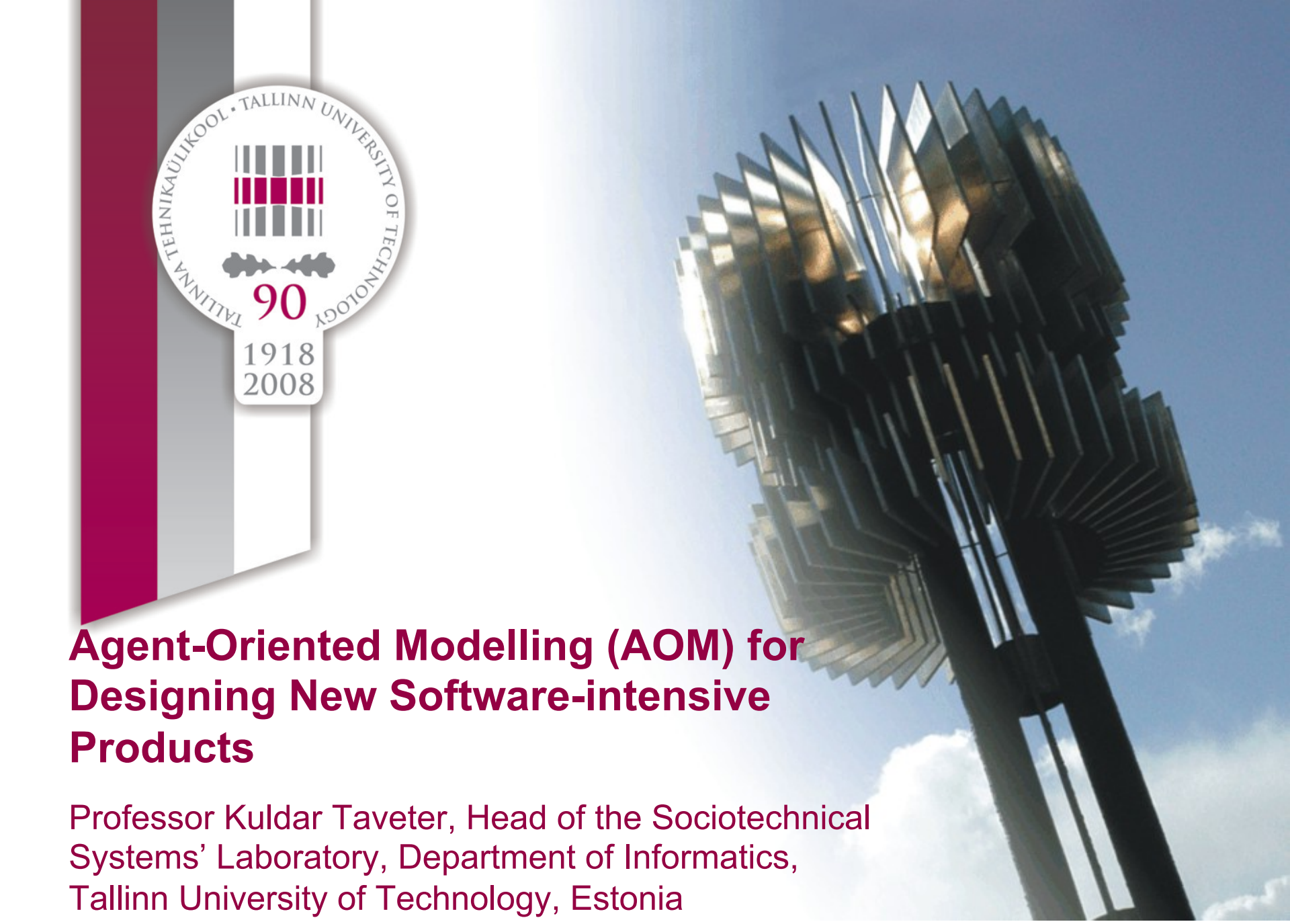

Agent-Oriented Modelling (AOM) for Designing New Software-intensive Products

Professor Kuldar Taveter, Head of the Sociotechnical Systems' Laboratory, Department of Informatics, Tallinn University of Technology, Estonia

Who am I?

- Name: Kuldar Taveter
- Position: Professor in Software Engineering, Head of the Laboratory of Sociotechnical Systems
- Education:
  - **Dip.Eng., TUT, 1988**
  - **M.Sc., TUT, 1995**
  - **Ph.D., TUT, 2004**
- Work experience:
  - **1985-1989: Institute of Cybernetics**
  - **1989-1993: Private companies**
  - **1993-1998: Department of Informatics of TUT**
  - **1997-2005: Technical Research Centre of Finland**
  - **2005-2008: The University of Melbourne, Australia**
  - **2008- : Department of Informatics of TUT**
  - **Jan-Aug 2011: University of South Carolina, USA**
  - **Apr – May 2016: Shanghai University for Science andTechnology, China**
- Research areas: Agent-oriented software engineering, engineering of sociotechnical systems, multiagent systems, intelligent systems

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What is design?

- A specification of an **artifact**, manifested by an **agent**, intended to accomplish **goals**, in a particular **environment**, using a set of **components**, satisfying a set of **requirements**, subject to **constraints**

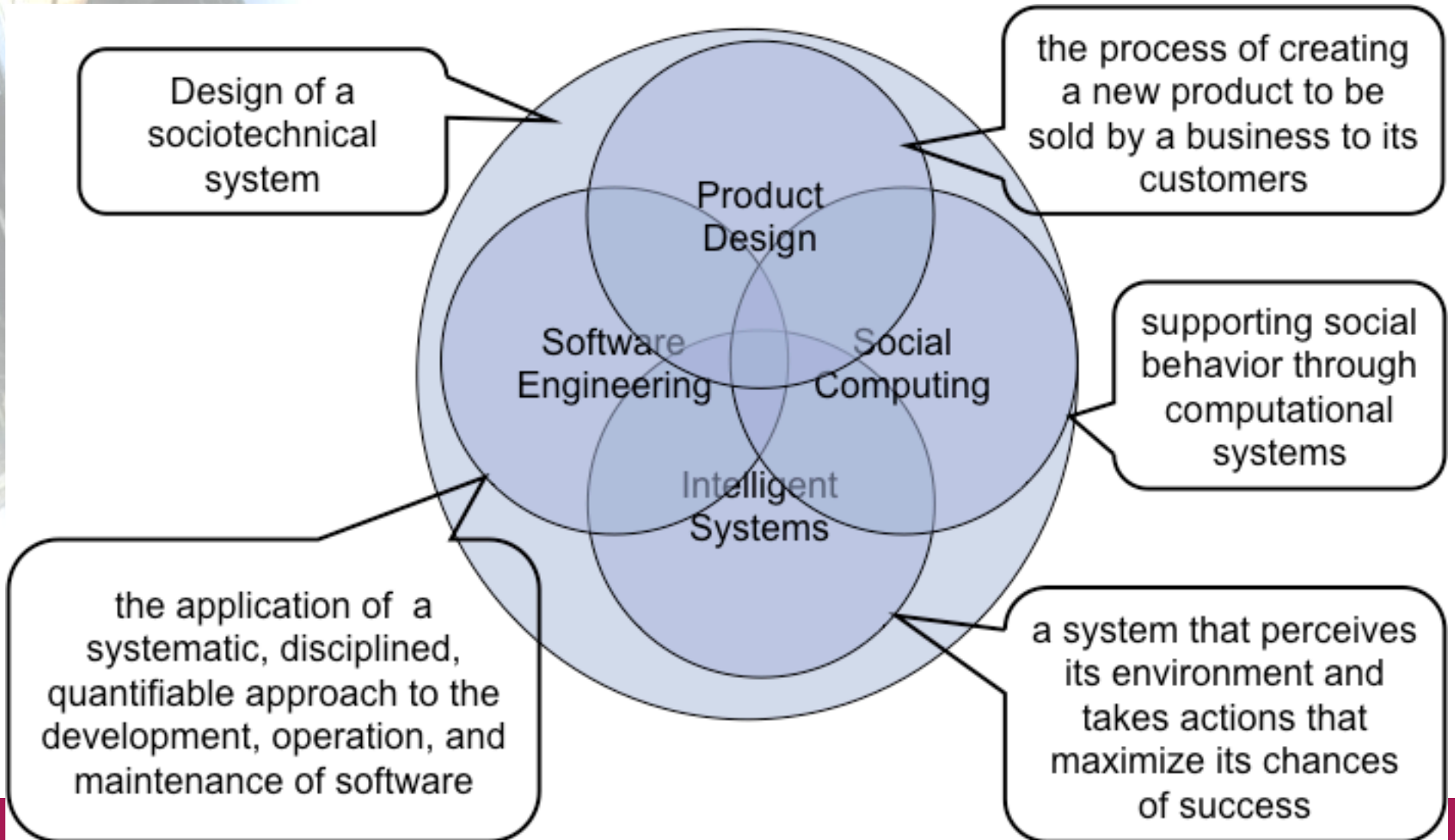
What is the artifact?

