

Chapter 4



Prof. Dr. Harald Störrle
Danmarks Tekniske Universitet (DTU)

Chapter 4: Stakeholders and Goals

DTU course 02264

Abstract

- People with vested interest (“stakes”) in a system are called stakeholders. The goals that these stakeholders pursue are affected by new systems: Either, the new system furthers their purpose, or it impedes with them.
- Since it is the stakeholders that, eventually, determine whether or not our system is a success, it is essential that we understand the stakes at play, and try to mitigate any disruptions it may impose on existing constellations.

Contents

1. Stakeholders
2. Goal Models
3. Goal Analysis



Prof. Dr. Harald Störrle
Danmarks Tekniske Universitet (DTU)

Chapter 4.1:

Stakeholders

DTU course 02264

Stakeholders and their importance

- **A Stakeholder is a person, group, or organization that has a direct or indirect stake in an organization because it can affect or be affected by the organization's actions, objectives, and policies.**
- **Whether or not a project will be considered a success or a failure is determined by the stakeholders alone.**
 - It doesn't matter what you think, and what is objectively the case (even if such a thing as objective truth would actually exist in the realm of communication).
- **There is no point arguing – they won't hire you again.**
 - After a failure, it is irrelevant whose fault it is, it still is a failure.
 - Pointing to contracts, standards, specifications etc. will not change the perception.
 - Even a court ruling in favor of a supplier will not change the client's perception.

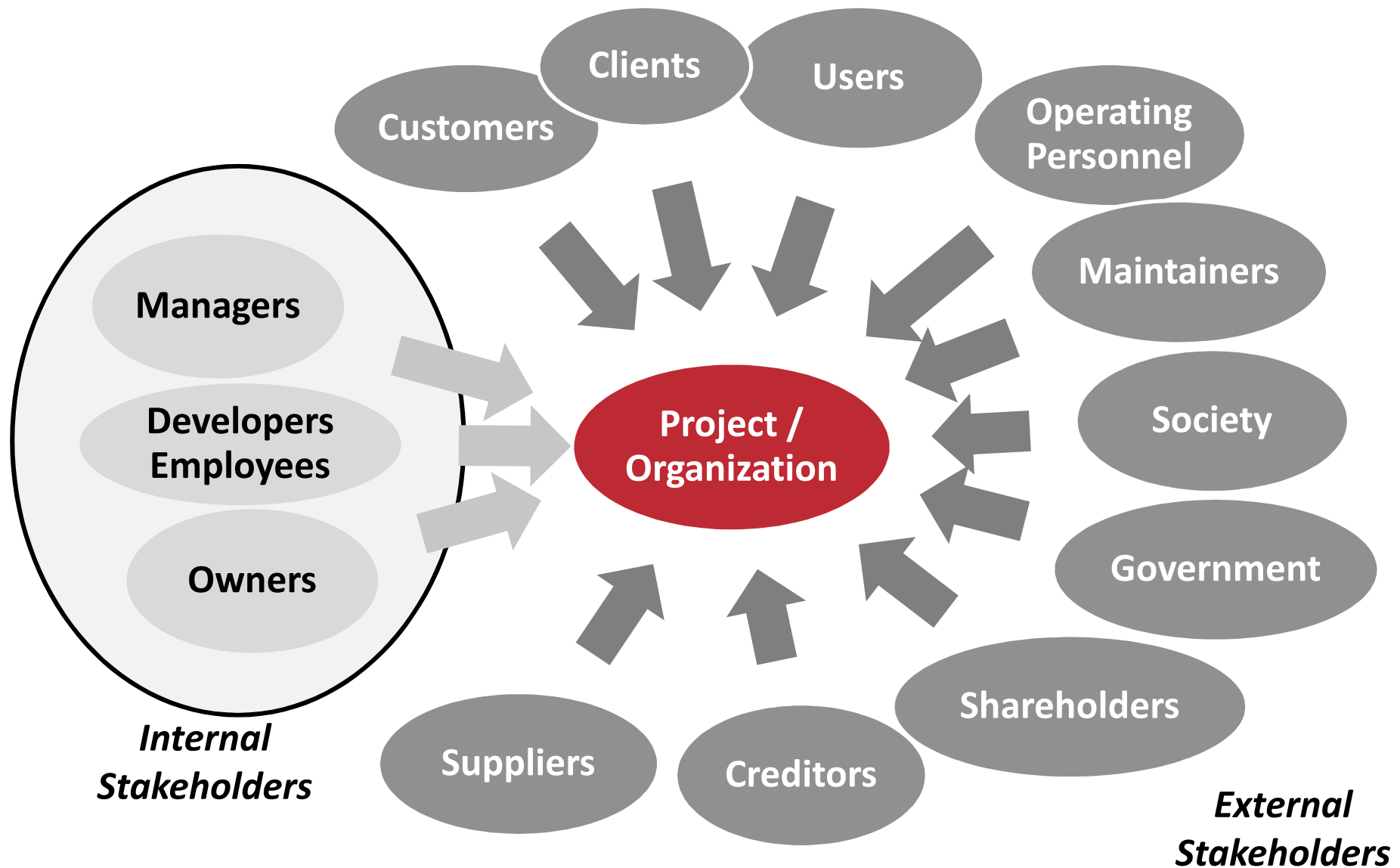
The Stakeholder perspective

- **So, to make your project a success, you need to convince the stakeholders that it is a success.**
 - Delivering a poor product will make it very, very hard to convince the client.
 - Delivering a great product helps, but is no guarantee whatsoever
 - Even miracles are sometimes not be enough.
- **A stakeholder's satisfaction is determined as the difference between his/her expectations and the actual result.**
 - Thus, RE becomes the process of balancing and negotiating sets of expectations as well as system development achievements.
 - Since different stakeholders may have diverging sets of expectations, RE is also the art of mediating opposing groups of stakeholders.
- **Obviously, there are two ways to increase the satisfaction of a stakeholder:**
 - Improve the result – but we are doing that anyway, as best as we can.
 - Reduce the expectations – frequently, the expectations are unrealistic.
- **It would be foolish to use try and influence only one of these factors.**

Who are the Stakeholders?

