force development and employment planning considerations, the Joint Force is unable to leverage the full potential of its combat power, and as a result military readiness may inevitably suffer against pacing threats.

PROBLEM FRAMING

Having a comprehensive understanding of the problem is vital to developing an enduring solution. In the past, improvements to force development, recruitment, management, and retention were developed with a narrow focus and in isolation from their effects on one another. The IT systems that support these processes have perpetuated the complex manpower management enterprise. The sheer volume and depth of information required to sustain each individual activity have created stovepipes that lose their intended connection to service lethality and operational readiness (see Appendix B).¹⁶ Accordingly, the DoD has recognized that manpower data and the disparate systems used by each service are flawed, inefficient, and plagued with redundancy.¹⁷ Though these systems were developed to improve processes and support strategic decision-making, they have instead become counterproductive. Perhaps of even greater concern, as highlighted by a recent Marine Requirements Oversight Council decision, these same systems can produce misleading assessments of capabilities and readiness all the way

up to the highest level of DoD crisis and contingency planning, and thereby create avoidable risk.¹⁸

There are several root causes to the data problem. Foremost, many of the IT systems used today are not interoperable or efficient, requiring multiple data entry points for the same type of information, increasing inaccuracy and workload requirements.¹⁹ Additionally, these systems were designed with divergent purposes and based upon a variance of data attributes, metrics, and definitions that can cause bias or inefficiencies in their algorithms. For example, multiple data-systems may capture the same information, yet portray contradictory values, creating inconsistencies and friction among stakeholders (service leadership) on whether or not to commit resources to an action.²⁰ Further, the massive amount of data available is not collected, aggregated, and presented in a meaningful way that leads to a synthesis of crucial information or improved human resource decision-making. Lastly, many of these systems are sanctioned by gatekeepers whose positions of influence and authority drive stakeholders into making ill-informed decisions without appropriate checks and balances.²¹

The very information that supports decision-making is also the solution to overcoming the bureaucratic barriers and flaws in system design. As emphasized by military theorist J.F.C. Fuller, “the more accurate the information from an observation, the better the reflection and more grounded is the decision.”²² Marine Corps Command and Control Doctrine further explains that there are multiple forms of information that can feed the decision-making cycle: raw data, processed data, knowledge and understanding (depicted in Figure 1).²³ This framework underscores the essential function of accurate and available manpower data in supporting talent-management decision-making. The current manpower problem begins at the base of the information hierarchy where data is an abstraction, has not been contextualized and without

meaning. For example, the same raw-data required to analyze and determine the personnel rating to assess force readiness also feeds manpower management assessments to staff an infantry battalion. As the information is processed and different meaning is applied, stakeholders can reach understanding and are better prepared to make resource-informed decisions that appropriately balance a finite manpower population. On the other hand, when the core information is inaccurate, fractured and/or inconsistent the base for decisions is flawed and stakeholders do not achieve a common operational picture.²⁴ With an understanding of the problem and the right application of emerging technologies, the services can lighten the cognitive load and increase the speed of analysis, decision and adaptation improving the military services' ability to maximize the power of human capital.

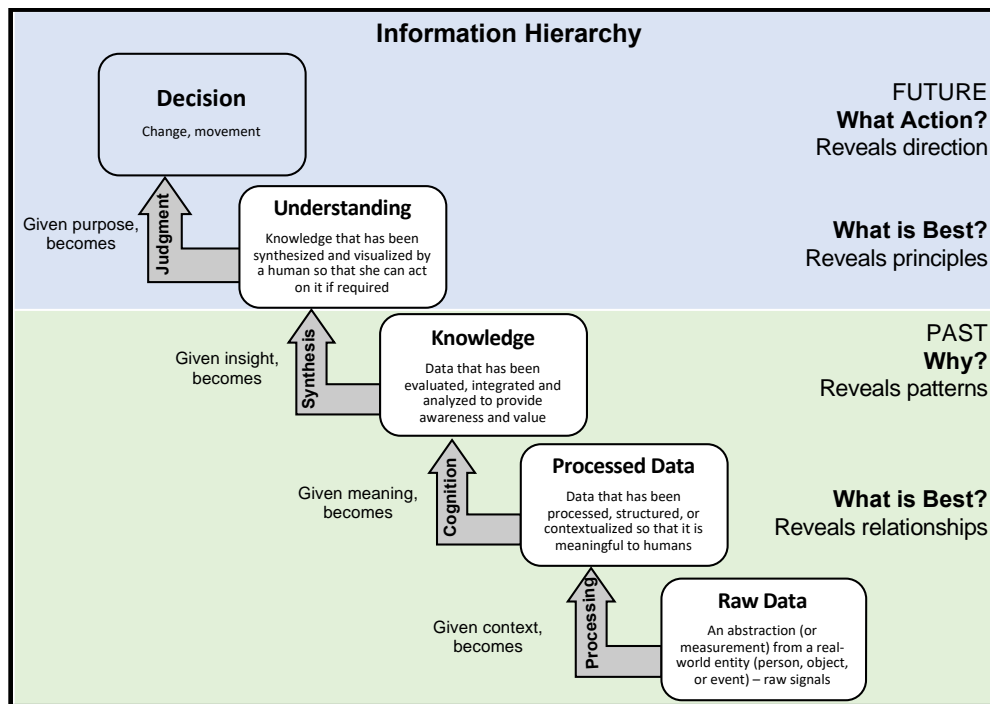


Figure 1. Ideal Information and Decision Hierarchy.²⁵

EMERGING TECHNOLOGIES

Since there is strategic-level focus on resolving the problem, there are multiple DoD and service initiatives working on possible courses of action to improve how the services resource

and manage human capital.²⁶ The most prevalent recommendation offered by government and industry is to jumpstart and leverage the family of artificial intelligence (AI) technologies (machine learning, deep learning, narrow and general AI) to improve and build efficiencies in the decision cycle.²⁷ According to industry experts, these trending technologies provide “the means to train algorithms and construct deep neural networks that improve the ability of machines to sense, decide, and act independently of human instructions or commands.”²⁸ They assume that “intelligent machines are the only way that human beings can process, let alone make sense of, the vast amounts of data being generated by ubiquitous [systems].”²⁹ Although these emerging technologies are promising, they are only tools and have limitations.

The Bayesian methods of analysis that drive many algorithms in AI are inherently anti-theoretical in the sense that they keep iterating on correlations between data sets and refining these relationships (WHAT is happening). For most data sets, AI cannot begin to address the WHY questions that are far more important. This problem will only get worse as more sophisticated AI increasingly finds correlations that humans cannot easily perceive.³⁰ Correlation is not causation; military cultures should not “prize information as an end in itself, and confuse the outputs of automated processes as certainty.”³¹ These tools cannot eliminate the decision-making cycle in war and most certainly cannot determine human will. Technology must be partnered with human intelligence and intuition when developing the mathematically-based algorithms behind these systems.³² Human responsibility must remain in the decision loop to embrace their full potential. As stressed in Marine Corps Warfighting Doctrine, “war is a human enterprise [and] no degree of technological development or scientific calculation will diminish the human dimension.”³³ The application of science and technology is meant to enhance a leader’s ability to apply the art of war through harnessing the individual’s “intuitive ability to

grasp the essence of a unique military situation and [apply creativity] to devise a practical solution.”³⁴ Although the recommendations provided in this analysis are data- and technology-driven, they are not the end state. The intent is not to replace individuals. The desired outcome is to maximize the potential and longevity of each service member that in aggregate, will result in the most lethal fighting force. The following recommendations therefore focus on the enhancement of systems, processes and data management to lay the foundation for the exploitation of AI.