- The entity (or class of entities) being designed. Note: this entity is not necessarily a physical object.
- Classes of artifacts:
  - **physical artifacts**, both simple, such as boomerangs (single-component), and composite, such as houses (made of many types of components)
  - **processes**, such as business workflows
  - **symbolic systems**, such as programming languages
  - **symbolic scripts**, such as essays, graphic models, animations, and software
  - **laws, rules and policies**, such as a criminal code
  - **human activity systems**, such as software design projects, committees and operas

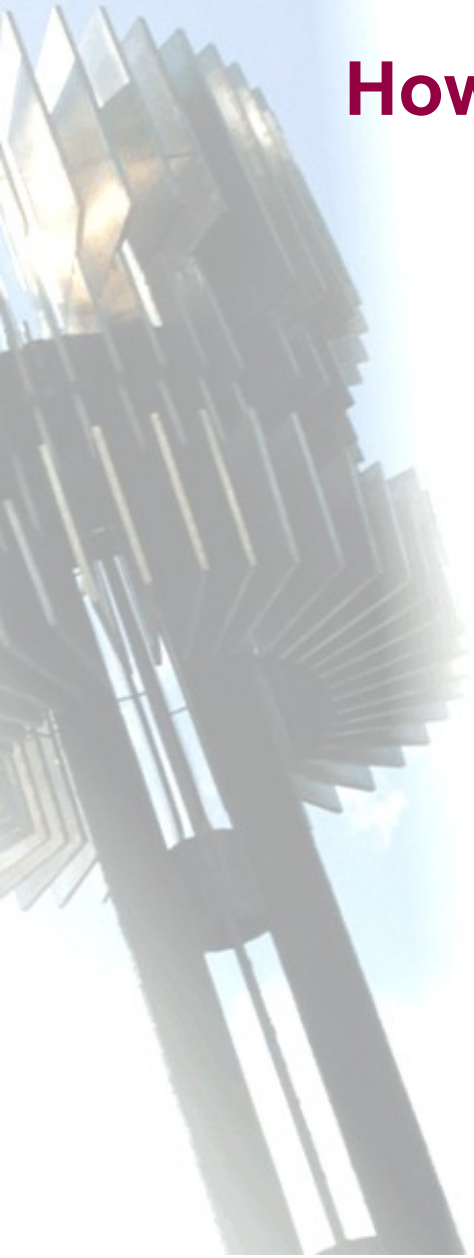
What is the artifact in our course?

- Software-intensive system with components embedded in physical devices or products

How is this course positioned?



How to represent a vision?



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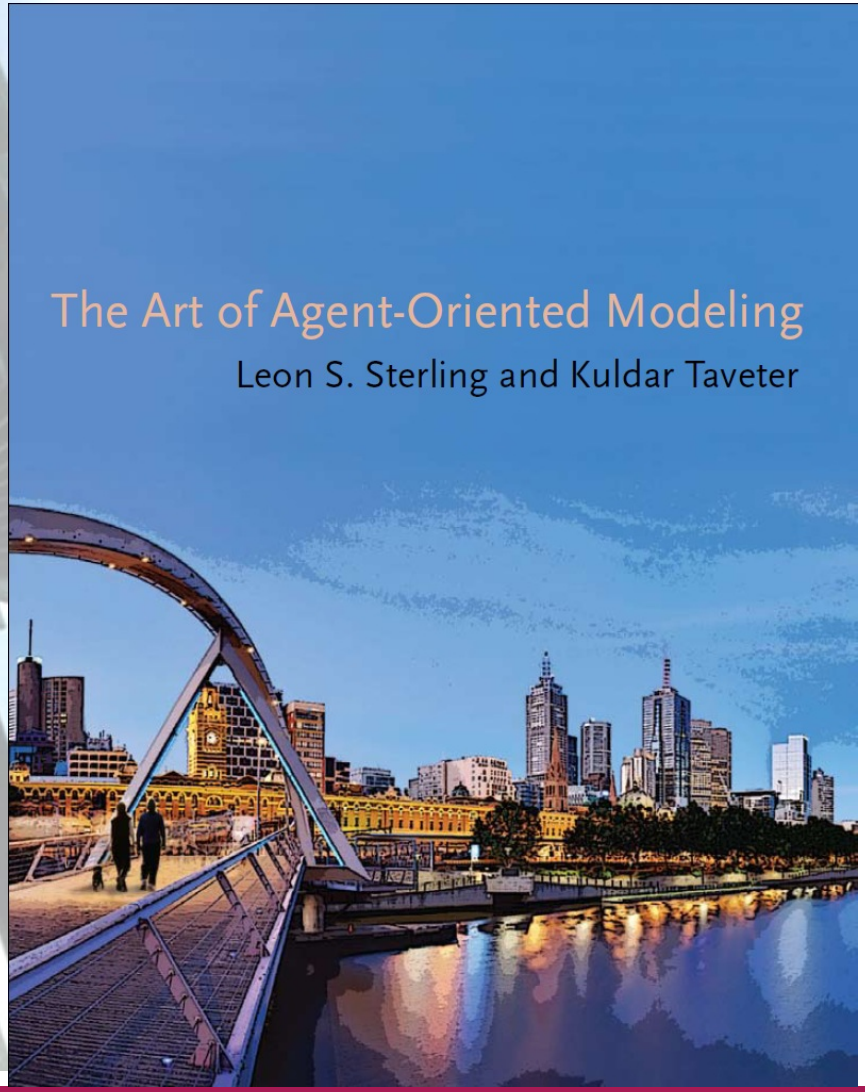
Agent-oriented modeling (MIT Press, 2009)



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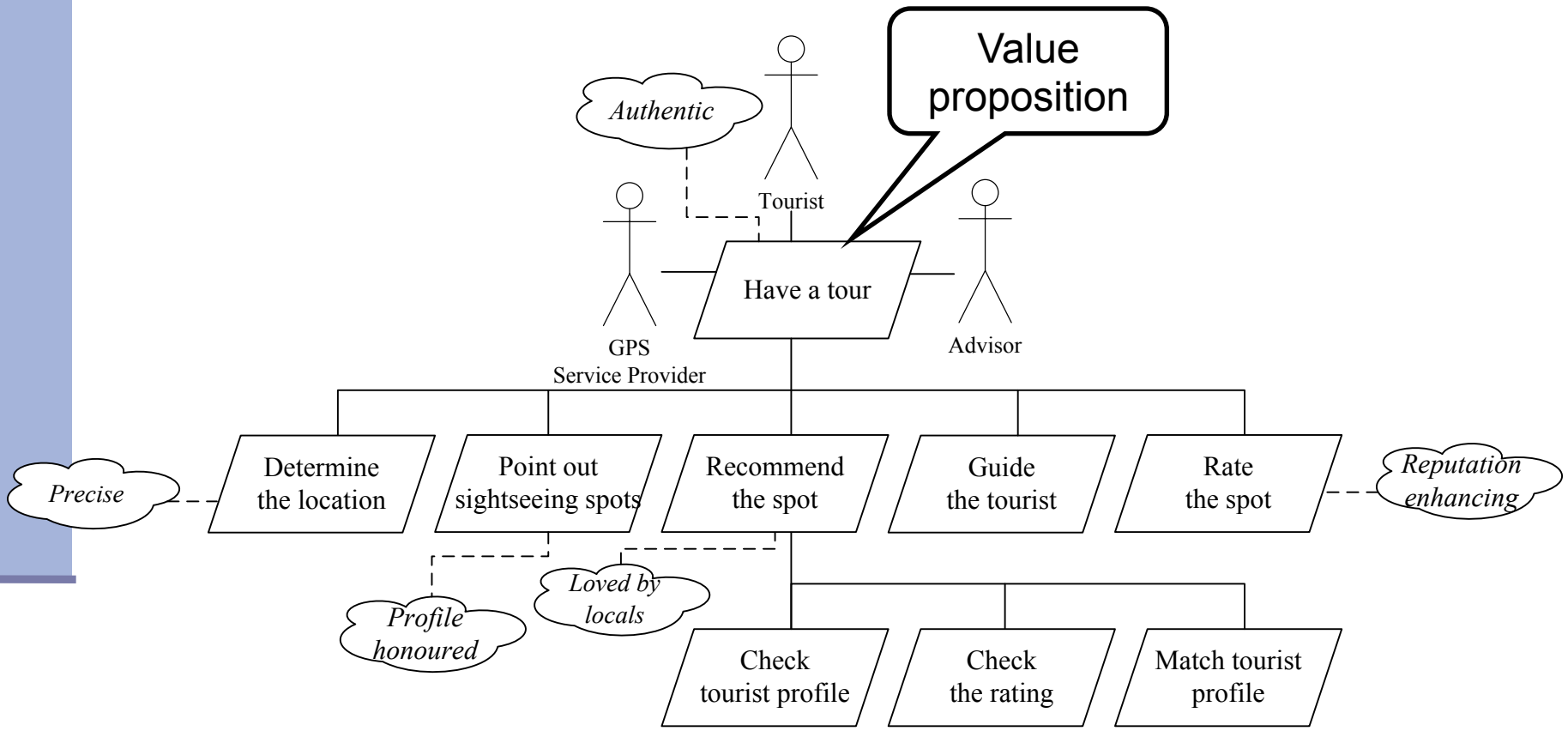
Notation for goal models

Symbol	Meaning
	Goal
	Quality goal
	Role
	Relationship between goals
	Relationship between goals and quality goals

