Analytics, Artificial Intelligence, and Digital Engineering Directorate Mission -> Vision

1. Introduction. The purpose of this memorandum is to highlight the need for a new directorate and outline the Analytics, Artificial Intelligence, and Digital Engineering Directorate (AAIDED) vision, mission, and capacity systems. Additionally, I will highlight the importance of innovation and the type of culture I will foster as your Director.

2. Background. For decades ATEC has been focused on commodity expertise. Our test and evaluation centers commodity alignment were a result of the DoD's focus on platforms. There is a tremendous organizational and technical debt in ATEC centers that focus on these commodity specific T&E infrastructures and evaluation methodologies. We define debt to mean the implied cost of organizational or technical rework necessary to modernize our T&E capabilities. We are now moving towards more complex system of systems architectures that require democratized data reduction workloads and analytical services deployed at the edge and the cloud. Our need for change is paramount. We are faced with a revolutionary transformation that will rely more on networks, artificial intelligence, autonomous systems, robotics, and data meshes. To prepare for this revolutionary transformation, the Army is modernizing towards the following three transformational landscape elements: architecture, data, and cloud. These elements are described within the DoD Digital Engineering Strategy, the Army Data Plan, and the Army Cloud Plan. Digital engineering is an integrated digital approach that uses authoritative sources of system data and models as a continuum across disciplines to support lifecycle activities from concept through disposal. ATEC, along with most of society, is entrenched in a document-based paradigm where we version documents that are dispersed across several organizations without a unifying state-of-truth. When something changes, it is difficult, often impossible, to propagate the change. Digital engineering provides the means to link acquisition strategies, system requirements, M&S models, architectural models, hardware-in-the-loop testing, and live testing into a unified digital thread to govern the full acquisition life-cycle.

In order to modernize within these transformational landscape elements, ATEC must adopt a data-centric, digital first mindset. Some of the leading hurdles to digital transformation are culture, archaic IT systems, lack of skills, and lack of clear leadership vision. Culture change is a long-term effort to transform growth-oriented mindsets, inspire innovation, embrace systems thinking, adopt agile, lean processes, foster collaboration, and acquire new skills. In response to the need for change, the AEC Director created the AAIDE Directorate to support the evaluation mission with analytical rigor while acting as digital ambassadors to modernize edge and cloud analytic pipelines, develop and apply AI evaluation methodologies and digital engineering practices.

To create an effective organization, we must first define and share a common vision. Our vision is a concise, future desired state or goal. Our mission consists of simple repeatable actions that will lead to our vision. To execute our mission, we must define the capacity systems that perform the functions needed to accomplish our mission. Learning is what drives our capacity to improve our effectiveness at accomplishing our mission. Every day, we come to work to complete a set of tasks. These tasks should align with the functions our systems perform. Therefore, to ensure we achieve our vision, we must clearly understand the functions our capacity systems perform and how we can best improve them through continuous learning. See this link to learn more about this learning -> capacity -> mission -> vision construct. Considering these definitions, we now define our vision and mission statements:

3. AAIDED Vision. *All decisions accelerated with democratized, quality data*.

We envision a future where ATEC institutes an adaptive T&E approach to execute rapid turnaround testing, feedback, and reporting. The adaptive T&E approach will leverage innovative digital processes, hybrid

infrastructures (on-prem, edge, and cloud), and advanced digital capabilities, while upskilling a digital workforce that will accelerate decisions. The ATEC Digital Transformation Strategy outlines this strategic approach; see this link. The following describes each of the vision elements in more detail:

Quality Decisions. We must all understand what a quality decision is. The six elements are: appropriate *frame*, creative, doable *alternatives,* meaningful, reliable *information*, clear *values and tradeoffs*, logically correct *reasoning*, and *commitment to action*. See this link for more information.

Acceleration. We use the word "accelerated" to emphasize two aspects. First, we want to embrace the six core operational testing principles our leadership developed; they are early Operational Testing (OT) involvement, tailor testing to the situation to increase flexibility, continuous and cumulative feedback, streamline processes and products to remove bureaucratic constraints, integrated and combined collection/test among contractors, developers, Developmental Testing and OT, and adaptive testing. The second aspect is to leverage edge and cloud analytic pipelines that involve data engineering, DCRA, model building, analysis, visualization, and delivery of insights. The critical enablers of these pipelines are the teaming of the right talent among test engineers, data engineers, data scientists, software engineers, system architects, data analysts, cloud solution architects, and evaluators.

