ECE450 – Software Engineering II

Today: **Requirements Engineering: Starting points for elicitation**

adapted from Steve Easterbrook's material on Requirements Engineering

Where do we start?

- Identify the problem
  - what is the objective of the project?
  - the "vision" of those who are pushing for it?
    - e.g., "Scheduling meetings is too costly right now"
- Scope the problem
  - given the vision, how much do we tackle?
    - e.g. "Build a system that schedules meetings", …or…
    - e.g. "Build a system that maintains people's calendars" …or…
- Identify solution scenarios
  - given the problem, what is the appropriate business process for solving it?
    - e.g. "Anyone who wants to schedule a meeting goes to the secretary, gives details and the secretary handles the rest", …or…
- Scope the solution
  - Given a business process, what parts should be automated, and how?
    - e.g. "Computer takes in scheduling request details, outputs a solution" …or…
    - e.g. "Solution arrived at interactively by secretary and computer" …or…

Requirements Elicitation

- Starting point
  - Some notion that there is a "problem" that needs solving
    - e.g. dissatisfaction with the current state of affairs
    - e.g. a new business opportunity, or a potential saving of cost, time, resources, etc.
- Collect enough information to:
  - identify the "problem"/"opportunity"
    - Which problem needs to be solved? (identify problem Boundaries)
    - Where is the problem? (understand the Context/Problem Domain)
    - Whose problem is it? (identify Stakeholders)
    - Why does it need solving? (identify the stakeholders' Goals)
    - How does the problem manifest itself? (collect some Scenarios)
    - When does it need solving? (identify Development Constraints)
    - What might prevent us solving it? (identify Feasibility and Risk)
  - become an expert in the problem domain
    - Learn how to find your way round a new problem area quickly
    - Use your (initial) ignorance as an excuse to ask (dumb?) questions
    - Recognize the domain expertise of the people you talk to

W6H
The journalist's technique:
What?
Where?
Who?
Why?
When?
How?
(Which?)

Identifying the problem

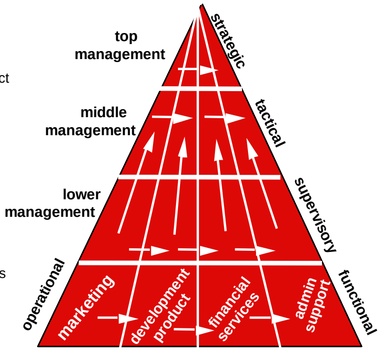
- Vague problem stated by the customer:
  - E.g. university textbook store:
    - Manager wants to computerize the book order forms filled out by instructors;
  - E.g. A large insurance company:
    - Claims manager wants to cut down the average time it takes to process an insurance claim from 2 months to 2 weeks
  - E.g. Large Government Aerospace Agency:
    - The president wants to send a manned mission to Mars by the the year 2020
- Often you only see symptoms rather than causes:
  - E.g. "Ontario patients needing X-ray scans have to wait for months"
  - The long wait is the symptom, not the problem. The problem may be:
    - Shortage of X-ray machines;
    - Shortage of trained staff;
    - Shortage of doctors to process the data
    - Inefficient scheduling procedures

Stakeholders

- Stakeholder analysis:
  - Identify all the people who must be consulted during information acquisition
- Example stakeholders
  - Users
    - concerned with the features and functionality of the new system
  - Designers
    - want to build a perfect system, or reuse existing code
  - Systems analysts
    - want to “get the requirements right”
  - Training and user support staff
    - want to make sure the new system is usable and manageable
  - Business analysts
    - want to make sure “we are doing better than the competition”
  - Technical authors
    - will prepare user manuals and other documentation for the new system
  - The project manager
    - wants to complete the project on time, within budget, with all objectives met.
  - “The customer”
    - Wants to get best value for money invested!