There are three fundamental elements that determine an organization’s readiness to fully leverage AI: strategy, “compute,” and data.³⁵ The first requirement is establishing a clear and shared understanding of the goals for employing AI. While seemingly obvious, without consensus on what insight AI modeling will drive, the resulting investment will almost certainly fail. When developing a strategy, understanding the technology is secondary to reaching a deep appreciation of an organization and its objectives.³⁶ A digital transformation will require a paradigm shift; military stakeholders and decision-makers must evolve.³⁷ They cannot continue to outsource “the processes and decisions to machines with little understanding of how the complex layers of code and algorithms interrelate to each other and the environment.”³⁸ Rather, they must assess and understand the original purpose of each human resourcing milestone and its intended relationship to the others, without the limitations of current technology platforms. Then, stakeholders, decision-makers and data analysts should jointly map the current workflows through the multiple IT systems to gain an understanding of where common systematic flaws or potential opportunities exist. The following questions were developed to facilitate this analysis:

Figure 2.

1. Who are the stakeholders and what are their relationships to each other?
2. Who is going to own the process and who will own the information?
3. Who are the decision-makers at every level within a respective process?
4. Who assigns tasks and who completes them?
5. Who must be informed regarding decisions and actions throughout the process?
6. What critical information facilitates each process and are there data collection gaps?
7. Where does data collection overlap and how can redundancy and inaccuracy be reduced?
8. Where is the unexploitable data stored and how will it be converted to usable information?
9. Is there missing information needed for decision-making or analysis?
10. How will it be collected, where will it be stored?
11. How will the data be secured and protected?
12. Who will require access to the information and who can input information?
13. What other system/process requires the same information and does that system already interface with the primary collection platform?
14. Are the definitions and metrics between the information that must interface clear and consistent?
15. How must the information be filtered or displayed to maximize understanding and increase the speed of decision?
16. How can information be merged from multiple systems/processes to quickly recognize and mitigate military risk?
17. How will the improved transparency across systems and senior staffs change power paradigms?

Recommended Problem Framing Questions.³⁹

The answers to these questions can be used to develop a strategy of how the services will leverage AI and other emerging technologies to better inform strategic human resourcing decisions and improve institutional talent management.⁴⁰

The second element for effective AI is data accessibility and requires a dedicated investment to break down existing data silos and stovepiped data repositories. Data accessibility is driven by the power to compute and enabled by data architecture and network infrastructure. According to Shane Shaneman, Director of Strategic Government Research/DoD, cloud computing has made AI accessible to millions and has become cost effective for the U.S. military.⁴¹ Specifically, a cloud-based platform will enable persistent storage, retrieval, and sharing of massive data sets across multiple service functions.⁴² When combined with AI, these platforms provide increased security, adaptability and functionality. Currently, there are multiple DoD modernization initiatives, like JEDI Cloud and Global Force Management Data Initiative, dedicated to digitally integrating the Joint Force.⁴³ Although, these are large-scale DoD investments to establish a unified data platform to increase storage and interoperability across

authoritative data-systems, there are many ad hoc service applications that must be accounted for (Appendix B). It is imperative that the military services capture and prioritize the information provided by these applications/systems to maximize the DoD’s investment to improve data accessibility and digital force integration.

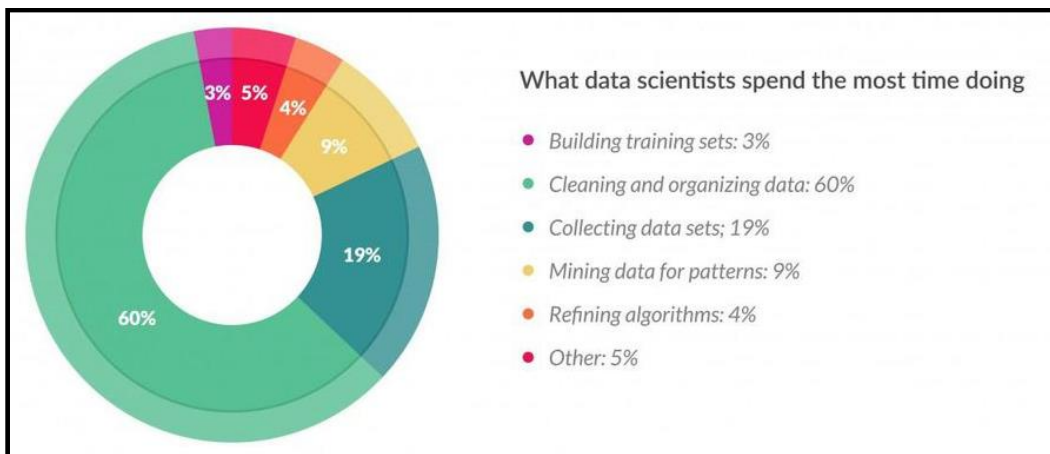


Figure 3. Data Scientists' Priority of Work for Application of AI.⁴⁴

Last, effective use of AI technologies is will require comprehensive investment in manpower data readiness – the “ability to access accurate and timely data in order to perform analysis in support of executive decision making.”⁴⁵ If the data that flows between IT systems is flawed, the analysis that follows will also be flawed and true synthesis will not be achieved. A recent CroudFlower survey of data scientists found that 79 percent of their time is dedicated to preparing and managing data for analysis (see Figure 3).⁴⁶ Since the military services do not have dedicated data-scientists to maintain their systems, the initial process design should target data at the source and build feedback loops that facilitate assessments for future refinements.⁴⁷ Overall, a well-developed manpower AI strategy can provide the vision and unity of effort to leverage symbiotic benefits of system interoperability, data readiness and a cloud based-based platform. Achieving these conditions allows the services to maximize the benefits of AI and ultimately increase the speed and accuracy of strategic human resource decision-making.⁴⁸

SHORT-TERM WINS

In the short-term, the initial process of data mapping will reveal opportunities within one process that can be analyzed and exploited for other valuable purposes. For example, during the Marine Corps recruitment process, the selection of the best qualified individuals for military service requires the collection of personal information on each prospective candidate to build a comprehensive picture of their overall fitness to be a Marine. This in-depth personal profile is captured in the Marine Corps Recruiting Information Support System (MCRISS) and includes citizenship and cultural background, mental aptitude, psychological and physical traits, and legal and medical history. The value of this nascent information does not end with accessions, but is also immensely supportive of other subsequent manpower decisions that influence a Marine's career progression (e.g., occupation selection, unit assignments, retention, etc.) or operational employment. However, due to fragmented interfaces between IT systems, much of this coveted information within MCRISS is unavailable to Military Occupational Specialty (MOS) producing schools.⁴⁹

Likewise, the information composed about student performance and behavior at their MOS school is captured in the Marine Corps Training Information Management System (MCTIMS). Yet, similar to recruitment data, the relevant information in student records does not transition upon graduation to their first duty station. The net result is a newly accessed and trained Marine, with a fractured profile of performance and academic history spread across multiple systems and unavailable to the gaining command. As such, the advantages of human resourcing in the accessions pipeline are limited to the basic available data points of rank, a given MOS, and time-in-grade/service. On a broader scale, the service is simply placing a "face to a space" instead of sourcing the right candidate to the right job.⁵⁰

Of greater significance is that the disconnection between manpower information systems is a critical gap with consequences that negatively affect individual and unit readiness.

