



Chapter 14

Knowledge Capture Systems: Systems that Preserve and Formalize Knowledge



Chapter Objectives

- ◆ To describe what are knowledge capture systems
- ◆ To explain how to elicit and store organizational and individual knowledge
- ◆ To discuss the value of organizational storytelling for knowledge capture
- ◆ To explain the two types of knowledge capture systems
 - To capture knowledge in *educational* settings
 - To capture *tactical* knowledge



What are Knowledge Capture Systems?

- Knowledge capture systems support process of eliciting explicit or tacit knowledge from people, artifacts, or organizational entities
- Rely on mechanisms and technologies to support externalization and internalization



Using Stories for Capturing Organizational Knowledge

Organizational stories:

- ◆ *“a detailed narrative of past management actions, employee interactions, or other intra- or extra-organizational events that are communicated informally within organizations”*
- ◆ include a plot, major characters, an outcome, and an implied moral
- ◆ play a significant role in organizations characterized by a strong need for collaboration



Using Stories for Capturing Organizational Knowledge

- Guidelines for organizational storytelling:
 - ◆ Stimulate the natural telling and writing of stories
 - ◆ Rooted in anecdotal material reflective of the community in question
 - ◆ Should not represent idealized behavior
 - ◆ An organizational program to support storytelling should not depend on external experts for its sustenance
 - ◆ Organizational stories are about achieving a purpose, not entertainment
 - ◆ Be cautious of over-generalizing and forgetting the particulars
 - ◆ Adhere to the highest ethical standards and rules



Using Stories for Capturing Organizational Knowledge

- Important considerations:
 - ◆ Effective means of capturing and transferring tacit organizational knowledge
 - ◆ Identify people in the organization willing to share how they learned from others
 - ◆ Use metaphors to confront difficult organizational issues
- Storytelling provides a natural methodology for nurturing communities because it:
 - ◆ builds trust
 - ◆ unlocks passion
 - ◆ is non-hierarchical



Where can storytelling be effective?

- Igniting action in knowledge-era organizations
- Bridging the knowing-doing gap
- Capturing tacit knowledge
- To embody and transfer knowledge
- To foster innovation
- Enhancing technology
- Individual growth
- Launching/Nurturing communities of practice
 - ◆ *thematic groups* (World Bank)
 - ◆ *learning communities or learning networks* (HP)
 - ◆ *best practice teams* (Chevron)
 - ◆ *family groups* (Xerox)



Techniques for Organizing and Using Stories in the Organization

- *Anthropological observation*
 - ◆ naïve interviewers
 - ◆ asked *innocent* and unexpected questions
 - ◆ caused the subjects to naturally volunteer their anecdotes
 - ◆ *curiosity* resulted in a higher level of knowledge elicitation



Techniques for Organizing and Using Stories in the Organization

- *Story-telling circles*
 - ◆ formed by groups having a certain degree of coherence and identity
- Methods for eliciting anecdotes:
 - ◆ *Dit spinning (fish tales)*
 - ◆ *Alternative histories*
 - ◆ *Shifting character or context*
 - ◆ *Indirect stories*
 - ◆ *Metaphor*