Types of stakeholders: Levels of authority

- Top management
  - establishes goals
  - does long-range planning
  - determines new market & product developments
  - decides on mergers & acquisitions.
- Middle management
  - sets objectives
  - allocates & controls resources
  - does planning
  - measures performance
- Lower management
  - supervises day-to-day operations
  - takes corrective action when necessary.
- Operational level
  - performs day-to-day operations



Identifying stakeholders’ goals

- Approach
  - Focus on ***why*** a system is required
  - Express the ‘why’ as a set of stakeholder goals
  - Use goal refinement to arrive at specific requirements
  - Goal analysis
    - document, organize and classify goals
  - Goal evolution
    - refine, elaborate, and operationalize goals
  - Goal hierarchies show refinements and alternatives
- Advantages
  - Reasonably intuitive
  - Explicit declaration of goals provides sound basis for conflict resolution
- Disadvantages
  - Captures a static picture - what if goals change over time?
  - Can regress forever up (or down) the goal hierarchy

Scoping decision 1

- Decide the scope of the problem:
  - *“Textbooks are often not ordered in time for the start of classes”*
  - But that’s just a symptom. (So you ask the manager “why?”)
    - *“Because we don’t receive the booklists from instructors early enough”*
  - Is that just a symptom of some other problem? (…so ask the instructors “why?”)
    - *“Because the instructors aren’t allocated to courses early enough”*
  - Is that just a symptom of some other problem? (…so ask the UG office “why?”)
    - *“Because we never know who’s available to teach until the last minute”*
  - Is that just a symptom of some other problem? (…so ask the dept chair “why?”)
    - *“Because there’s always uncertainty about who gets hired, sabbaticals, etc.”*
  - Is that just a symptom of some other problem? (…so ask the dept chair “why?”)
    - *“Because instructors we want to hire don’t accept our offers early enough”*
  - Is that just a symptom of some other problem? (…so ask the new recruits “why?”)
    - *“Because some other universities seem to wait for ages before making offers”*
  - Is that just a symptom of some other problem? (…so ask U of Waterloo, etc, “why?”)
    - *“Because it takes our department a long time to reach consensus on hiring”*
  - Is that just a… …oh wait… …maybe we can develop a decision support system for faculty hiring at U of Waterloo, and that will help us get our textbooks for the start of class…

How to scope the problem

- Difficulty:
  - Every problem can be seen as as symptom of some other (larger) problem
  - You can keep on tracing root causes forever if you're not careful
- Approach: (…ask yourself these questions…)
  - Is there a reasonable expectation that this problem can be solved?
    - (…independently of the larger problem?)
  - Is there a reasonable expectation that solving this problem will help?
    - (…without also solving the larger problem?)
  - Is this a problem that the stakeholders want solved?
    - (do the "local experts" think this problem is the one that matters?)
  - Is this a problem that someone will pay you to solve?
    - (Hint: a feasibility study should quantify the return on investment)

Scoping decision 2

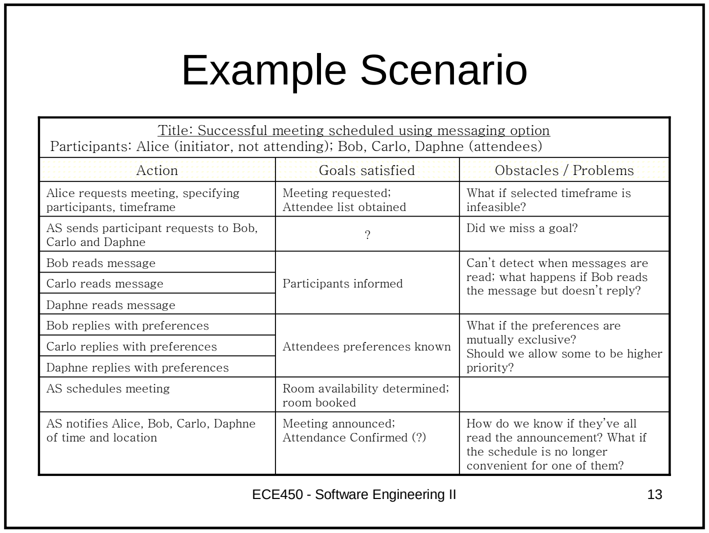
- Decide the scope of the solution
  - Say you decided that delay in processing booklists from instructors is the right level of problem to tackle.
    - *"So, let's computerize the submission of textbook forms from instructors"*
  - But while we're at it:
    - *"it would help if we also computerized the submission of orders to the publishers"*
  - …and of course:
    - *"we ought to computerize the management of book inventories too, so we can quickly check stock levels before ordering new books"*
  - …and in that case:
    - *"we might as well computerize the archives of past years booklists so that we can predict demand better"*
  - …and therefore:
    - *"it would also make sense to provide a computerized used book exchange, because that has a big effect on demand for new books"*
  - …and then of course there's … oh, wait, this is going to cost millions!
    - Bookstore manager: *"tell me again how this automated used book exchange will help me order books faster?"*

