CREATING KNOWLEDGE SYSTEMS

ORGANIZATION

1) General illustration of how expertise and expert judgment form the structure and content of a prototype Knowledge System.

2) Specific considerations (lessons learned) in creating a prototype Knowledge System.

GENERAL ILLUSTRATION

If you have formally elicited the problem definition and expertise (and maybe expert judgment),

you can use these to build a
usable,
useful
prototype Knowledge System (KS)
within a few days.

CREATE AND POPULATE THE STRUCTURE

Create the structure of the prototype Knowledge System from the elicited expertise.

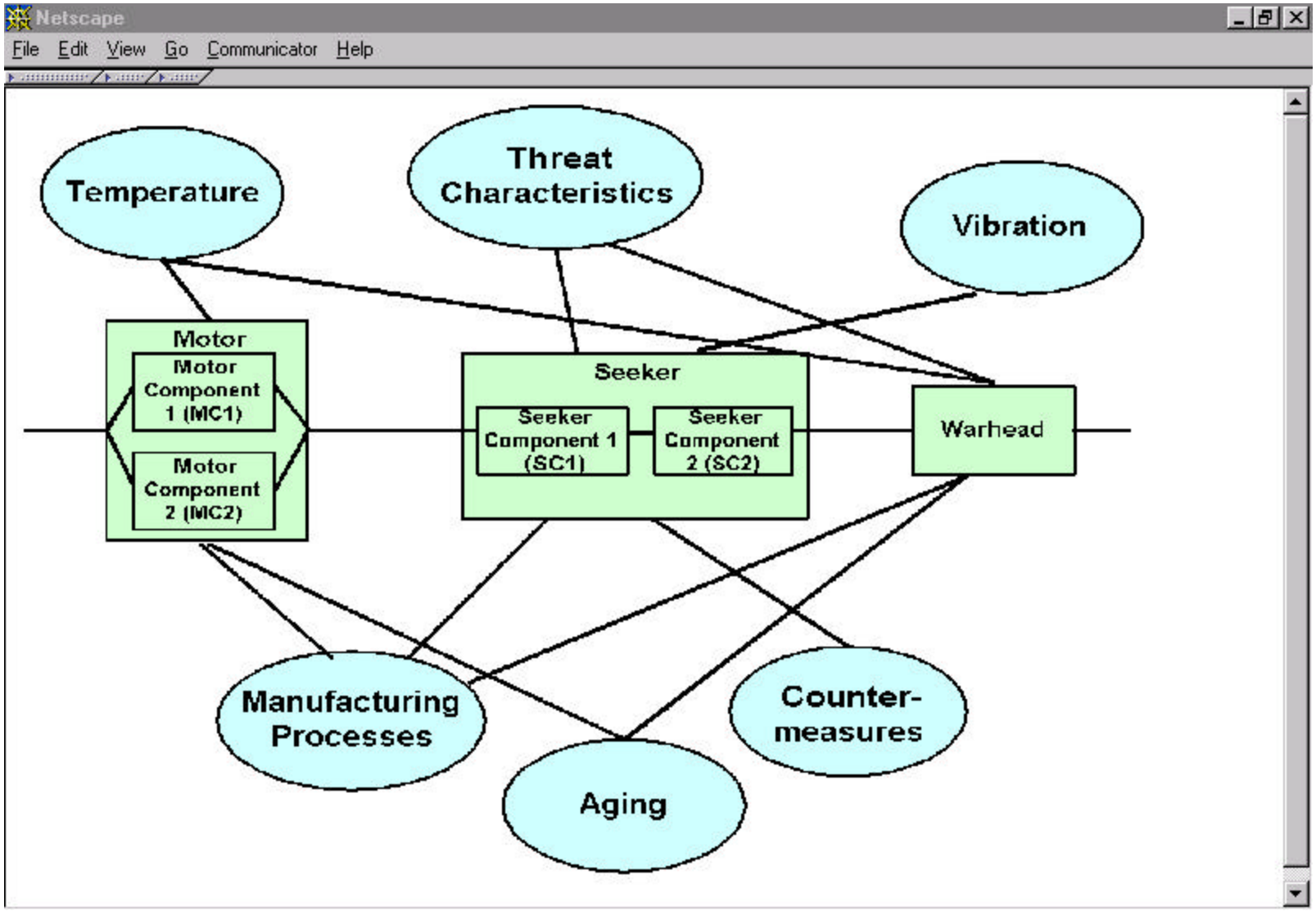
Use the expert judgement and other data (contents) to populate the structure.