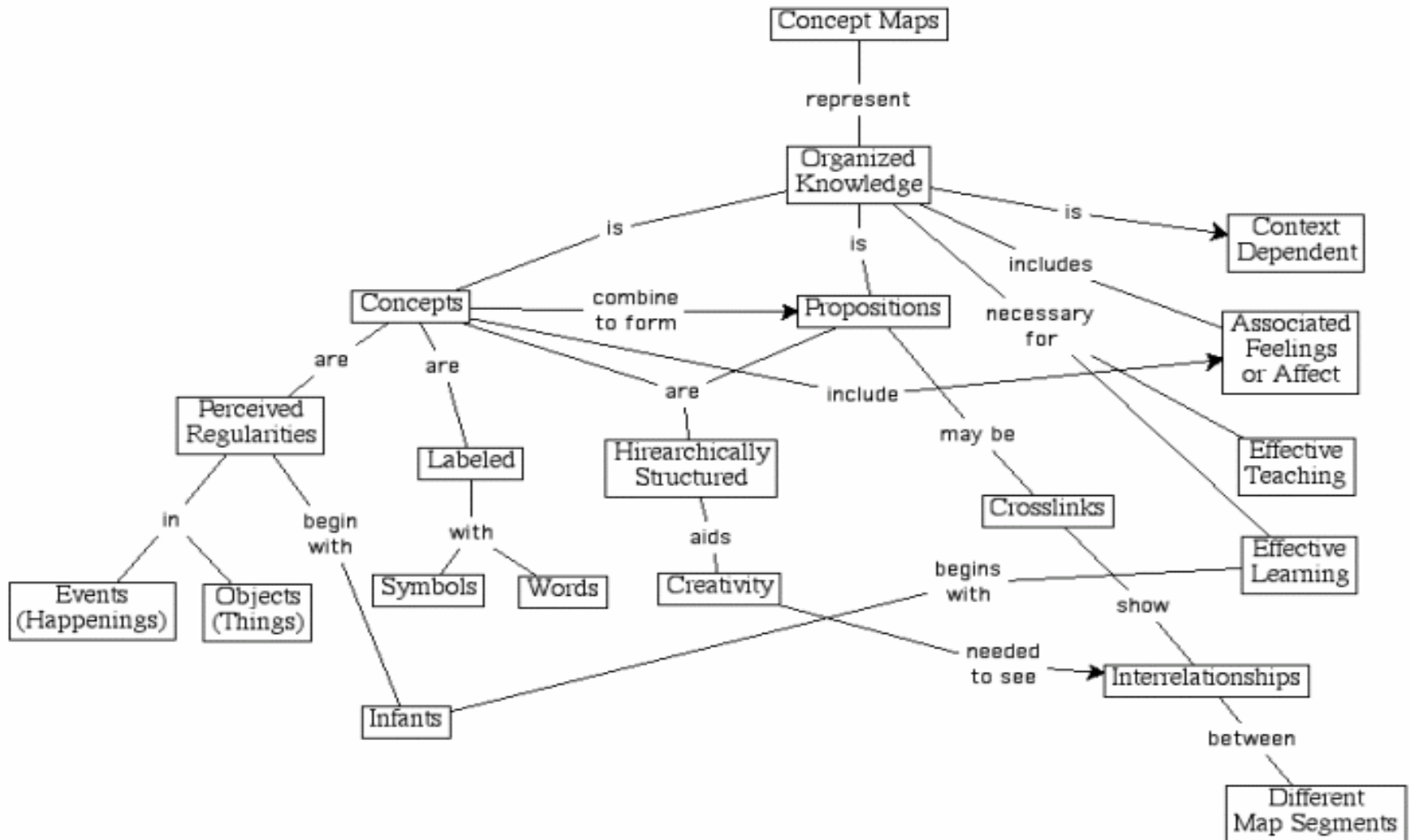


Knowledge Representation through the use of Concept Maps

- Based on Ausubel's learning psychology theory
- Concepts, enclosed in circles or boxes. are perceived regularities in events or objects designated by a label
- Two concepts connected by a linking word to form a *proposition, semantic unit* or *unit of meaning*
- Vertical axis expresses a hierarchical framework for organizing the concepts
- inclusive concepts are found at the top, progressively more specific, less inclusive concepts arranged below
- relationships between propositions in different domains are *cross-links*