How to scope the solution

- Difficulty:
  - We could keep on throwing more technology at the problem forever
  - It's hard to decide when to stop adding extra "bells and whistles"
- Approach (…select among alternatives carefully…)
  - Is there a reasonable expectation that this alternative can be implemented?
    - (…independently of all the other options?)
  - Is there a reasonable expectation that implementing this alternative will (help to) solve the original problem?
    - (…without also having to address other aspects of the problem?)
  - Is this a solution that the stakeholders can live with?
    - (do the "local experts" think they would use all these functions?)
  - Is this a solution that someone will pay you to build?
    - (Hint: a feasibility study should quantify the return on investment for each alternative)

Scenarios

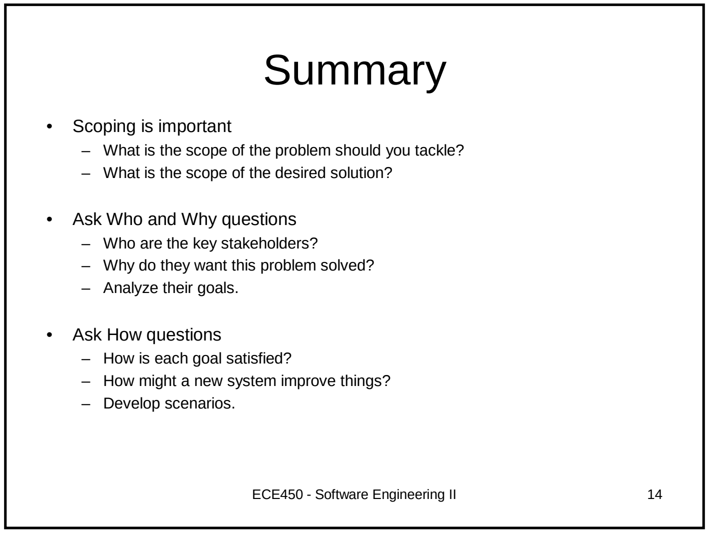
- Scenarios
  - Specific sequence of interaction between actor and system
  - Tend to be short (e.g between 3 and 7 steps)
  - May be:
    - positive (i.e. required behavior)
    - negative (i.e an undesirable interaction)
  - May be indicative (describe current system) or optative (how it should be)
- Advantages
  - Very natural: stakeholders tend to use them spontaneously
    - E.g "suppose I'm admitted to hospital - what happens during my admission?"
    - Typical answer: "You, or the person accompanying you would talk to the person at the admissions desk. You have to show your OHIP card and explain who referred you to the hospital. Then you…" [and so on]
  - Short scenarios very good for quickly illustrating specific interactions
- Disadvantages
  - Lack of structure
  - Hard to check for completeness



Example Scenario

Title: Successful meeting scheduled using messaging option
Participants: Alice (initiator, not attending); Bob, Carlo, Daphne (attendees)

Action	Goals satisfied	Obstacles / Problems
Alice requests meeting, specifying participants, timeframe	Meeting requested; Attendee list obtained	What if selected timeframe is infeasible?
AS sends participant requests to Bob, Carlo and Daphne	?	Did we miss a goal?
Bob reads message	Participants informed	Can't detect when messages are read; what happens if Bob reads the message but doesn't reply?
Carlo reads message		
Daphne reads message		
Bob replies with preferences	Attendees preferences known	What if the preferences are mutually exclusive? Should we allow some to be higher priority?
Carlo replies with preferences		
Daphne replies with preferences		
AS schedules meeting	Room availability determined; room booked	
AS notifies Alice, Bob, Carlo, Daphne of time and location	Meeting announced; Attendance Confirmed (?)	How do we know if they've all read the announcement? What if the schedule is no longer convenient for one of them?



Summary

- Scoping is important
  - What is the scope of the problem should you tackle?
  - What is the scope of the desired solution?
- Ask Who and Why questions
  - Who are the key stakeholders?
  - Why do they want this problem solved?
  - Analyze their goals.
- Ask How questions
  - How is each goal satisfied?
  - How might a new system improve things?
  - Develop scenarios.