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
Lecture 4:

Stakeholders and Goals

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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

- minimize costs
- serve more passengers
- maintain passenger comfort
- improve safety
- maintain safe distance
- clearer signalling

- reduce staffing
- minimize operation costs
- minimize development costs

- add new tracks
- automate braking
- increase train speed
- automate collision avoidance
- more frequent trains
- hire more operators
- buy new rolling stock
- maintain passenger comfort
http://istar.rwth-aachen.de/

Tropos
Secure Tropos
...

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

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

- **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

- **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

Date range entered --> Initiator

Date range entered --> Participant

Participants are inquired --> Scheduler

Available dates obtained --> Agreeable slot found

Agreeable slot found --> Agreement obtained and stored

Agreement obtained --> Scheduler

Available dates stored --> Participant

Agreement obtained --> Scheduler

Available dates entered --> Participant

Agreement confirmed --> Participant

Date agreed --> Participant

Proposed date sent --> Participant
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
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
- Decision be made face-to-face
  - Agenda be defined
  - Meeting be scheduled
  - Meeting be held
  - Minutes be circulated
  - Meeting be requested
  - Date and location set
  - Attendees know details
  - Changes be handled
    - Attendee list obtained
    - AV & other needs defined
    - Participant availability known
    - Facilities booked
    - Attendance confirmed
    - Change requests accepted
Elicit Operations

When the refinement should stop?

- Crucial planning decision be made
  - Decision be made by email discussion
  - Decision be made face-to-face
    - Data are location set
      - Attendee list obtained
        - AV & other needs defined
      - Facility booked
        - Room availability determined
      - Meeting announced
        - Change requests accepted
  - Attendee know details
    - Minutes be circulated
      - Participants notified
        - Attendance confirmed
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