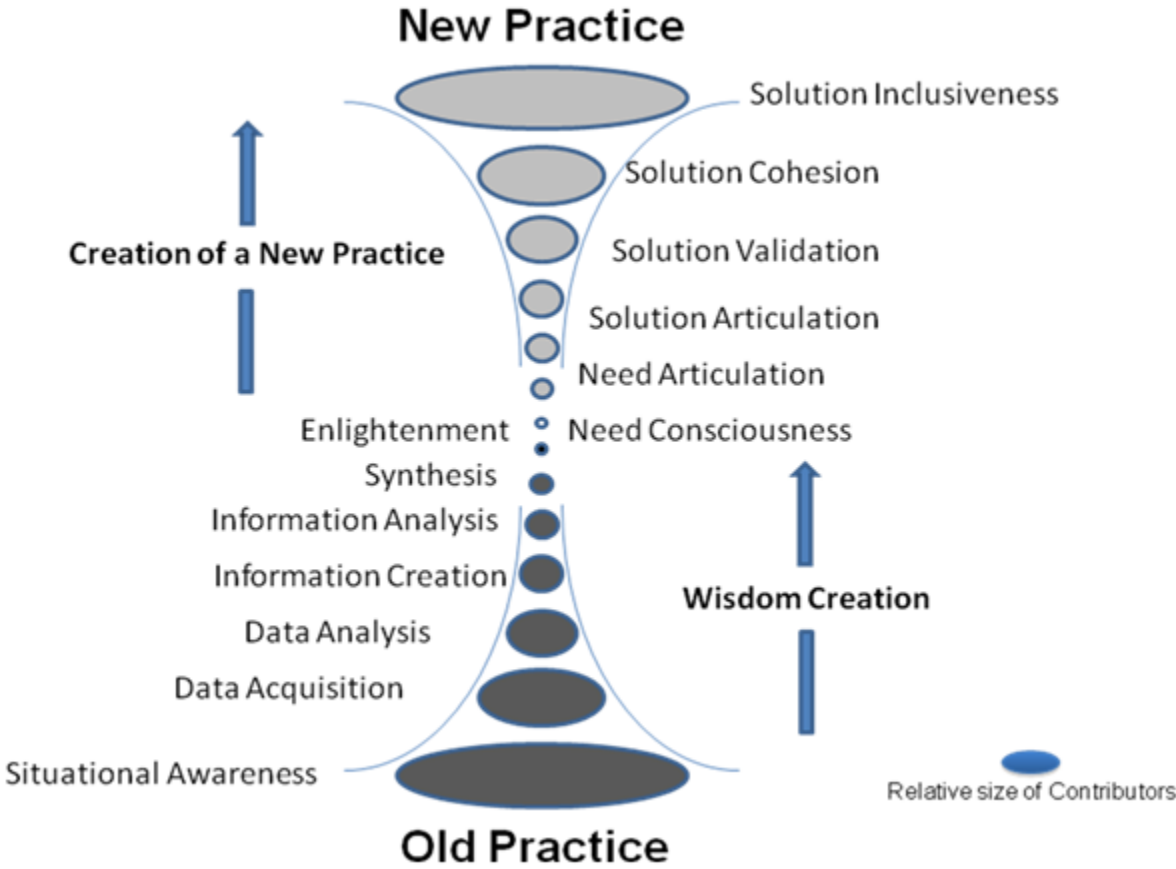


Mission Enterprise Architecture (MEA)



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Introduction

For the past twenty years the author has been supporting U.S. government transformation efforts and has initiated educational programs aimed contributing to create the next leadership of technical and scientific leaders in the US. Through these efforts the authors has sought to identify an abstract framework that can be used for effective transformation. In doing so the authors has discovered a model that articulates the essence of an enterprise and its execution levels.

The element of this model includes four fundamental concepts:

For the past twenty years the author has been supporting U.S. government transformation efforts and has initiated educational programs aimed at contributing to create the next leadership of technical and scientific leaders in the US. Through these efforts the author has sought to identify an abstract framework that can be used for effective transformation. In doing so the authors has discovered a model that articulates the essence of an enterprise and its execution. This model includes seven fundamental concepts:

1. Posture as the synthesis of strategy, culture and practice of an enterprise
2. Posture Assessment as a measurement of an enterprise ability and capacity to execute its commitment (obligation).
3. Mission Enterprise Architecture (MEA) is the structural framework that articulates the posture (strategy, practice and culture); and defines the mission, service, support and administrative areas; enabling systems; administrative systems; operations, location, mission assurance and security systems.
4. Mission Performance Reference Model as means to measure enterprise performance against the different layers of the MEA.
5. Execution in four domains: Strategy, Operations, Tactics and local Implementation. Each with its own concomitant performance reference model.
6. Embedded Independent Validation and Verification (IV&V)
7. Taxonomy Based Lessons Learned at four levels of abstraction: Strategy, Operations, Tactics and local Implementation

