# Knowledge Based Collaboration Webs

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**The Problem:**

- Why do projects never finish on time?
- Why do organizations fail to recognize impending disasters and imminent opportunities?
- Why do organizations repeat their mistakes?

We belive that all of these are symptoms stemming from a common problem, the failure of the organization to capture, structure and disseminate information that is created in the normal working life of its members.

**Motivation:** A well known car company issued recalls in three successive years for the same design flaw. In another company, a production engineer fixed a problem in one model year, only to have the fix removed in the next year, because nobody understood why the fix had been installed. US Intelligence agencies have overlooked the signs of emerging crises because analysts in different areas didn't know about one another's work. In all these case, organizations functioned poorly because information wasn't made available to those who could use it. We believe that a well-structured collaborative infrastucture that understands the interests, roles and capabilities of the participants in the organization could make sure that information reached those who can best exploit it.

**Previous Work:** This project builds on previous work by our group on behalf of the Media Affairs Office in the Executive Office of the President of the United States and related projects conducted for the National Performance review. In those projects we 1) built an infrastructure that disseminates information to participants based on their interests 2) Built the ability for the participants to annotate documents with commentary, critiques and the like.

**Approach:** We are structuring our system as a knowledge-based system that reacts to and reasons about the structure of a collection of information-nodes linked together by annotations. The most common information nodes are documents, but there are also nodes representing:

- Organizational goals, and the plans to achieve them.
- People in the organization, their interests, capabilities, and responsibilities.
- Resources and the plans for assembling them to provide services.
- Issues, proposals about how to deal with them, and the arguments for and against each proposal.

The knowledge-based system acts as a faciliator to the participants; it notices when nodes are created that are relevant to each participant and routes them information to them. It also notices when the contents of the information base suggest that new tasks must be conducted; in such cases, it notifies relevant people of the new task inviting them to participate. It attempts to involve people whose expertise and availability make them relevant candidates.

For the system to be effective, it must understand at least some of the content of the information nodes. But the information nodes may be large and complex multimedia documents and our current natural language capabilities are not capable of parsing and analyzing such documents. However, we do allow people to attach a special annotation, called a precis, to any document; the precis is a short natural language summary of what's important or interesting about the document. Preces are parsed and their content is added to the knowledge base of the system; inferences are drawn from this information using rule-based reasoning techniques.

**Difficulty:** This project is attempting to develop an infrastructure from an entirely broad range of capabilities. We need to extend the capabilities of our natural langague processing tools so that preces of greater complexity can be handled in a fully automatic fashion. We need to develop better models of how people interact in organizations so that our system can better appreciate how people's commitments and availabilities. We need to extend our representations of peoples interests, expertise and responsiblities to more accurately model when they should become involved.

**Impact:** A system of the type we are building can aid people both by providing them the information they need when they need it and by making sure that they aren't deluged in information they don't need to see. It can make sure that organzations pay attention to issues which might otherwise be hidden by blind spots.

**Future Work:** So far we have investigated these ideas in an asynchronous context, primarily using the Web and Email as the means by which information is captured and disseminated. However, we feel that these interfaces must be augmented by more natural interfaces, that are enabled by our work on the Intelligent Room and on the Environmental Unit of Project Oxygen. Thus we will in the future concentrate on adding techniques to capture and disseminate information in synchronous, multimodal interactions utilizing speech recognition and machine vision.

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