- **Key stakeholders in a business organization include**
 - management, employees, shareholders;
 - customers, government agencies, creditors, suppliers, and trade unions;
- They are often classified as internal/external.**
- **Organizations developing and running software have additional internal stakeholders that must be considered.**
 - E.g. developers/maintainers, data center operation personnel.
 - Their job effectiveness strongly depends on their motivation, so they have considerable power in the project.
- **Only if they all work together will development efforts be successful.**

Who are the Stakeholders?



Stakeholder Aspects

Aspect	Values		Description	Comment
Type	Internal External	Inside organization Outside organization	whether a stakeholder is or is not part of the project	Indicates whether/how stakeholder may be influenced
Exposure	* ** ***	None or little Somewhat affected Massive impact	the degree to which the stakeholder will be affected by the system and the changes it implies	Indicates degree of motivation to influence project
Power	* ** ***	None or little considerable Make or break	the degree of force a stakeholder is capable of exerting	-
Urgency	* ** ***	Within years/never Within months Within days	the timeframe in which a stakeholder is expected to react to changes in the system	-

Taken together, these factors determine the importance of a stakeholder.

Power and urgency of stakeholders

Stakeholder	Type	Exposure	Power	Urgency	Importance
Taarbaek Community	external	**	***	***	***
Executives / Owner	internal	**	***	***	***
Project Manager	internal	**	***	***	***
Chief Librarians	external	***	***	**	***
Readers	external	***	***	*	**
Developers	internal	*	*	***	**
Librarians	external	***	**	**	**
Future LMS Buyers	external	***	**	*	**
Maintenance & Operations	external	***	**	*	**
Local Media Retailers	external	*	*	*	*
General Public	external	*	*	*	*
Cooperating Libraries	external	*	*	*	*

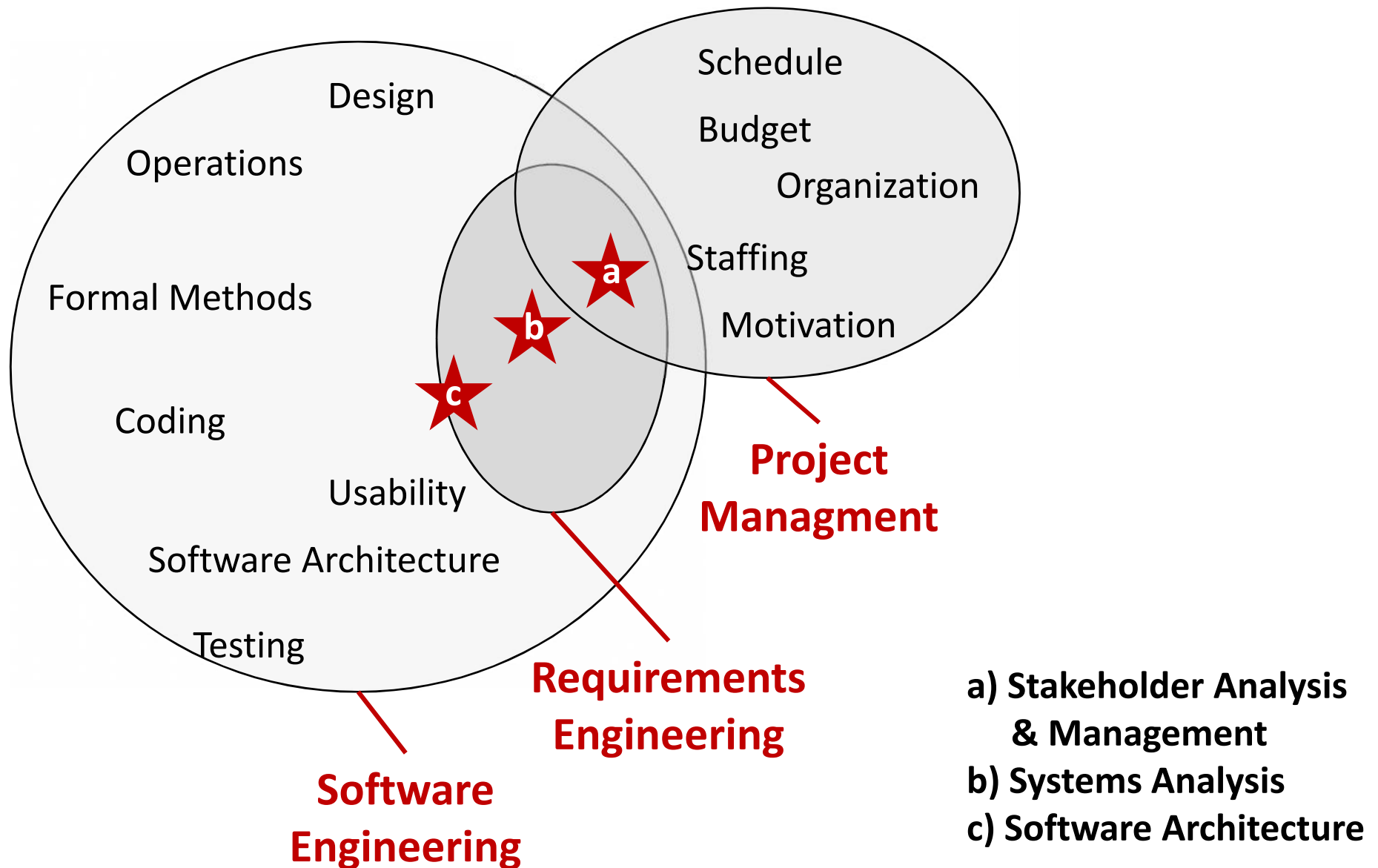
Rule of thumb: Importance = $\lceil (\text{Power} + \text{Urgency}) / 2 \rceil$

Stakeholder Management

- **For every stakeholder you should define what their stakes are, and how they may be engaged, that is, measures to**
 - Find out about their concerns and problems, early and reliably;
 - Let them provide input to the project in a channeled way ;
 - Provide them with information about the projects progress and issues;
 - Track and manage their expectations.