With these contributions the author aims to provide an enterprise's leadership and the enterprise proper with system of constructs that provide:

- Clarity of thought.
 - Aligned Strategy, practice and culture.
 - Everyone in the enterprise understands their role in fulfilling the mission, knows what they are supposed to do, and how they will be evaluated.
 - Resources are assigned more effectively.
 - Performance measures are within the scope of the evaluated area.
 - Each activity can be traced back to the mission.
- Plans are a tool for efficient execution.

- Execution is contextualized and more efficient.
- Tools for an effective learning enterprise.
- Clarity of exposition in reporting to justify funding requests and reporting performance.

This paper addresses the concept of Mission Enterprise Architecture (MEA) and introduces the notion of Mission Performance Reference Model (MPRM)

Mission, Enterprise and Architecture

Let's begin by defining the three terms mission, enterprise and architecture:

Mission:

The mission is a description of the fundamental purpose of an enterprise. It answers the question, "Why does the enterprise exist?" Missions are time variant; they conform to the époque, the historical becoming of the enterprise.

Enterprise

Enterprise is an organic unit composed of multiple entities, bound together by a single strategy, core culture, and a set of common practices that give the enterprise a single posture. Each entity in the enterprise has its own peculiarities (cultural and practical nuances), the strategy of each entity is a corresponding element, assigned to the entity, of the overall strategy. An enterprise, by its own nature, is hierarchical, for it has unity of purpose to which all entities (components) are bound to, and contribute to realize.

Architecture

From Greek chief/master builder. For both, Romans and Greeks, architecture is a structure with beauty and durability for a utility (purpose and function) conceived by a master builder. Architecture is the product of a master builder. It is the concretization of mental abstraction that binds the utility (mission) with the practical systems and components (the structure). It defines the structure (hierarchies, relations and flows) and behavior (function) of an entity. It is important to emphasize a key architectural principle: form (structure) follows function (mission) and not vice versa.

IEEE, and adopted by DoD, defines architecture as the "organizational structure of a system or component, their relationships, and the principles and guidelines governing their design and evolution over time." The function is implicit because systems by definition is a collection of components bound together to perform a function. Most modern treatments of architecture allow the "system or component" to be an arbitrary entity. Thus, architecture is a description of an entity in terms of its function and structure, including its interfaces and performance. In general architecture is decomposable at multiple levels of abstraction.

A well crafted architecture provides visibilities at multiple levels of abstraction that allow all participants to clearly visualize the enterprise, understand how their activity enables the vision, verbalize the mission

and their role unambiguously, articulate what needs to be done and who is empowered to do it, and how performance is measured.

The “As Built” or the “As Is” Architecture describes how the current enterprise was built and for what purpose. The “To Be” or “Target” Architecture describes what the future enterprise will be and any modifications to its purpose. The Transition Architecture describes the transition stages along the transformation or evolution path from the current “As built” to the future “To Be” enterprise.

The architectural constructs evolve around the key entity of the enterprise, entity-centric architecture. For data driven enterprises--such as the Internal Revenue Service (IRS), where the interaction between the client (the taxpayer) and the IRS is primarily the interchange of data: Tax Id and tax return submission by the taxpayer and refund information from the IRS, the key entity is data, the architecture is data-centric.

Enterprises where the primary entity constitutes humans the architecture is organic-centric. The mission and the performance reference models of the enterprise are human oriented. Examples of such enterprises are Health Systems, the Department of Education, Police Departments, etc. Other enterprises where products are the primary entity the architecture is production-centric. Similarly institutions where the money is the primary entity—in any of its manifestations—the architecture is finance-centric. In summary, the entity around which the architecture is constructed is the one that provides more value to the user. For example in DoD’s Net-centric environment, where situational awareness data is paramount in war fighting, architectural framework is data-centric (DoDAF V2.0), as opposed to system-centric (former version).

For health enterprises, where people are the primary entity and the primary interaction is between individuals, the architecture is organic-centric.

Perdurant (durable) Architectures

A mission driven, organic-centric architecture can be the foundation of a perdurant enterprise. The Constitution of the United States is a form of organic-centric architecture (with the citizen at its core) whose resulting institutions have survived for almost two and a half centuries. The founding fathers crafted an enterprise (the US Government with three branches) with the US Constitution as its architectural framework that has allow dramatic changes in the economy, population, technology, etc. to be seamlessly incorporated into the framework without a need to re-architect the nation.