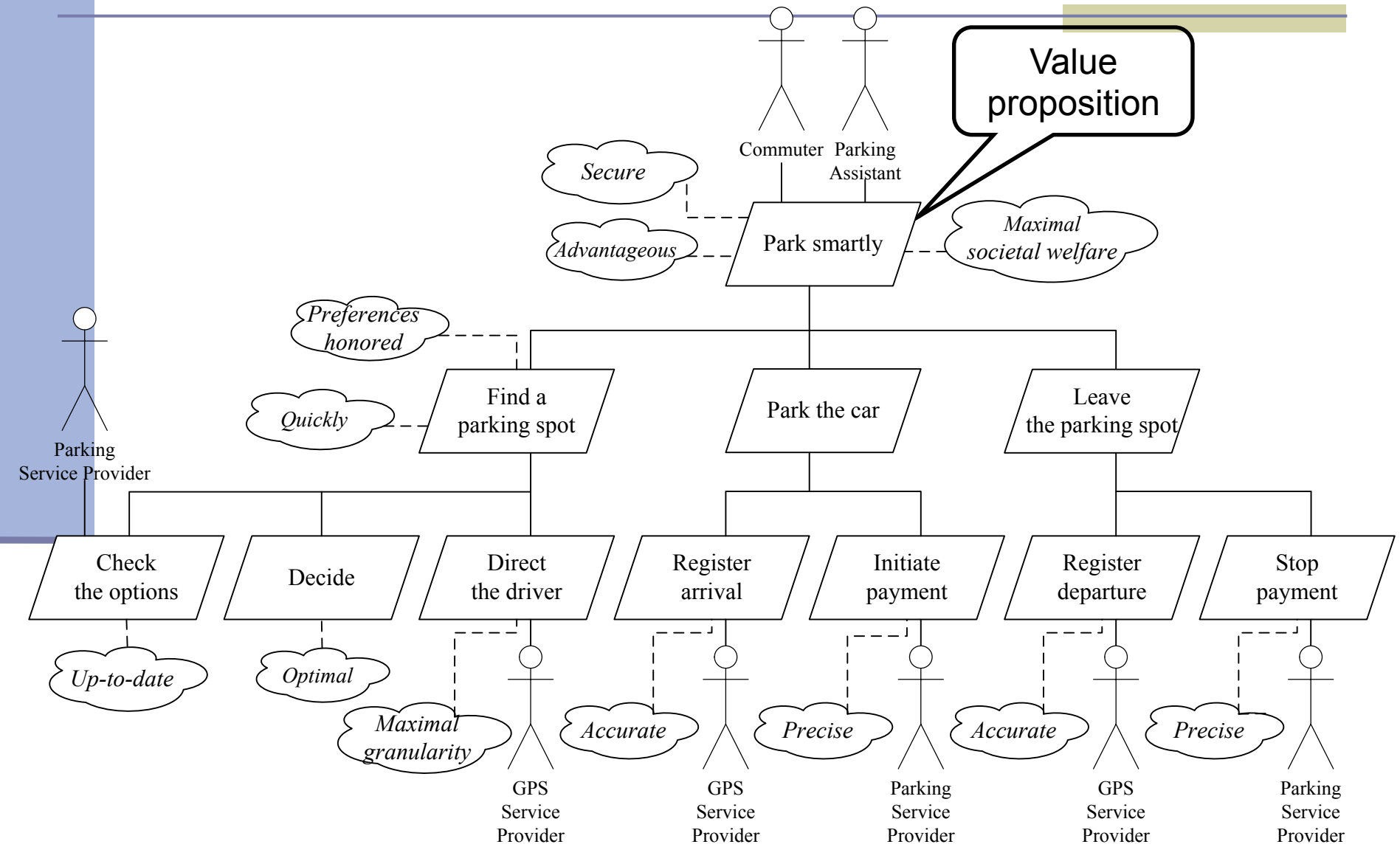
Tourist advisor

Goal model for tourist advisor



Smart parking

Goal model for smart parking

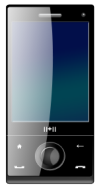


Fair grocery shopping

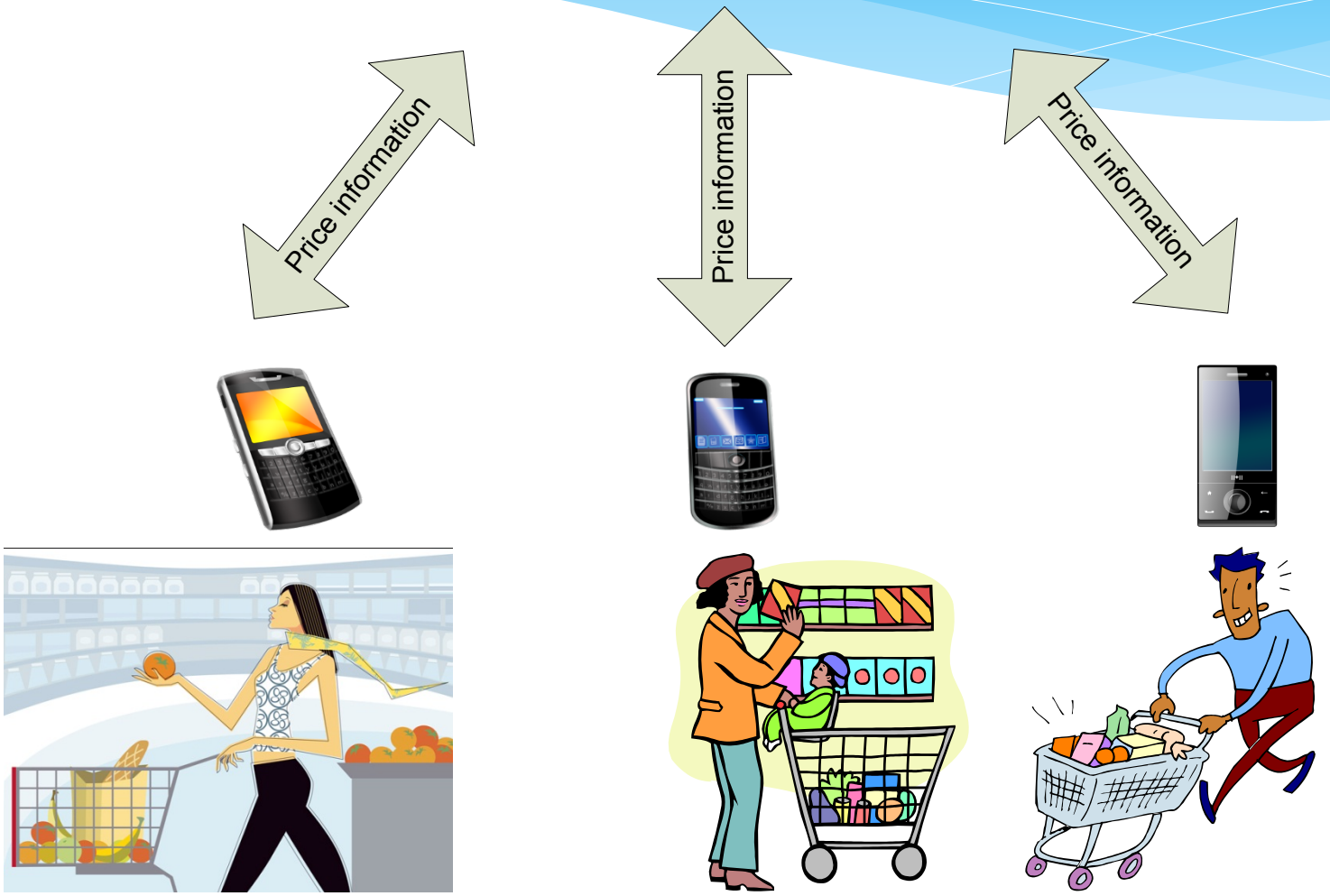
Product information

Product information

