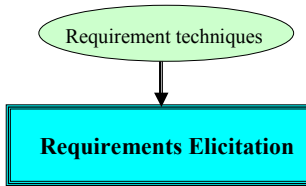
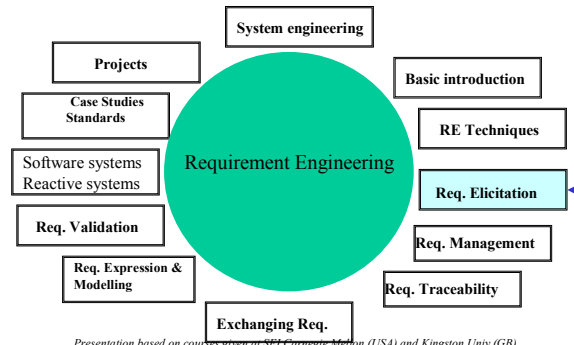


## Requirements Elicitation



Presentation based on courses given at SEI Carnegie Mellon (USA) and Kingston Univ (GB)

## Requirements Elicitation



Presentation based on courses given at SEI Carnegie Mellon (USA) and Kingston Univ (GB)

## Contents

- Requirements elicitation
- Guidelines
- Methodology
- Basic techniques for eliciting requirements
  - Interviews
  - Meetings
  - Planning
  - ...

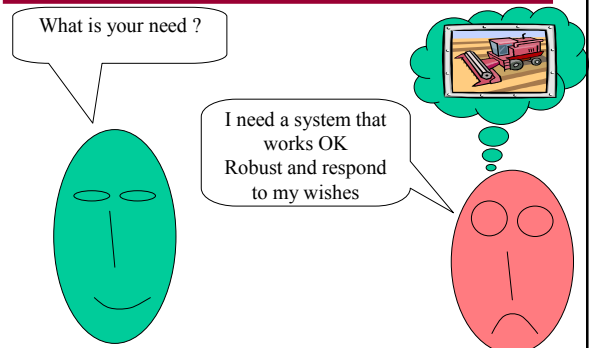
## Some basic points

- Elicitation is not Acquisition
- Requirements are not available like sensor data  
***Not just read them systematically !!***
- Elicitation is not specification and modelling
- *Too much importance has been given to expression and modelling*
- RE Determines the **success** of the mission
- Elicitation determines the **success** of the RE process

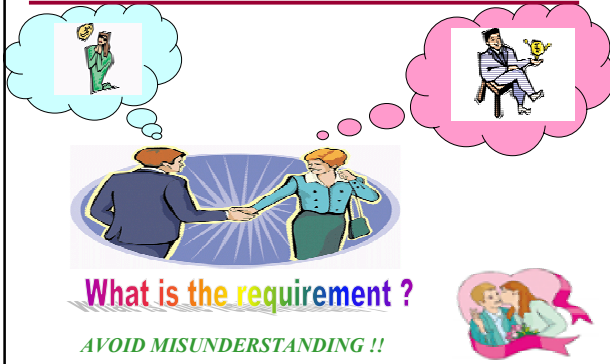
## What Is Elicitation ?

- Process of identifying needs
- Front End to systems development
- Involves social, communicative issues and Technical issues
- Requirement expression is the step to model the requirements.

## A common Problem !!



## As problems in social life



## A simple scenario

- I need a book
- **What for ? Or What discipline ?**
- To .....; in fact anything to level up my terminal
- **So you any item but Not necessarily a book**



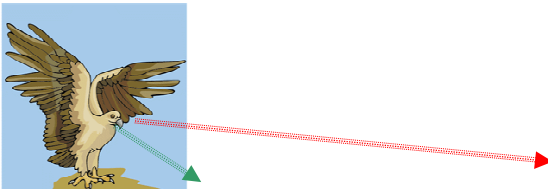
## Elicitation : a subset of goals

- Identify the relevant parties . The stakeholders
- Gather the *Wish List* for each stakeholder
- Document and refine the Wish list
- Expected properties
  - Unambiguous
  - Complete
  - Verifiable
  - Consistent
  - Modifiable
  - Traceable

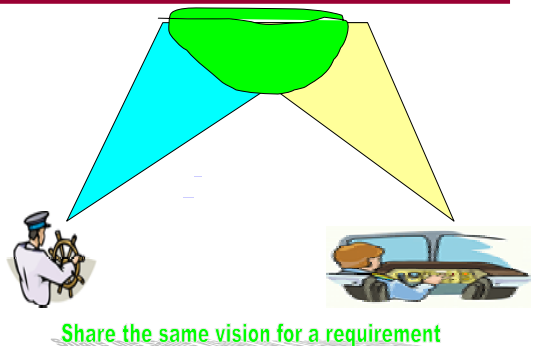
## Common generic problems

- Scope : too much or too little
- Understandings : Users and developers
  - Users have an incomplete understanding of their needs
  - Analysts and SE have a poor knowledge of problem domain
  - Ease of omitting obvious information Volatility : changing requirements

