Innovative Technologies for the 21st Century
Decision Maker: Research, Retrieve, Organize and Manage Information

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Dr. Sondra K. Patrick and Dr. Reynolds Ferrante, Professors
Graduate School of Education and Human Development
The George Washington University

Introduction

Every new idea, every new invention, every new discovery to advance society brings increasing complexities in the form of new problems which old paradigms are incapable of solving.

At the beginning of the 21st Century, every decision maker at every level of every organization is overwhelmed with an avalanche of information on conditions, developments, and events that effect the present and future of our society and our world. Today, nations are closer together yet further apart than they have ever been. Telecommunication is instantaneous. Data are collected from every conceivable—and sometimes inconceivable—source. A distant battlefield is controlled dynamically and virtually from an office on the other side of the globe. News agencies report throughout the world simultaneously in multiple languages. As a result, simplicity and predictability have now been replaced by complexity and uncertainty.

In truth, the world may be no more complex than any other time in history, but in our efforts to make sense of this challenge and deal with it effectively, we are beginning to look at some new ways of thinking about the
problems facing society at every level—government, business, and individual. The problems we face are complex, dynamic, time sensitive, incipient, universal, and information laden. At the same time, many strategic planning paradigms once considered adequate in solving complex problems are no longer workable by themselves. In fact, they can become dangerous deceptions if we continue to put faith in them alone and do not look beyond their confines toward new problem-solving possibilities presenting themselves to us.

Today, decision making is not a linear process. The traditional linear-reductionist, decision-making process has been overtaken by new and untested situations that require collaborative, consensus management strategies. The complexities created and revealed by this new environment require that new paradigms be designed, developed, and examined in technologically enriched settings through collaboration and cooperation among such groups as research universities, national research laboratories, think tanks, government agencies, business and industry.

KMC Objective

To address these challenges, we have developed a Knowledge Management Center (KMC). The objective of the KMC is to design a centralized, consensus-based process which coordinates and structures data and information from multiple sources across different platforms to retrieve, manage and analyze large scale data sets and information to improve administrative decision making across business, government, military and education.

KMC Process

The KMC process includes the following 4 phases:

1. Phase 1 involves information retrieval.
2. Phase 2 includes the use of a Consensus-Based Process to Determine Agreement on Key Policies from executive and administrative staff personnel across all types of organizational structures.
3. Phase 3 uses both Information and Consensus Management Requirements of experts to formulate a knowledge management analysis process.

4. Phase 4 is concerned with the development and implementation of simulation scenarios that serve the requirements of administrators.

**KMC Functions**

The following functions and applications described below are integral to the KMC Process:

- Retrieve and query large data and information sets rapidly
- Research large structured and unstructured databases using complex search strategies and algorithms
- Comprehensively search multiple and complete websites with natural language queries
- Embed graphic, sound and dynamic video objects for enhanced visual representation of data
- Embed voice and gesture activation technologies for rapid ease of retrieval and management of data in the KMC
- Carry out statistical and 2-D and 3-D graphical data analyses from multiple data sources on demand
- Provide graphical structures that allow for simultaneous viewing of multiple data and information sources
- Track and monitor all queries for analysis
- Provide an invisible interface for seamless connectivity between and across applications and processes
- Provide encryption masks for secured, authorized access with controlled lockouts
- Create websites that directly link URLs to WWW for ubiquitous access and long-term usability
- Provide dynamic updating to the Knowledge Management Center from new data sources with little or no required programming
- Provide wireless access to current and future data sources
- Ensure that software and hardware are usable across many platforms and configurable with PATHFINDER (National Ground Intelligence Center (NGIC)) and
simulation/modeling (Lawrence Livermore National Laboratories (LLNL)).

- Utilize commercially available and tested software and hardware products
- Design a user friendly interface to provide seamless connectivity from one application program to another.

Three types of data/information will be included in the KMC.

1. Archival Data are permanent components of the management information system database located on a central database system.
2. Half-Life Data is time bound. This information is tagged for removal from the system by the project administrator and archived, but not readily available for searching once it is no longer considered current.
3. Dynamic Data includes day-by-day letters, documents, images, emails, and other data sources that are essential for daily decision-making.

**KMC Features**

- **Interoperability**— The lack of interoperability of hardware, software, and systems that process information has been a common problem in 21st Century organizations across education, military, government, business and industry. The condition continues to be a serious detriment to rapid response for administrative decision makers at all levels of responsibility. While it is not possible to achieve complete interoperability from any dynamic information system, the KMC attempts to improve interoperability through its basic system design which includes data standardization and the structuring of data and information across platforms, programming languages, and automated data conversion strategies through advanced automated filters. The KMC also includes continuous monitoring of archival, half-life, and dynamic data required at each stage in the KMC process. Interoperability is not a static one-time process, rather it is a continuous process in which input data and output information from multiple data sources co-exist and operate with major processing units such as the National Ground Intelligence Center’s (NGIC) decision making system known as PATHFINDER, the Lawrence Livermore National...
Laboratories’ (LLNL) JCATS simulation and modeling system, and The George Washington University’s Consensus Laboratory process.

