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!
Stakeholders

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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

• Stakeholders
  – Identifying the problem owners

• Goals
  – Identifying the success criteria
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**
- **improve safety**
- **reduce staffing**
- **minimize operation costs**
- **minimize development costs**
- **clearer signalling**
- **maintain safe distance**
- **maintain passenger comfort**
- **automate collision avoidance**
- **automate braking**
- **increase train speed**
- **more frequent trains**
- **add new tracks**
- **hire more operators**
- **buy new rolling stock**
- **incrementally increase**
- **incrementally decrease**
http://istar.rwth-aachen.de/

Tropos

Secure Tropos

...
• **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

- **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
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
Look for Alternatives

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

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

- Crucial planning decision be made
  - 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
    - Participant availability known
    - Facilities booked
    - Meeting announced
    - Change requests accepted
    - AV & other needs defined
    - Room availability determined
    - Attendance confirmed
    - Participants notified
When the refinement should stop?
• **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
- Decision be made face-to-face

Or-decomposition

Agenda be defined
- Meeting be scheduled
- Meeting be held
- Minutes be circulated

Date and location set
- Room availability determined

Attendees know details
- Facilities booked
- Attendance confirmed

Meeting be held
- Meeting announced
- Change requests accepted

Meeting be requested
- Attendee list obtained
- AV & other needs defined

Participants notified

Decision be made by email discussion, or face-to-face decision, with further steps to define agenda, schedule a meeting, hold the meeting, and distribute minutes. Attendees are informed of details, and room availability is confirmed. This process includes proposing a meeting, obtaining attendee lists, defining AV and other needs, and notifying participants.