Concept Map about Concept Maps

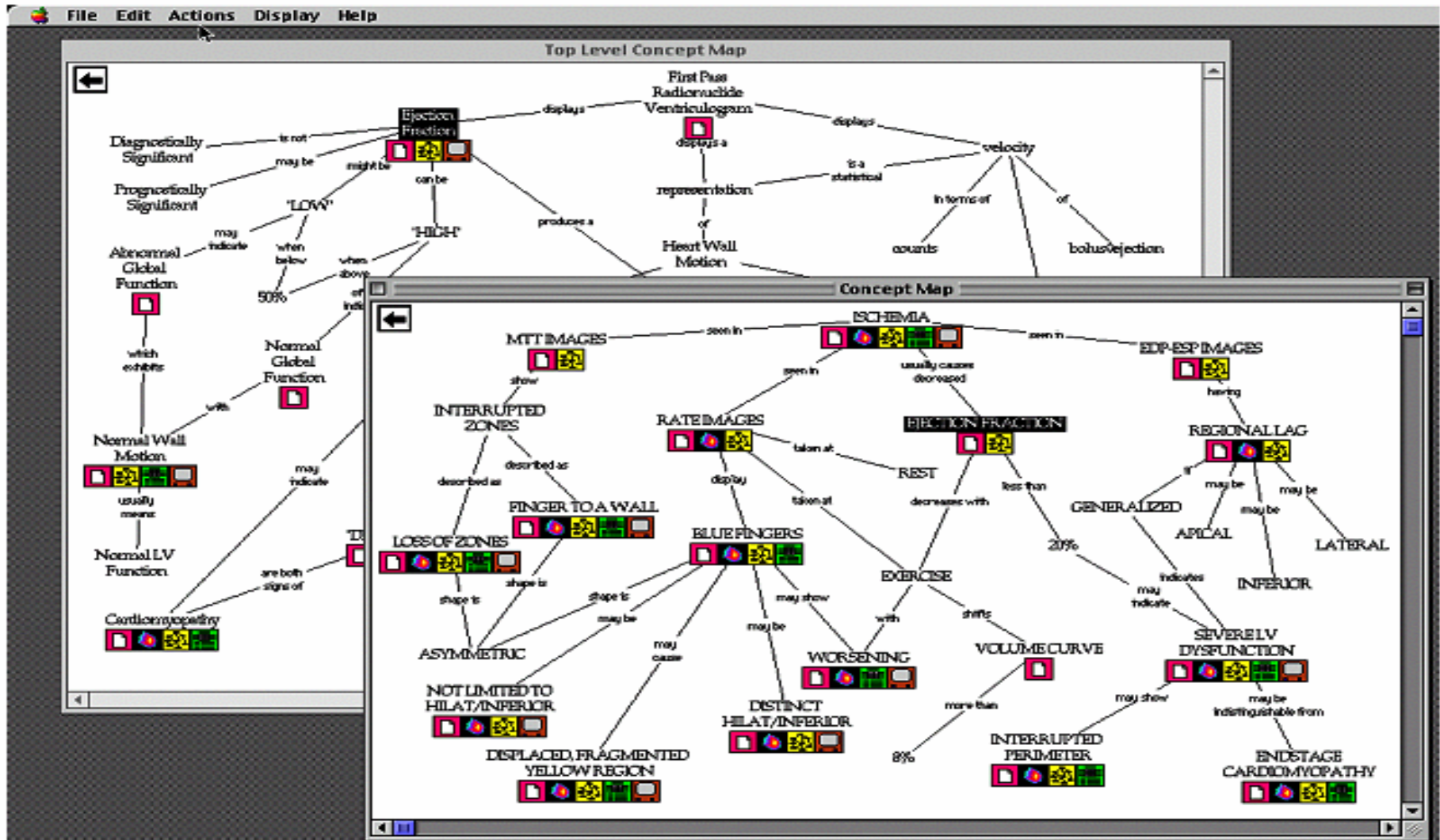




Knowledge Capture Systems: CmapTools

- To capture and formalize knowledge resulting in context rich knowledge representation models to be viewed and shared through the Internet
- Alleviates navigation problem with concept maps
- Serve as the browsing interface to a domain of knowledge
- Icons below the concept nodes provide access to auxiliary information
- Linked media resources and concept maps can be located anywhere on the Internet
- Browser provides a window showing the hierarchical ordering of maps

Segment from Nuclear Cardiology using CmapTools





Explanation Subsystem using CmapTools

File Edit Actions Display 1:19 PM

Concept Map

First Pass Radionuclide Ventriculogram

- displays Ejection Fraction
- displays Text Window
- is a statistical Movie

Ejection Fraction

- is not Diagnostically Significant
- may be Prognostically Significant
- might be Abnormal Global Function
- can be LOW
- can be HIGH
- produces a Text Window