Example:
RDMS archival prototype
RDMS problem-solving prototype

Really Deadly Missile System - Netscape

File Edit View Go Communicator Help

- Really Deadly Missile System
- Archive Prototype
- Problem Solving Prototype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Temperature
Threat Characteristics
Vibration
Motor
Motor Component 1 (MC1)
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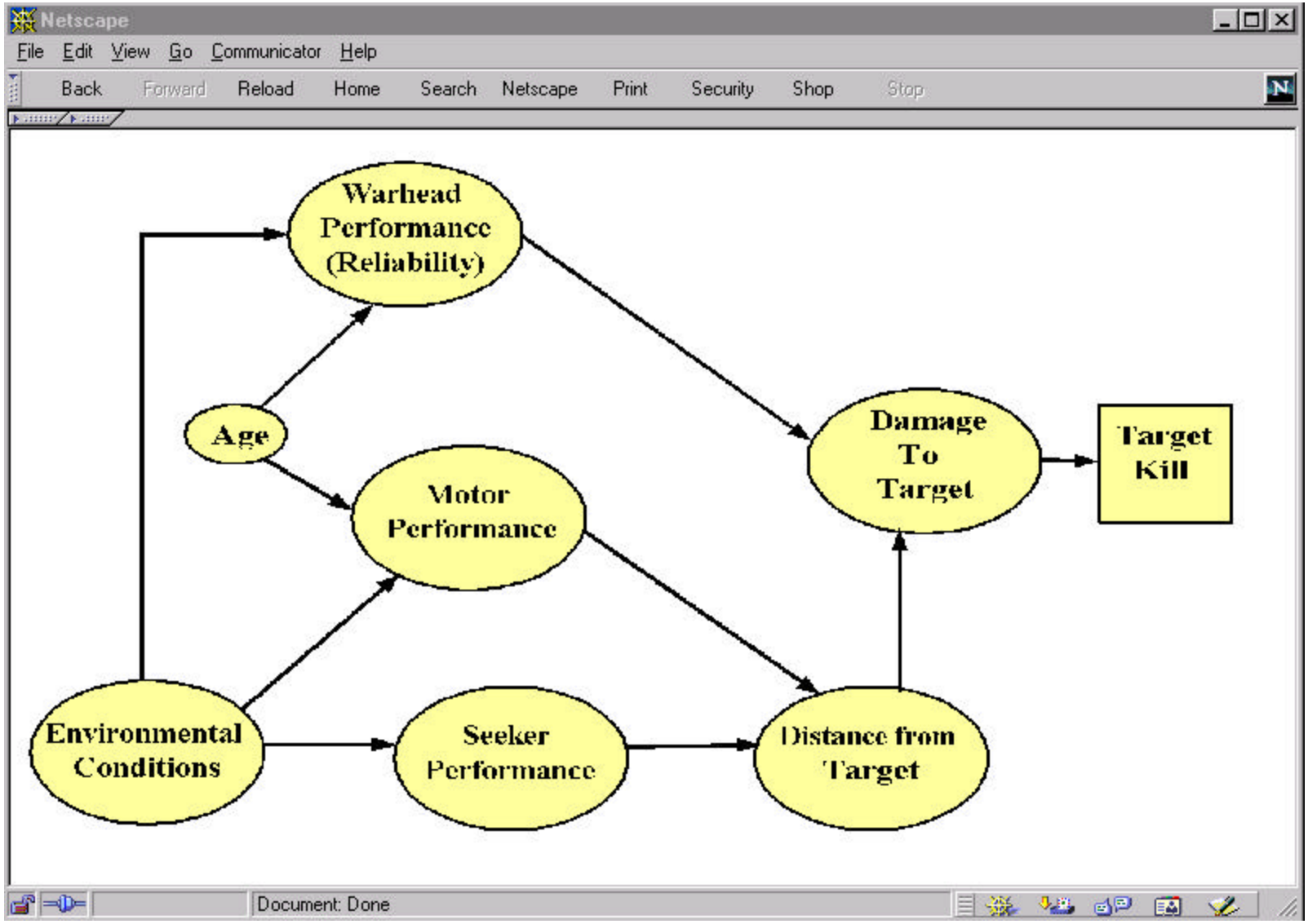
Seeker
Seeker Component 1 (SC1)
Seeker Component 2 (SC2)
Warhead
Manufacturing Processes
Aging
Counter-measures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Warhead Performance (Reliability)