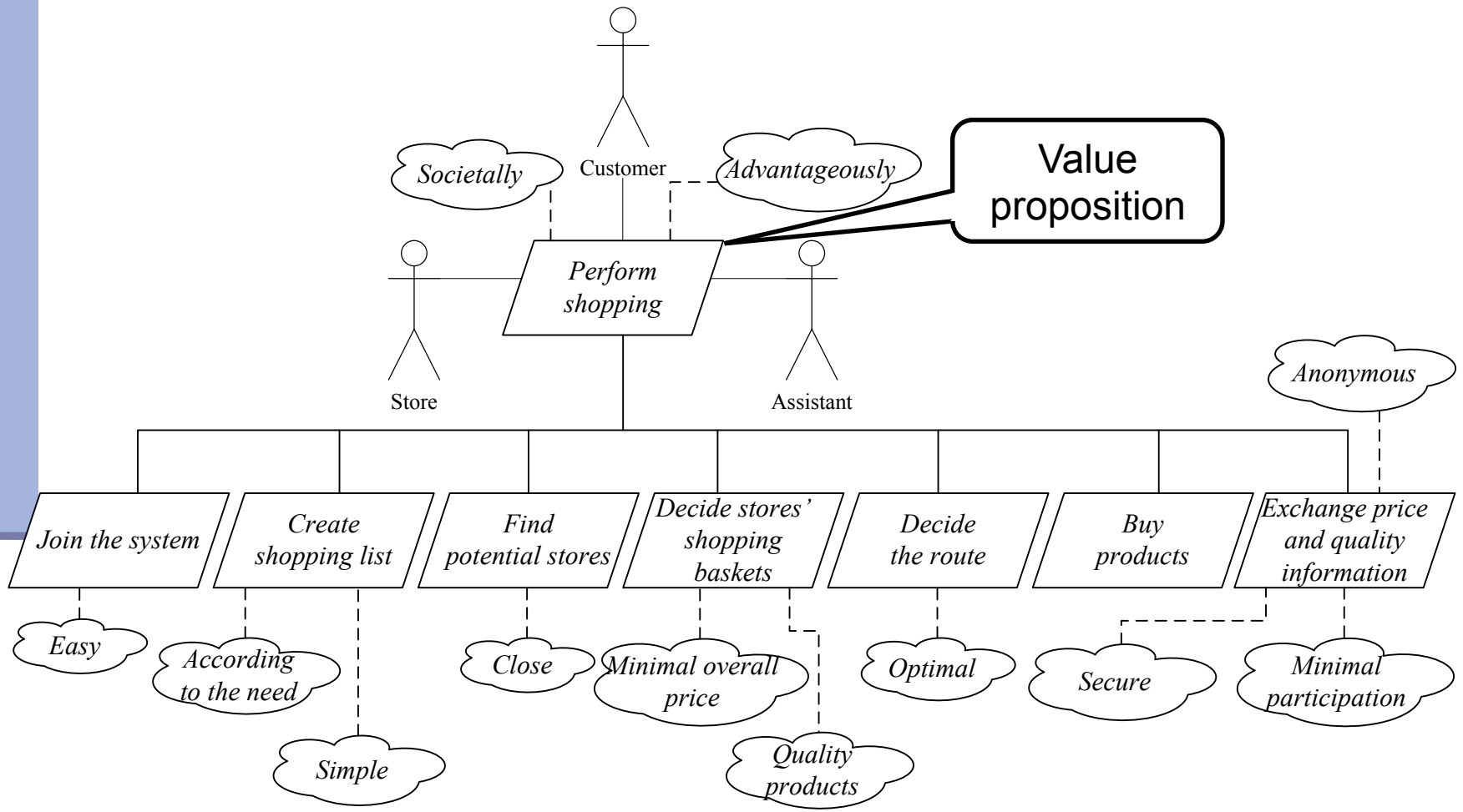
Product information



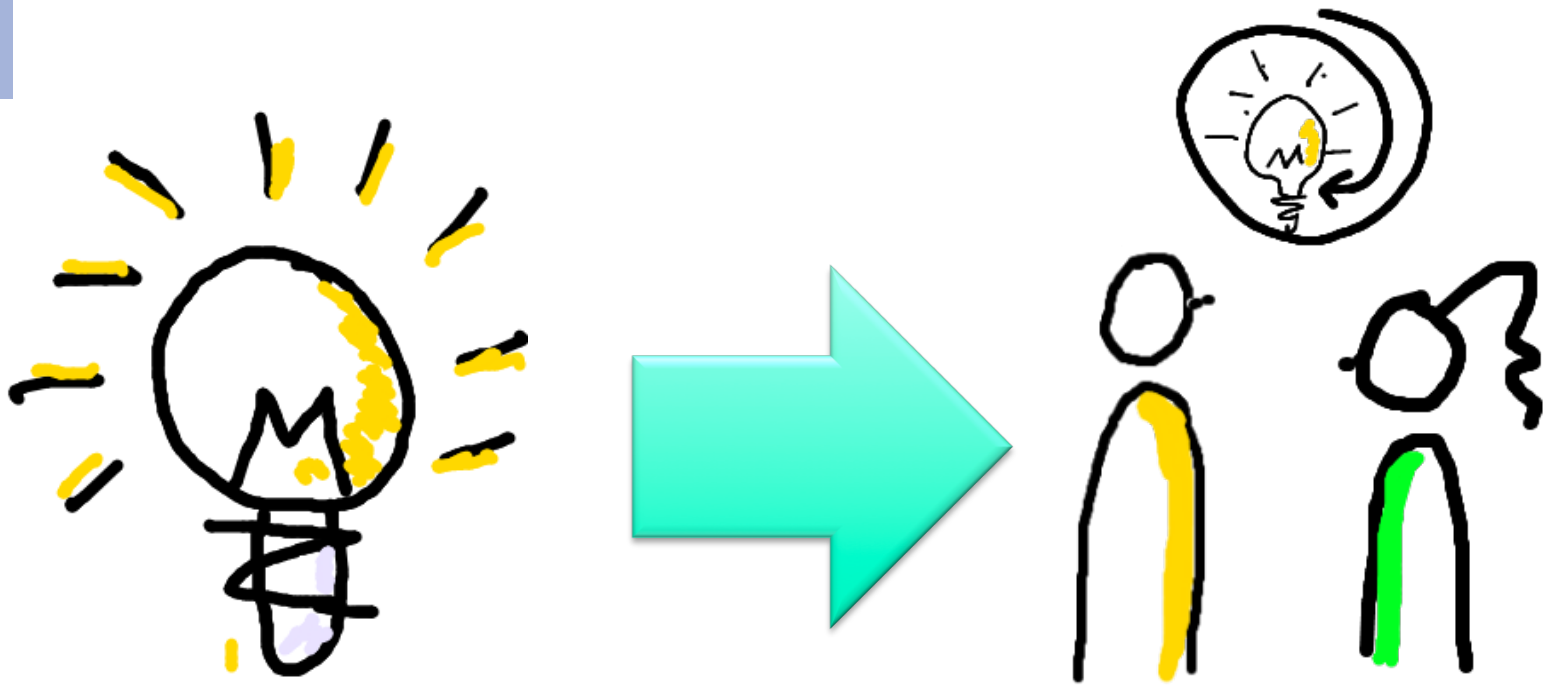
Fair grocery shopping



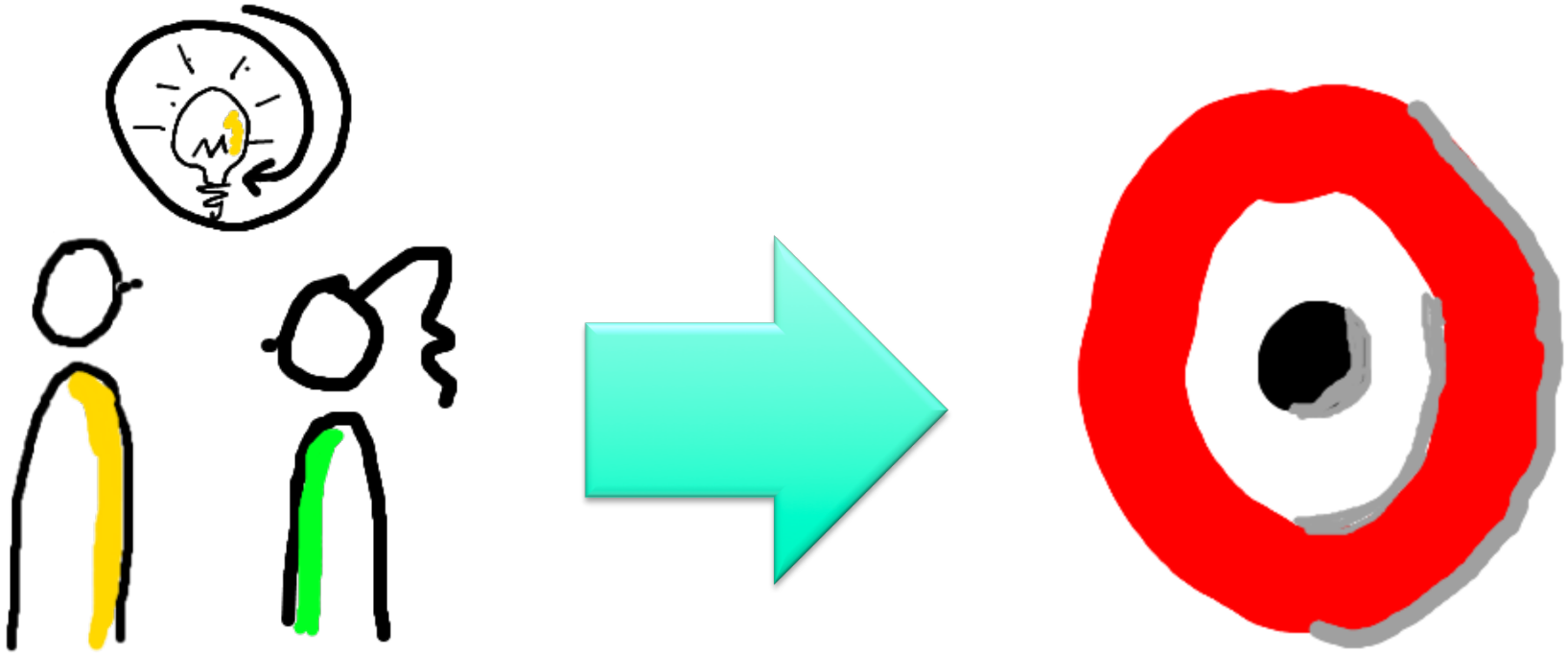
Goal model for fair grocery shopping



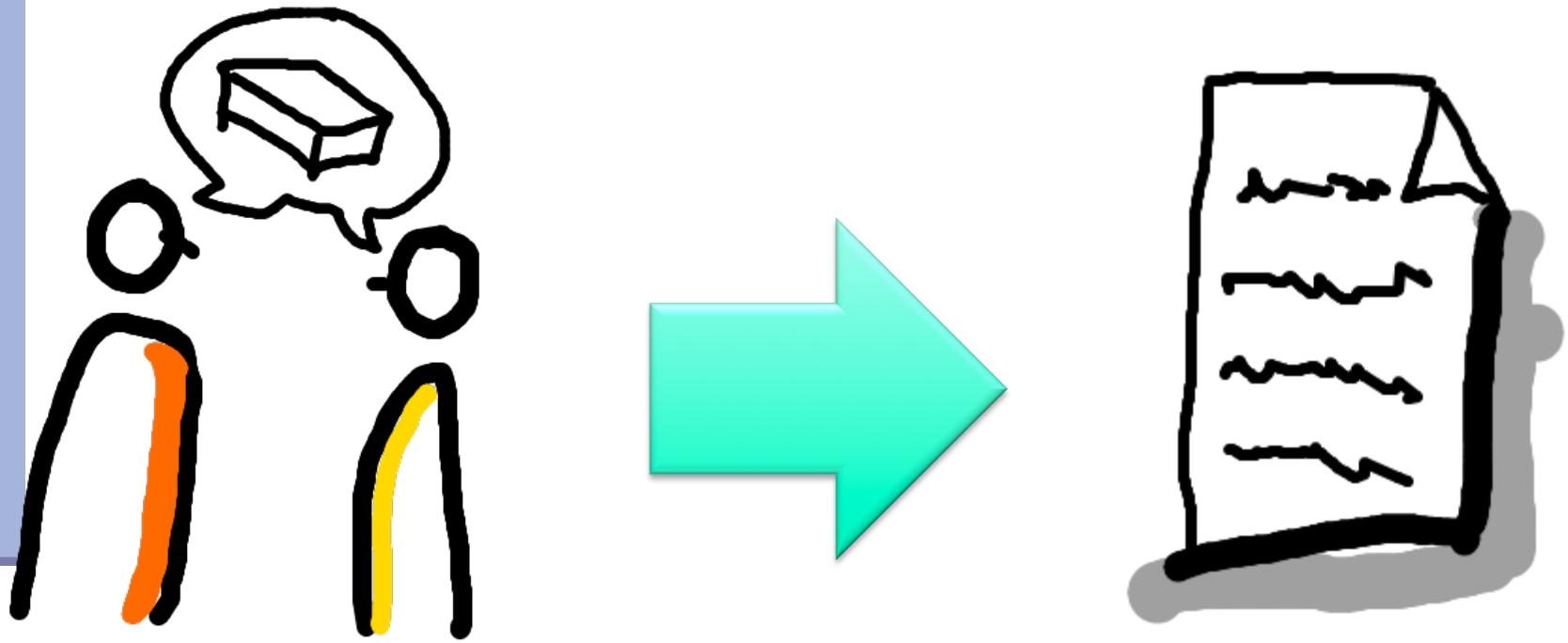
First an Idea



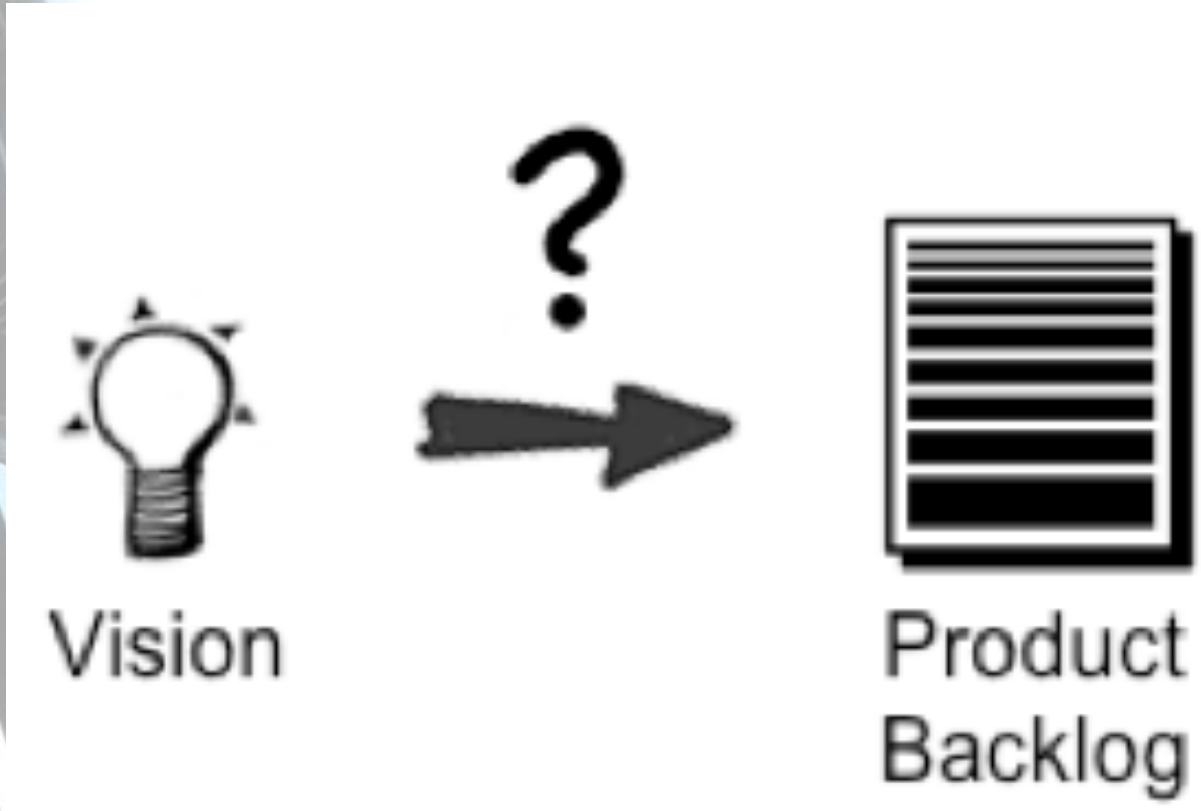