LOW

- may indicate
- when below

HIGH

- when above

ISCHEMIA

- seen in
- usually causes decreased EJECTION FRACTION

RATE IMAGES

- taken at EJECTION FRACTION
- display BLUE FINGERS

BLUE FINGERS

- shape is
- may be
- may cause

DA WALL

NUCESModelIF

Top Level Concept Map

- Normal Wall Motion Map
- Ischemia Concept Map
- Nonspecific Wall Motion Map

Ischemia Text Concept Map

Ischemia Picture Map

Card

Click on a box to select that

BLUE FINGERS

If a region of the ventricle contracts less than it should, that region will be seen on images as a blue region or blue finger. These regions may occur in the High Lateral and High Inferior regions in basically normal patients. Distinct blue fingers limited to the High Lateral/Inferior region require explanation.

Hypertension or aortic stenosis can cause up to 10% of the general population to have blue fingers in otherwise normal patients. Blue fingers in the High/Lateral or Inferior region of the blood vessel in the wall of the ventricle are a sign of Ischemia.



Knowledge representation through context-based reasoning

- Tactical knowledge
 - ◆ human ability that enables domain experts to assess the situation *at hand* (therefore short-term)
 - ◆ myriad of inputs, select a plan that best fits current situation, and executing plan
 - ◆ recognize and treat only the salient features of the situation
 - ◆ gain a small, but important portion of the available inputs for general knowledge



Knowledge representation through CxBR

- *Context* - set of actions and procedures that properly address the current situation
- As mission evolves, transition to other context may be required to address the new situation
- What is likely to happen in a context is limited by the context itself