Age
Motor Performance
Damage To Target
Target Kill
Environmental Conditions
Seeker Performance
Distance from Target
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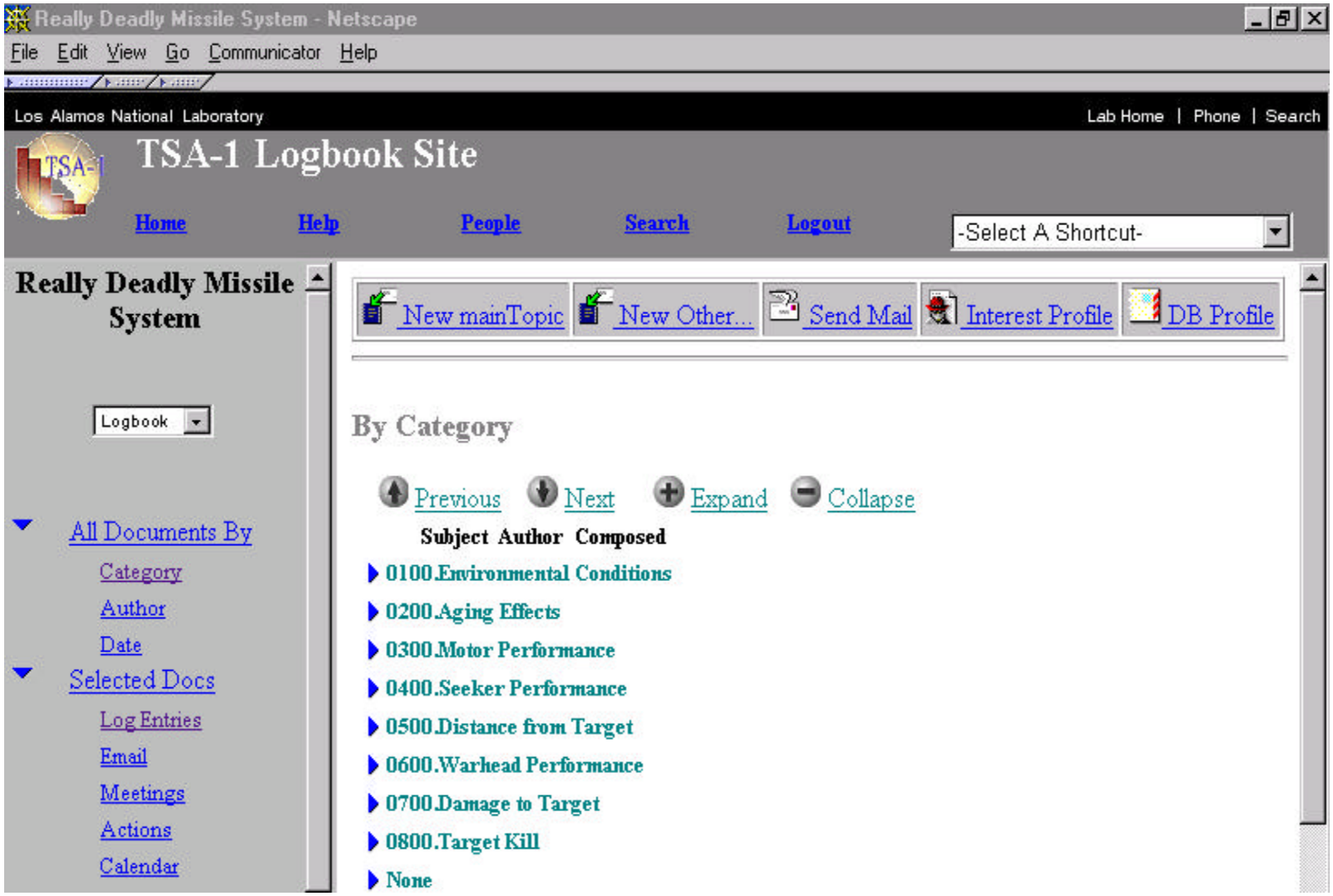
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Meetings
Actions
Calendar
New mainTopic
New Other...
Send Mail
Interest Profile
DB Profile
By Category
Previous
Next
Expand
Collapse
Subject Author Composed
0100.Environmental Conditions
0200.Aging Effects
0300.Motor Performance
0400.Seeker Performance
0500.Distance from Target
0600.Warhead Performance
0700.Damage to Target
0800.Target Kill
None