Then a Vision



Then a Product Backlog

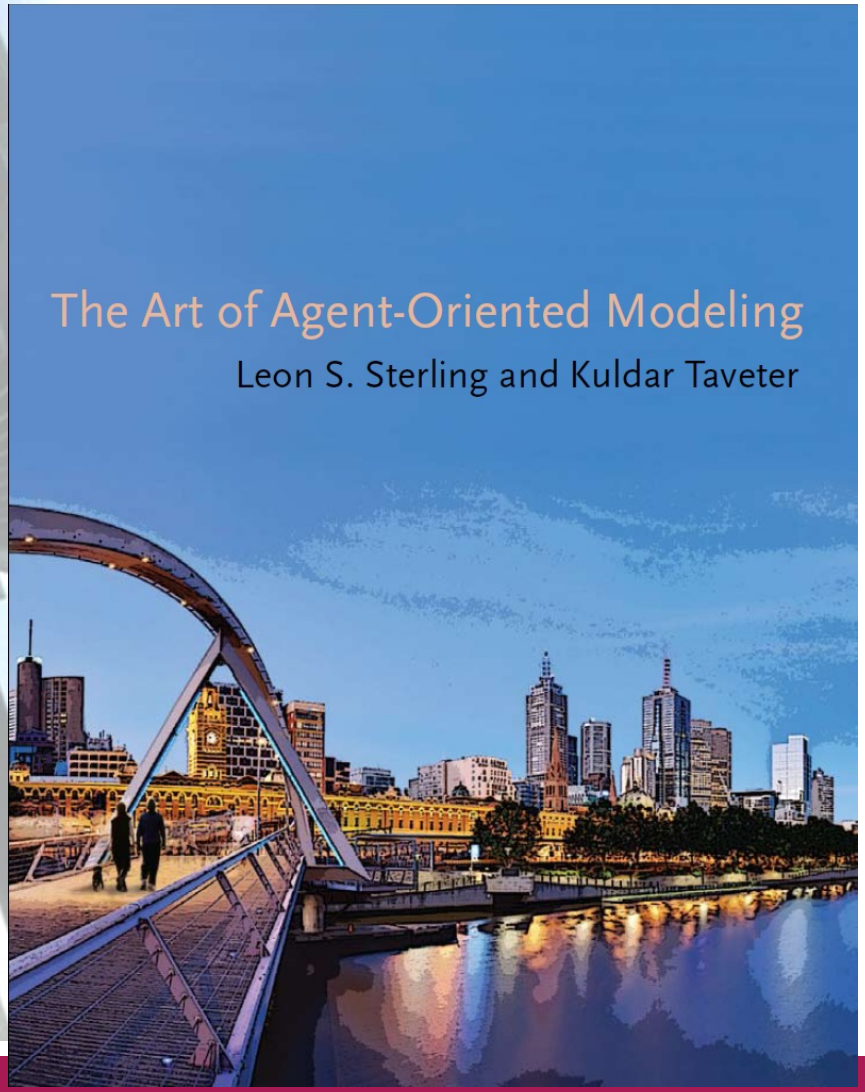


How to create Product Backlog?

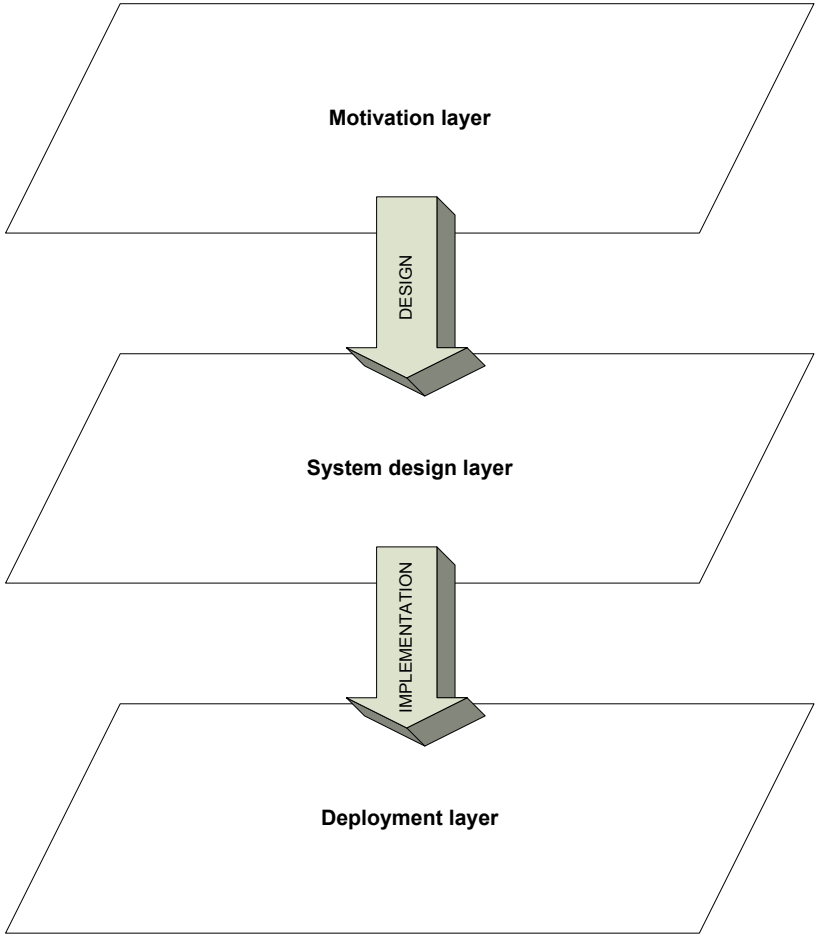


How to manage Product Backlog?

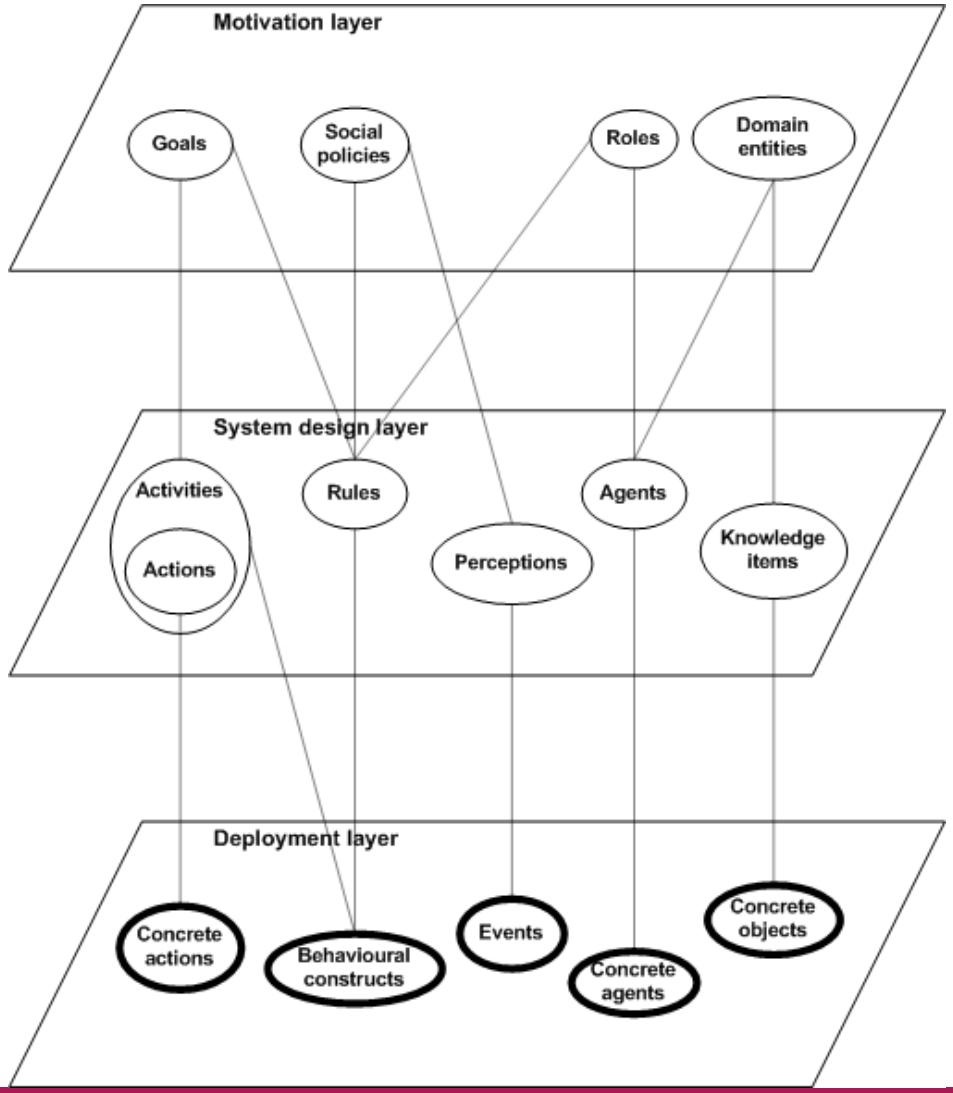
The methodology of Agent-Oriented Modelling (AOM)



