Focused Workshop 12
Automating Software Engineering
Knowledge Delivery

Process Breakout Group
Participants

Lisa Finneran (SPC)
Arthur Pyster (FAA)
Marc Kellner (SEI)
Sharon Self (EDS)
AW Brown (CSE)

Scribe: Marwan Abi-Antoun (CSE)
Top-9 Research Areas

1. PI Approach of SE: Scalable? Xformable?
2. Process Engineering Issues: What; How; Tools...
3. Process Artifacts’ Structure/Form => Patterns
4. How to capitalize/transform legacy process info
5. Intelligent Navigation [vs browsing]
6. (‘ilities of) Useful process description/capture =? Modifiable
7. Appropriate level of detail for
8. Recommended Views (4+1 or ?)
9. Views: Relations between; Xform across
10. Effective Training Mechanisms for Process K
Goals

1. Leverage interdisciplinary opportunities within university
2. Address "near term" solutions. Low fruit
3. Consider end user context
4. Understand state of the practice
5. Understand barriers/complexities/deficiencies
6. Re-use of legacy
7. Long term vision
8. Fun

Knowledge Capture & Delivery Issues

1. Basic end user problem solving approach for planning use
   "Get information when needed in alignment with the way user will use."
2. What knowledge, what sequence, what time?
   Push vs. pull delivery
   Collaborative vs. individual "expert" knowledge
   • Incentives
   • Feasibility
3. Push vs. pull incentives
   • Capture
   • Use
   • Fun
4. Value of knowledge/info.
5. Identification of what is needed
6. Capture of knowledge processing
7. Knowledge representation – User interface
   • Visual
   • Spoken
   • Written
   • Multiple representations
8. Interacting with knowledge
   • Static
   • Dynamic
   • Feedback control
   • Validation
9. Knowledge summary with respect to end users context
   • information vs. data
10. Political aspects
    • Influences
    • Control access
    • Ethics
    • Security
11. Knowledge filtering
   - Portable context
   - Searching

12. Collaborative metadata
   - automatic
   - capture during life cycle
     - # used
     - freq. Access
     - comments
     - who
   - implicit representation
   - Shelf life – half life
   - Capture of user value perceptions

13. Domain specific knowledge capture and delivery
    - High level breakup
    - Low level delivery
    - Evolution

14. Structured guidance

15. Increase access dimensionality – system interface
    - access points
    - presentation options
    - S-charts: capture knowledge from resulting actions.
    - Integration “transparency” of knowledge management systems
    - Interaction interface (standardized)

16. Capture of exception scenarios
Diagonal Bin Model

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Automating Product Knowledge

Breakout Group Summary

Categories

A - Definitions
B - What properties of systems are the knowledge that we want to capture (criteria)?
C - Goals/Purposes of knowledge
D - Barriers to capturing and using knowledge
E - How is knowledge represented?
F - Process

Definitions

- A - (H/M) What is knowledge? (specifically about products)
- A/B - (M/L) Need taxonomy and prioritization of products so I can make decisions about them
- A/B/D - (H/M-H) Domain specific product knowledge
- A/B/3/D (H/M-H) What do we mean by accessible?
- A - Difference between Data, Information & Knowledge
- A - Note: Knowledge may cut across domains

Participants

- Judy Kerner (The Aerospace Corporation), Moderator
- Morton A. Hirischberg (US Army Research Lab)
- A. Spencer Peterson (Northrop Grumman ESSS)
- Howard E. Verne (Linon Guidance and Control Systems)
- Douglas A. White (Air Force Research Laboratory)
- Steven Wong (TRW)
- Alexander Egyed (USC-CSE), Scribe

Fundamental Issues (H)

- What is the data/info we need to have about a product in order to derive knowledge about a product
- Keeping knowledge in more accessible formats
  - What do we mean by accessible?
- Knowledge about: What are you trying to do vs. how do you do it? (i.e rationale capture)
  - We have ways (e.g. reverse engineering source code) of automating "how" knowledge, but we need "what" and "why" knowledge
- How to structure knowledge so it is accessible to the user as well as to the person who contributed the information.

Definitions (cont.)

- A - Analogy (wingfoil)
  - Knowledge is the equations supplemented by other laws (e.g. physics) and/or principles (e.g. manufacture) and system requirements/constraints
  - Information is the set of equations of the lines of airfoil
  - Data consists of any points on the airfoil
Properties

- BID: (L-M) One tool will not fit all product areas (e.g., real-time systems need very different tools).