SPECIFIC CONSIDERATIONS

These considerations are overlapping and iterative steps. They are lessons learned.

Illustrated with a problem-solving focused prototype knowledge system.

Engine Knowledge System is a composite of existing systems for engine companies and has had its proprietary information removed.

ELICIT EXPERTISE AND JUDGMENT

Will assume have performed steps mentioned in previous sessions:

that have identified advisor expert(s) and have elicited:

- **problem definition, identification of a unifying metric, and analysis strategy.**
- **expertise (knowledge structure).**
- **expert judgment and other data sources.**

DETERMINE FOCUS - EXAMPLE

Elicit from advisor experts what the KS is to do for them and the work practices it will be part of:

- **how KS is to support problem solving/decision making:**
  - **of component teams who must predict whether their system will meet reliability goals early in the life cycle and later.**
  - **of team members who consider the effect of "what ifs" on the systems' reliability and its associated uncertainty.**

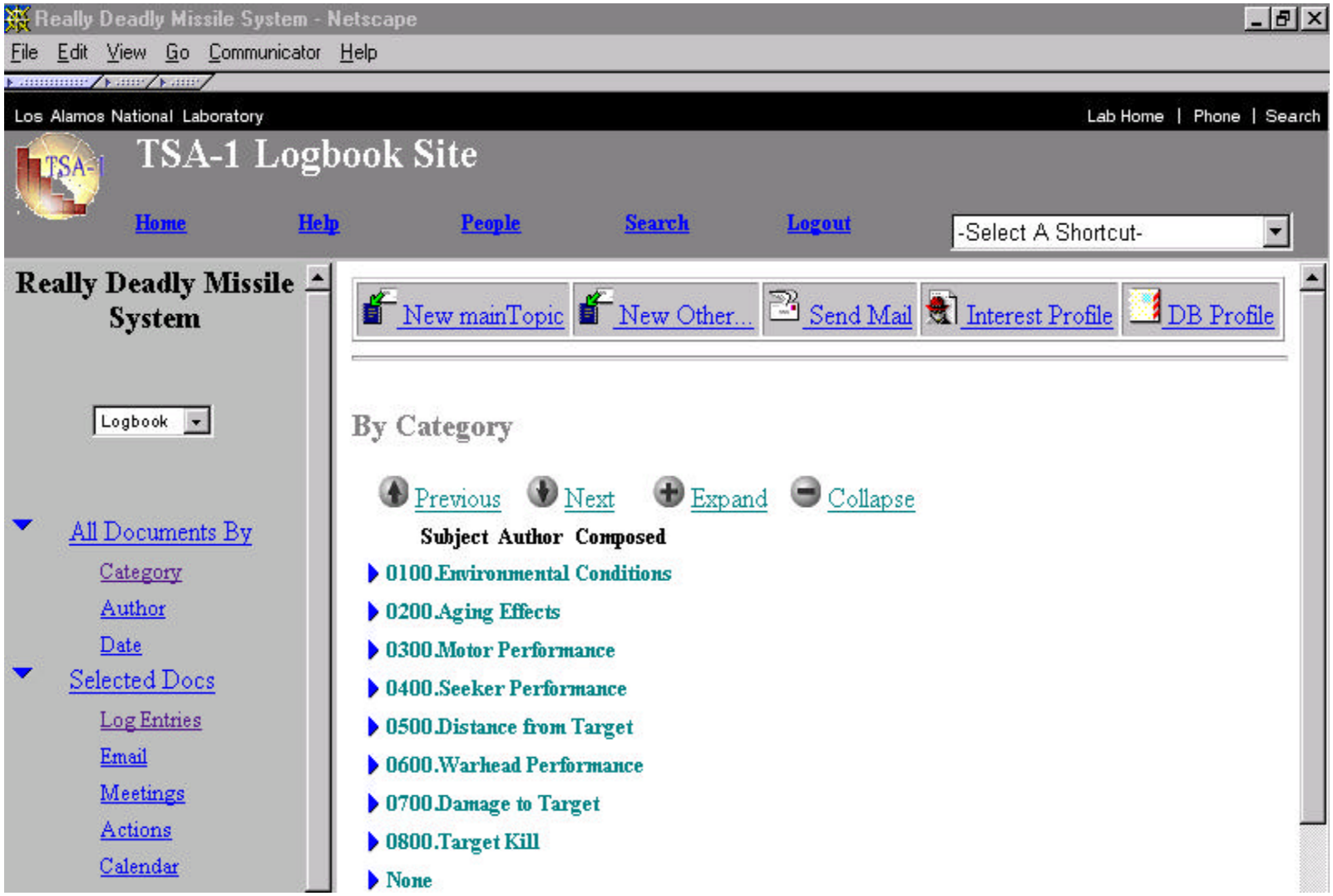
DETERMINE FOCUS - EXAMPLE

- **unifying metric and analyses:**
  pdf and Bayesian statistics.

- **state of knowledge:**
  evolving.

- **focus:**
  problem solving initially, later add archival.

