

Webtanks for Knowledge Management: Web-based Collaborative Learning Environment

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ABSTRACT

My assignment at NASA Ames Research Center is to develop a program plan for a think tank, BEACON (Bio-Evolutionary Advanced Concepts for NASA), that brings together cross-disciplinary teams to conceive the next generation of NASA technology and scientific research across IT and Fundamental Biology. A “webtank” (think tank on the web) is being developed to support think tank activities. Prior to implementing a webtank for BEACON, I initiated collaboration with the SETI Institute on their development of a high school integrated science curriculum (astronomy, geology, biology, and the evolution of technology) where students explore how the concept of evolution underpins and integrates these disciplines. Curriculum requirements for the final *Evolution of Technology* module provided an opportunity to develop, pilot, and test a self-organizing collaborative web environment, or webtank, to be later adapted, augmented, and extended to support BEACON. SETI established a systematic method for pilot testing and field testing all elements of the curriculum, and so offered a useful webtank testbed.

KEYWORDS

Computer-supported, web-enabled, intranet, collaborative learning

INTRODUCTION

Webtanks (think tanks on the web) can be designed to serve as guides, frameworks to facilitate collaboration, and knowledge management repositories, supporting students, designers, and inventors in team innovation. High school students in *Voyages Through Time*, SETI’s new, integrated science and technology curriculum will form teams and collaborate to conceive new inventions. The webtank supports their invention process as a

- **series of prompts** to help student designer/ inventor teams generate innovative, integrated design concepts for their new inventions;
- **way to facilitate collaboration**, enabling students to interact with other students around issues that arise as they design and integrate those projects into a larger, collaborative plan;
- **framework to structure archives and resources** in order to reTRACE creative processes that have occurred in this environment.

COLLABORATIVE KNOWLEDGE-MAKING AND MANAGEMENT

I define *information* as “interpreted data,” while *knowledge* is “information in action.” Knowledge management is often equated with databases and information storage. If instead, knowledge management is integrated into a collaborative knowledge-making process, users post their knowledge resources to share. Critical to successful knowledge management is having a framework that facilitates and supports collaborative knowledge-making, so the webtank is designed to serve two complementary functions:

- A repository, offering a knowledge management framework for information resources and project archives (passive mode), and
- A think tank “prompt”, providing process support for invention and collaborative problem-solving and capability to record sessions (active mode).

Users click back and forth between passive and active modes. Collaborators use document libraries (passive mode) to prepare for collaborative problem-solving sessions (active mode). The meetings themselves, and the ways the meetings use these resources, can be captured (active mode), permitting later analysis of what worked and what didn’t, as well as refinement of the knowledge management system based on its continual assessment in use. So a Continual Survey Questionnaire capability supports ongoing development. It can gather qualitative metrics from the perspectives of learners, team leaders or teachers, and website developers (concerned with knowledge management, scalability, and maintenance).

Yale University Professor Irving Janis studied why committees fail by analyzing a number of case studies from public policy. If Janis was correct in stressing the importance of each individual’s perspective for group process, then a webtank to

support self-directed learning and innovation will require mechanisms to retain individual identity within the larger group process. Drawing an analogy between collaborative problem-solving and evolution supports this position; having a lot of cells doesn't make an organism complex; it's still just a lot of cells. Differentiation is a prerequisite for complexity in cells as in collaborative group learning.

In the active mode a Webtank Integration Broker supports collaborative transactions, so potential collaborators can bring their project ideas and find others with whom they can collaborate on a "bigger picture" that combines multiple projects. Complementing the active mode, at the end of a problem-solving session the webtank, again in passive mode, evaluates individual web entries and archives process records with multiple mechanisms for search and matching, requiring metadata and search capabilities. Some of the process record-keeping and archiving can be automated and could benefit by adapting AI tools for knowledge acquisition, indexing and retrieval. Additional technical challenges include design of a scalable environment that will self-organize as it scales up, establishing centralized human manual control and coordination that can gradually be replaced by decentralized autonomous agent control.

Conclusion

Webtanks can serve as petri dishes to culture the creative process, so that "invisible observers" can study how performance in this environment. Though any theory about the creative process is hard to prove, my premise is that a partial correlation can be drawn between individual creative process (unobservable) and group design and concept formation, where the invention process is open to view. NASA, with its vast network of collaborating universities, has need for better knowledge management systems so that a range of institutions working on aspects of the same problem from different disciplinary perspectives can more effectively collaborate. A problem-focused webtank necessarily crosses institutional boundaries, starting small to develop to test knowledge management strategies in its own document collection, data and project archives and to develop a system that can later be extended. Webtanks can pioneer a new type of intranet, one that is project or program-based, rather than institution-based, providing a foundation for emergent intelligence in distributed smart systems of the future.

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