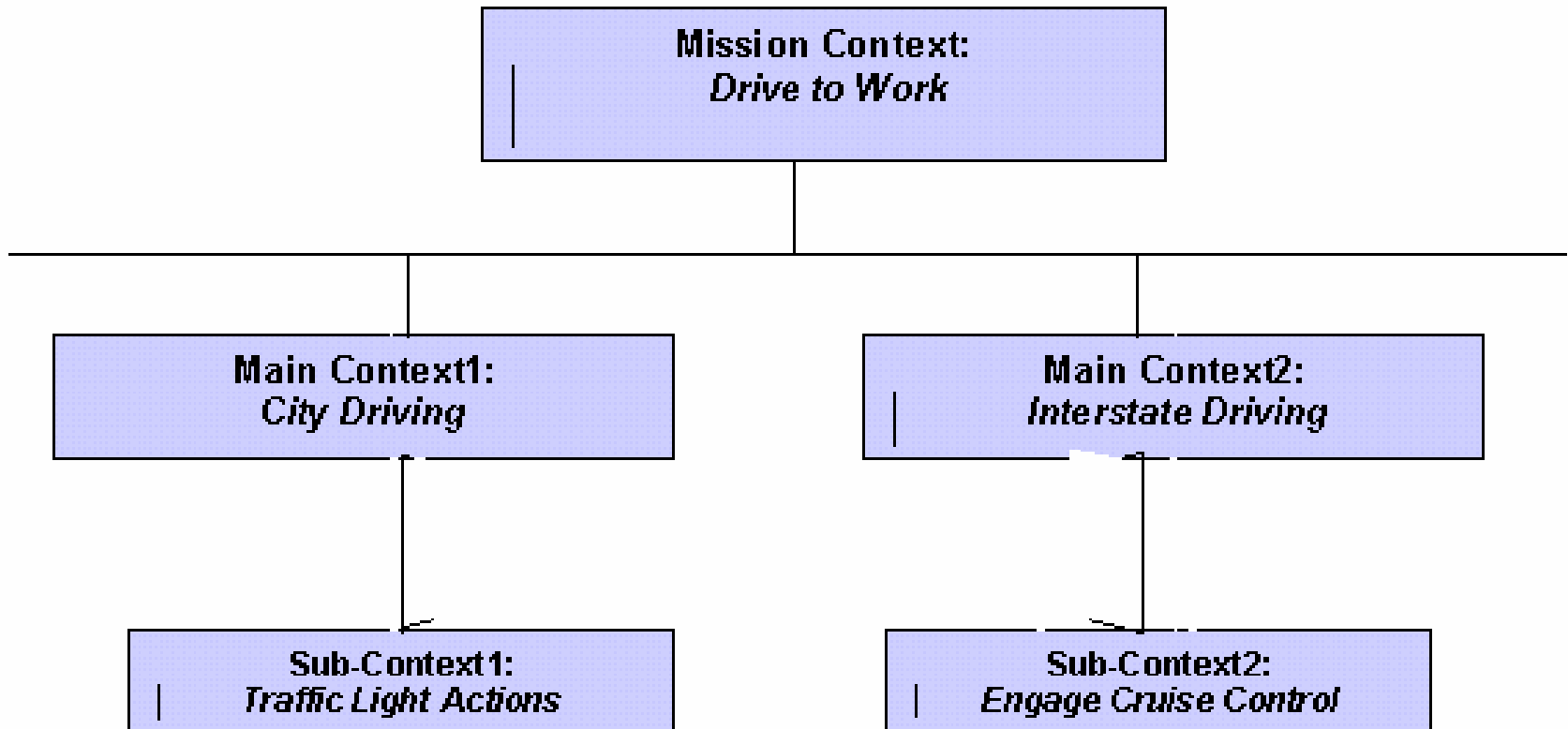


Knowledge representation through CxBR

- *Mission Context* - defines the scope of the mission, its goals, the plan, and the constraints imposed
- *Main Context* - contains functions, rules and a list of compatible subsequent Main Contexts
- *Sub-Contexts* - abstractions of functions performed by the Main Context which may be too complex for one function



Knowledge representation through CxBR





Knowledge Capture Systems based on CxBR

- *Context-based Intelligent Tactical Knowledge Acquisition (CITKA)*
 - ◆ uses its own knowledge base to compose a set of intelligent queries to elicit the tactical knowledge of the expert
 - ◆ composes questions and presents them to the expert
 - ◆ result is a nearly complete context base can be used to control someone performing the mission of interest in a typical environment



Knowledge Capture Systems based on CxBR

- CITKA consists of four modules of independent subsystems:
 - ◆ Knowledge engineering database back-end (KEDB)
 - ◆ Knowledge engineering interface (KEI)
 - ◆ Query rule-base back-end (QRB)
 - ◆ Subject matter expert interface (SMEI)



Barriers to the use of knowledge capture systems

- Barriers to the deployment of knowledge capture systems from two perspectives:
 - ◆ the knowledge engineer who seeks to build such systems
 - ◆ the subject matter expert, who would interact with an automated knowledge capture system to preserve his knowledge



Barriers to the use of knowledge capture systems

- Knowledge Engineer requires developing some idea of the *nature* and *structure* of the knowledge very early in the process
 - ◆ must attempt to become versed in the subject matter, or the nature of knowledge
- An automated system for knowledge capture, without *a-priori* knowledge of the nature, is essentially not possible



Barriers to the use of knowledge capture systems

- From the point-of-view of the expert:
 - ◆ need to take the initiative of learning how to interact with the system
 - ◆ some people may be resistant to trying new things
 - ◆ can be overcome, with adequate training and the utilization of user-friendly interfaces



Using learning by observation capture knowledge

- Research on how humans and animals learn through observation
- Use of learning through observation to automate the knowledge acquisition task
- Learning by observation shows promise as a technique for automatic capture of expert's knowledge, and enable computers to automatically “learn”



Conclusions

In this chapter we:

- Described knowledge capture systems
 - ◆ design considerations
 - ◆ specific types of such systems
- Discussed different methodologies and intelligent technologies used to capture knowledge
 - ◆ concept maps as a knowledge-modeling tool
 - ◆ context-based reasoning to simulate human behavior
- Explained how stories are used in organizational settings to support knowledge capture



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