- **other requirements:**
  Lotus Notes as later front end.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Interest Profile
DB Profile
By Category
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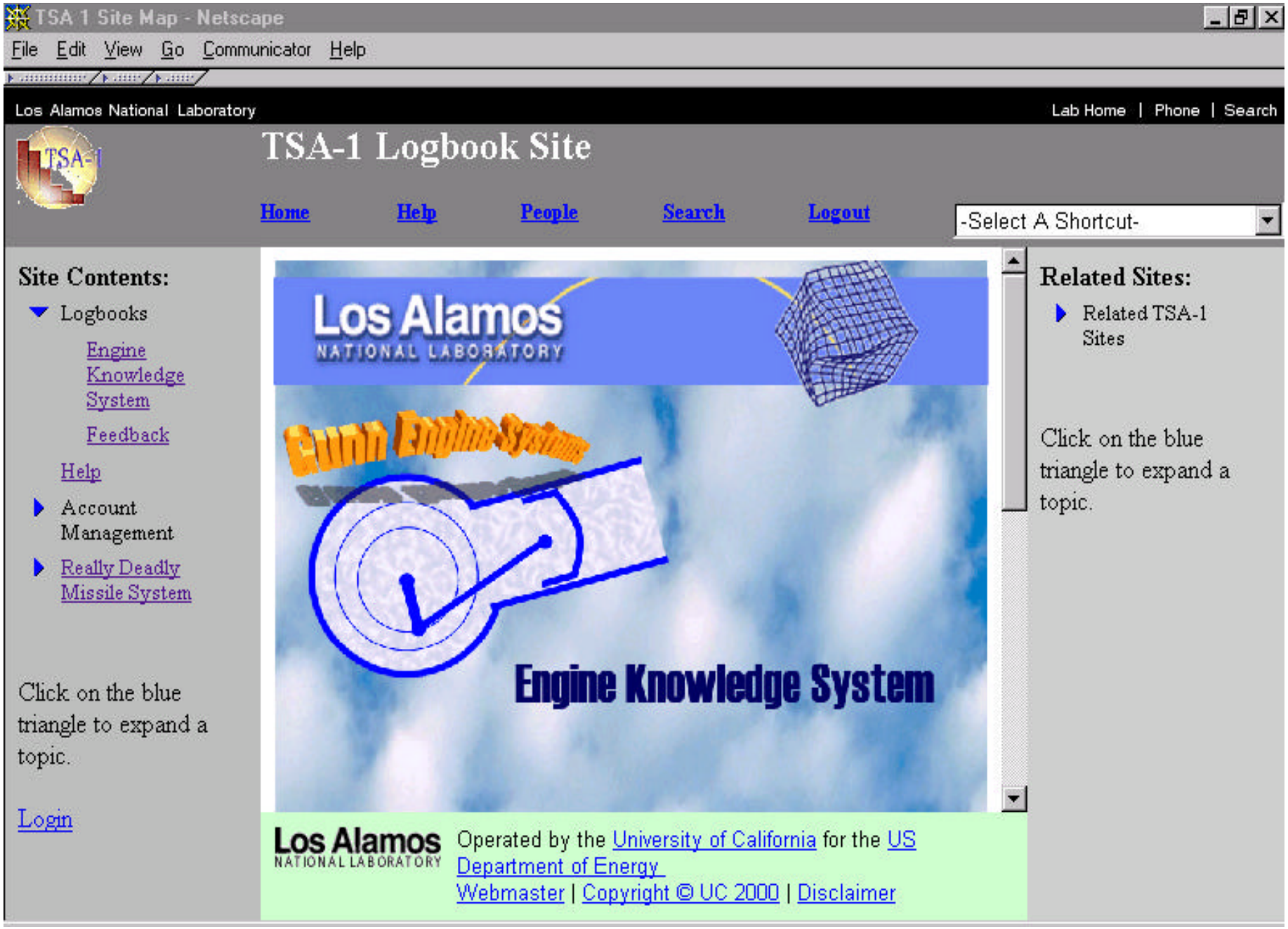
Collapse
Subject Author Composed
0100.Environmental Conditions
0200.Aging Effects
0300.Motor Performance
0400.Seeker Performance
0500.Distance from Target
0600.Warhead Performance
0700.Damage to Target
0800.Target Kill
None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SELECT SOFTWARE

For archival knowledge systems:

- **web applications (XTM and Java Script)**

Example: Slapper Detonator Knowledge Base.