The information lost in transition is necessary to guide and sustain the personal transformation that occurs between the training environment and the operating forces.⁵¹ Capturing the critical information across the accession pipeline and making it available to the gaining commands, in a meaningful way, will facilitate important decisions on the best qualified personnel to fill leadership billets, provide insight into training deficiencies, highlight personnel risk, focus mutually-supporting command programs, and enable the development of training plans that collectively will improve overall readiness. Ultimately, the unexploited data that exists across multiple platforms and records is a missed opportunity to further improve service-wide talent management, inform force development, and properly resource the force.⁵²

Furthermore, a comprehensive DoD investment in interoperability and cohesiveness between manpower data-systems can accelerate major process improvements that could increase unit readiness and cohesion. For instance, Figure 4 depicts an average Marine Corps infantry battalion's personnel deployment timeline. Generally, 35-45 percent of the enlisted population lacks sufficient contract length to meet their next deployment, causing drastic personnel turnover during a critical time in the pre-deployment cycle.⁵³ Marine Corps authoritative data-systems currently collect all of the required information about service member qualifications for reenlistment. Yet, each Marine must initiate the process and gather all the information/correspondence necessary to submit a reenlistment package through the chain of command, making this process redundant and inefficient.

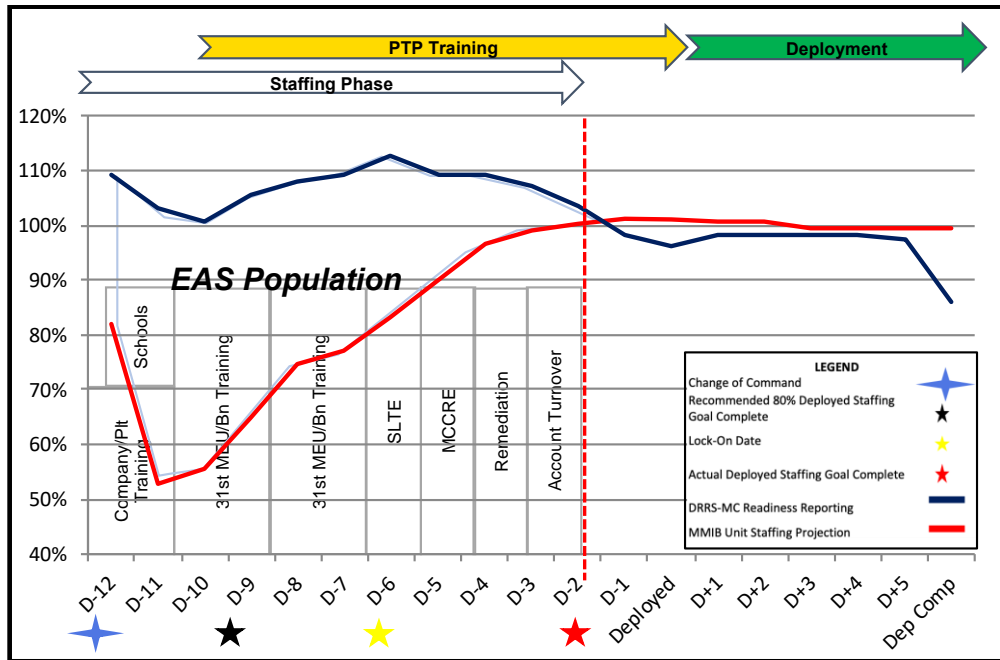


Figure 4. Marine Infantry Battalion Unit Build Example.⁵⁴

However, by leveraging narrow AI and service-member data that is already captured in authoritative data systems, the Marine Corps can improve data synthesis and more efficiently identify and select those members of the force who are best qualified for retention. The retention process can be reversed to a push instead of a pull system, in the same manner that credit card companies and banks target individuals with good credit by offering them pre-approved loans or lines of credit. Instead of waiting for all submissions to come through once a year— which creates an administrative bottleneck of re-enlistment packages moving up the chain of command— HQMC can proactively pre-approve the most qualified Marines for re-enlistment or extension, pending the immediate commander’s endorsement. Furthermore, the process can provide an in-stride assessment to those less-qualified service members so that they can work to improve their competitiveness for retention. For commanders, the process improvements made available through data synthesis will provide some administrative relief and increase their capacity to mentor and develop Marines competing for reenlistment. In addition, pre-approved

extensions can provide qualified and experienced Marines the option to stay on for the next deployment and still meet transition requirements. For those who choose to exit the service, they can be pre-approved for reserve contracts, providing Reserve Affairs Division with a higher quality pool of candidates. Further, individuals unqualified for future service would be informed earlier, better enabling individual preparation for transition out of the service. Finally, Manpower Management Division would have a clearer assessment of what billets must be resourced further in advance. Overall, the service would have better projections of personnel available for deployment and more important, unit deployment cycles would be more stable, increasing unit readiness and cohesion.

Achieving data readiness across the recruitment, manpower management, employment, and retention processes will produce multifaceted effects at all levels of command and decision making. At the lower echelons, the demand for information needed to support human resourcing decisions represents a tremendous administrative burden that can seem all-consuming. For instance, all Marine units are required to comply with the Inspector General of the Marine Corps Inspection Program (CGIP). On average, a Marine infantry battalion is required to manage 42 CGIP functional areas while meeting its operational deployment requirements, with approximately 20 of them linked to personnel management (e.g., retention, promotions, records management, etc.).⁵⁵ Further, approximately 40 collateral duties and 18 authoritative data-systems are required to support these programs. How does a commander manage this demand and best apportion his personnel to meet all his requirements and his mission? Does a commander really understand the varying military and individual skills resident in his unit's population? Is he retaining the right individuals? The burden levied on the command, the inefficiency of the associated data-systems, and the absence of the necessary information to

ideally employ the personnel optimally within the unit are all interconnected. In a short period, the investment in data readiness alone can improve the processing and quality of information across those service systems to lighten some of the burden on operating force units and return valuable time back to those commands to reinvest in personnel, materiel, and training readiness.

LONG-TERM IMPACTS

Dynamic Talent Management – Individual Focused

In the long-term, a dynamic talent management model that is enhanced by the application of AI, can be designed to reveal the essence of a service member's talent or natural aptitude and not just a generic military profile. With this knowledge, military leaders can cultivate strengths and balance weaknesses with the strength of others. The power to understand the true capability of the force in real-time can bring a decisive advantage in the battlefield. For example, at the beginning of World War II, the U.S. armed forces were “not well organized for large scale combat against a great power enemy” and were unprepared to mobilize the population.⁵⁶ The Victory Plan was the fundamental planning document that propagated the American Strategy to prepare the country for war. Notably, the principal author was a military service member, Major Albert Coady Wedemeyer. Major Wedemeyer was imminently qualified to author this strategic plan based on his unique personal, educational and military experience.⁵⁷ The circumstances that placed him in the right position at the right time to strategically influence the capacity of the United States to mobilize the nation for war was the product of chance.⁵⁸ Nonetheless, human resourcing and talent management must not rely on mere fortuity to achieve a desired endstate. Responsible military leadership must sufficiently invest in data readiness and emerging technologies now to provide the U.S. military the ability to find and properly employ eminently qualified individuals such as Major Wedemeyer at the right time to prepare for the next crisis.