## The Scope problem



## The Misunderstanding pb



## Some data on the Pb

- 56 % of errors were due to poor communication between user and analyst
- Such errors cost 82% of the available staff time
- Three main issues
  - people involved comes from different backgrounds
  - Language used may be too informal or too formal
  - A large amount of information to be commicated and not really structured

## The misun ...

- Stakeholders may be located at different levels
- May correspond to levels to abstraction
- From informal knowledge to ...formal expression
- Notion of maturity levels
- Dont mix up with abstraction levels
- Many people are involved : Questions
  - When in the elicitation process ?
  - At what level ?

## The Volatility problem

- **REQUIREMENTS EVOLVE : A basis**
- Some requiremenrs are more emphasized than needed during elecitation process
  - **The boss is always rights**
  - **His needs are more considered even not mature and ambiguous**
- Change may occur due to
  - Misunderstanding
  - Scope

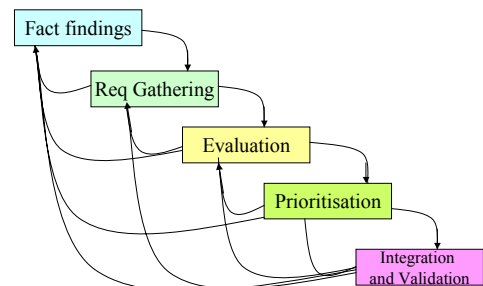
## An Elicitation methodology Framework (DOD-SEI)

- basic remark : Most requirements problems are due to requirements elicitation
- General remark . No technique is comprehensive enough to adequately cover all mentionned issues
- Objective : Synthesize all methods and techniques into a methodology which can be instantiated upon a target system's atributes

## See table 4.1 in SEI document

- Information gathering
- Requirements Expression and analysis (see later course on this topic)
- Validation

## The Elicitation methodology



## Fact findings

### User

- Identify Stackholders
- Determine operational and problem contexte
- Identify other systems
- Perform context analysis

### Developer

- Identify domain experts
- Id. Domain
- Conduct technological survey
- Asses cost/implementation

## Requirements gathering

### User

- Get Wish List

### Developer

- Classify wish list
  - \* Functional
  - \* NFR
  - \* Env.
  - \* ...

See [www.incose.org/rwg](http://www.incose.org/rwg)  
paper on requirements  
categorisation

## Evaluation and rationalisation

### User

- Perform abstraction to answer question
- see interview techniques

### Developer

- Perform risk assessment
- Cost benefit ...

## Prioritisation

### User

- \* Dtermine criticality

### Developer

- Prioritisation of requirements
- basis : cost, criticality, ...

## Integration and validation

### User

- Adress completeness : TBD type
- validate req with respect concept of operation
- Decide to go on next step
  - \* Demo
  - \* prototype
  - \* ...

### Developer

- Consistency checking

## Conclusion on the methodology

- Abstract methodology
- Still be considered as guide
- An evaluation crireria to be developed :
- ***No information on evaluation***

## The stackholder connection

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- Sometimes called requirements analysis or requirements discovery
  - Involves technical staff working with customers to find out about the application domain, the services that the system should provide and the system's operational constraints
  - May involve end-users, managers, engineers involved in maintenance, domain experts, trade unions, etc. These are called stakeholders
- 

## Specific elicitation techniques

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- Documentation
  - Interviews
  - Questionnaires
  - Scenarios
  - Ethnography
- 

## Gathering Information About...

---

- **The organisation**
  - goals, structure, functional units, policies
  - **The people**
  - authority, duties, relationships, information, needs
  - **The work**
  - tasks, work flows, procedures, schedules, volumes, performance criteria
  - **The work environment**
  - work areas, resources
- 

## Gathering Information From...

---

- **Documentation**
  - charts, manuals, job descriptions, forms, reports
  - **System users and managers**
  - **External sources**
  - other companies, vendors, publications, seminars, workshops, on-line data services
- 

## Interviews

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- **The requirements engineer or analyst discusses the system with different stakeholders and builds up an understanding of their requirements.**
  - **Identify**
    - work flows
    - factors that influence the operations of systems
    - the elements (documents, procedures, policies etc.) that make up systems
- 

