System context

Subject facet
Usage facet
IT system facet
Development facet

Core activities

Documentation
Elicitation
Negotiation

Requirements artefacts

Goals
Scenarios
Solution oriented requirements

Validation
Management
Intention with regard to objectives, properties, or use of the system
Lecture Objectives

• Remind what stakeholders and their interests are
• Discuss principles of goal modelling
• Present different goal modelling approaches
  – $i^*$
  – KAOS
Lecture 4:

Stakeholders and Goals

- Stakeholders
  - Identifying the problem owners

- Goals
  - Identifying the success criteria
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!
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• Financial interest
• Development interest
• Usage interest
Finding stakeholders: The Org Chart

• Organization charts show
  – Areas of responsibility (flows upwards)
  – Lines of authority (delegated downwards)

• A useful tool for figuring out where the stakeholders are
  – …but remember that most activities involve connections that cross the org chart
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
Stakeholders and Goals

- Stakeholders
  - Identifying the problem owners

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Goals

• **Approach**
  – Focus on *why* a system is required
  – Use goal refinement to arrive at specific requirements
  – Goal analysis
    • document, organize and classify 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

• **Goals:**
  – Describe functions that must be carried out

• **Actors:**
  – Owners of goals

• **Tips:**
  – Multiple sources - better goals
  – Associate stakeholders with each goal
  – Use scenarios to explore how goals can be met
Goal Modeling

• **(Hard) Goals:**
  – Describe functions that must be carried out. E.g.
    • Satisfaction goals
    • Information goals

• **Softgoals:**
  – Cannot really be fully satisfied. E.g.
    • Accuracy
    • Performance
    • Security
    • ...

• **Also classified temporally:**
  – Achieve/Cease goals
    • Reach some desired state eventually
  – Maintain/Avoid goals
    • Keep some property invariant
  – Optimize
    • A criterion for selecting behaviours

• **Agents:**
  – Owners of goals
  – Choice of when to ascribe goals to agents:
    • Identify agents first, and then their goals
    • Identify goals first, and then allocate them to agents during operationalization

• **Modelling Tips:**
  – Multiple sources yield better goals
  – Associate stakeholders with each goal
    • reveals viewpoints and conflict
  – Use scenarios to explore how goals can be met
  – Explicit consideration of obstacles helps to elicit exceptions
Goal analysis

• Relationships between goals:
  – One goal **helps** achieve another (+)
  – One goal **hurts** achievement of another (-)
  – One goal **makes** another (++)
    • Achievement of goal A guarantees achievement of goal B
  – One goal **breaks** another (---)
    • Achievement of goal A prevents achievement of goal B

• Goal Elaboration:
  – **“Why”** questions explore higher goals (context)
  – **“How”** questions explore lower goals (operations)
  – **“How else”** questions explore alternatives
Softgoals

• Some goals can never be fully satisfied
  – Treat these as softgoals
    • E.g. “system be easy to use”; “access be secure”
    • Also known as ‘non-functional requirements’; ‘quality requirements’
  – Will look for things that contribute to satisficing the softgoals
  – E.g. for a train system:
Softgoals as selection criteria

- **maintain passenger comfort**
- **serve more passengers**
- **minimize operation costs**
- **minimize development costs**
- **reduce staffing**
- **improve safety**
- **clearer signalling**
- **maintain safe distance**

- **add new tracks**
- **increase train speed**
- **automate collision avoidance**
- **more frequent trains**
- **hire more operators**
- **buy new rolling stock**

- **automate braking**
- **++**
- **++**
- **++**
- **-**
- **-**
- **-**
- **-**
- **-**
- **-**
- **-**
- **-**

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• **Strategic dependency model**  
  – used to express the network of intentional, strategic relationships among actors

• **Strategic rationale model**  
  – used to express the rationales behind dependencies

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Strategic dependency model (1)

- **Actor**
  - carries out actions to achieve goals

- **Role**
  - characterization of the behavior of a social actor within some context
  - a set of **roles** typically played by one **agent**

- **Agent**
  - actor with concrete, physical manifestations, such as a human individual
  - an **agent** occupies a **position**

- **Position**
  - used between a role and an agent
  - a **position** is said to cover a **role**
Strategic dependency model (2)

- **Dependee**
  - Actor who is depended upon on a dependency relationship.

- **Depender**
  - The depending actor on a dependency relationship.