Stakeholder	Stake	Engagement
Chief librarian	LMS will heavily influence work of chief librarians, but not threaten their jobs. On the other hand, jobs of librarians supervised by C.L. may be endangered and C.L.s may feel responsible for them	It is extremely important to win the chief librarians over for the project, but it is also important not to overload them. So it is better to involve them only in the decision making, not in the elicitation process.
Readers	Readers are interested in getting library services in a friendly, competent, and fast way, at an affordable price. Innovative services like online access may be welcome but will probably not be asked for specifically by the readers. Readers as Tårnbæk citizens have great interest in project success.	After testing and before production, a marketing campaign shall inform the readers of LMS and its capabilities and implied changes. Before that, information shall be displayed at TCL targeting regular readers. Broad participation is not possible due to project schedule constraints

Stakeholder Management vs. RE vs. SE



Practical Tips

- **Consider all stakeholders**
 - Even presumably unimportant stakeholders must be considered.
 - Failure to this may be considered as evidence for lack of due diligence.
 - Making a wrong assessment is a mistake, not making an assessment is negligence.
 - A set of 5-10 stakeholders is usually sufficient.
- **Stakeholders with different importance cannot be merged.**
- **Preparation vs. Presentation**
 - A summary table is suitable for an oral presentation.
 - Adding (a selection of) detail descriptions for important stakeholders is good practice for a written presentation.
 - For conducting the analysis, however, different formats may be more appropriate (e.g. spreadsheets, unstructured text, posters, ...)
 - Using a tabular schema for all aspects will help you avoid inadvertent omissions, similarities, and inconsistent assessments.
- **Think of real people**
 - If you consider the communication between a stakeholder and the project, it may be helpful to think of concrete persons talking to each other which represent them, e.g. the mayor of Tårnbæk for the client and the Project leader for the project, or some librarian as a user and a developer for the project.



Prof. Dr. Harald Störrle
Danmarks Tekniske Universitet (DTU)

Chapter 4.2:

Goal Models

DTU course 02264

Premature Commitment

- **Many people tend to specify solutions rather than requirements.**
 - We call this phenomenon „premature commitment”.
- **Premature commitment to a particular solution often rules out other, potentially better solutions.**
 - Better may be referring either to quality attributes (e.g. faster, more reliable, more modular) or to project objectives such as development cost and duration.
- **Also, people do get carried away by a system-in-the-making, specifying more and more features that have little or no added value to the client.**
- **This is not just making projects more expensive than strictly necessary, it also dilutes focus and resources, and so, in the end, may endanger the whole project.**

Benefits of Goal Analysis

- **One effective way of reducing premature commitment is using a goals analysis first and strictly tying all subsequently defined requirements to the goals.**
 - This way we ensure that every feature is justified by the client's needs, which is also a great help in prioritizing requirements, negotiating with the client, and justifying the requirements specification.
- **Preliminary empirical studies suggest that goal analysis pays off for projects from approximately 100 person/years on.**
 - Goal analysis has been demonstrated to work and be beneficial not just for green-field development, but also for reengineering and maintenance.

A goal is an intentional description of a characteristic property of the system under construction or the construction process.

Goals

- **A goal is a reason why some stakeholder wants this particular system or function.**
 - It is a motivation for creating this particular system, not some other system.
 - It refers to the target system, not *only* to other concerns of the stakeholder.
 - It *may* also refer to the domain, market, client, or economic situation, but *also* to the system.
 - It refers to the system as a whole, not to individual features and/or parts of the systems and their properties.
- **Goals shall be reduced to the very core of the argument.**
 - Express goals as commands (e.g. “make desired media readily available”).
- **Goal diagrams will be used to visualize goals and their relationships later.**
- **Goals will be used to justify requirements.**
 - The rationale for any given requirements is to satisfy one or more of the goal.
 - Prioritizing requirements may refer to the goals, too.