- **Sustainability** -- One of the principle objectives of the KMC will be to maintain sustainability of its developments given the continued dynamic changes in the field as new conditions and demands become evident in all locations. While no one can absolutely ensure that it will be possible to sustain long-term research developments and strategies, the KMC supports a range of proven software and hardware technologies through partnerships with proven organizations that increases its ability to produce products with long term and long range viability.

- **Affordability and Evolutionary** -- There are three factors that allow the KMC to be both affordable and evolutionary. First, the KMC uses proven and tested technologies that are readily available on the commercial markets. Second, the KMC utilizes the PATHFINDER knowledge management database system developed by NGIC over the past 13 years. This is one of the most advanced and comprehensive database system developed. It is fully capable of providing multi database access from any level or size of archival information. It is also capable of secondary query capabilities that allow staff and field commanders to ask ‘What If?’ questions of the data available to them. Third, the KMC supports high-level decision making capabilities for decision making that heretofore has not been possible through the use of software applications that allow decision makers to examine issues from multiple perspectives using probability and ‘What If’ scenarios. These predictive capabilities have not been readily available in the dynamic organizational environments because the interface between hardware, software and decision making requirements has not been available. The evolution of the synthesis of technology has been difficult to achieve because of multi and disparate technology platforms, as well as a lack of comprehensive management paradigms for linking advanced knowledge decision making to administrative and organizational decision making.

**Emerging Technologies from the KMC Process**
In order to better understand the process that will be used to coordinate and synthesize all types of information for the Knowledge Management Center, a description of the supporting applications is provided below. These technologies (software and hardware) have been developed and tested by the partnership agencies.

- **PATHFINDER**—The central analysis system for the Knowledge Management Center is PATHFINDER developed by the National Ground Intelligence Center over a period of more than 13 years. PATHFINDER is a developmental and operational system that provides analysts with computer software tools to help analyze information drawn from large Government and commercial data sources. PATHFINDER allows the analyst to search, retrieve, arrange, compare, and visualize the content of tens of thousands of documents at a time.

- **JCATS**—Joint Conflict and Tactical Simulation (JCATS) is a computer based conflict simulation system in widespread use throughout the government and military. It has been primarily used for training of command staff as well as field commanders, analysis of weapons and force structures, course of action planning and analysis for mission rehearsal coordination and timing. Its primary characteristics are real-time, stochastic, high resolution, interactive simulation modeled at the entity-level.

- **NXT3**—NXT3, developed by NextPage®, accesses information where it physically resides. Single point of access to distributed information for moving, replicating, or recreating content is a simple process that accommodates most systems. NXT3 lets you create a Content Network, a new system for accessing distributed content in its native location and format—a system where you centralize your access not your content. The software allows the user to automatically access multiple websites and stores information results for query using standard Boolean operands. Any size database is manageable in NXT3. With a Content Network, NXT3 can access a virtual repository of distributed information that physically resides in different locations. This includes the intranet, an extranet, or across the Internet. NXT3 can access and navigate that information as if it were in one single place.
database can be automatically updated and queried with current information always available.

NXT 3 Vision, Goal and Capability*:
• NXT 3 Vision: Empower people with information
• NXT 3 Goal: Streamline knowledge intensive interactions across the enterprise
• NXT 3 Capability: NextPage software solutions bring predictability, efficiency, and lower costs in managing, publishing and distributing strategic content assets.

Knowledge Management Issues Related to NXT 3*:
• I rely on lots of content to do my job.
• The content is out there, but I can’t find it.
• I found the content, but it’s out of date.
• I need content without a network connection.
• Someone else controls the content, but needs to share knowledge assets with a wider audience.
• No single standard for publishing – but end user needs to unify content for work product.

NextPage impact*:
• Help users quickly find the answers
• Improve accuracy, consistency, currency
• Deliver content online, offline (disconnected), and to external users
• Solve a group problem with a scalable solution for extended organizations
• Allow departmental content control with IT sponsorship of the infrastructure

*These materials were included in NEXTPAGE’s presentation at the 2003 Mid-Atlantic EDUCAUSE Conference.

• **SPSS (Statistical Package for the Social Sciences)**-- SPSS is a comprehensive system for data analysis. This package can take data from any type of file and generate tabulated reports, charts, plots of distributions and trends, descriptive statistical, and complex statistical analyses. SPSS, Inc. has a family of related products that will be important in
prediction and visualization of information for Urban Operations and the Armed Forces.

Additional support for the KMC incorporates innovative technologies to enhance access, retrieval, management, analysis, communication and visualization. There is a growing cadre of specialized tools that need to be tested for their application to the KMC for use in various organizational settings such as Browse3d, groove.com, Dragon Naturally Speaking, and others.

**KMC Technologies to Support Applications for Higher Education Administration**

Information retrieval, consensus-based decision management, and data management and analysis are have always been critical elements in the decision making process for higher education administrators. For years, these elements were operationalized at a local or regional level. Today’s post secondary institutions operate within a much more complex and global community. New technological innovations are eliminating geographic boundaries for student recruitment, curriculum and program development, instructional formatting, and institutional partnerships for research and development. Making massive amounts of information on a wide range of relevant issues available quickly and efficiently to the decision maker is what the KMC is designed to do.

Projects like the KMC, using off-the-shelf products, raise questions about uniqueness. The effectiveness of the KMC lies in its structured coordination of qualitative judgments and powerful software applications in unique ways to provide access to powerful data sources for high level decision making.