Military Knowledge Management

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INTRODUCTION

Knowledge is a critical component of military operations, and the military has been an early adopter of knowledge management (KM) technologies. Significant events include a strategic use of tools to filter information into knowledge, the designation of knowledge officers in high-level strategic positions, and the implementation of knowledge systems as a means to support situational awareness and understanding. Following is a brief overview of knowledge management within the military and a review of knowledge theory and practice pertinent to military knowledge management.

MILITARY KNOWLEDGE MANAGEMENT

The military is extremely diverse in its knowledge systems and practices. In the collective, the military would be the equivalent of many large corporate conglomerates, each with multiple research and development (R & D) branches. Adding to the complexity is the secrecy of many of the systems. To attempt to summarize military knowledge management in its entirety would be presumptuous, if not impossible. Rather, this discussion will focus on some representative systems and approaches being advanced in military-sponsored KM research and practice. Included are comparisons to knowledge-management initiatives in the private sector. The discussion begins with an overview of private-sector and academic-research practices that have carried forward into the military.

Relevant Research

The importance of knowledge management has been equated to the importance of natural resources in previous generations wherein strategies that companies once devoted to optimizing capital and labor are now being applied to maximize the productivity of knowledge resources (Silver, 2001). A means to maximize productivity in the military is to integrate systems, technologies, and information resources. Such aggregations are increasingly under the umbrella of knowledge management.

At a technical level, military knowledge management is addressed within enterprise-systems engineering initiatives, with a current initiative force transformation through network-centric systems (MIT, 2002). Knowledge systems may be an adjunct to specialized computing systems or an umbrella under which information and communications technologies can be grouped. Similar to the private sector, military KM integrates disciplines addressing computer and communications technology, cognitive science and artificial intelligence (AI), and human-computer and human-systems integration. There is additional research addressing information synthesis or fusion, with XML (extensible markup language) as a categorization schema and ontology structure in support of semantic understanding. In addition are military-specific KM initiatives such as command and control, military intelligence, and sensors.

Common to both the military and private sector is research into mechanisms to consolidate data and information into knowledge, and once integrated, to understand strategic options and cause-effect relationships (Primix Solutions, 2000). The desired result is improved decision making, interorganizational communications, cooperation, and interaction (Schwartz, Divitini, & Brasethvik, 1999). An example at the macrolevel is Army knowledge management with its transformation mission toward a knowledge-based organization that integrates best practices into professional duties through active involvement with the knowledge infostructure (MIT, 2003).

At a microlevel are issues in knowledge design that address navigation and search mechanisms (Sherman, 2000), and knowledge structures to help achieve a goal or objective (Saward, 2000). In the military, a current focus is on context to help document knowledge flows (Nissen, 2001). Metrics are important for the assessment of knowledge initiatives, and means have been advanced to address the value of specific knowledge units (Gao & Sterling, 2000), to include relevance weightings for context-integration points, and to allow the knowledge value added (KVA) methodology to ascertain return on knowledge investments (Housel & Bell, 2001).

Both the military and private sector have an interest in cognitive understanding and research to encode pro-

cess, procedural, and expert knowledge into software (Storey, Goldstein, & Ullrich, 2002); to find techniques to capture common-sense knowledge in a context-sensitive manner and extract expert-level specifics (Storey & Day, 2002); to derive metacognitive attributes to help define relationships between user cognitive needs and knowledge metadata (Maule, 1998, 2000, 2001); and to implement reasoning tools to identify patterns of behavior to resolve problems or identify opportunities (Fensel & Motta, 2001). All of these approaches are active in military research as a means to structure or derive knowledge for decision-support applications.

A next step is to make this processed knowledge readily available. Portals with collaborative tools are mechanisms to establish relevance (Silver, 2001); to personalize, sort, and filter information (Moore, 2001); and to enhance business intelligence with decision support (Ruber, 2000). A portal with real-time chat and messaging empowers users with collaborative abilities (Loria, 2001). In the Navy, portals have become a primary means for information, communications, collaboration, work-flow coordination, and decision support (Maule, Gallup, & Schacher, 2003).

Also notable is the trend toward communities of practice as a means to build knowledge expertise. Communities increase social capital or the economic value of relationships within an organization and therein lower the cost of knowledge. Workers find information more quickly and realize overall information efficiencies as a life cycle of involvement forms around the knowledge community (DoN CIO, 2000). In the military, knowledge communities support work-group collaboration around specific knowledge concepts or initiatives. They help extend and expedite the traditional reach of individuals to colleagues who can share knowledge in a just-in-time manner (Tate, 2001). For example, the Air Force Materiel Command is fielding an Air Force-wide knowledge management initiative using the community-of-practice methodology to support collaboration among a widely dispersed workforce to enable teamwork, communication, and sharing within a virtual environment (AFMC, 2003).

Warriors need specific data in a timely manner. As in the private sector, semantics, ontology, and XML are emerging techniques to support transparent, automated knowledge exchange. Research in semantics has established that (a) content can be embedded with meaning, (b) relationships between meanings are delineated, and (c) access methods are coordinated around those meanings (Grimes, 2002). Semantics can additionally characterize participant roles in an interaction to establish relationships between entities, context, and knowledge bases (Storey et al., 2002). XML provides the syntax and structure, and ontology provides the means to define terms and relationships (Berners-Lee, Hendler, & Lassila, 2001). Value is added through classification and metadata (Chandrasekaran, Josephson, & Benjamins, 1999).

Military-specific ontology has been developed to aid in experimentation analysis and to contextualize problem scenarios in support of detailed situational assessment and understanding (Maule, Schacher, Gallup, Marachi, & McClain, 2000; Schacher, Maule, & Gallup, 2001). Military-specific ontology is being developed by agencies including DARPA (Defense Advanced Research Projects Agency) with its DAML (DARPA agent markup language), and the North Atlantic Treaty Organization (NATO) with its LC2IEDM (Land C2 information exchange data model; NATO, 2000).

MILITARY KNOWLEDGE SYSTEMS

Similar to KM private-sector research, there are many approaches to knowledge management in the military, each with its own set of tools, techniques, and methodologies. These range from AI-based techniques, to the statistical analysis of content, to ontology and metadata for categorization, to structural methodologies for cognitive profiling and user personalization, and to data mining for content pattern recognition. In complex environments, such as the military, an effective approach might involve several techniques, multiple tool sets in various combinations, and the integration of knowledge outputs with current situational data to help form an understanding for decision makers.

The services have taken somewhat different routes to KM. The Navy has its wide-reaching $6.9 billion Navy-Marine Corps intranet program that is converting 200 networks into the world's largest intranet while simultaneously consolidating date, information, and knowledge resources. The Army is using knowledge management as a way to centralize systems management at major commands under the CIO's (chief information officer's) office, and the Air Force portal will consolidate hundreds of disparate legacy data systems into a single decentralized point of access (Onley, 2001).

Current Practices

Joint-forces operations and cross-service integration is a current focus in the military. With this comes the challenge of data, information, and knowledge integration across the services. In response to such challenges are new techniques to evolve data into information, and information into knowledge and understanding. Figure 1 provides a Navy perspective to illustrate how knowledge is evolved from learning and training to address technol-