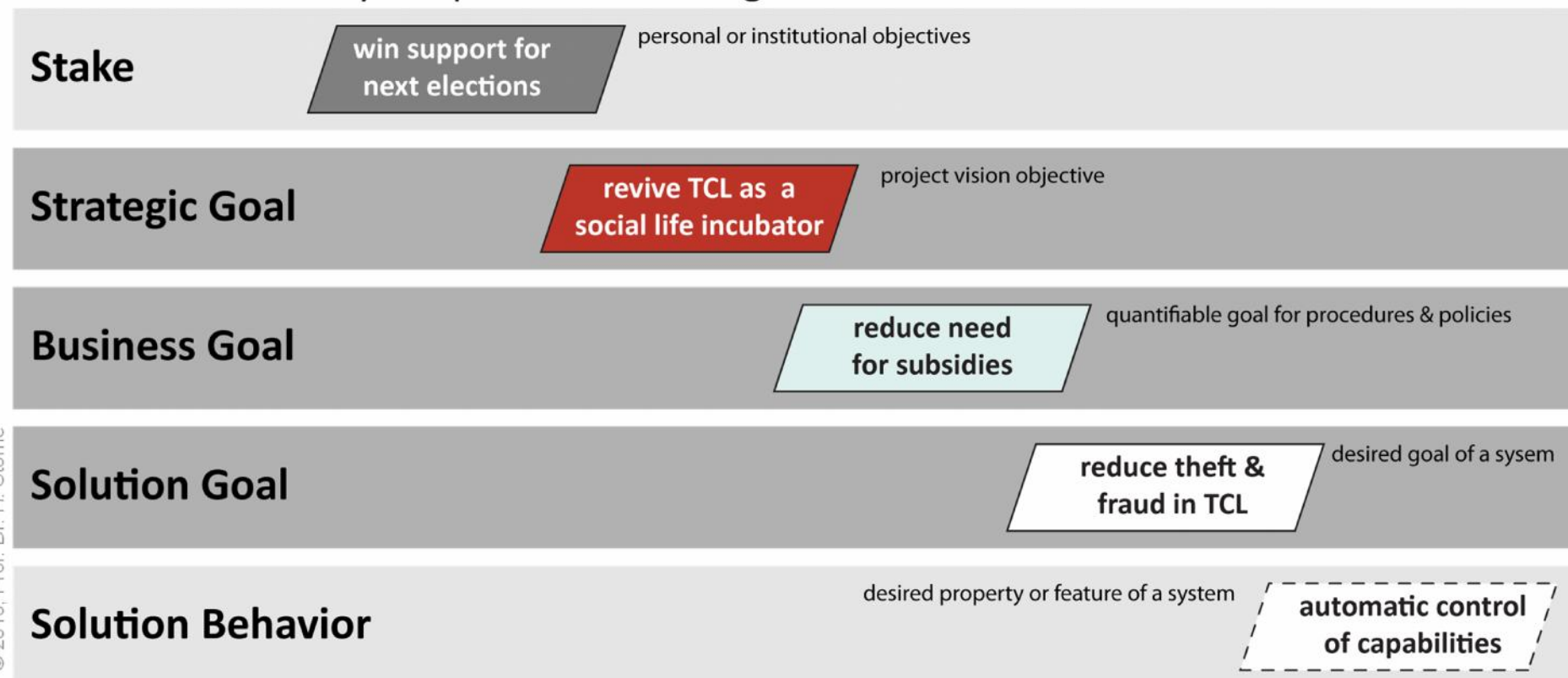
Example Goals in the LMS

- **For instance, the mayor of Tårbæk may have the following goals.**
 - G1 I want to keep my job as mayor of Tårbæk when the next election comes.
 - G2 We want to make the community more attractive to its inhabitants by stimulating the cultural life in Tårbæk.
 - G3 Reduce need for subsidies.
 - G4 Reduce theft and fraud at TCL.

- **All of these statements are goals of the mayor, but not all of them help us in determining what system to build.**
 - G1 is personal motive/a stakeholder's stake. It may be important to understand when acquiring the tender, but should not go into goals analysis.
 - G2 is a strategic goal ("vision objective"); it may be implemented in many ways and does not necessarily lead to the LMS application.
 - G3 is a business goal that helps justify the creation of the LMS, but does not provide much guidance.
 - G4 is one of several possible contributions to G3, but still does not prescribe a system.

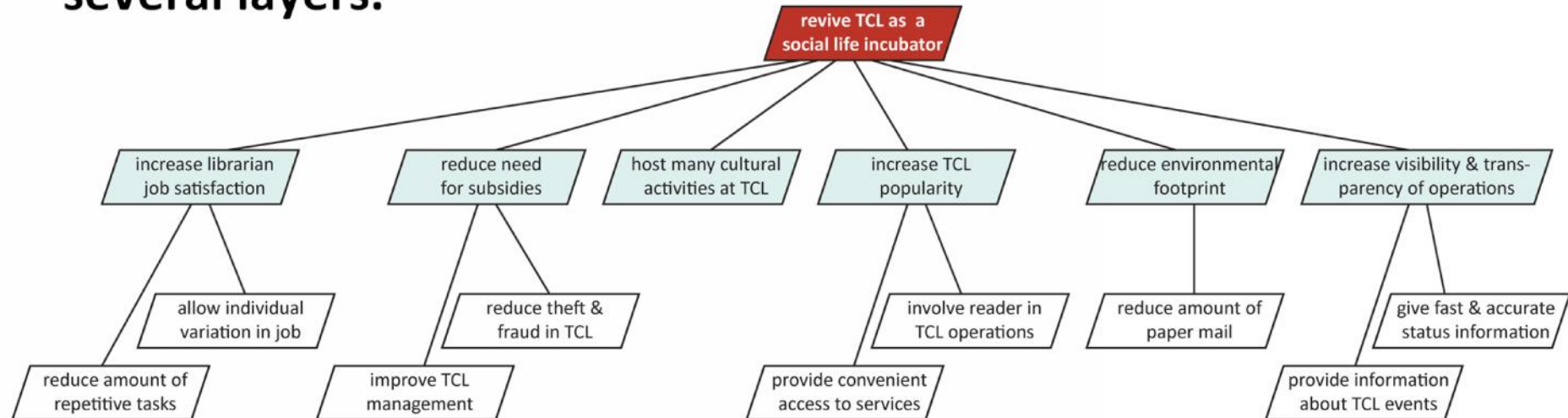
Goal levels

- **Goals exist at different levels, but not all of them are always helpful:**
 - the stakes are relevant for project management but offer little help towards developing a system;
 - Solution behaviors are very concrete already: prematurely committing to one of them may keep us from finding a better solution.