- BIA: (M-H) Need taxonomy and prioritizations of products so I can make decisions about them.

- BIDIA: (H-M-H) Domain specific product knowledge.

- BIDE: (WM-H) Models for different domains.

- BIDIC: (M-H) How do we represent different qualities of products (e.g., system)?

- BIC: (HL) What are the products? Are specifications? Are systems? Are technology information?

- BIC: (WH) Make sure product info is useful to maintain, revise, build similar products.

- BIDIA: What do we mean by accessible?

- BIDIA: (WM-H) What do we mean by access?

- BIDIA: How do we represent different qualities of products (e.g., security, fault tolerance, real-time constraints, maintainability, evolvability)?

Properties (cont.)

- BIC: (HL) Capturing:
  - components
  - design rationale: product we often fail to capture now, such as what we didn't do and why we did what we did.

- BID: (M-M) How do we structure knowledge so it is accessible to the user as well as to the person who contributed the information?

- BIDIA: What are the products? Are specifications? Are systems? Are technology information?

- BIDIC: (M-H-H) Models for different domains.

- BIC (WH) What are the products?

- BIDIC: (HM-H) Identifying and structuring the knowledge so it is useful, retrievable, relevant.

- BIC: How to structure knowledge so it is accessible to the user as well as to the person who contributed the information?

Goals/Purposes of Knowledge

- C: (WH) Products that will keep the soldier alive and help him defeat the enemy.

- C: (WH) Products should be:
  - simple
  - do a job
  - have enough aids to facilitate this (e.g., context sensitive help).

- CBR: (HL) What are the products?
  - specifications
  - systems
  - technology information

- CBF: (WM-H) Identifying and structuring the knowledge so it is useful, retrievable, relevant.

- BIDIA: (WM-H) What do we mean by accessible?

- BIDIA: How to structure knowledge so it is accessible to the user as well as to the person who contributed the information?

Goals/Purposes of Knowledge (cont.)

- BIC: (HL) Capturing:
  - components
  - design rationale: product we often fail to capture now, such as what we didn't do and why we did what we did.

- BID: (M-M) How do we structure knowledge so it is accessible to the user as well as to the person who contributed the information?

- BIDIA: What are the products? Are specifications? Are systems? Are technology information?

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- BIC: How to structure knowledge so it is accessible to the user as well as to the person who contributed the information?
**Goals/Purposes of Knowledge**

- **C** - Support for product warranties - long term
- **CIB** - Make sure product info is sufficient to
- Design new products
- Build similar products
- **CIB** - Capturing:
  - comments
  - designs/notebooks - properties we often fail to capture now, such as:
  - why we didn’t do it and why
  - why we did what we did
- **CIB** - (HM) Make sure product info is sufficient to
- Maintain products
- Revise products
- Build similar products
- **CIB** - (HM) - Keep information in useful formats
- **CIB** - (HM) - Keep information in accessible formats
- **CIB** - (HM) - General problem: Abstracting knowledge as rule-bases

**Barriers**

- **DIB** - (LH) One tool will not fit all product areas (e.g., real-time systems need very different tools)
- **DIA** - (HM) - Domain specific product knowledge
- **DID** - (HM) - Not one language (representation)
- **DIB** - (HM) - Models for different domains
- **DID** - (HM) - How much does it cost to get a return on investment for knowledge capture?
- **DIF** - (HM) - Do we know how to get computers to turn into knowledge?

**Barriers**

- **D** - Software doesn’t have an analogy to Math or Physical constraints
- **DIB** - (HM) - Identifying and structuring the knowledge so it is useful, retrievable, relevant
- **DIF** - (HM) - Can we abstract knowledge as rule-bases?
- **DIF** - (HM) - Can the computer structure the knowledge to make it accessible to others?
Knowledge Representation

- IB/H: Not one language (representation)
  - How to overcome?
- IB/H: Models for different domains
- IB/H: How do we represent different qualities of products (e.g., systems)?
  - Security, fault tolerance, real-time constraints, maintainability, evolvability
- IB/H: What are the languages used?
  - Mathematics
  - Natural languages
- IB/H: Fundamental: Keeping knowledge in more accessible formats
  - What do we mean by accessible?
- IB/H: Models for different domains
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Process

- FIB/H: Information analysis to extract knowledge
- FIB/H: Turning "data mining" into knowledge
- FIB/H: Extracting knowledge from information
- FIB/H: Use secondary data to build products
- F: - Information Acquisition
- F: - Turning Information into Knowledge

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