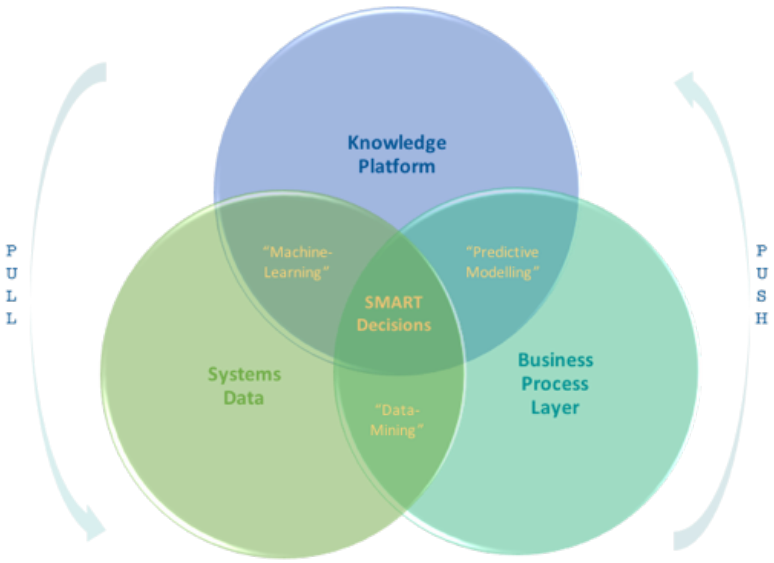
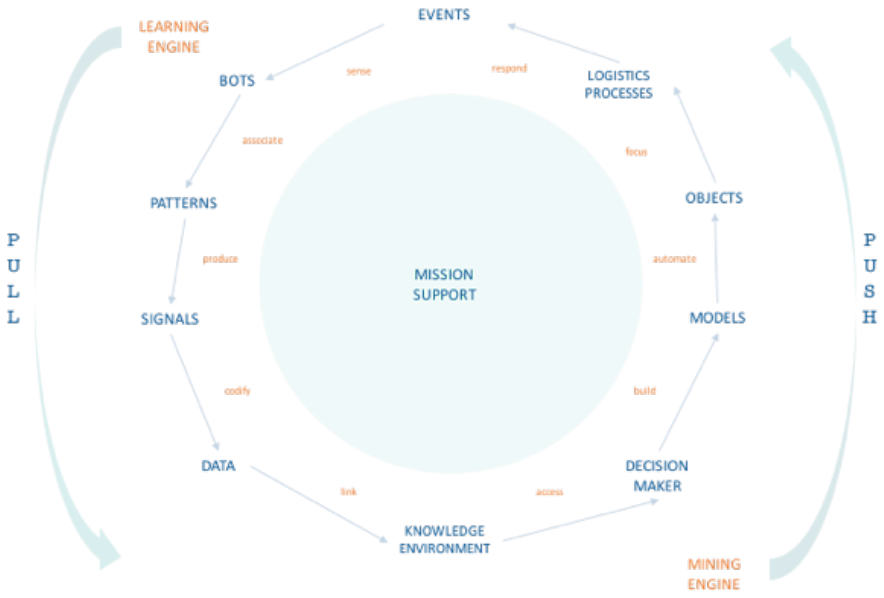
SMART Logistics: Imbedded AI Enabling Cognitive Decision Support

SMART Logistics describes a proposed approach to supply-chain logistics where information management performs as a strong enabler of enterprise-critical decision support, and where decisions are contextualized throughout the enterprise through a network of "linked data". In the present-day Knowledge Economy, enterprises preserve their competitive edge through the continual cultivation of data into information, and information into wisdom. Traditionally, the process of information management describes the transformation of raw data into actionable information. Borrowing design insights from the field of Artificial Intelligence, SMART Logistics improves upon this focused “push” of information upwards to a knowledge platform through an increased reliance of perceptive-feedback channels, which sense and codify information into data. This “pull” infrastructure enables the automation of processes to become learning systems of data-centric pattern recognition and prescriptive decision-support. Thus, through system-imbedded “intelligence”, the interoperability of enterprise-linked data transforms decisions into SMART decisions supporting mission objectives.