Relationships Between Goals: Composition

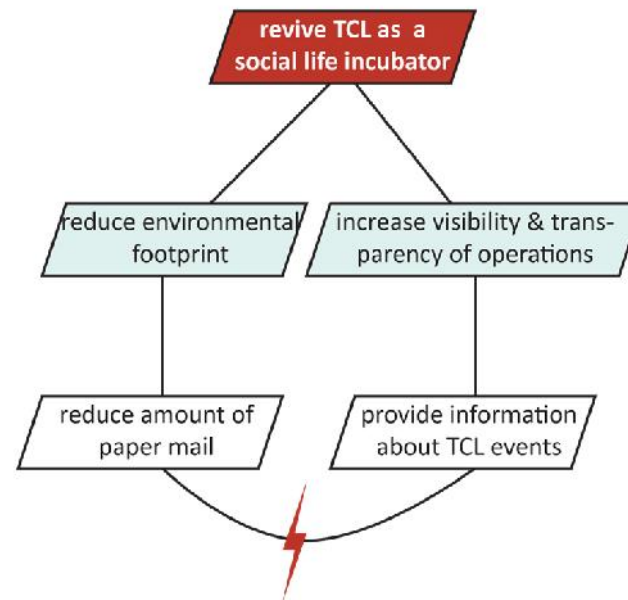
- Many goals are fairly naturally decomposed into sub-goals, across several layers.



- Typically, this decomposition forms a tree, although sometimes the structure is a Directed Acyclic Graph (DAG).
- The tree visualizes our main argument to convince the client that the system under construction is addressing the postulated needs entirely and cost-efficiently (i.e., without unneeded parts).

Relationships Between Goals: Obstruction

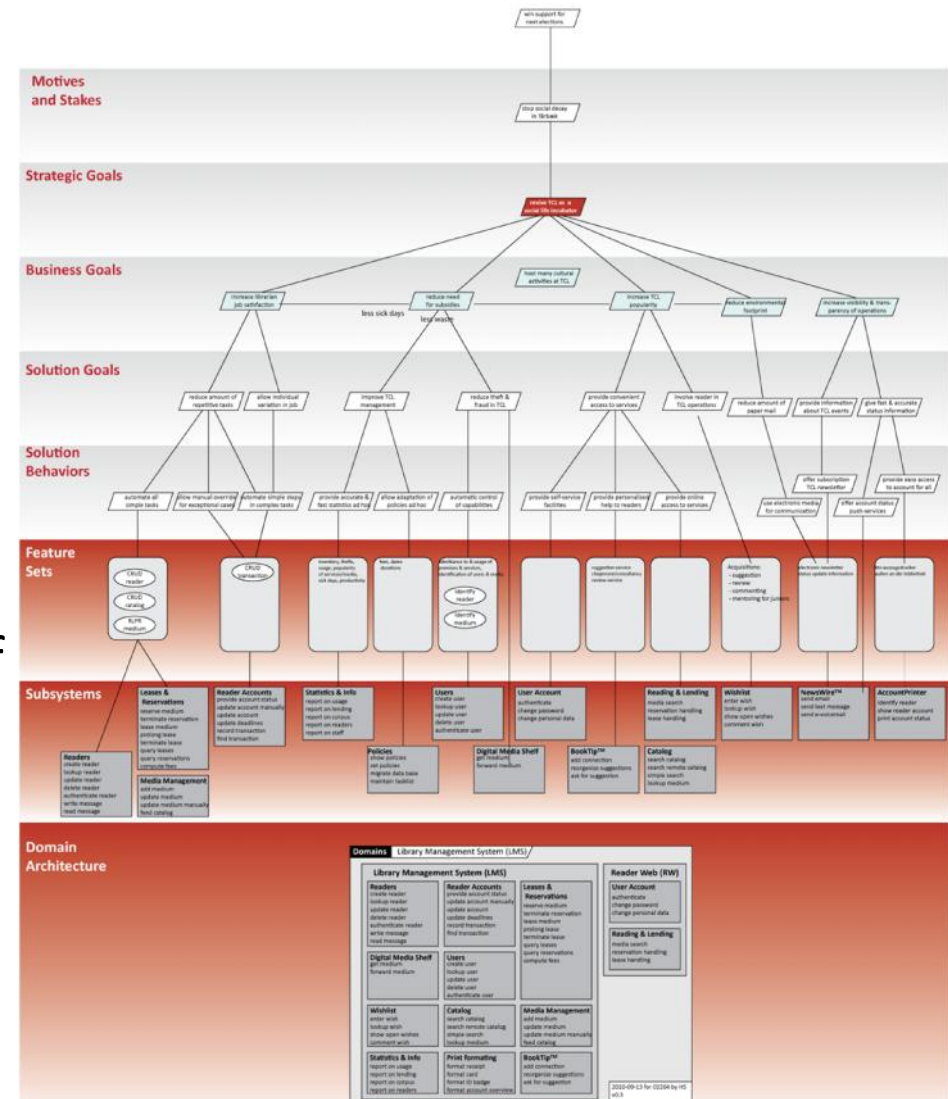
- There are often conflicts between goals, i.e., satisfying one goal may obstruct the other one.
 - Obstruction relationships are often but not always symmetric.



- Defining a conflict does not mean that there is no solution, it just means that achieving both goals at the same time is not trivial.

Deriving Domain Architecture from Goals

- Very often, elements of domain architectures may also be derived directly from the goals.
- The goal poster visualizes the connection between goals, domains, and their processes.
- It is not recommended to create such a poster as part of the analysis.
- Adding more detail to them and putting them together to domains, however, is a design task.



This picture is not supposed to be legible.

Additional Information on Goals

- Often, goals need additional comments to clarify what is meant by them. This can be captured in a list of comments.