Democratized Data. Democratized data means that data is accessible to all. This requires an enterprise architecture that integrates data and applications with services. We envision a future where our data products are developed and hosted in the cloud with connections to our analytical-ready data.

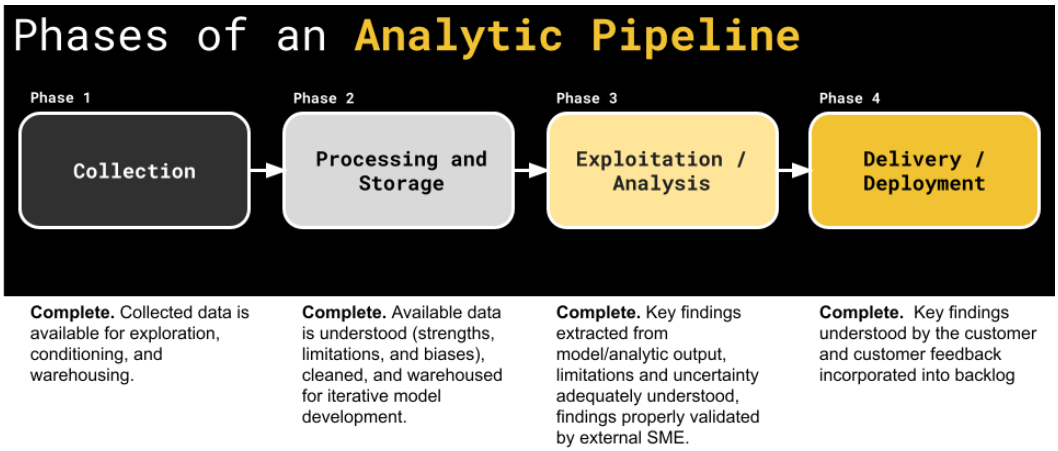
Quality Data. Quality data encompasses the entire data management framework that involves data governance, architectures, modeling and design, VV&A of M&S, security, integration and interoperability, document and content management, reference and master data, data warehousing and business intelligence, metadata, and the data quality elements. We will partner with the ATEC Chief Data Officer to establish our Data Strategy that aligns with the Army Data Plan and perform experiments on data platforms to inform how to make data an enterprise asset.

4. AAIDED Mission. *To rapidly perform quantitative analysis with modern analytic pipelines to visualize and communicate insights in support of the T&E mission.*

Rapidly: We use the word "rapidly" to emphasize our need to quickly assemble relevant insights. We do this by innovating new ways to increase efficiencies and leverage technology. These new innovative ways include cloud computing technologies, high performance computing resources, analytical tools, computer languages, and digital engineering practices.

Perform Quantitative Analysis: As complex systems continue to be instrumented with more and more sensors, the amount of data collected for each test has surpassed the level of an evaluator's cognitive processing ability. As a result, large amounts of instrumentation data collected during testing currently goes unused. Additionally, evaluator's time is consumed with reading hundred or even thousands of Test Incident Reports (TIRs), watching hours of video, and manually correlating observational logs, instrumentation data, and other forms of data. The T&E mission is rapidly progressing from a platform focus to a focus on system of systems with embedded AI. Embedded AI involves a stack of technologies above the system of systems platform and networking layers that interact in complex ways. These additional layers include massive data management, machine learning, world view modeling, decision support, planning and acting, autonomy and human-AI interaction. ATEC must develop new T&E approaches to keep pace with these revolutionary systems.

Utilize Modern Analytic Pipelines to Visualize and Communicate Insights in support of the T&E mission: The modern approach to assemble insights from various data sources is to execute a robust analytic pipeline. The phases of a modern analytic pipeline are shown in the following figure.