Conceptual space for design



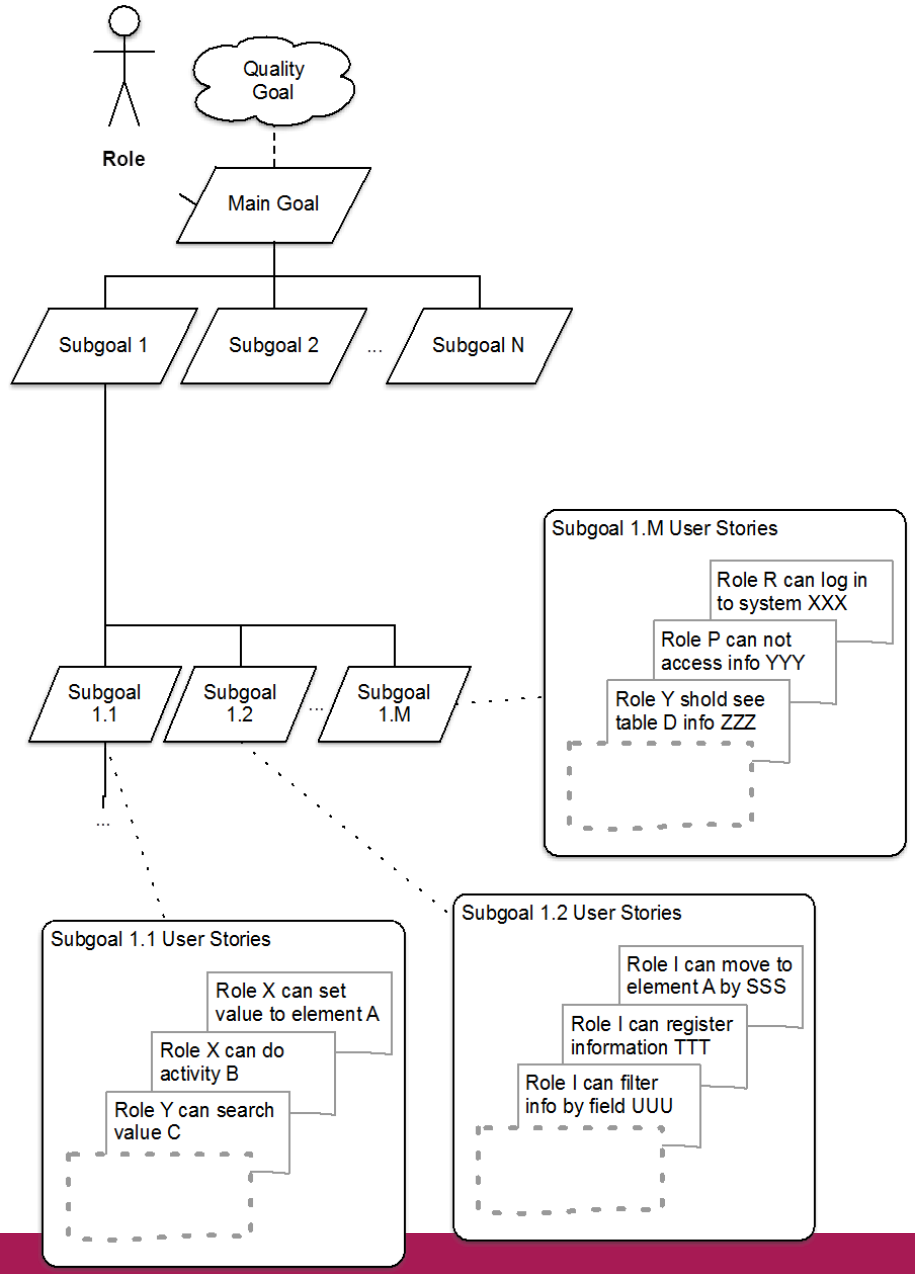
Conceptual space populated with concepts



Agile Agent-Oriented Modeling (Kuldar Taveter, Tanel Tenso)

- Problem domain (product backlog) is presented as a goal model
- A goal model connects functional requirements, quality requirements, and roles
- A goal model is constantly updated within iterations of an agile design process

Agile AOM (AAOM)

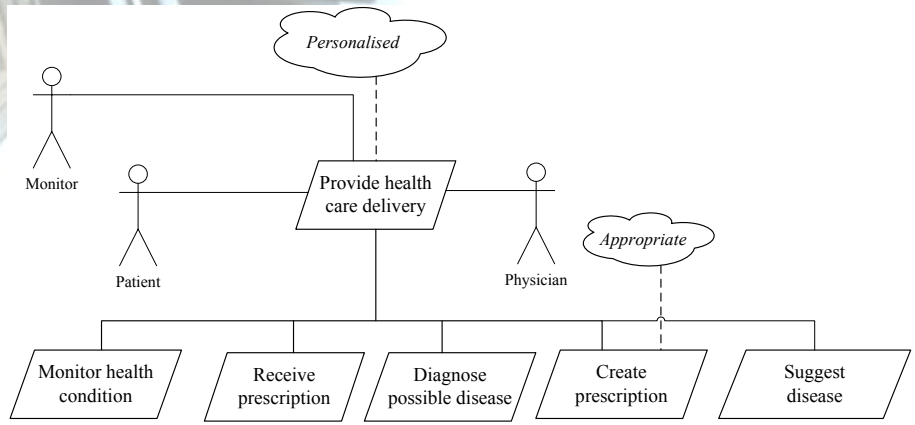


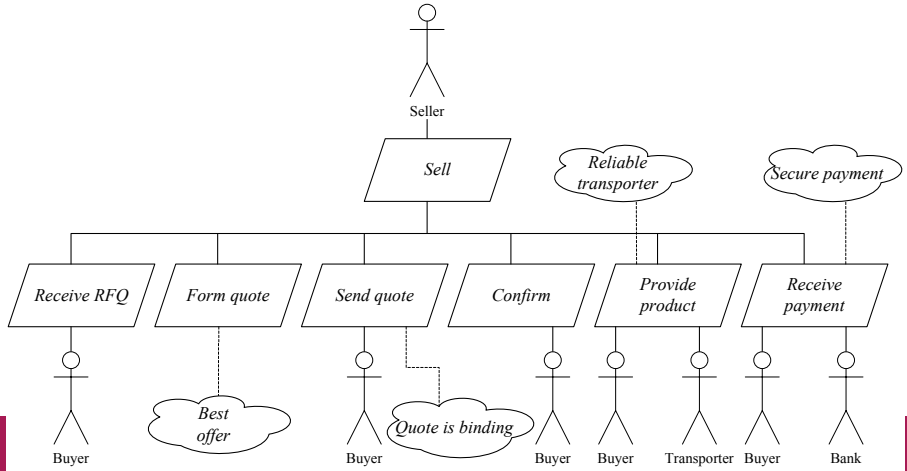
User stories

- As a user playing some role, I must be able to perform some activities [in order to achieve some goal]

Examples of user stories

- As a user playing some **role**, I must be able to **do something** in order to **achieve some goal**
- Example 1: As a *Receptionist* I want to *Register patient* to *Monitor health condition*
- Example 2: As a *Seller* I want to *Ship order* to *Provide product*





Other examples

- Issue Management
- Simulation of crisis management (EU FP7 project)