SMART Logistics

Artificial Intelligence is at once a theoretical field of academic study and a cloud of emerging technological capabilities. SMART Logistics bridges both the field and the tools with a view that AI-technologies enable the "intelligent" automation of Decision Support Systems (DSS's). There are three capabilities that together comprise a DSS: (1) Data Management layer; (2) Business Process Management layer; and (3) User-accessible Platform layer. We define "intelligent decision support" as the ability of the DSS to (1) provide data-driven analytics and event management that inform human decision-making, (2) automate business processes and workflows, and (3) continuously improve real-time events predictions through pattern-learning processes. SMART Logistics identifies three capability areas within AI that together enable these three functionalities with Decision Support Systems.



These AI-capabilities not only intersect with the decision-support layers; they provide the engines automating efficient information exchange supporting decision-makers. Data-mining and

deep search algorithms push data from a resting state into a knowledge-exchange platform. There, simple statistical methods transform actionable data into probabilistic models that enable proactive stakeholder decisions responding to predicted event scenarios. What differentiates SMART Logistics from its preceding schools-of-thought, however, is the design that seeks to enable innate, responsive system-learning that anticipates event-requirements as they unfold. In this top-down approach, machine-learning and data-mining engines function aggregately to (1) sense the external environment through a variety of sensors and machine-human interactions, (2) codify knowledge from the platform-layer into the enterprise data environment, (3) make numerous, rapid predictions about unfolding events through pattern-associations to previously stored data, which may be quickly retrieved from memory, and (4) algorithmically trigger a learning response that improves the correlation of memory-associated predictions with real-time events.

Through “push” analytics, simple statistical methods may be applied to reliably forecast anticipated needs for future events. Through “pull” analytics, data-mining methods sense, capture and codify unfolding events as Big Data, while machine-learning methods enable the Decision Support System to improve its micro-predictions responses over time. Together, push and pull analytics drive cognitive sense-and-respond functionality within a DSS that is not unlike intelligent processes that operate within the human neo-cortex. SMART Logistics is, therefore, the “cerebral” emergence of logistical processes from the intersection of human-thinking processes and supra-human processing potential. Through imbedded AI, SMART Logistics not only support human-made data-backed decisions, but also impart human-like sentience into the automated responses to sensory stimuli, thus enabling “cognitive” logistics supporting the enterprise.

Developing Analytic Maturity

The vision of imbedded AI as a decision-support tool enabling SMART logistics processes describes a future-state of a Marine Corps analytic capability that is founded upon principles of both data management and data governance, which are especially relevant today. Meanwhile, there are many, simple data-driven understandings with potentially profound implications for logistics processes that can deliver effective views describing logistics efficiencies. To predict, data must be authoritative, assessable and standardized. To automate machine learning, data must be openly accessible and standardized. Regardless of the breadth of the data, scope of the method, sophistication of the technologies, and skills of the analyst, the enterprise requirement for open, quality data is non-negotiable.

So much money – public money; vital-to-our-troops money – lies wasted when we fail to integrate promising technologies and proven methods into a basic analytic capability supporting USMC readiness. From the military context, a failure to frame a decision through applied analytics results not only in wasted public resources, but also in the unmitigated risk to the lives of our nation's sons and daughters. Hybrid logistics looks at harnessing the untapped potential of existing data through predictive analytics while also standardizing the process by which data is accessed, stored, shared and assured throughout the enterprise. When the right people, the right processes, and the right technologies are applied to solve a specific, well-defined problem, actions maintain greater efficiency, utility and beneficence.

If the USMC desires the ability to increase efficiencies within its logistics processes through the integration of automated machine learning and algorithmic deep search capabilities, the enterprise must first support the governance of data quality. Next, it must shift the understanding of the need to network information systems to an understanding of the need to

directly link data to other data elements. Linked data ensures both the accessibility and standardization of data across the enterprise while also lending necessary contexts that inform data understanding. Open, linked data provides an essential foundation enabling patter-associated machine learning. Finally, the processes that delegate the push and pull of meaning across the operating environment must ensure a high degree of top-down and associative connectivity. By enabling simple, predictive analytics, Hybrid Logistics establishes and essential entry-point for establishing the above three requirements supporting embedded-AI within logistics decision-making processes.