Requirements Elicitation:  
Part 2

Goal-Directed Strategy 2:  
Using more expressive power

Knowledge Acquisition:  
A Relative of Requirements Elicitation

Data/Information Elicitation Techniques

How to elicit?

✧ Goal-Directed Strategy 2: Using more expressive power

✦ Expressive Power  Revisited

"Propositional and predicate logic provide all the basic concepts
needed for a systematic engineering design methodology"

[C. A. Hoare, Mathematical Models for Computing Science,

✧ modelling all the possible worlds

=> what are they?

=> what are our conceptualization of them?

d these are philosophical questions!

✧ Ontology

on-tol-o-gy n. The branch of philosophy that deals with being
what exists in reality?
what are essential things in reality?
entities, activities, constraints
goals, agents, roles, rationales

✧ Epistemology

e-pis-te-mol-o-gy n., pl. -gies. 1. The division of philosophy
that investigates the nature and origin of knowledge.
how do we organize them?
Goal-Directed Strategy 2: Using more expressive power

Example: A Library System

E.g., Library System

- send an overdue notice via mail
- send an early notice via email/phone
- to ensure books are regularly available within library use only
- why? it takes time and money to ensure books are regularly available what's regular availability?
- books in shelf why?
- to satisfy book request why?
- to make the system effective

Alternatives

- to make the system effective
  - AND
  - to make book availability known
    - AND
    - enough books
      - AND
      - books_registered
    - AND
    - books_placed
      - to ensure books are regularly available
        - OR
        - send an overdue notice
          - within library use only
        - send an early notice
          - via mail
          - OR
          - via email/phone

Richer ontology -> during goal reduction, identity:

Concerned objects
Constraints
Actions
Agents (human, hw, sw,...)
Responsibilities

Concerned object: system
Agent: borrower

Concerned object: book

Action: register books
Agent: human (CounterAgent) or hw (BarCodeReader)

Action: place books
Agent: Cart/Replace-Agent

Constraint: impose restricted use
How to elicit?

E Domain Analysis

"support reuse of generic domain modelling patterns"
=> significant reduction in elicitation, specification & validation

F Identify commonalities between similar applications
F store requirements in a repository
F select one or more similar requirements and tailor
G E.g., "resource-allocation" meta-domain model

  to make the system effective
  AND
  to make resource availability known to satisfy resource request

  to make the system effective
  AND
  to make book availability known to satisfy book request
  AND
  enough books
  AND
  books_registered
  AND
  book available
  AND
  books_placed
  AND
  to ensure books are regularly available
  OR
  to send an overdue notice
  OR
  via mail
  OR
  via email/phone

G resource-allocation has as instances:
  airline reservation system, hotel reservation system, car rental, class registration, etc.

How to elicit?

E Knowledge Acquisition: A Relative of Requirements Elicitation

F From AI, largely intended for acquiring expertise (e.g., of doctors, lawyers)
  practised by "knowledge engineer"
  Recall: requirements elicitation -> capturing "knowledge" of domain

F Use of mediating representations:
  help bridge the gap between the structure of expert' knowledge
  and formal, computer-based representations
  (e.g., Text, Note, Diagram, Chart, Table, Frame, Rule, Semantic-Net)

F Automatic KA techniques

H infer new knowledge from past experience
  worksFor(bill, john)
  worksFor(maria, john)
  worksFor(george, john)
  forall x worksFor(x, john) For whom does Susan work ?

H suggest refinement
  forall x, y (x <> y) -> worksFor(x, y)

H detect inconsistencies
  forall x worksFor(x, john)
  worksFor(eve, maria)

F Issues recognized for KA
  novice K <> expert K --> diff. types of customers
  experts may not want to tell --> "say-do" problem
  expertise (experience) doesn't always translate into "rules"
  --> reqs. analyst: informal -> formal (ethnomethodology)
**Data/Information Elicitation Techniques**

