

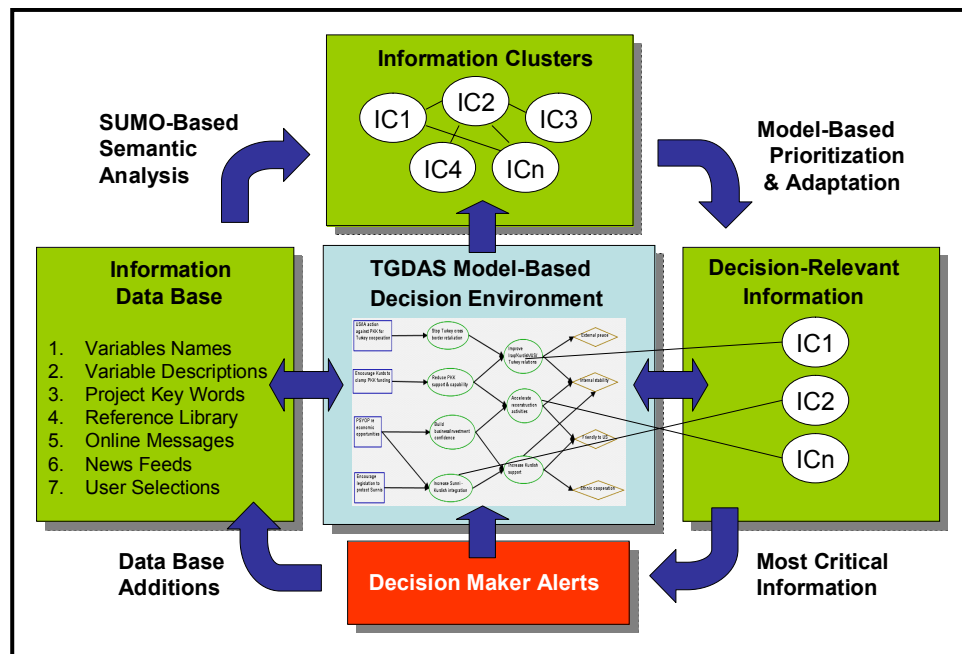
Netcentric Adaptive Information Management System (NAIMS)

NAIMS is the first comprehensive information management tool designed specifically to meet the needs of individual and team decision making. The focus is on challenging decision situations such as high stakes planning under uncertain conditions with competing objectives and serious time constraints.

Information Challenges. Good information makes the difference between success and failure in complex decision making for the military, in business, finance, medicine, and other situations. Yet decision makers often have difficulty specifying and then finding the information most important to their decision needs. Even when the desired information has been identified, they may have difficulty weighing its potential value against the costs of obtaining and analyzing it. And even accurate, timely information is ineffective if planners fail to recognize its implications and do not appropriately integrate it with other pieces of the puzzle. Paradoxically, *too much information* can also degrade the quality of decision making. Finally, coordination among members of planning or operational teams can be compromised when information is not properly shared or is differently understood.

The NAIMS Solution. NAIMS retrieves, organizes, displays, and helps clarify information from stored libraries and from incoming real-time sources such as message streams and news feeds. NAIMS operates on the principle that information has practical value *if and only if it can affect the way a decision is made*. Accordingly, NAIMS utilizes cognitively natural ways of organizing multi-media information, and combines these with rigorous decision analytic methods for evaluating the potential impact of information on decision outcomes. It adapts in real time to the evolving situation picture and to users' decision processes represented as project-specific templates and dynamic models. The NAIMS technology is a substantial improvement over more typical search engines that select information independent of what the information will be used for.

Model-Based Architecture. NAIMS uses advanced algorithms to (1) extract key semantic concepts from an information data base that includes decision variables as well as stored and newly incoming information, (2) cluster the information with respect to common attributes; (3) assess the relevance of different clusters to factors in decision model; and (4) prioritize clusters based on their operational context. NAIMS also incorporates software agents and visualization tools that assist in accessing the available information, making inferences from the most important information items, and determining new information gathering and fusion requirements.



NAIMS Modules. As shown in the above diagram, NAIMS is divided into four major functional modules, which are described briefly in the following.