When the military services have created the conditions to fully exploit AI, the convergence of people, processes and technologies within human resourcing should reduce the element of chance and enable the deliberate recognition and sourcing of human talent where and when most needed to meet the competing demands for skilled, capable and intelligent military and civilian expertise. Appendix C provides a snapshot of Defense Ready, Customer Relationship Management (CRM) cloud-based software used by Marine Corps Forces Special Operations Command (MARSOC). It is linked to Marine Corps and DoD data-systems to provide tailored Individual Career Path and Future Opportunities by Grade that streamline the time consuming and inefficient research process for vectoring personnel.⁵⁹ Defense Ready demonstrates that although the same data feeds decision-loops across various chains of command, how the information is filtered and displayed can be tailored to the problem set it is meant to solve at each level without a tremendous investment in time and research.

A comparable proof of concept is the 360 Personnel Profile prototype found in Appendix D. The SecDef's Close Combat Lethality Task Force, the Marine Corps Warfighting Lab, and StackForce are developing a more sophisticated software designed to provide a 360-degree personnel profile of each service member that comprehensively captures military and individual skills, as well as physical and psychological competencies.⁶⁰ In addition to interfacing with current DoD systems and applications, this platform can capture the unexploited data the services generate, as well as convert static information found in service doctrine and publications, into dynamic performance evaluation metrics. When combined with accurate workflows derived from data mapping, this information can be aggregated and evaluated to provide a comprehensive profile of individual performance, career history and potential future employment.⁶¹ This application will allow commanders to evaluate and improve individual and unit-level readiness

based on assessments of their proficiencies against a set of established standards and real-world examples of successful performance (see Appendix D). Concurrently Manpower and Reserve Affairs (M&RA) is working with the Johns Hopkins Applied Physics Laboratory to use psychological testing and psychometrics to develop models that predict recruit training success (Appendix E). While numerous comparable initiatives across the DoD could independently fix its target objective, none independently address the core problem. However, if the DoD demanded unity of effort of these disparate projects, the military services would gain greater greater advantage and probability of success in the long-term.

Dynamic Talent Management - Enterprise/Operational Level

At the enterprise level, dynamic talent management platforms will uncover the vulnerabilities, deficiencies and risks across recruitment, accessions, manpower management, and retention, that must be mitigated and resolved. The comprehensive manpower information collected, when paired with the computing power of AI, can be used to generate trend and gap analysis, projections for budget resourcing, force development plans, and force employment models in real time and space. At the operational level, these applications can be integrated to provide interactive task organization options, optimal Training, Exercise, and Employment Plan (TEEP) configurations, and Global Force Management (GFM) alternatives. With a heightened common operational picture and understanding of force availability and readiness, planners can test the information in large scale exercises and war games, increasing their organization's ability to adapt and integrate across the Joint Force. Ultimately, the foundation provided by manpower data readiness will have strategic effects across the DoD by improving the "four pillars of global integration: planning, decision-making, force management and force design."⁶² Finally, the framework provided in this analysis should be considered beyond its application to today's

military challenges. At present, there are approximately 1.4 million active duty and over 800,000 reserve personnel serving in the U.S. military services.⁶³ During the conduct of World War II, the armed forces grew to about 16.1 million service members. Approximately 405,000 died and 670,846 were wounded (Figure 5).⁶⁴

Branch of Service	Number Serving	Total Deaths	Battle Deaths	Other Deaths	Wounds Not Mortal
Total	16,112,566	405,399	291,557	113,842	670,846
Army	11,260,000	318,274	234,874	83,400	565,861
Navy	4,183,466	62,614	36,950	25,664	37,778
Marines	669,100	24,511	19,733	4,778	67,207

Figure 5. WWII (1941-1946) Mobilization and Casualty Statistics.⁶⁵

How would today’s military services process and sustain the exponential proliferation of data created by the mobilization of the American population and the mass number of casualties that result from large scale combat operations? The military services are not prepared for that scale of war in their current form. An investment in data readiness now should build the capability of the armed forces to contend with this challenge in the future. Appendix F, provides a conceptual model of how the dynamic talent management framework can be used to support comparable major combat operations. In general, this framework has the potential of accelerating the “speed of senior leaders’ decision-making, integrating operations worldwide and delivering forces capable of competing and winning against any possible adversary”⁶⁶ In the event of future major combat operations with a peer competitor, data readiness will be a critical difference that enables and helps sustain the strategic advantage throughout an enduring conflict.

CONCLUSION

The proliferation of emerging technologies is leveling the field of global power and providing opportunities that embolden rising competitors to advance their interests from

positions of greater strength and parity with the United States. Within this new normal global operating environment, no longer is there the relative security that had once been based solely on the capabilities and technologies of an industrial military machine to provide a strategic advantage over near-peer or inspiring adversaries across all operating dimensions. Within this normalizing environment of comparable relative combat power between competitors, the United States' ability to harness and develop the human potential of its military is what will achieve strategic offset. The future lethality and resiliency of the U.S. military is directly and inextricably linked to human capital and how effectively the military services can recruit, develop, employ, and retain the force.

However, at present the effectiveness of these processes is insufficient and must be modernized and transformed to maintain stride with pacing threats.⁶⁷ The first step is to resolve the data proliferation problem by streamlining each process, mapping their connections and improving data readiness to provide a means to create solutions that were previously not possible. Expanding the investment in data readiness and accessibility is a multifaceted approach that will lead to improved understanding and increased speed of decision-making across recruiting, manpower management, force employment, and retention. When fused with the benefits of a cloud-based service and emerging technologies such as AI, a dynamic talent management model will create the conditions to regain military overmatch over rising competitors and preserve the strategic advantages of the United States on the global stage. In contrast, failing to make an aggressive investment to resolve the insufficient and fractured human resourcing processes could be the difference between winning and losing in future warfare.

APPENDIX A - Terms and Acronyms
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Assessment. Assessment is the continuous monitoring and evaluation of the current situation and progress of an operation. It is the basis for adaptation, keyed to the overall purpose, oriented on the future, and focused on emerging opportunities. Successful assessment requires the commander's situational understanding and his recognition of the difference between planned goals and the situation as it exists. This difference between what was planned and what actually happened becomes the catalyst for decision-making, either to correct deficiencies or seize opportunities. (MCDP 1-0 W CH1, 3-24)

Artificial intelligence (AI). The ability of a system "devoted to making machines intelligent," in which intelligence is that "quality that enables an entity to function appropriately and with foresight in its environment."⁶⁸

- Artificial General Intelligence (AGI). AGI, sometimes referred to as strong AI, is the intelligence of a machine that could successfully perform any intellectual task that a human being can. It involves a system with comprehensive knowledge and cognitive computing capabilities such that its performance is indistinguishable from that of a human, at least in those terms. The broad intellectual capacities of AGI would be boosted far beyond human capacities by its ability to access and process huge amounts of data at incredible speeds.
- Narrow Artificial Intelligence (narrow AI). Narrow AI is a specific type of artificial intelligence in which a technology outperforms humans in some very narrowly defined task. Unlike general artificial intelligence, narrow artificial intelligence focuses on a single subset of cognitive abilities and advances in that spectrum.