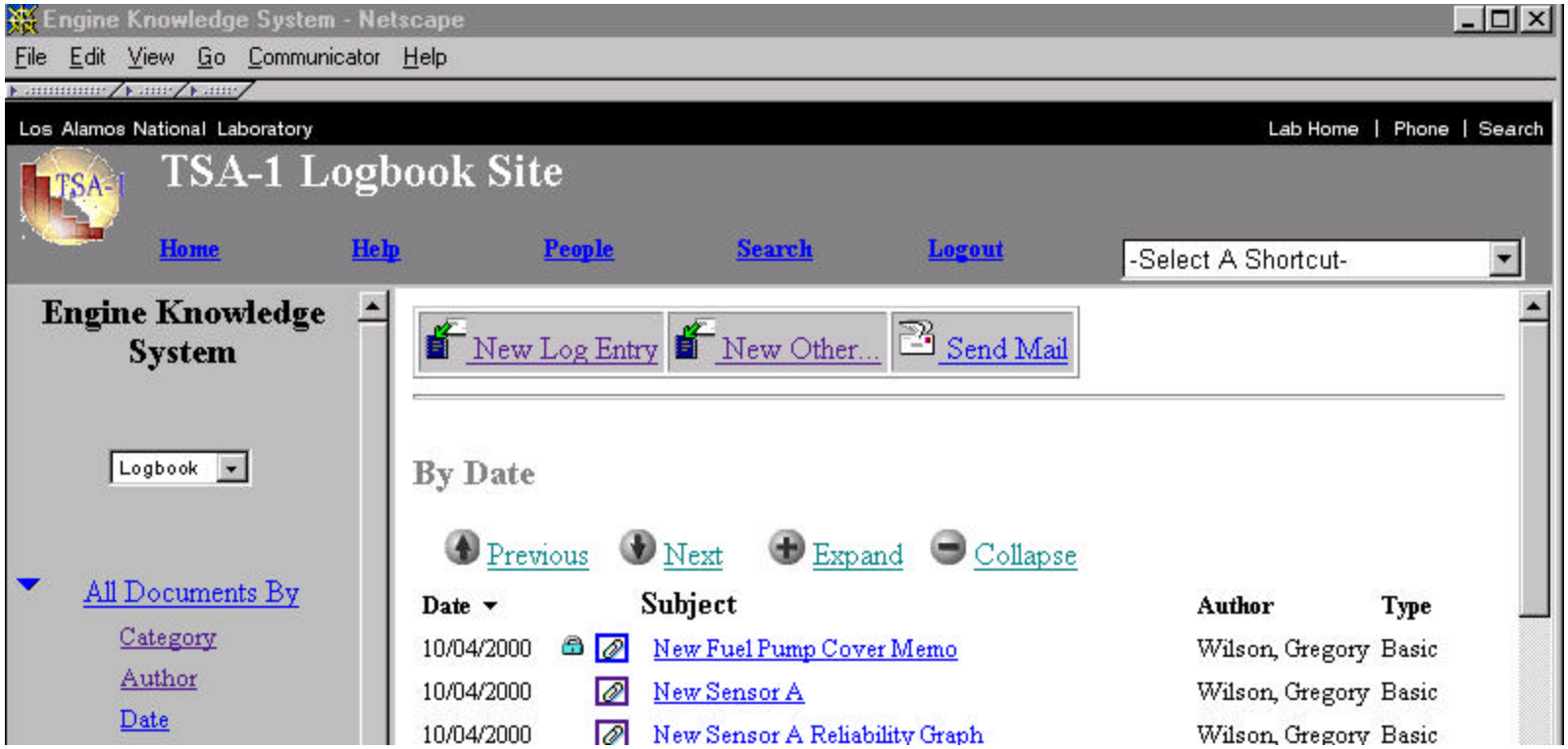
For archival or problem-solving knowledge system:

- **off-the-shelf groupware (e.g. IBM's Lotus Notes Domino). Range from usual groupware to specialized for knowledge management.**

Example: Prototype Engine Knowledge Systems

NECESSARY FEATURES IN GROUPWARE

- **easy for users of all backgrounds to enter knowledge and to perform knowledge updates (of structure and judgments).**
- **access control.**
- **email uploading of files.**
- **easily customized views (e.g., by category, author, date, summary, etc.)**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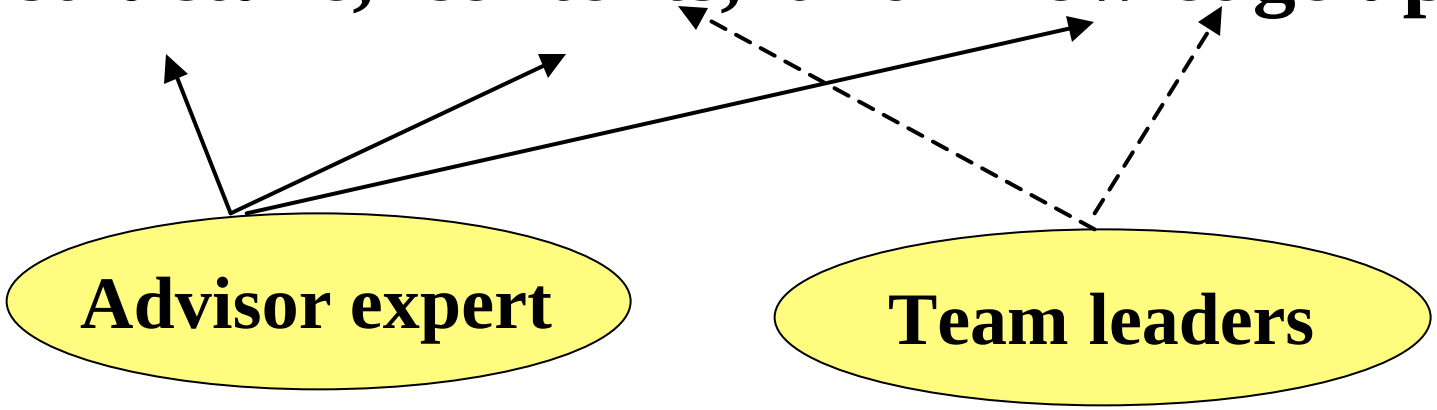
Author
Date
New Log Entry
New Other...
Send Mail
By Date
Previous
Next
Expand
Collapse
Date
Subject
Author
Type
10/04/2000 New Fuel Pump Cover Memo Wilson, Gregory Basic
10/04/2000 New Sensor A Wilson, Gregory Basic
10/04/2000 New Sensor A Reliability Graph Wilson, Gregory Basic