- **Dependum**
  - Element around which a dependency relationship centers.
Strategic dependency model (3)

- **Goal dependency**
  - the depender depends on the dependee to bring about a certain state of affairs in the world

- **Task dependency**
  - the depender depends on the dependee to carry out an activity

- **Resource dependency**
  - the depender depends on the dependee for the availability of an entity

- **Softgoal dependency**
  - a depender depends on the dependee to perform some task that meets a softgoal
Strategic dependency model (4)
Strategic rationale model (1)

- **Actor boundaries**
  - all of the elements within a boundary for an actor are explicitly desired by that actor
  - to achieve these elements, an actor must depend on the intentions of other actors

- **Goal (hardgoal)**
  - intentional desire of an actor

- **Softgoal**
  - criteria for the goal's satisfaction are not clear-cut
  - judged to be sufficiently satisfied from the point of view of the actor

- **Task**
  - actor wants to accomplish some specific task, performed in a particular way

- **Resource**
  - actor desires the provision of some entity, physical or informational
Strategic rationale model (2)

• **Means-ends**
  – a relationship between an end, and a means for attaining it
  – "means" is expressed in the form of a task
  – "end" is expressed as a goal

• **Decomposition**
  – task can be decomposed into four types of elements: a subgoal, a subtask, a resource, and/or a softgoal
Strategic rationale model (3)

- **Contribution**
  - **Make**: strong enough to satisfice a softgoal
  - **Some+**: positive with unknown strength
  - **Help**: not sufficient by itself to satisfice the softgoal
  - **Unknown**: polarity is unknown
  - **Break**: sufficient enough to deny a softgoal
  - **Some-**: negative with unknown strength
  - **Hurt**: not sufficient by itself to deny the softgoal
  - **Or**: satisficed if any of the offspring are satisficed
  - **And**: satisficed if all of the offspring are satisficed
Strategic rationale model (4)
KAOS
KAOS

Constructs of Goal and Agent models

• **Goal**
  – Prescriptive assertion that captures an objective which the system-to-be should meet
    • **Achieve/Cease goals**
      – Reach some desired state eventually
    • **Maintain/Avoid goals**
      – Keep some property invariant

• **Softgoals**
  – Cannot really be fully satisfied
    • Accuracy, Performance, Security

• **G-refinement**
  – Relates a set of subgoals whose conjunctions possibly together with *domain properties* contribute to the satisfaction of the goal

• **Domain property**
  – Descriptive assertion about object in the environment which holds independently of the system-to-be
KAOS

Constructs of Goal and Agent models

- **Agent**
  - Active object which plays a specific role towards goal achievement by monitoring or controlling specific object behavior

- **Assignment**
  - A possible assignment of a goal to an agent
  - **Responsibility** – an actual assignment of a goal to an agent

- A goal effectively assigned to
  - A **software agent** is called **requirement**
  - An **environment agent** is called **expectation**
KAOS

Goal and Agent (responsibility) model
Explore Context

• “Why” questions explore higher goals
  – Rationale for the initial goals
  – Companion subgoals that were overlooked in the first place
Explore Context

• “Why” questions explore higher goals
  – Rationale for the initial goals
  – Companion subgoals that were overlooked in the first place

Why?

```
Crucial planning decision be made

Decision be made face-to-face

Meeting be scheduled
```

Why?
Look for Alternatives

• “How else” questions explore alternatives
  – Better solutions to the higher level goals
  – Different design of the system-to-be

Alternatives
Elicit Operations

- “How” questions explore lower goals
  - Refine goals until reaching subgoals that can be assigned to individual agents
Elicit Operations

- Decision be made by email discussion
  - Crucial planning decision be made
  - Agenda be defined
  - Meeting be requested
    - Meeting be scheduled
    - Date and location set
    - Attendees know details
    - Changes be handled
      - Minutes be circulated
      - Attendance confirmed
      - Participants notified
      - Change requests accepted
      - Participants notified
      - Change requests accepted
      - Room availability determined
      - Meeting announced
      - Facilities booked
      - Participant availability known
      - Attendee list obtained
      - AV & other needs defined
When the refinement should stop?
Responsibility assignment

- **Refine goals into subgoals**
  - Latter require the cooperation of fewer agents

- **Stop refining a goal**
  - Goal is assigned as the responsibility of a single agent

- **Alternative goal responsibility assignments**
  - Different design of system-to-be
KAOS

Constructs of Operation model

• Operation
  – An input/output relation over objects
  – Define state transition

• Operationalisation
  – Relationship between goal and operation

• Performs
  – Agent performs operations
KAOS

Operation model

- Check time of last agenda entry
- Update agenda with new information
- Maintain [Participant agenda up to date]
- Scheduler
- Agenda
  - meetingDates: Date
Lecture Objectives

- Remind what stakeholders and their interests are
- Discuss principles of goal modelling
- Present different goal modelling approaches
  - $i^*$
  - KAOS
Take Home!

• **Stakeholders**
  – Identifying the problem owners

• **Goals**
  – Identifying the success criteria

• **Social Modelling**
  – Early requirements
  – Late requirements
  – Architecture design
  – Detailed design
Example Goal Elaboration

Crucial planning decision be made

Decision be made by email discussion

Meeting be requested

Attendee list obtained

AV & other needs defined

Attendees' preferences known

Room availability determined

Meeting be scheduled

Date and location set

Facilities booked

Meeting be held

Attendees know details

Minutes be circulated

Meeting be held

Attendance confirmed

Changes be handled

Meeting announced

Change requests accepted

Participants notified