Bayesian Inference. A naive Bayes classifier is an algorithm that uses Bayes' theorem to classify objects. Naive Bayes classifiers assume strong, or naive, independence between attributes of data points. Popular uses of naive Bayes classifiers include spam filters, text analysis and medical diagnosis. These classifiers are widely used for machine learning because they are simple to implement.⁶⁹

Combat Power. Combat power is the total destructive force we can bring upon the enemy at a given time or place. Combat power consists of material, men, weapons, terrain, leadership, tempo, surprise and many other factors.⁷⁰

Common Operational Picture (COP). A single identical display of relevant information shared by more than one command. A common operational picture facilitates collaborative planning and assists all echelons to achieve situational awareness.⁷¹

Compute. In modern computing, refers to activities, applications or workloads that require more processing resources than its memory or I/O resource requirements. Generally speaking, compute is used to describe concepts and objects geared towards computation and processing. For example, CPUs, APUs and GPUs are considered compute resources while graphics processing applications like 3-D rendering and video games are described as compute-intensive applications.⁷²

Close Combat Overmatch. The ability of a squad sized unit to impose its will on a similar sized opponent under all conditions and operational environments. Achieving overmatch includes both materiel and non-materiel solutions, including the close combat focus areas described in the definition of "close combat."⁷³

Data Readiness. The ability to access accurate and timely data in order to perform analysis in support of executive decision making.⁷⁴

Deep Learning. The subset of machine learning composed of algorithms that permit software to train itself to perform tasks, like speech and image recognition, by exposing multilayered neural networks to vast amounts of data.⁷⁵

Interoperability. Interoperability is the ability of systems, units, or forces to provide services to or access services from other systems, units, or forces, and use the services to operate effectively together.⁷⁶

Machine Learning (ML). Machine learning is an application of AI that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it learn for themselves.⁷⁷

Psychometrics. Psychometrics is the measurement of educational and psychological phenomena; these can be elements of learning, personality, aptitude, ability and associated mental processes. It deals with the theories and methods for measuring psychological phenomena that cannot be directly observed as well as with as with methods for identifying and controlling for error in those measurements. The TAPAS AI proof of concept falls under this discipline.⁷⁸

Readiness. The ability of U.S. military forces to fight and meet the demands of the national military strategy. Readiness is the synthesis of two distinct but interrelated levels. (JP 1-02)

- Unit Readiness. The ability to provide capabilities required by the combatant commanders to execute their assigned missions. This is derived from the ability of each unit to deliver the outputs for which it was designed. (MCO 3000.13, I-9)
- Joint Readiness. The combatant commander's ability to integrate and synchronize ready combat and support forces to execute his or her assigned missions. (MCO 3000.13, I-9)

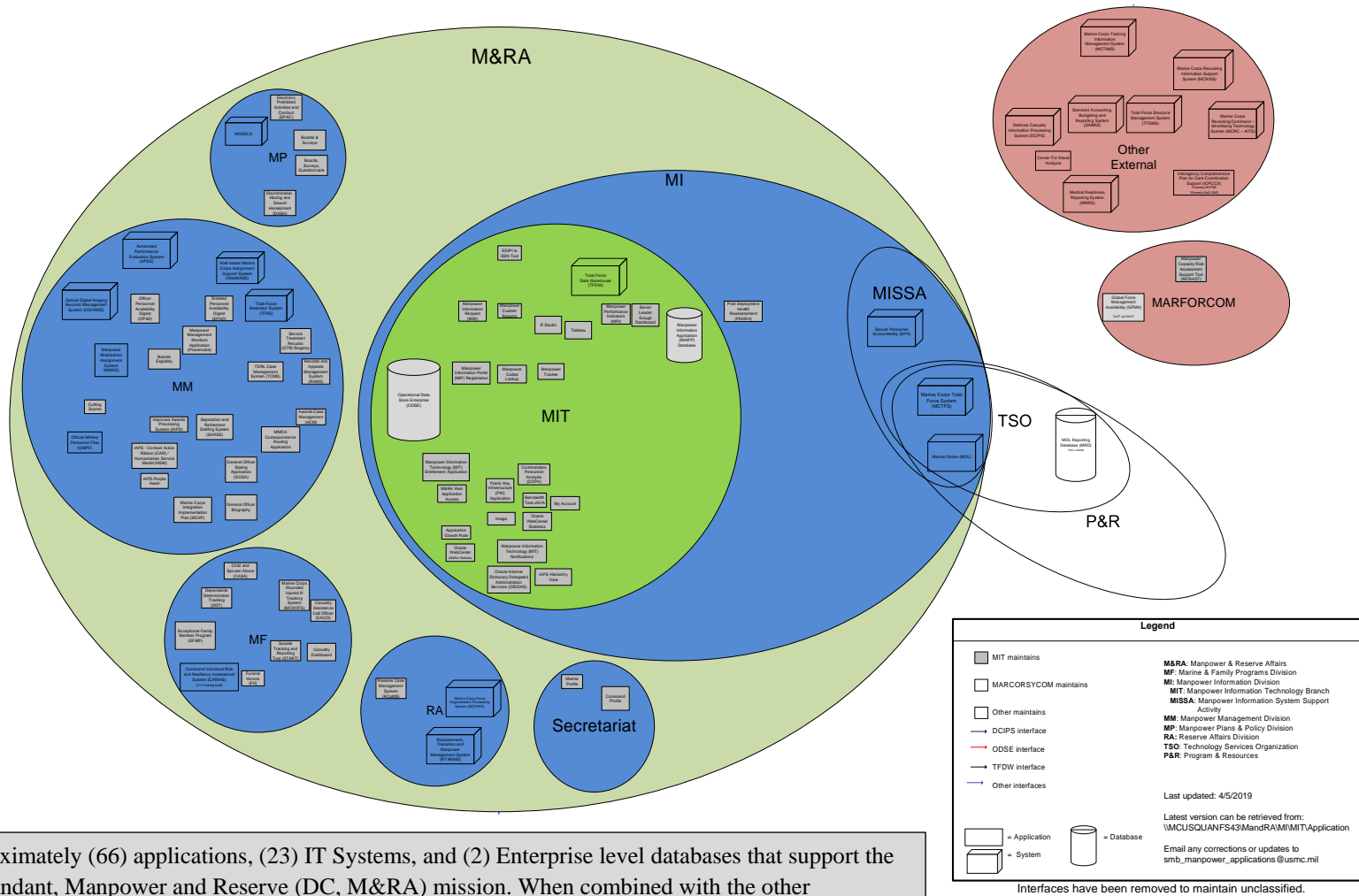
Staffing: The objective of the staffing process is to make the optimal match of current assignable inventory to maximize the fill of staffing goals. The output of the staffing process is an individual assignment to a specific billet within a specific command. (MCO 3000.13, 10-11)

Talent. Natural aptitude. (Merriam-Webster)

Talent Management. The anticipation of required human capital for an organization and the planning to meet those needs. Talent management is a systematic process of identifying the military capability required and the force structure that can achieve that capability; recruiting quality candidates; training, mentoring and employing them to maximize their abilities; and retaining them to achieve long-term service objectives.⁷⁹

APPENDIX B - System of Silos Example – Marine Corps

UNCLASSIFIED



There are approximately (66) applications, (23) IT Systems, and (2) Enterprise level databases that support the Deputy Commandant, Manpower and Reserve (DC, M&RA) mission. When combined with the other numerous service IT requirements, this creates a system of silos that: (1) impedes effective institutional talent management; (2) negatively affects strategic human resourcing; (3) and reduces service readiness and lethality.