- **Sampling**
  - The process of systematically selecting representative elements of a population, often applied to documents ("hard" data, e.g., transaction log)
  - Useful as it can minimize costs/overhead during data gathering (only a portion, no direct involvement of customer)
  - Sampling tasks:
    - **Data determination**
      - E.g., in building/improving an ATM system
        - How much time/transaction (-> #machines, response time improvement)
        - How many errors before completion (-> UI design, robustness, help fns)
        - Correlation between amount and time spent (-> max amt, accuracy assurance)
        - Peak period, interval between transactions (-> performance improvement)
        - Success/failure ratios (-> bad transaction types, time of day/week)
    - **Population**
      - E.g., transactions
        - Transactions in 4 local branches for 1 week
    - **Type determination**
      - **Purposeful sampling** choose population elements the analyst considers important with no regard to statistical issues (e.g., only high amount/frequent transactions)
      - **Random sampling** every kth element
    - **Sample size**
      - E.g., consider 1/10th of all transactions (in 4 local branches for 1 week)
      - The bigger the size, the higher the cost of sample collection, but higher confidence level
How to elicit?

Data/Information Elicitation Techniques

F Questionnaires

H kinds of information sought: attitudes, beliefs, behavior
- not normally found through sampling (hard data) or interviews
  But if not anonymous, customers may be reluctant to answer questions

Have you used any meeting scheduler system before? Y N
If yes, are you satisfied with it? 1 2 3 4 5
If no, would you try a meeting scheduler system when available? Y N
Would you encourage other people to use one? Y N
How much time are you willing to spend in each session?
  5 minutes<  5 minutes< & <10 minutes 10 minutes< & <20 minutes

H avoid open questions
(because answers to such questions are hard to correlate and interpret)
Do you think a new meeting scheduler will succeed?
Do you believe a mtg scheduler system should drastically change our daily lives?

H questionnaires should be short
(otherwise, people may be reluctant to participate with busy schedule)

H administer the questionnaire using simple rules
  J scoring scheme: e.g., a range of from 1 to 5
  J group inter-related questions
  E.g., Q 1 2 3 represent customer satisfaction with current systems
       Q 4 5 6 7 represent customer willingness to try a new one

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How to elicit?

Data/Information Elicitation Techniques

F Interviewing

H kinds of information sought:
tacit knowledge as well as hard facts, opinions, feelings, goals

J dos: planning ahead of time
See how experienced journalists do it!

read background material
(mtgs, scheduling mtgs, mtg scheduler systems)

establish interviewing objectives
(what are you trying to get out of the interview?)

decide whom to interview
(people are busy; likely or important customers)

call people ahead of time to prepare:
tell the purpose, duration, possibly question types

decide on interview structure & question types
(write down questions & answer them ahead of time)

hold the interview
review on-line notes -> disseminate -> difference recording & resolution

J don’ts: needs mastery of skills
buzzwords/acronyms to impress
unusual body language
(unsual tone of voice, facial/body expressions, dress, etc.)

often people can’t articulate their perception or their needs;
often people are reluctant to reveal their thoughts;
often people are reluctant to reveal their needs.

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How to elicit?

Data/Information Elicitation Techniques

**Group Meetings**

Kind of group interview, often conducted in terms of "stimulus material" (videos, stories, ...)

*Success depends on the kinds of participants and moderator*

- E.g., Joint Application Development (JAD)

- Joint Requirements Planning (JRP)
  - usually for high-level managers;
  - identify and examine business goals, problems, critical success factors, strategic opportunities

- Joint Application Design (JAD)
  - identify and examine the end users' needs

**4 tenets of JAD:**

- **K** group dynamics
  - participants (developers, users/customers)
  - leader/moderator/facilitator
  - recorder/scribe

- **K** visual aids
  - E.g., calendars, participants, equipments, locations

- **K** organized, rational process
  - periodic, democratic, conflict accommodating

- **K** WYSIWYG documentation approach

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**Ethnomethodology** *(People’s methods)*

- Sometimes, observation is the best way to understand how things are done
- (esp. where) social order is accomplished on a moment-to-moment basis
- So, OBSERVE in a NATURAL setting

- e.g., stock brokerage (multiple phone calls, computer), HCI
- ethical, legal implications, if video-taping without notification
- observation not in a natural setting, if people are aware of being observed
  - needs maximal natural setting, minimal interruption
- can be too time-consuming to analyze the recording
  - gradual identification of critical tasks and focusing