In the next section, address the abstract composition of perdurant architectures that allows for the specificities to change and be seamlessly accommodated without changing its logical framework.

Mission Enterprise Architecture

The Mission Enterprise Architecture (MEA) is the structural framework that articulates the Mission and defines the mission areas, service areas, support areas, administrative areas, enabling systems, administrative systems, operations, location, mission assurance and security systems, and the concomitant reference models of the enterprise¹.

Architecture can be viewed as a system of actionable abstract constructs that organize the structural thinking and the implementation posture (strategy, culture and practice) of complex enterprises.

In developing the concept of a Mission Enterprise Architecture the author will use an example as a medium to assist us in better understanding the constructs of a MEA. To avoid complexities we will limit the example to sports medicine research with a narrow focus mission of repairing injuries related to sports and/or exercise.

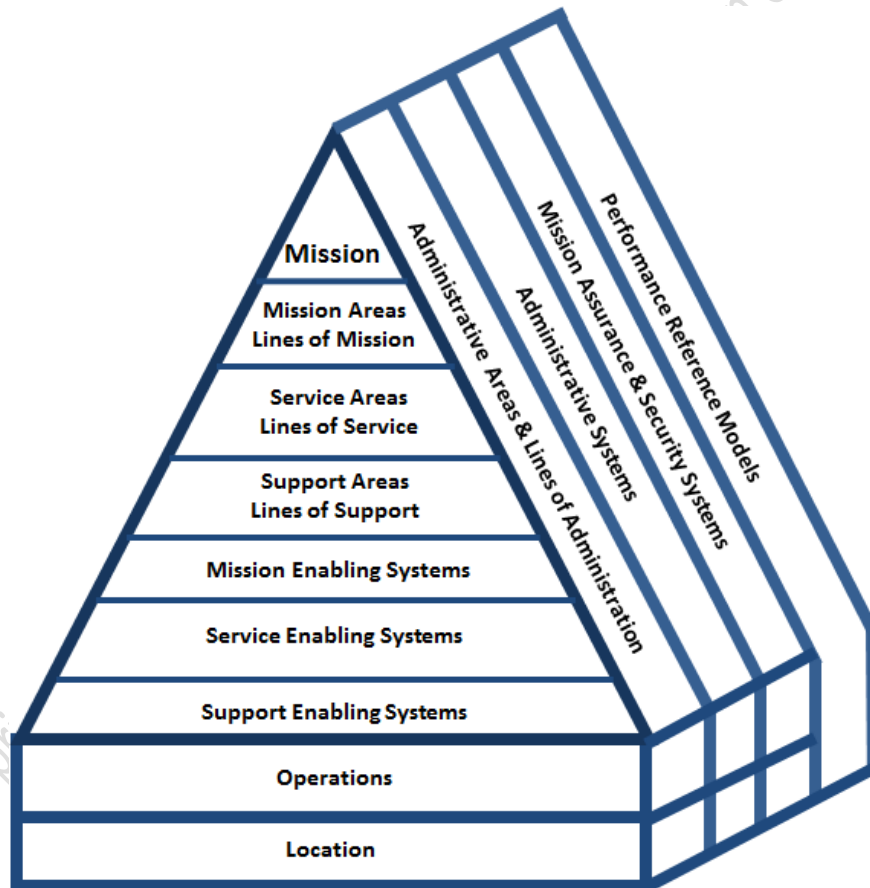


Figure 1. Pictorial Representation of the MEA Structural Framework²

¹ Depending on the nature of the enterprise not all of the identified constructs need to be incorporated.

² Pictorial Representation of the MEA Structural Framework is Afilon copyrighted.

Mission:

*The mission is a description of the fundamental purpose of an enterprise. It answers the question, "Why does the enterprise exist?" Missions are time variant; they conform to the époque, the historical becoming of the enterprise. For the sports medicine example, the mission may be defined as the physical fitness, treatment and prevention of **physical and brain** injuries related to sports and exercise.*

Mission Areas and Lines of Mission

The mission areas are derived from the mission of the enterprise, and, as a whole, fully encompass and substantiate the mission. In defining mission areas one should consider the multiple perspectives that a mission area may embody: for something, the avoidance of something and/or against something. The lines of mission are specific components of the mission area. Taken in their entirety the lines of mission comprise a mission area.

A mission area derived from treatment of physical injuries is spinal cord injury recovery research. A line of mission is stem cell research.

Services Areas and Lines of Service

Service areas are sets of human endeavor that supplement the mission areas.