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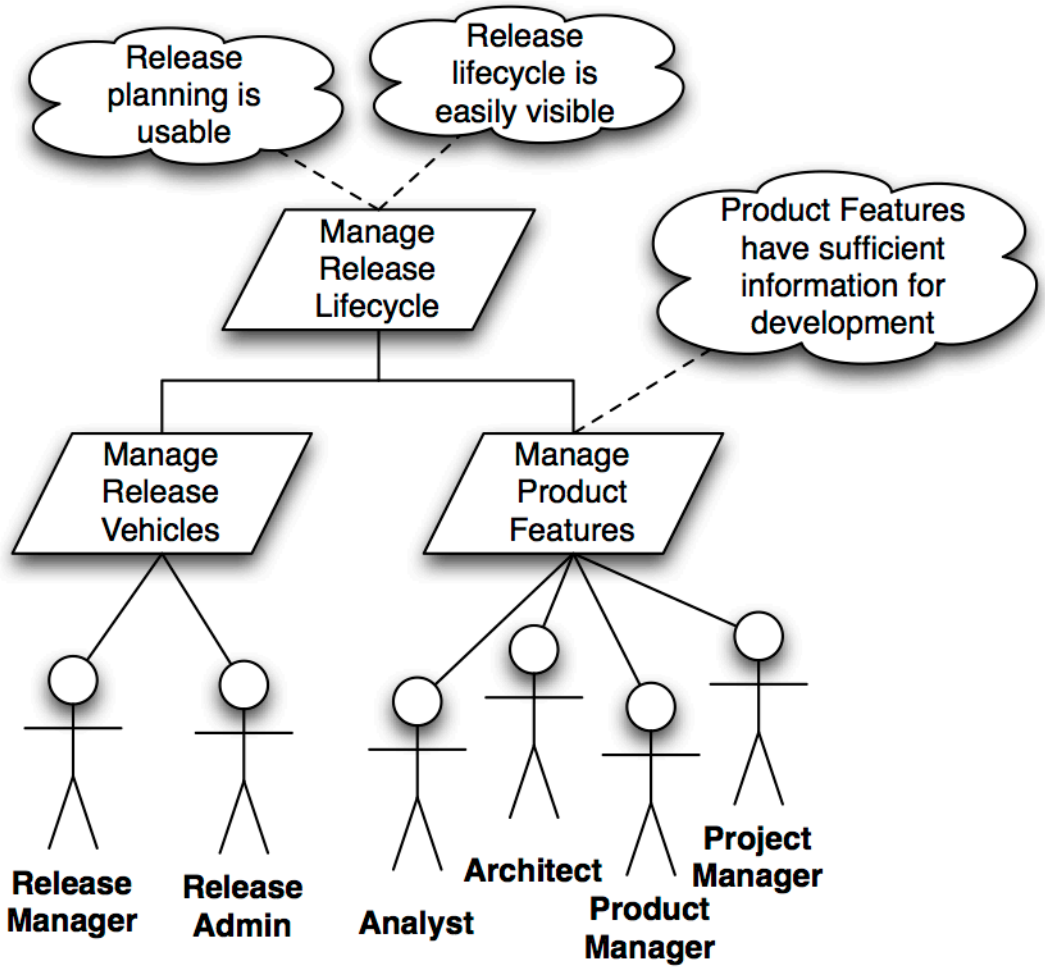
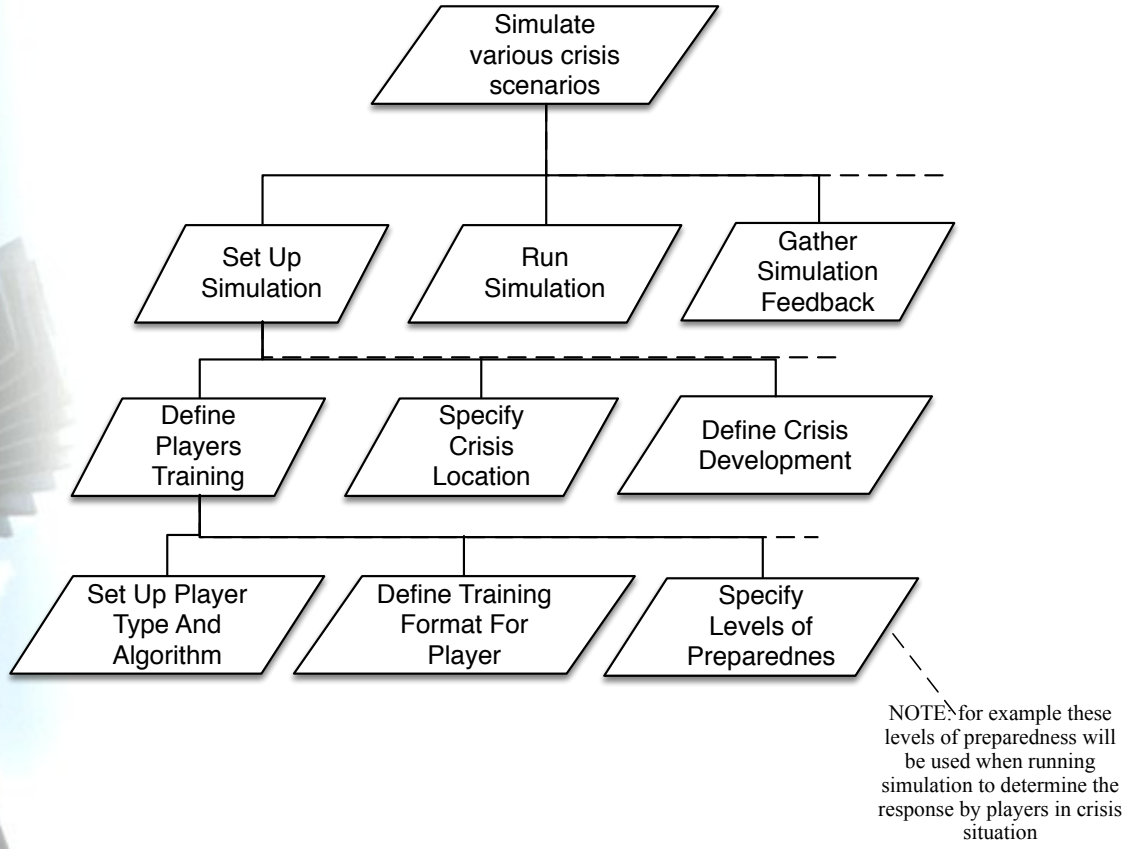
Goal model for the application of issue management



User stories for the sub-goal “Manage Release Vehicles”

- As a (human playing the role of) Release Admin, I must be able to add a new Release Vehicle to manage release vehicles;
- As a Release Admin, I must be able to change Release Vehicles to manage release vehicles;
- As a Release Manager, I must be able to see a list of Release Vehicles to manage release vehicles;
- As a Release Manager, I should not be able to edit a list of Release Vehicles to manage release vehicles;
- As a Release Manager or Release Admin, I should be able to sort a list of Release Vehicles into the ascending or descending order to manage release vehicles.

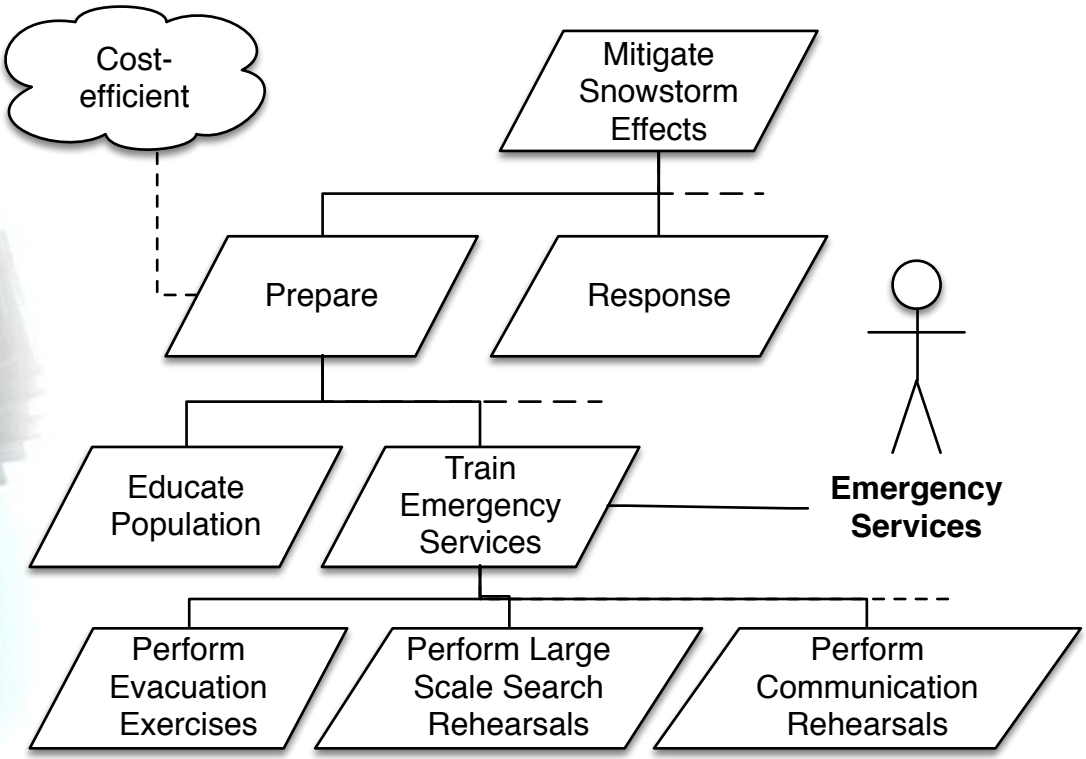
A goal model for the application of crisis management simulation



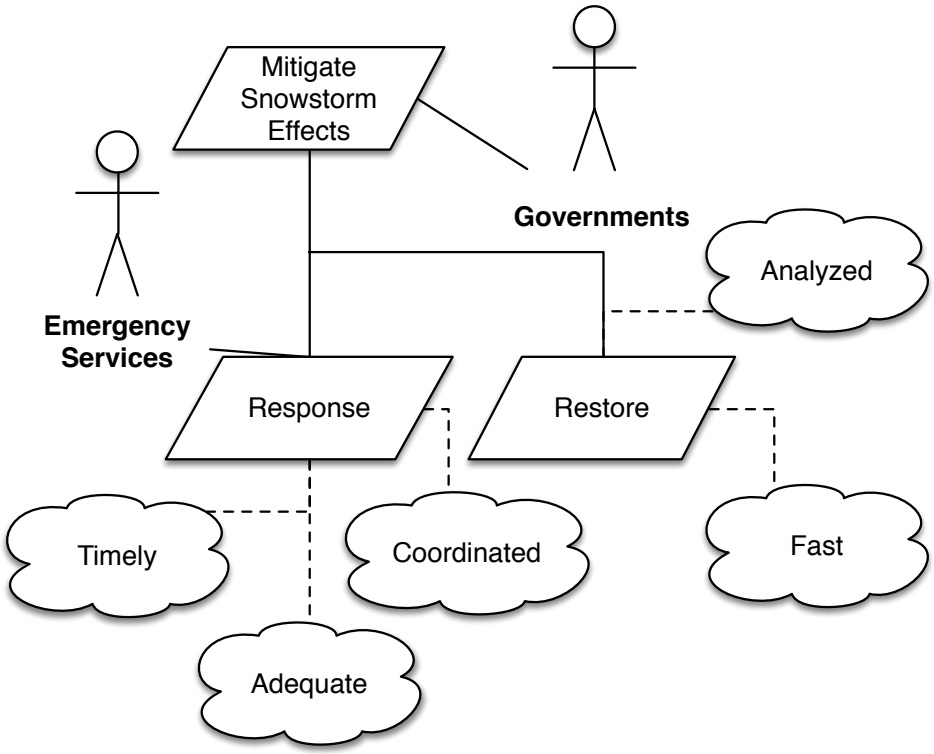
User stories for the sub-goal “Set Up Player Type and Algorithm”

- As a Simulation Model Administrator, I want to define the “Snowstorm Training” type of training for a player of the “Emergency Service” type to set up player type and algorithm
- As a Simulation Model Administrator, I want to define other types of training for a player of the “Emergency Service” type to set up player type and algorithm. NOTE: training types are “Earthquake Training”, “Chemical Burn Training”, etc.