Figure 6. System of Silos - Marine Corps.⁸⁰

APPENDIX C - Defense Ready Software Application

Defense Ready is cloud based CRM software under the Microsoft Dynamics umbrella. Defense Ready enables SOF readiness and mission success through the integration of data that facilitates MARSOC's multifaceted relationships and preparation for future operational requirements. Prior to leveraging the technology, MARSOC spent a significant amount of time preparing quality of data, identifying anomalies and duplication. They then mapped every structural billet to each unit member. The end result was tailored organizational workflows mapped in the Defense Ready Software that capture Skills and Practice Communities at the individual and aggregate level.⁸¹

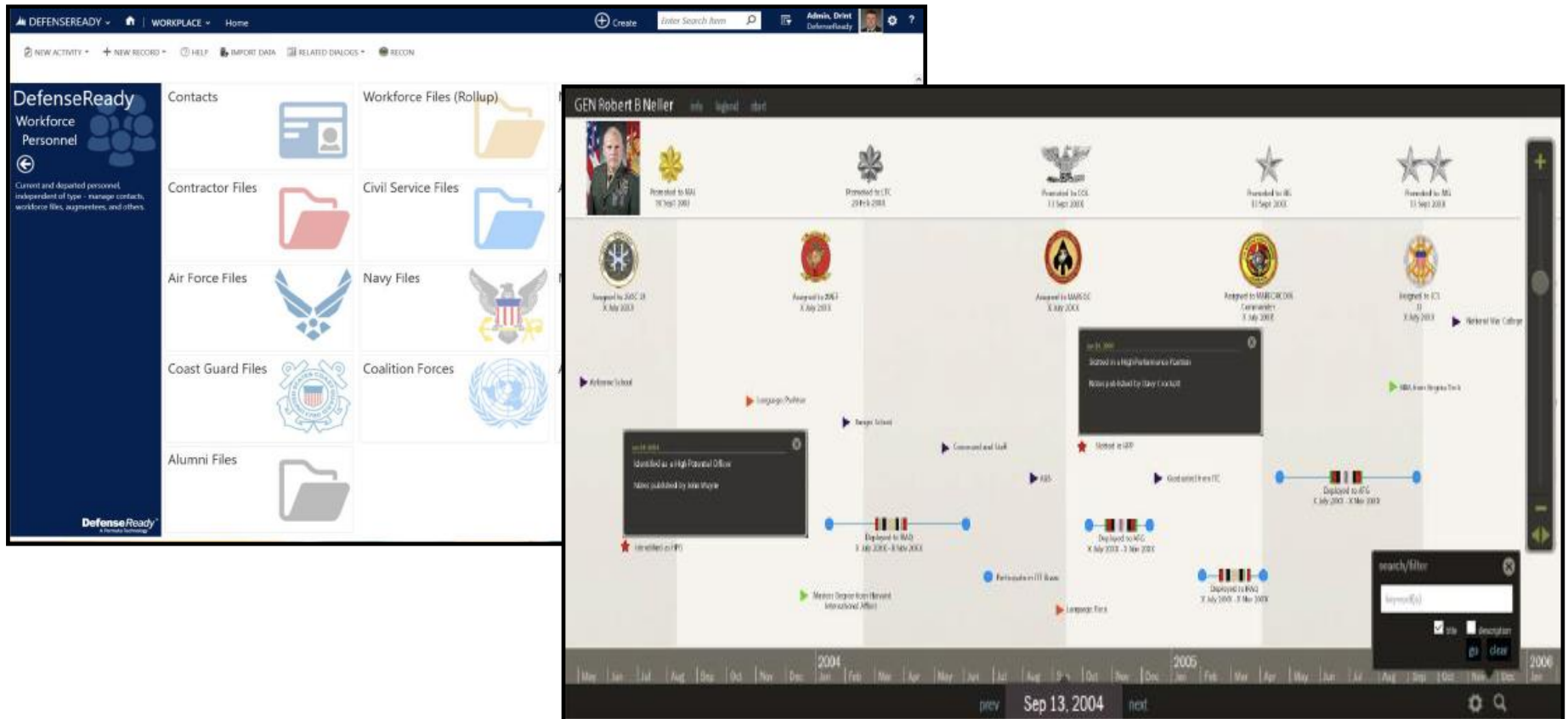
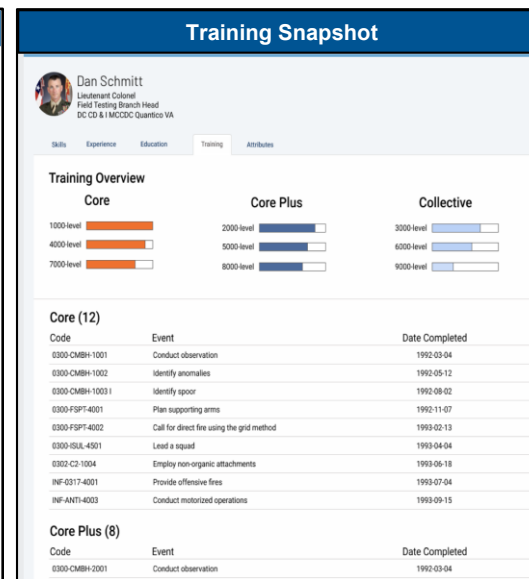
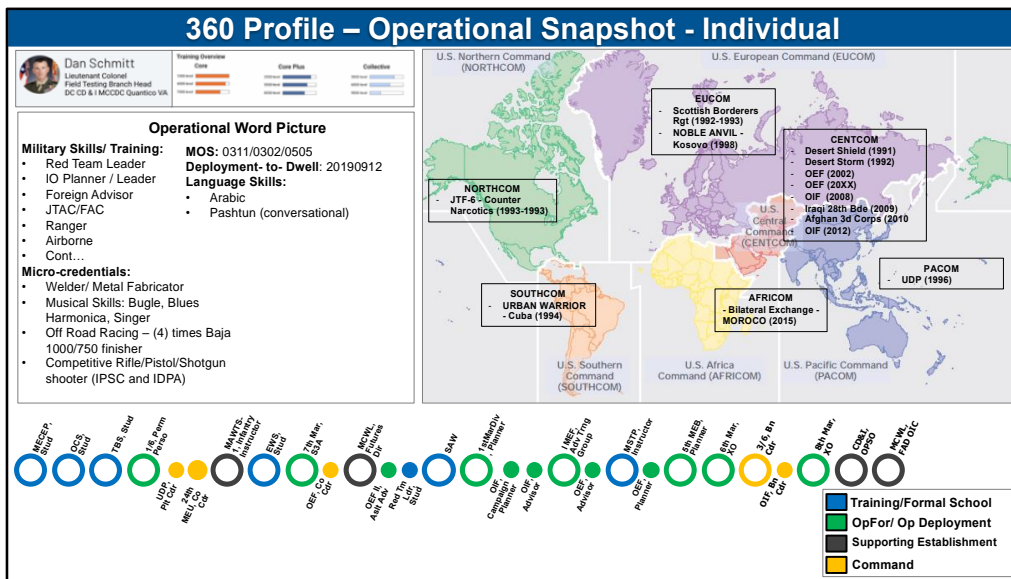