No.	Goal	Explanation	level	supports	obstructs
1	Revive TCL as a social incubator	The main reason for people leaving the town is lack of cultural offerings and events. The one cultural institution that could contribute significantly in this sense is the community library.	Strategy	-	-
2	Reduce environmental footprint	The current TCL procedures are very wasteful, which is both expensive and impacts our new green image negatively.	Business	1	-
3	Reduce amount of paper mail	One of the largest amount of CO2 emission is the usage of paper mail, although there are only small distances to cover in Tårnbæk.	Solution	2	5
4	Increase visibility and transparency of operations	In order to serve as a cultural incubator, the TCL's operations must be permanently visible and understandable to the people in the community.	Business	1	-
5	Provide information about TCL events	First of all, people need to know about events. This addresses not just library users, but the general public.	Solution	4	3



Prof. Dr. Harald Störrle
Danmarks Tekniske Universitet (DTU)

Chapter 4.3:

Goal Analysis

DTU course 02264

Goal Analysis

- **The process of creating a goal model in a structured and systematic way is called goal analysis.**

- **There are several good sources for goals:**
 - Stakeholder analysis: the stakes of stakeholders are their goals;
 - Business process analysis: the process results may be goals;
 - Background documents: e.g. the business scenario, or the management summary;
 - Existing requirements: what goal do they serve?
 - Other goals: what are their parts? What are they part of? How are they related?

- **Goals can be analyzed systematically and step by step.**

Goal Sources



Starting With Goals

From the Business Scenario

[...The cultural renaissance of the community], however, critically depends on updating Tårnbæks antique library management system [...] buying such a system or having one built for purpose comes at prohibitive cost. [...] In order to be able to increase the chances for reselling the system once it is in operation, **it is important to address as large a market as possible** with the product. [...]

From Persona „Anders Nielsen“

[...] He will need to improve the cost/ throughput ratio, i.e. either **manage TCL with less staff/cost** and/or **increase the number of items leased**, and the **revenue generated from fees** and contributions of readers and supporters. Currently, however, he does **not** have **free capacity** to develop such strategic initiatives. He would have to offload some of his work to the other **librarians**, but they are **overloaded**, too.

From Stakeholder „Librarian“

[...] Librarians are interested in **improving** or at least maintaining their **work environment**. Depending on the individuals, they may or may not appreciate **change** as such, but they would almost certainly appreciate if they can **offer better services** to their customers and **have more time** available to help them. The librarians have a great interest in **securing their jobs**. [...]

From Context Model

- Satisfy the agreement with other libraries to exchange catalog data and media
- Offer large(r) number of remote catalogs and media sources
- Offer various configurations (e.g. with or without self service terminal, book dispenser robot)

Goal Analysis Steps

- **Collect initial set of goals.**
 - Consult personas, stakeholders, case study description and other documents to extract goals and brainstorm.
 - Consider usage policies and what goals they demand and/or implement.
 - Express goals in imperative (or present tense, if imperative is awkward).
- **Arrange all goals into sets of small sub-graphs according to the composition relationship, then complete backwards/forwards/sideways.**
 - Start simple, and establish the direct connections first.
 - Given some specific goal, ask: What other goals are part of it? What other goals is this part of? What other goals does it support? What other goals conflict it?
- **Proceed to connect sub-graphs to one large connected graph of goals.**
 - If two goals are indirectly connected, introduce new goals between them to make a chain of direct connections.
 - Add relationships between goals as you go along.
- **Classify goals according to their level.**
 - Match the resulting graph with the layer structure and assign the levels (Stake, Strategy Goal, Business Goal, Solution Goal, Solution Behavior) to nodes with a similar distance to the root.
- **Pitfalls**
 - It is ok to add sets of additional/alternative feature at leafs if you have any good ideas, but you don't have to!
 - Do not refine features! Do not refine goals beyond 5 steps away from the nearest root!

Describing Goals

- Little differences in the descriptions of goals may have potentially large impacts on the requirements (and thus the system) they justify. So, good goal descriptions do matter, and small differences may actually be quite momentous.

“Help readers find the books they want”



This goal is restrained to „books“. Expanding it to all types of media implies that LMS must possess and process knowledge on all of them, including, say, computer games. But where do we get that information from? How does a given computer game relate to a book (e.g. WWII game vs. Churchill's Memoirs)?