## Types of Interviews

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- **Closed interviews. The requirements engineer looks for answers to a pre-defined set of questions**
    - goal-directed and systematic
  - **Open interviews There is no predefined agenda and the requirements engineer discusses, in an open-ended way, what stakeholders want from the system.**
    - Appropriate when we want to explore an issue
    - establish rapport and obtain a broad view
-

## Interviewing essentials

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- **Interviewers must be open-minded and should not approach the interview with pre-conceived notions about what is required**
  - **Stakeholders must be given a starting point for discussion. This can be a question, a requirements proposal or an existing system**
  - **Interviewers must be aware of organisational politics - many real requirements may not be discussed because of their political implications**
- 

## Interview Steps

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- **Preparing**
  - **Planning**
  - **Opening and Closing**
  - **Conducting**
  - **Following up**
- 

## Preparing for the interview

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- **Review**
    - organisation reports
    - annual reports
    - statements of departments goals
    - long-range planning goals
    - existing procedure manuals
    - systems documentation
    - understand their language
- 

## Planning of Interviews

---

- **Identify sources**
  - **prepare**
    - \* purpose, outline of points to cover
  - **venue**
  - **appointments**
  - **prepare the interviewee**
    - \* points to cover, useful documents
- 

## Questioning

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- **Open questions**
    - tell me what happens when a customer calls
  - **leading questions**
  - **be wary of negative responses**
    - exceptions?
  - **Subjects who try to please**
- 

## Listening

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- **Judge content and not delivery**
  - **withhold evaluation and response**
  - **be flexible**
  - **work at listening**
  - **resist distractions**
  - **keep your mind open**
  - **listen for ideas**
-

## Opening and closing and Following Up the interview

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- **Introduce yourself**
  - **state the purpose of the interview**
  - **briefly summarise the areas that have been discussed, highlight important points and your understanding of them**
  - **thank the interviewee for the time**
  - **Ask closed questions**
  - **Document the results**
- 

## Questionnaires

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- **Validity**
    - sample size, audience
  - **Reliability**
  - **Questions**
    - open ended
    - fill in the blank
    - multiple choice
    - rating scales
- 

## Scenarios

---

- **Scenarios are stories which explain how a system might be used. They should include**
    - a description of the system state before entering the scenario
    - the normal flow of events in the scenario
    - exceptions to the normal flow of events
    - information about concurrent activities
    - a description of the system state at the end of the scenario
- 

## Scenarios

---

- **Scenarios are examples of interaction sessions which describe how a user interacts with a system**
  - **Discovering scenarios exposes possible system interactions and reveals system facilities which may be required**
    - **Operational semantics**
- 

## Observation and social analysis

---

- **People often find it hard to describe what they do because it is so natural to them.**  
*Sometimes, the best way to understand it is to observe them at work*
  - **Ethnography is a technique from the social sciences which has proved to be valuable in understanding actual work processes**
  - **Actual work processes often differ from formal, prescribed processes**
- 

## Meetings

---

- **Meetings consume resources**
    - must improve quality of meetings
  - **Meetings have different objectives**
    - solve problems, clarify issues
    - brainstorm solutions to problems
    - resolve conflicts
    - conduct reviews
    - collect and merge facts and data
    - report progress
    - assign actions
-

## Meetings: Planning

---

- **Define clearly the expected results or outcomes of the meeting**
  - **Find if possible a way to eliminate the need for the meeting**
    - do we really need the outcome of this meeting at this moment?
    - Is there another more efficient and more effective way to accomplish what is to be accomplished by holding this meeting?
    - If yes and no are the answers to the two questions then proceed
- 

## Meetings: Planning

---

- **Prepare agenda for the meeting**
    - reasonable time allocation for each topic
    - circulate at least two days before the meeting
    - to allow time for the attendees to prepare, comment and make schedule arrangements
    - identify and notify required meeting attendees. Must have the right people
    - the appropriate information and knowledge to support meeting goals and objectives
    - the authority (direct or delegated) to make decisions and commitments if required by the meeting's goals and objectives
    - the need to understand what is going on and the rationale behind any decisions or commitments made during the meeting
- 

## Meetings: Planning

---

- **Meeting location considerations**
    - room size, lighting, noise, temperature, humidity can distract
    - need for audio/visual aids in working order
  - **Start and Finish on time**
  - **Record and publish minutes**
  - **Have handouts ready for distribution**
  - **review the agenda, meeting goals and objectives first**
  - **discourage interruptions and deflections from the topic at hand**
  - **follow the agenda schedule as closely as possible**
- 