Figure 7. Defense Ready Platform⁸²



Potential Application Across Service Milestones

- Talent Management** (Institutional, Unit, Individual Levels): This in-depth individual profile will a comprehensive assessment of hard and soft skills (to include micro-credentialing). It provides a platform for skills validation and vetting, supervisor and peer ratings to evaluate performance and develop individual career progressions plans. The same information can be used at the institutional level to optimize unit staffing, manage MOS fields, or track service trends.
- Force Preservation.** Dynamic career mapping could identify stress points in a service member's career. When aggregated at the unit level and overlaid with the unit's TEEP and service annual events (summer mover season, promotion boards, etc.), high risk areas will be exposed that can be mitigated through shifting events, personnel augmentation or increased leadership presence.
- Training Plans.** In aggregate, this information can be used to track unit training milestones or gaps. It is beyond, simply recording a training event in an after-action. Training regulations and doctrine can be converted into an interactive assessment tool. A commander can track individual and small unit proficiency in specific occupational skills or Mission Essential Tasks in real time.
- Readiness.** When personnel and training information is accurate and timely, readiness assessments will depict true readiness of the force. As information becomes richer, AI models can be used to calculate/predict readiness against the spectrum of OPLANs/contingency/crisis response plans in real-time.
- Trend Analysis.** With the application of AI, this module can provide predictive modeling, across human resourcing milestones and visual presentation of unit assessment/After-Actions Reports.
- Risk Analysis.** The 360 Profile can interface with DoD risk assessments tools/programs to capture and display critical information that is necessary to assess and mitigate Military Risk.
- Global Force Management.** Dynamic Operational Profile (Training, Deployments, Billet History, Geographic Location Assignments) that can feed force employment/GFM sourcing solutions.

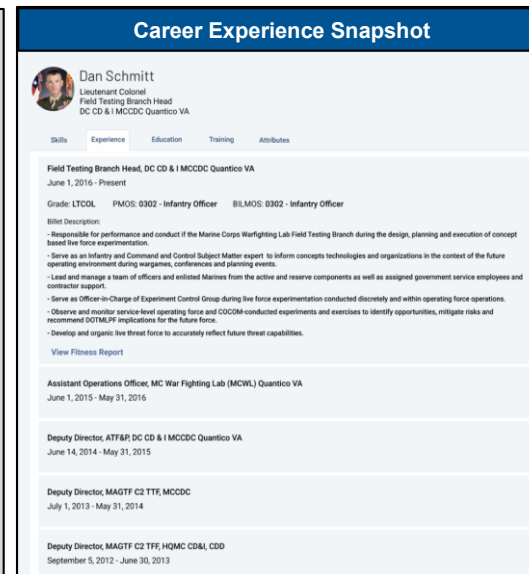
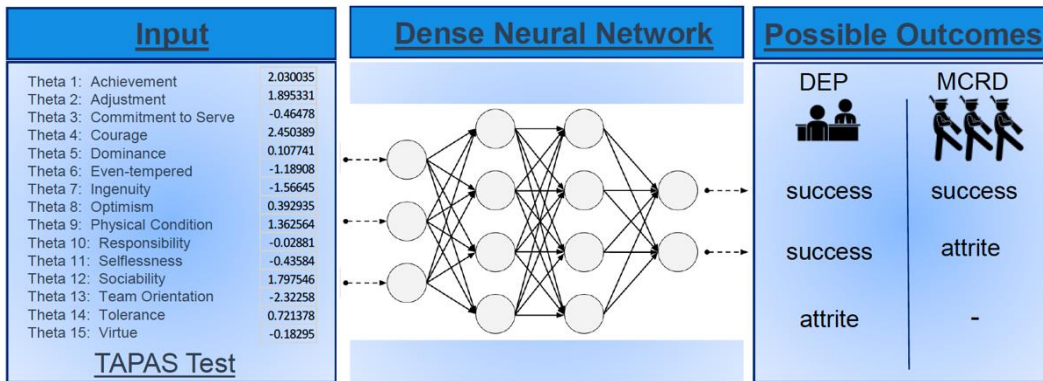


Figure 8. 360 Profile Proof of Concept – Individual View. 83

APPENDIX E - John Hopkins Applied Physics Laboratory - TAPAS: Predicting Recruit Success

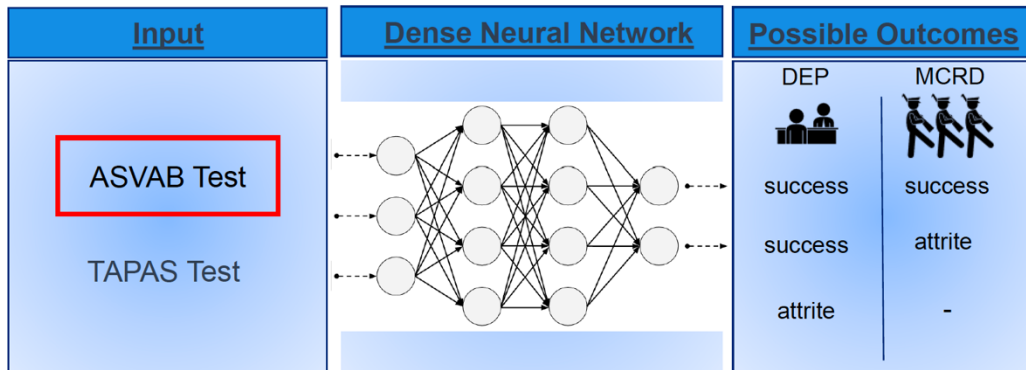
DC, M&RA is exploring the potential options that AI and ML can offer to the modernization of people analytics. TAPAS AI proof of concept is intended to demonstrate that AI can provide predictive capabilities in areas that exploit the competence and skill sets of individual Marines.⁸⁴

- **Problem.** Predict individual’s likelihood of completion or attrition in the Delayed Entry Program/Marine Corps Recruit Training process using the TAPAS test
- **AI Solution.** A fully-connected neural network can interpret numerical input and extract features leading to predictive outputs
- **Impacts.** Decision-making ability is provided early in the training pipeline



A neural network is a mapping from an input to an output

- Another option would be to map directly from the test results, not an interpreted output, to the desired outcomes — end-to-end Deep Learning
- ASVAB results would likely contain additional predictive power