„Help readers find the media they want“

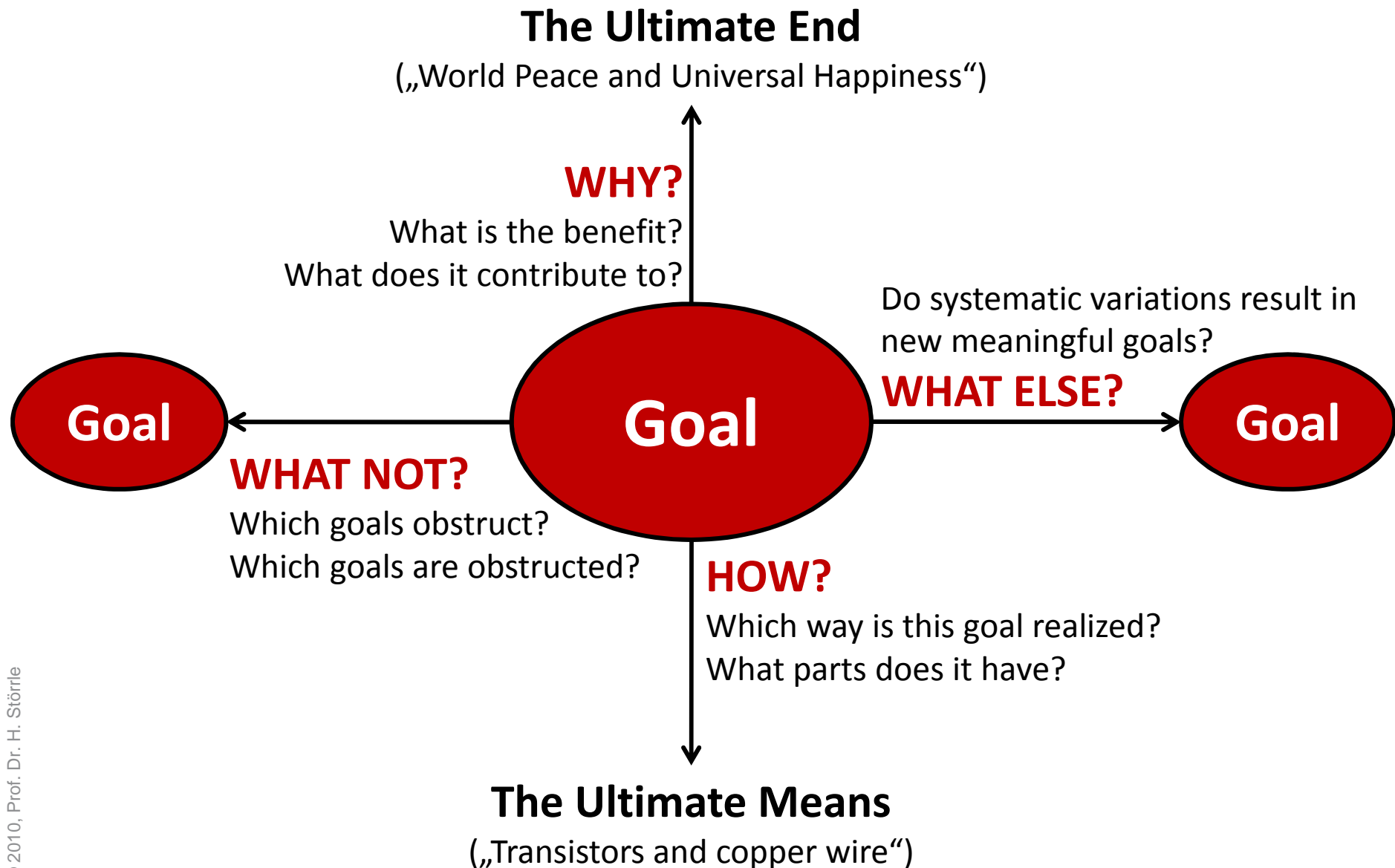


Finding is fine, but isn't it all about actually getting the media?

„Help readers get the media they want“

If we say „get“ instead, we may still only justify remote catalog access, not remote lending. Also, „get“ would allow to justify connections to retail systems (like bookseller, computer games store). Note that the LMS business case mentions these stakeholders explicitly as being part of the joint initiative behind this project.

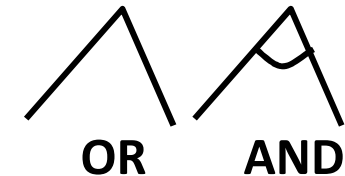
Locating and Expanding Goals



Advanced Goal Specification Approaches

- There are several many ways of making goal models more powerful.

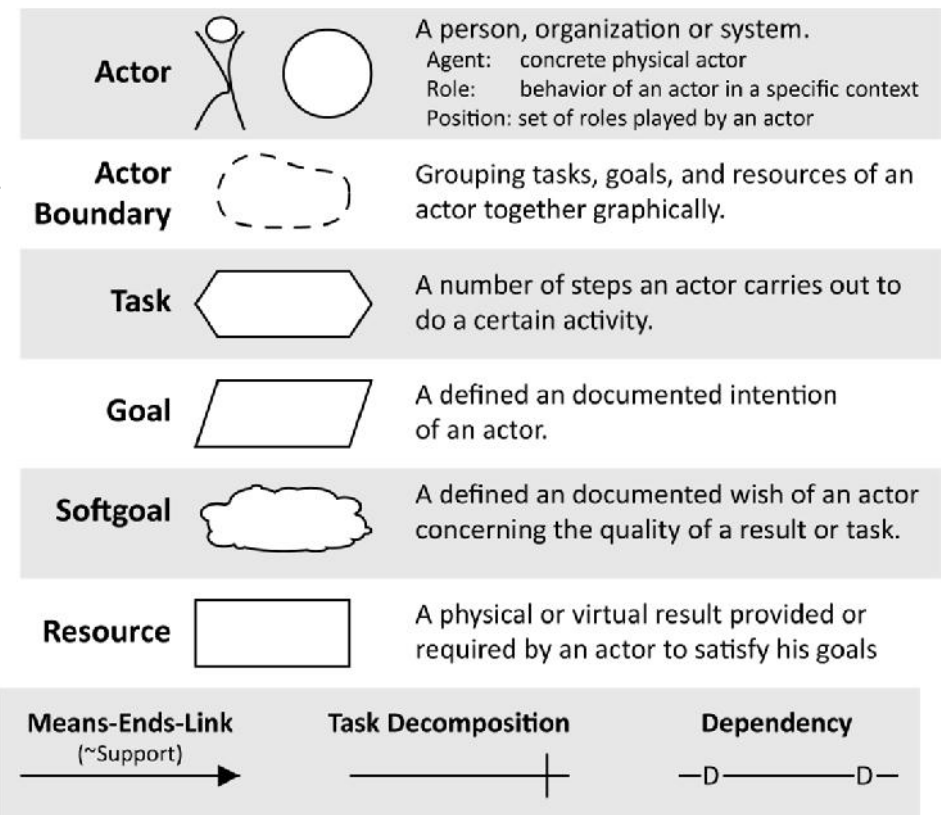
- E.g. we may add alternative-support connections.