## Active Listener Guidelines

---

- **Clear your mind of everything except the speaker, the topic and what the speaker is actually saying. Prevent trying to read more into what the speaker is saying than the speaker is actually saying**
  - **Capture as accurately as possible the information that the speaker is conveying**
  - **Let the speaker know by actions that s/he is interested in what is being said**
  - **Ask questions as they arise to clarify points, indicate understanding and provide feedback to the speaker**
- 

## Active Listener Guidelines

---

- **Ask that the central ideas, themes and summaries be repeated to assure complete understanding**
  - **Do not attempt to formulate replies, rebuttals or counterexamples while the speaker is talking**
  - **Do not draw conclusions until you have heard the whole story**
  - **Accept that understanding is not agreeing**
  - **Do not be afraid to ask if there is something that you have not been told.**
- 

## Methodologies

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- **A number of techniques are available to describe the workings of a system**
  - **Many people have taken a number of these techniques and produced a method for using them to arrive at a specification**
-



## Methodologies Division

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- **Main Division**
    - Data driven
    - SSADM
    - Process driven
    - Yourdon
    - JSD
  - **Is there a universally best methodology?**
    - No
  - **Can I combine methodologies?**
    - Maybe
- 

## Comparison of Methodologies

---

- **Can one compare the available methodologies?**
    - against an ideal methodology
    - not feasible because no suitable specification of an ideal methodology exists
    - assess the features and facilities of each methodology within a formalised framework
    - invent questions about each methodology
    - ask the questions for each methodology
    - merge and describe the results
    - decide?
- 

## Typical Comparison Questions

---

- **For the comparison one may ask**
    - Does the methodology cover all phases? Which ones? How thoroughly.
    - Are the steps fairly proceduralised or does the methodology only give broad directions? Are analysis, design and implementation given equal weight?
    - Is it data or process analysis oriented?
    - Does it cover prototyping and incremental development?
    - How are the results of analysis and design expressed?
    - Is the methodology supported by software?
    - What types of applications is it suited to? History?
- 

## Decomposition Diagrams

---

- **A high-level organisation (or function or activity) is decomposed into lower organisations (or functions or activities). The lower we go in the hierarchy the greater the detail revealed**
  - **Used to show organisation, system, program, file and report structures**
  - **organisation**
    - functions
      - processes
        - procedures
        - program structures
- 

## Viewpoints for requirements elicitation

---

- The Preview approach addresses the cases where
    - Sources from radical sources
    - Identify key business drivers
    - Incremental process for requirement elicitation
- 

## PREVIEW Components

---

- Viewpoint name : an identifier
- Viewpoint focus : interaction, domain, stakeholder
- Viewpoint concerns : all concerns applicable
- Viewpoint sources : individuals, documents
- Viewpoint requirements : Req. from source
- Viewpoint history : changes record

**Limited only to requirement elicitation  
and NOT Validation**

---

## Example (Somerville paper ICRE-98)

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- Emergency braking system
  - Viewpoint name : *emergency braking system*
  - Viewpoint focus : *The protection system of the train which must detect dangerous conditions and apply emergency braking to bring train to a safe state*
  - Viewpoint concerns : *Safe compatibility*
  - Viewpoint sources : *systems design; function spec of existing protection software*
- 

## Example

---

- Viewpoint requirements :
    1. *Detection of excess speed , if the speed of the train exceeds the safe speed for the current track segment by more than 6 kmh emergency braking must be applied*
    2. *Detection of overshooting, if the signal sensor indicates a danger setting and the front of the train has entered the signalled track segment, emergency braking shall be applied*
    3. *Frequency of invocation , detection of excess speed, detection of overshooting, and determining the necessity of emergency brake application shall be performed once every iteration of the on board software application cycle*
  - Viewpoint history : *case of evolving requirement(following an accident or a failure)*
- 

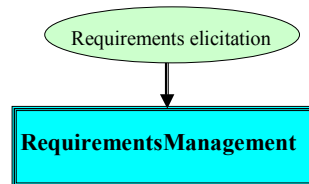
## Conclusions

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- Elicitation Process is The FIRST PHASE
  - Needs to be successful → Just DO IT
  - Be convinced it needs to be done
  - Any technique will do (see resources and papers)
- 

## Next lecture

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## Reading and assignment

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- Papers
    - Christel & Kang : Issues in requirement elicitation
      - Read sections 1 through 6 of the paper [Christel & Kang : Issues in requirement elicitation](#) and answer the following questions:
        1. Describe an example requirements elicitation for each of the three major categories of elicitation problems and suggest a technique for solution.
        2. What are the chief differences between the user-oriented and developer-oriented tasks of requirements elicitation?
  - Contact XX for requirement elicitation for the following concept of operation
    - HPI Scheduler
    - Web site for RE course
    - A students utilities to be done at HPI (web site for students).
-