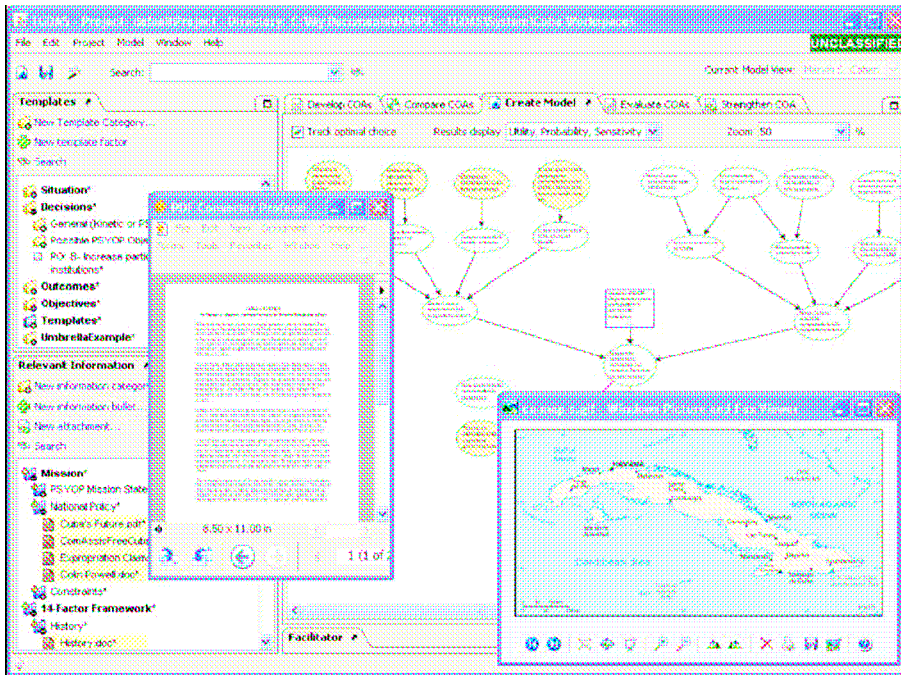
Model Based Decision Environment represents the decision space in terms of a decision model. NAIMS currently runs with Perceptronics Solutions innovative Tactical Group Decision Analysis System (TGDAS), but can operate in other model-based environments as well.

Information Data Base contains all of the information associated with the decision problem, including the names and descriptions of the decision variables, selected key words, existing information libraries, and new information received from message streams, online news feeds, etc.

Information Clusters are formed using a combination of the defined decision factors and the available information itself. Our clustering algorithm utilizes semantic concepts found in the Suggested Upper Merged Ontology (SUMO) as well as selected proper nouns, and performs as well or better than other reported clustering algorithms.

Decision Relevant Information is identified by associating the clusters with the decision model variables, by prioritizing the clusters with respect to the calculated value of information about that decision variable to the decision outcome, and by prioritizing information within the cluster with respect to its degree of connectedness to other information.

Decision Maker Alerts are used to highlight particularly critical decision-relevant information already available in the existing library or newly arrived via a message stream, news feed or other real-time medium.



NAIMS Adaptation. NAIMS' prioritization and alerting algorithms adapt by "observing" user annotation, selection and association of information. A unique feature of our approach is that clustering initially occurs in an unsupervised manner, and is iteratively refined as decisions are made, using information choices as feedback.

Users can also directly "instruct" NAIMS by creating their own links between decision factors and documents, customizing folder categories for information storage, and modifying the decision model as circumstances change or understanding improves. Long-term adaptive learning occurs as the saved models, clusters and links are shared with new users and influence the beginnings of similar projects.

Robust and Adaptable. NAIMS runs on a standard laptop computer in a networked or individualized mode. In the networked mode, a central server provides a shared distributed data

base with access to digitized information sources inside or outside the organization. The server will also allow users to distribute and share documents, decision factors, categories, and models with one another. NAIMS continues to support information management and modeling functions during periods when connectivity is lost, and updates as soon as connectivity is restored.

NAIMS incorporates state of the art artificial intelligence technology for conceptual analysis, information clustering, and decision modeling and analysis.

Friendly User Interface. For its user interface NAIMS builds on the proven technology of its sister product, the Tactical Group Decision Analysis System (TGDAS). Both NAIMS and TGDAS provide a tested, human-factored graphical user interface that makes complex support tools easily accessible for non-specialized users. For example, familiar pop-up windows allow users to examine in depth the NAIMS-highlighted information associated with the decision models variables and to quickly make important connections among related information items.

Real Time Support. NAIMS supports decision makers with automatic displays, flexible search, customizable alerts, and proactive guidance. When new information arrives, NAIMS automatically calculates its priority and the decision factors that it affects. At any time, users can ask NAIMS for the documents that bear on a factor or for other documents that pertain to a document of interest. Users can also ask NAIMS to alert them to the arrival of information that meets pre-set criteria of relevance and priority. NAIMS simultaneously guides further information collection and analysis by estimating the value of more information about each factor in the decision model and the cost required to gain it.

NAIMS can be used as standalone software or can be easily embedded into existing software systems, technology infrastructures, and decision processes.

More Information. The NAIMS technology described here has been developed under SBIR Phase II Contract No. W31P4Q-07-C-0139 jointly funded by DARPA and the USSOCOM. To learn more about the NAIMS product and its availability, contact:

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