A goal model for the functionality of the application



Elaborated goal model



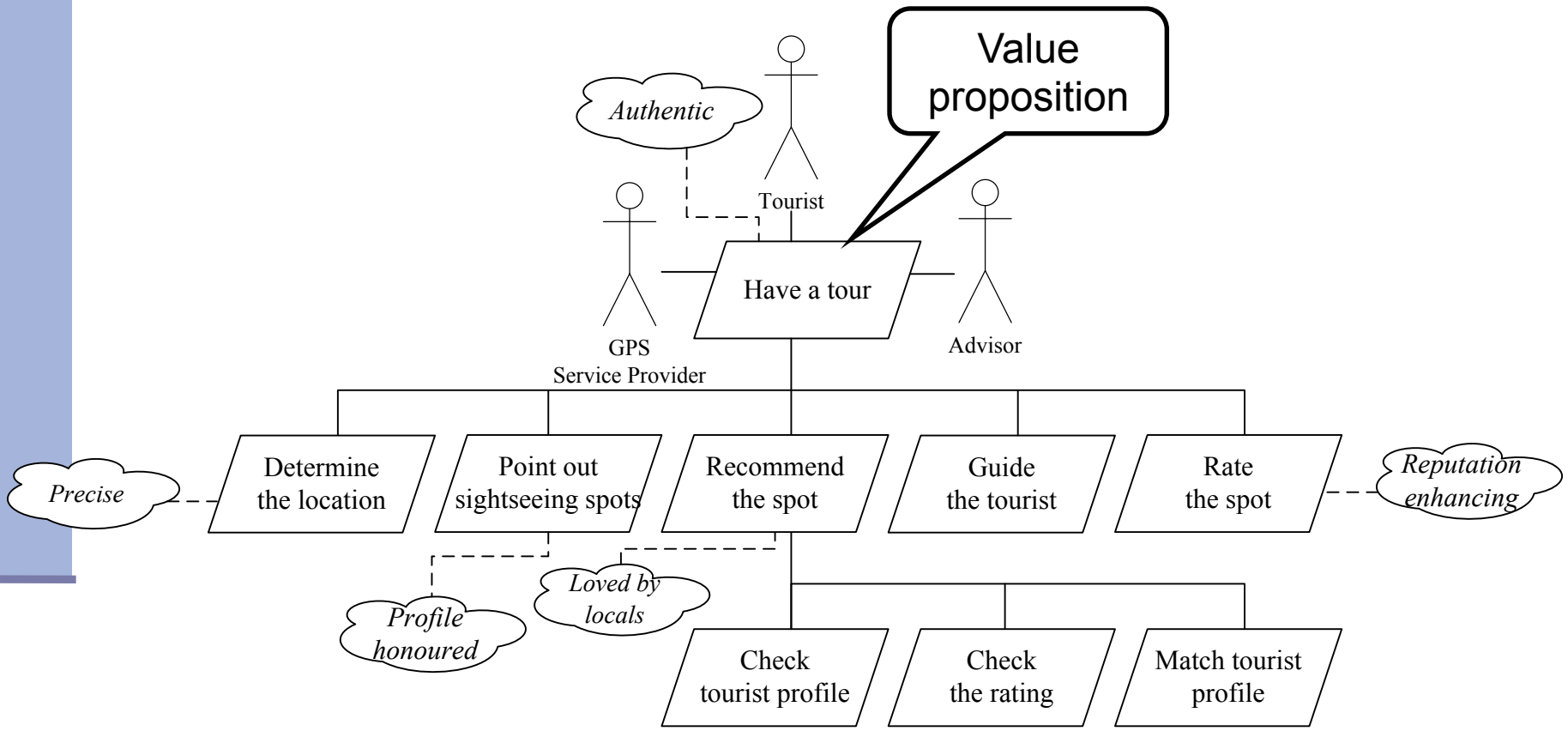
Example of Product Backlog

As a	I want to	So that (I can)	Business Value	Estimate
HR Manager	Publish new vacancies	Find candidates	80	20
Job Hunter	Apply for a job	Quickly apply for a job	80	40
HR Manager	Triage applicants	Politely eliminate unpromising candidates	50	8
Googlebot	effectively find and index all postings	Ensure that internet searchers can find job postings on this site	50	13
System Admin	quickly recognize and analyze system	ensure rapid resolution of technical problems	30	20

Example of Sprint Backlog

User Story	Tasks	Day 1	Day 2	Day 3	Day 4	Day 5	...
As a member, I can read profiles of other members so that I can find someone to date.	Code the ...	8	4	8	0		
	Design the ...	16	12	10	4		
	Meet with Mary about ...	8	16	16	11		
	Design the UI	12	6	0	0		
	Automate tests ...	4	4	1	0		
	Code the other ...	8	8	8	8		
As a member, I can update my billing information.	Update security tests	6	6	4	0		
	Design a solution to ...	12	6	0	0		
	Write test plan	8	8	4	0		
	Automate tests ...	12	12	10	6		
	Code the ...	8	8	8	4		

Hands-on-exercice (Alternative 1): Elaborate the below goal model into user stories!

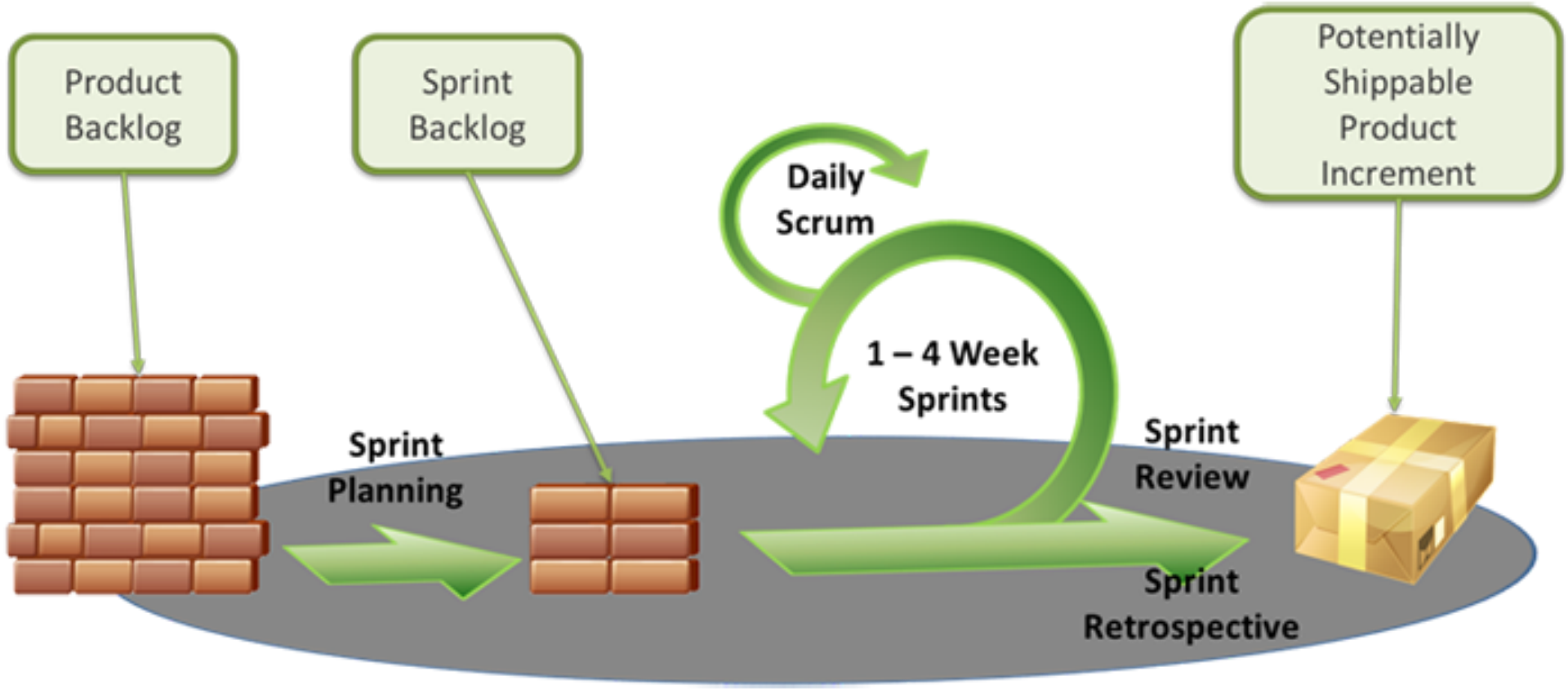


Hands-on exercise (Alternative 2): Create a goal model for your product idea

Artifacts in agile methodologies

- Lean Startup: *validated learning* vs. working software
- Lean UX: *delivered value* vs. working software

Iterations of Scrum



Conclusions

- Presentation and elaboration of problem domain is of critical value
- Analysis should be included in the iterative loop
- Sprint backlog has a goal
- User stories describe the implementation of (business) goals
- User stories are divided into tasks
- Business goal = Potentially Shippable Product Increment