CREATE STRUCTURE - EXAMPLE

- **Software used: Lotus Notes Domino.**
- **Who will enter:**

structure, contents, and knowledge updates:



- **Will one person or many enter the structure: initially one, the advisor expert.**

POPULATE STRUCTURE - EXAMPLE

Prototype Engine Knowledge System

Two ways of adding files:

- **Advisor can add files or URLs, to structural categories.**
- **Advisor can do mass email uploads of files or URLs to a particular structural category.**

Can add customized views.

CREATE STRUCTURE - EXAMPLE

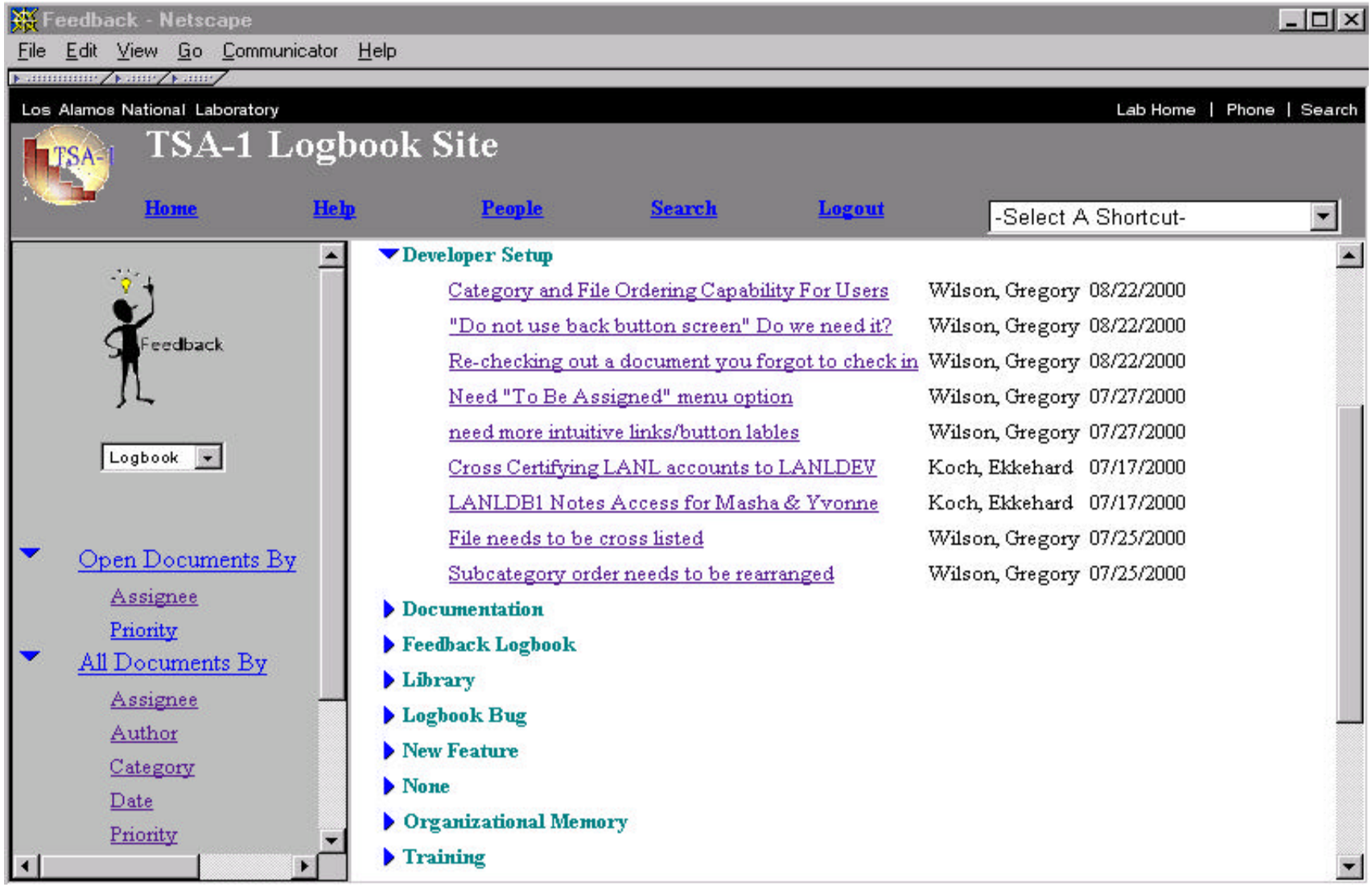
- **How plan to motivate users to enter structure/contents:**