An examples of Service Areas in a stem cell research is the stem cell bank. Lines of service in stem cell bank are:

- Testing to establish the identity of the cell line and identify general cell characteristics
- Testing to demonstrate that the starting cell material has not been contaminated with potential microorganisms or viral pathogens.

Support Areas and Lines of Support

Support areas are activities that strengthen the mission and service areas.

An example of a support area is research facility planning. Lines of support in facility planning could be stem cell lab and stem cell bank design.

Administrative Areas and Lines of Administration

A bureaucratic set of activities to control the proper utilization of human, material, technical and financial resources.

An example of an administrative area is human resource management. A line of human resources is recruitment of stem research scientists.

Mission Enabling Systems

Mission Enabling Systems enable the mission areas and the lines of mission.

Example: Research universities with laboratory facilities for the conduct of research in spinal cord stem cell transplantation.

Service Enabling Systems

Service Enabling Systems enable the service area and the lines of service.

For our example the enabling systems for the Stem Cell Bank are:

1. Advanced instruments for the mm-to-nm-scale characterization of materials including:
 - FEI Titan S 80-800kV Aberration-corrected TEM/STEM, HAADF, EELS;
 - Thermo Scientific K-Alpha X-Ray; Photoelectron Spectrometer (XPS); Hitachi HF-3300 300kV TEM/STEM, EDS;
 - Hitachi NB-5000 Dual-Beam F18 with STEM, EDS, OIM.
2. Mathematical models, simulation techniques and computation algorithms to characterize the functional interrelation of network components regulating the process of differentiation and lineage specification of hematopoietic stem cells.
3. Storage facilities and transportation system.

Support Enabling Systems

Support Enabling systems enable the support area and the lines of support.

For Example: Simulation models for Stem cell research laboratory design considering: The scope of research to be performed in the laboratory; anticipated staffing levels; space requirements by zone of activity; layout for workflow efficiency; Special design requirements; desired adjacencies to other departments or services.

Administration Systems

Administration Systems enable the administration area and the lines of administration.

Examples are: automated systems to receive, track grants, make disbursement and closeout stem research grants; electronic human resource management system.

Operations

Sets of ongoing activities to perform a function for the achievement of a projected result. Example: a documented set of recurring process and procedures in the utilization of advanced instruments and mathematical techniques to establish the identity of a cell line and to identify the general characteristics a stem cell.

Location

The physical venue or the spatial location, where resources (organic or material) are housed and operated, and/or where an activity takes place (e.g. Stem Cell Bank and stem cell testing).

Mission Assurance and Security Systems

Mission Assurance is the security posture of an organization aimed at assuring the mission, goals, policies, methods, functions, operations, and assets of an enterprise.

- Physical security: Is the set of policies, functions, infrastructure and practices that protect and defend physical infrastructures, contents (human and materiel), and perimeter, campuses, other physical assets, and/or defined physical perimeters by ensuring their integrity, availability, reliability, non-penetration, non-usurpation, non-violation and non-compromise.
- Information Assurance: Measures that protect and defend information and information systems by ensuring their confidentiality, integrity, authentication, non-repudiation, and availability.

Example: The protection of the Stem Cell Bank infrastructure, the stem cells, the test equipment, the test procedures, the data, the mathematical algorithms, the computational infrastructure and staff.

MEA Recursion

An advantage of this generalized construct is the recursive nature of the structure, with conservation of topology, applied to its different constructs. For example, for the Stem Cell Bank, one could articulate its posture; its mission, service, support and administrative areas, etc. In this sense the IRS example given above can be thought of as a recursion of the Department of Treasury. This recursive property, at multiple levels, allows all participants to clearly understand their role in the enterprise and the enterprise proper.

Mission Performance Reference Model (MPRM)

A set of quantifiable and qualifiable performance standards for every construct of the MEA. The MPRM serves as a guide for design and measurement of performance. Continuous measurements of performance assist in:

- Measuring performance vs. vision. Are we getting there?
- Measuring performance vs. mission. Are we doing thing and are we doing it right?
- Measuring performance vs. strategic goals. Are we achieving milestones aligned with the mission?
- Measuring performance vs. strategic objectives. Are we achieving objectives that lead to goal achievement?
- Measuring performance vs. tasks. Are we performing and completing the tasks to meet objectives?
- Driving practice changes to improve performance.
- Measuring the alignment of the practice with the strategy.
- Measuring the alignment of the strategy with the current conditions.
- Rearticulating the strategy when performance requires qualitative and/or quantitative leaps in improvement.

The disciplined and repeatable process to conduct MPRM is the subject of another document.