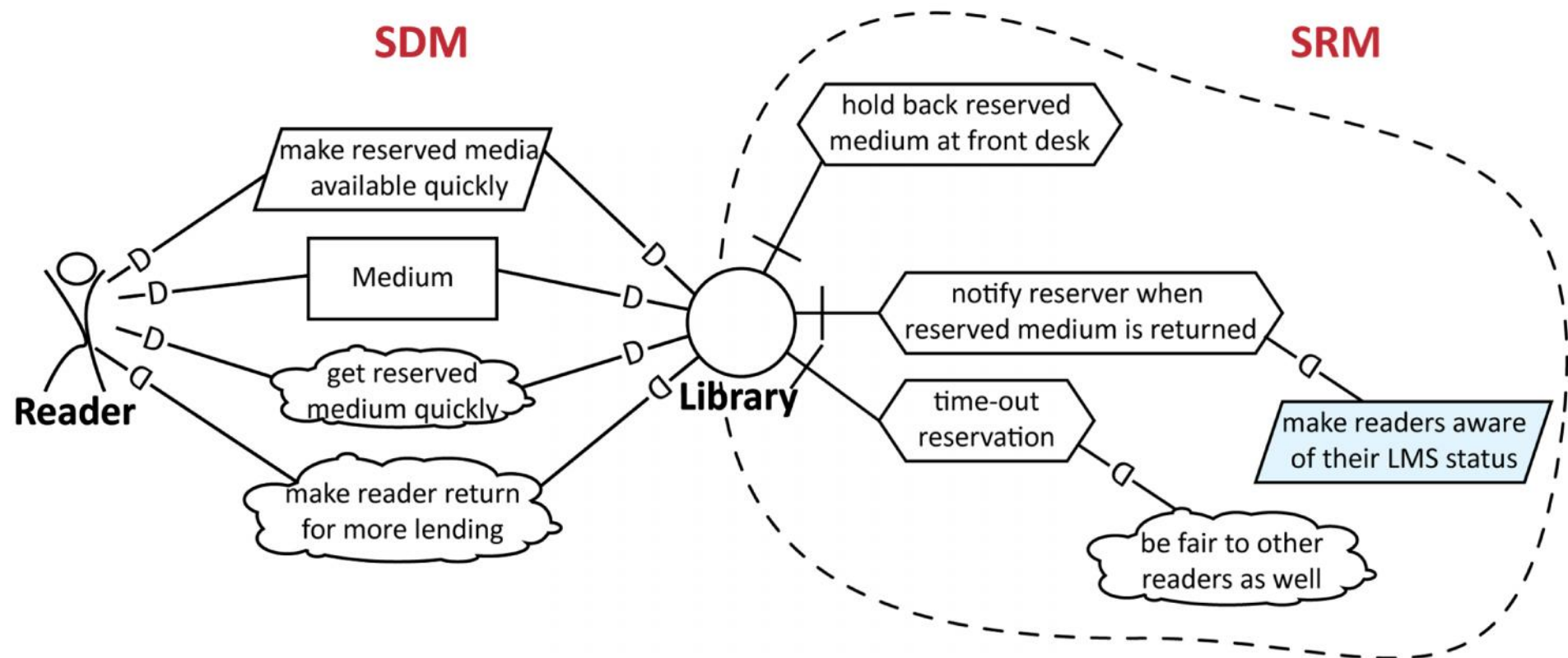
- There are also more advanced techniques for specifying goals, the two best known being KAOS and i^* .
- KAOS (“Keep All Objects Satisfied”) offers a complete goal analysis method and is more bottom-up-style.
 - It provides models that extend traditional software development models “upwards”, i.e. to the more abstract level of requirements and intentions.
- i^* (“*I star*”) follows a more top-down approach, focusing on a very detailed and differentiated analysis of intents.
 - i^* is also often associated with formal specifications and stepwise refinement.

Formal Goal Analysis with i^*

- The i^* -approach was developed in the early 90s as a goal elicitation framework. It is based on the notion of an “intentional actor”.
- The strategic dependency model (SDM) models dependencies between actors.
 - goal/softgoal dependency - an actor depends on another actor to attain a goal or quality of goal
 - resource dependency - an actor needs a resource from another actor
 - task dependency - an actor needs another actor to carry out a task
- The strategic rationale model (SRM) represents interactions between the goals of actors, justifying their dependencies.
 - Task decomposition
 - Means-ends links between tasks and goals



Strategic Dependency/Rationale Models



SDM

The reader depends on the library to get reserved media, and to get them quickly.
The library depends on the reader to come back and stay a customer.

SRM

The library holds back returned media that are reserved, notifies the reserve, and cancels the reservation if the medium is not being picked up.

Formal Specification of Goals

- **Goals may be represented in formal languages such as temporal logics.**
 - In the following, assume an object `lms` for the LMS, its fields (accessed by the usual dot-notation) holding all the data represented in the LMS.
 - If a reader holds a reservation on a medium that is represented in the corpus of TCL with at least one copy, the reader may eventually lease that medium.
$$\begin{aligned} &\forall r \in \text{lms.Reader}: \\ &\quad \forall m \in \text{lms.Catalog}: \\ &\quad \quad \exists c \in \text{lms.Corpus} \text{ with } \text{isCopyOf}(c,m): \\ &\quad \quad \quad \text{reserves}(r,m) \Rightarrow \langle \rangle \text{mayLease}(r,c) \end{aligned}$$
 - If a reader leases some medium item, then eventually this copy is either returned or reported lost .
$$\begin{aligned} &\forall r \in \text{lms.Reader}: \\ &\quad \forall m \in \text{lms.Catalog}: \\ &\quad \quad \exists! c \in \text{lms.Corpus}: \\ &\quad \quad \quad \text{isCopyOf}(c,m) \wedge \text{leases}(r,c) \Rightarrow \langle \rangle (\text{lost}(c) \vee \text{returned}(c)) \end{aligned}$$

Formal Specification of Goals

- **Formally specified goals may be used as a first step towards formal specifications, thus allowing verification of the system created.**
 - For a lot of safety critical software some form of verification is required by law.
- **Formal specifications allow powerful tool support.**
 - For instance consistency checks, checks for correct refinement, behavioral and temporal analysis and so on.
 - Even in the absence of legal requirements using formal techniques may contribute significantly to reducing errors early, and thus to the overall project success.



Prof. Dr. Harald Störrle

Software Engineering Section
Department of Applied Mathematics and Computer Science
Technical University of Denmark
Matematiktorvet
Building 303b.056
DK-2800 Kgs. Lyngby

hsto@dtu.dk

www.compute.dtu.dk/~hsto