  Not difficult because of the approach--
  - **users see that they will access Knowledge System as part of their work practice and that they will actually use the results.**
  - **easy to use and modify.**

CREATE FEEDBACK LOG

Create an Electronic Record of Feedback

- **Description of the problem or the requested change to the prototype,**
- **priority: top, high, med, low,**
- **Author,**
- **time stamp,**
- **person(s) assigned to,**
- **status: pending, in progress, resolved.**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Assignee
Priority
All Documents By
Assignee
Author
Category
Date
Priority
Developer Setup
Category and File Ordering Capability For Users Wilson, Gregory 08/22/2000
"Do not use back button screen" Do we need it? Wilson, Gregory 08/22/2000
Re-checking out a document you forgot to check in Wilson, Gregory 08/22/2000
Need "To Be Assigned" menu option Wilson, Gregory 07/27/2000
need more intuitive links/button lables Wilson, Gregory 07/27/2000
Cross Certifying LANL accounts to LANLDEV Koch, Ekkehard 07/17/2000
LANLDB1 Notes Access for Masha & Yvonne Koch, Ekkehard 07/17/2000
File needs to be cross listed Wilson, Gregory 07/25/2000
Subcategory order needs to be rearranged Wilson, Gregory 07/25/2000
Documentation
Feedback Logbook
Library
Logbook Bug
New Feature
None
Organizational Memory
Training

MOTIVATE WIDER PARTICIPATION - EXAMPLE

1) Started with having advisor expert(s) participate in creating the prototype KS.

2) Ask advisor expert(s) to identify additional advisor experts.

3) Ask new advisor experts what will motivate/inhibit users from contributing.

Example: Prototype Engine KS

motivate - listing contributors, getting analysis results back to users.

inhibit - using prototype when glitchy.

MOTIVATE WIDER PARTICIPATION - EXAMPLE

4) Discuss quality control issue with advisors: who oversees and the tradeoffs between continuous updating by users and quality control.

5) Discuss automation of elicitation of expert judgment.

MOTIVATE WIDER PARTICIPATION - EXAMPLE

6) pilot test (AKA "usability test") the prototype on the new advisor experts and revise it before giving access to their respective communities.

usability tests (Jakob Nielson, 1993): have users think aloud as they use the prototype.

7) provide access control capability.

PROVIDE ACCESS CONTROL-EXAMPLE

Access control allows contributors to decide who has what kind of access to their files.

System authenticates users when they log on and gives them their prescribed access.

Example: Engine Systems prototype

- **read - author can read others files but only edit own: subject matter experts.**
- **write - author can read and edit files: analysts.**
- **deposit - author can contribute files but not read own or others' files.**

PLAN TRANSITION OF PROTOTYPE

Plan transition of prototype knowledge system to user communities' server.

The approach facilitates a smooth transition to where users own the knowledge system, update their knowledge, and maintain the system.

Stages:

•We start working with the user as consultant.

PLAN TRANSITION OF PROTOTYPE

- **Users, especially advisor experts, learn how to elicit expertise, expert judgment, and to build prototype systems and statistical analyses in collaboration with us.**
- **Our role as consultants gradually decreases as the users' role increases.**
- **The knowledge system is migrated to the users' server. We serve in minimal consulting role, as needed.**

SUMMARY

Knowledge Systems and the field of Knowledge Management are evolving rapidly.

Our niche in Knowledge Systems:

Systems for experts NOT expert systems.

- **Collaborative design,**
- **Methods/tools for self elicitation and representation, and**
- **Customizing to the users' cognition and culture (work practices) and linking to statistical analyses.**

KNOWLEDGE SYSTEM REFERENCES

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http://www.aaai.org/Pathfinder/html/expert_systems.html

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http://ksi.cpsc.ucalgary.ca/KAW/KAW.html

Electronic magazine on knowledge management:
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Meyer, M.A., and Booker, J.M, (Los Alamos National Laboratory report LA-11667-MS), *Eliciting and Analyzing Expert Judgment: A Practical Guide*, American Statistical Society, SIAM Series. Forthcoming. pp. 153-56.

Nielson's references on usability design and testing of web applications:
http://www.NNgroup.com/reports/books.html