Our workforce must learn to collect data from a variety of sources stored in files, databases, data lakes, and websites (phase 1), tidy the data into variables and observations, and transform data into new forms suitable for analysis (phase 2). Visualizing data allows us to explore our data, generate questions, and uncover insights. Modeling complements our visualization with mathematics that allows us to diagnose tests events, predict outcomes, and prescribe actions (phase 3). Once we develop new insights, we must learn to effectively communicate to decision makers in a way that is operationally relevant. A new form of analysis reporting are web applications with interactive displays used to communicate insights that are hosted in cloud environments. We must visualize and communicate insights in a way that resonates with senior leaders with new methods and tools (phase 4).

5. Capacity Systems. *Apply and innovate analytics, develop and apply AI evaluation methodologies, and adopt digital engineering practices.*

Apply and Innovate Analytics: We provide direct support to priority 1 and 2 programs with quantitative insights in support of the evaluation mission. We conduct statistical test planning to determine the type of data needed, how much, and under what conditions. We promote a rigorous Evaluation Decision Review process with a focus on instrumented data, data reduction, and data access while innovating with edge and cloud analytic pipelines. We conduct post-event analysis and develop data applications for analysis, visualization, and reporting tools. We develop organizational training to promote best practices in the areas of statistics, data science, and data analysis.

Develop and Apply AI Evaluation Methodologies: We coordinate with ATEC HQs, OTC, our Test Centers, and external AI partners to identify and develop AI T&E policies and methodologies and develop the requirements for T&E infrastructure and tools (range, instrumentation, data, etc.). We support ASTs for programs, experiments, and demonstrations with AI components and apply novel T&E methodologies for AI capabilities. The AI Coordinator embeds with the Artificial Intelligence Integration Center (AI2C) in Pittsburg, PA to co-develop AI evaluation methodologies. We lead projects to experiment with the use of AI and machine learning to improve the T&E mission execution.

Adopt Digital Engineering Practices: We provide direct support to AST chairs and evaluators by developing M&S execution plans for T&E strategies, performing research and discovery of M&S technologies, and leading/executing Verification, Validation, and Accreditation (VV&A) in accordance with policy. We partner

with ATEC, ASA (ALT), OSD SE, AFC RSI, FCC on authoritative architecture development in support of the system evaluation planning while actively engaging with the digital engineering community of practice. While partnering with external stakeholders, we develop proof of concepts for a digital engineering ecosystem that supports digital twins, digital threads, life-cycle traceability, product views, and automated system of systems updates. We identify and develop the tools needed by AEC evaluators to assess complex system of systems. We coach AEC evaluators and test center managers on how to digitize T&E documentation to accelerate T&E timelines for planning and execution.

6. Innovation. Innovation is the result of critical, creative, systems thinking, and the conversion of new ideas into valued outcomes. It is important that we create an environment where we value idea generation and allow for the implementation of promising ideas into actionable solutions. Due to the nature of our work, we often are consumed with reading and responding to emails, sitting in meetings, and creating slides. Although these activities are necessary, they distract us from the deep thinking, problem framing, reading, coding, analyzing, writing, and learning that will lead to high impact innovation. I encourage all of you to reflect on the time we spend innovating and reward those who can implement transformational ways of achieving our vision.

7. Culture. My role as the Director is to lead our team to successfully achieve our vision and to live by the Army Values of Loyalty, Duty, Respect, Selfless Service, Honor, Integrity, and Personal Courage. Central to this role is to establish a culture of learning that will increase our capacity system's ability to perform our key functions. An organizational culture is when individual team members share the same mental models that support the mission and vision. We use mental models to understand reality and continually update them as we learn more information. An organization that learns to do its mission every day and shares the same mental models will achieve its vision. Our culture should value improvements to how we do our work, more than the work itself. I encourage you to learn new skills that will increase our capacity to perform our mission so that we can adapt together as a winning team. It is my hope that each of us feels valued and fulfilled with the work we do and the time we spend together. Effective teams require trust, shared understanding/mental models, and commitment to a common vision. My focus will be to foster a learning culture, encourage innovation, and enable our team to perform our mission. I will make every effort to provide you with the autonomy you need to realize your full potential. The intent of this memorandum is to provide the foundation for our team's development into a highly effective organization. I look forward to working closely with you to achieve our common vision.

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