An “end-to-end” solution would ignore human-engineered test results

APPENDIX F - Manpower War Planning Model – Digital Fusion Center

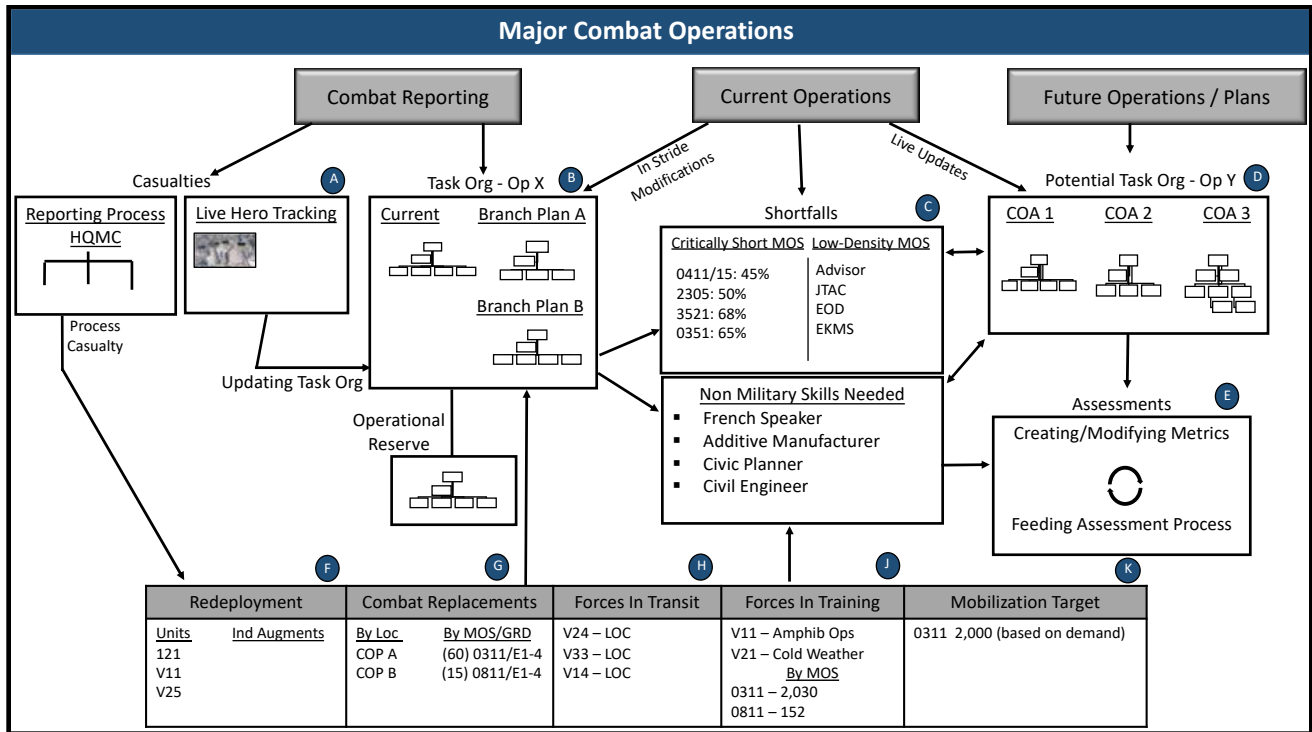


Figure 10. Potential Application for Future War Planning and Execution.

This interactive war planning model is meant to capture and fuse critical information from multiple systems and stakeholders in real-time to rapidly mobilize, deploy and sustain forces globally. In the future, comparable AI models may enhance human cognitive capacity and speed of decision-making to create strategic momentum and maintain military overmatch over peer competitors.

The War Planning Model above could provide:

- A. Live tracking of casualty from battlefield to final destination. Tracking and processing of administrative service requirements for casualties. Information loop is connected to home unit and concurrently reconciling gaps in current task organization and signaling demand to the combat replacement process.
- B. The task organization model allows planners to create task organizations in planning that will become interactive during combat operations. They will be connected to casualty model, personnel accountability and global force management systems to facilitate quick decisions about force employment or reorganization.
- C. As operations are ongoing and casualties increasing, manpower shortfalls will be registered and will feed into models F through J to continue the flow of personnel into the theater or signal demand demand to service providers.
- D. While operations are ongoing, future operations are in planning, Model D will allow planners to establish requirements and build interactive task organizations based on potential courses of action.
- E. Model E, provides a venue to monitor real-time performance assessments. Once, assessment plans are developed and measures of performance and effectiveness registered, the live feed of information across the war planning model will be collected and organized to facilitate analysis.
- F. through K. This module will fuse critical information about the mobilization, deployment, and

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- ¹ Department of Defense, *Summary of the National Defense Strategy of The United States of America* (Washington, DC, 2018), 1-2, <https://www.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf>.
- ² The concept of military overmatch and close combat overmatch is a current focus of the SecDef's Close Combat Lethality Task Force, established in 2018. See [Appendix A](#) for definition. Close Combat Lethality Task Force. *Campaign Plan*, Coordinating Draft Version, C-PLAN CD-15, 15, July 7, 2018, 20.
- ³ United States Congress, House Armed Services Committee, *John S. McCain National Defense Authorization Act for Fiscal Year 2019: Conference Report to Accompany H.R. 5515* (Washington, DC, 2018).
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- ⁵ Close Combat Lethality Task Force. *Campaign Plan*, 4-10.
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- ⁹ Brian McKenna, "Data Overload Is Not About Human Limitations; It's about Design Failure," UX Collective, October 23, 2018, <https://uxdesign.cc/data-overload-is-a-design-problem-bc6b76e3cd6c>.
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- ¹⁴ Department of Defense, *Summary of the National Defense Strategy of The United States of America*, 1.
- ¹⁵ Since the military service that is confined to an end strength by federal law, talent management may also govern decisions on "separations" where the service separates those members who are not competitive or not in compliance with regulations to make room for the recruitment of new service members.
- ¹⁶ Manpower Information Division, *Applications and Systems View (UNCLASS)*, (Manpower and Reserve Affairs, Quantico VA, April 5, 2019), Visio graphic.
- ¹⁷ Close Combat Lethality Task Force. *Campaign Plan*, 15.
- ¹⁸ Headquarters United States Marine Corps. *Data Readiness and a Ready Data Environment-From Concept to Reality*. MROC Decision Memorandum 05-2016. April 20, 2016, 3.
- ¹⁹ See [Appendix A](#) for definition of interoperability. Department of Defense, *Joint Enterprise Defense Infrastructure (JEDI) Cloud Program*, Cyber Security Plan, Version 1.0. (Cloud Computing Program Office, June 11, 2018).
- ²⁰ Mabel Annunziata, "Does the Corps have a 'Ready Bench: An analysis of the disparity between supply and operational demand (master's thesis, Marine Corps University, May 2018), 4-8.
- ²¹ **Graham Allison and Philip Zelikow, *Essence of Decision: Explaining the Cuban Missile Crisis* (New York: Longman, 1999).**
- ²² J. F. C. Fuller, *The Foundations of the Science of War*, 1926, Reprint, (Fort Leavenworth: U.S. Army Command and General Staff College Press, 1993), 40.
- ²³ U.S. Marine Corps, *MCDP-6, Command and Control* (Washington, DC: Department of the Navy. Headquarters Marine Corps, 1997), 63-104.
- ²⁴ See [Appendix A](#) for definition of common operational picture.
- ²⁵ Key aspects in three information/decision making models were assessed and combined to make this Figure 1. U.S. Marine Corps, *MCDP-6, Command and Control*, 67; John D. Kelleher and Brendan Tierney, *Data Science* (Cambridge, MA: MIT Press, 2018), 240; and Marek Kwitek, "A Feasibility Study of Azure Machine Learning for Sheet Metal Fabrication," (master's thesis, University of Vaasa. Faculty of Technology Industrial Management, 2016), 16.
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- ²⁸ Chris Brose, *The Moneyball Moment (Or: How I Learned to Stop Worrying and Love Autonomous Military Forces)*, Aspen Strategy Group, 2018, 2.

²⁹ *Ibid.*, 3.

³⁰ See [Appendix A](#) for definition. Peter Hays, USAF SAF-SP (USA), email message to author on April 23, 2019.

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³³ U.S. Marine Corps, *MCDP-1*, 19.

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⁴¹ Shane Shaneman, Director of Strategic Government Research/DoD.

⁴² Jason Kulpa, "Why Is Customer Relationship Management So Important?" *Forbes*, October 24, 2017, <https://www.forbes.com/sites/forbesagencycouncil/2017/10/24/why-is-customer-relationship-management-so-important/#4543164b7dac>.

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