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Hypermedia Applications (Web e Multimedia) 2010-2011
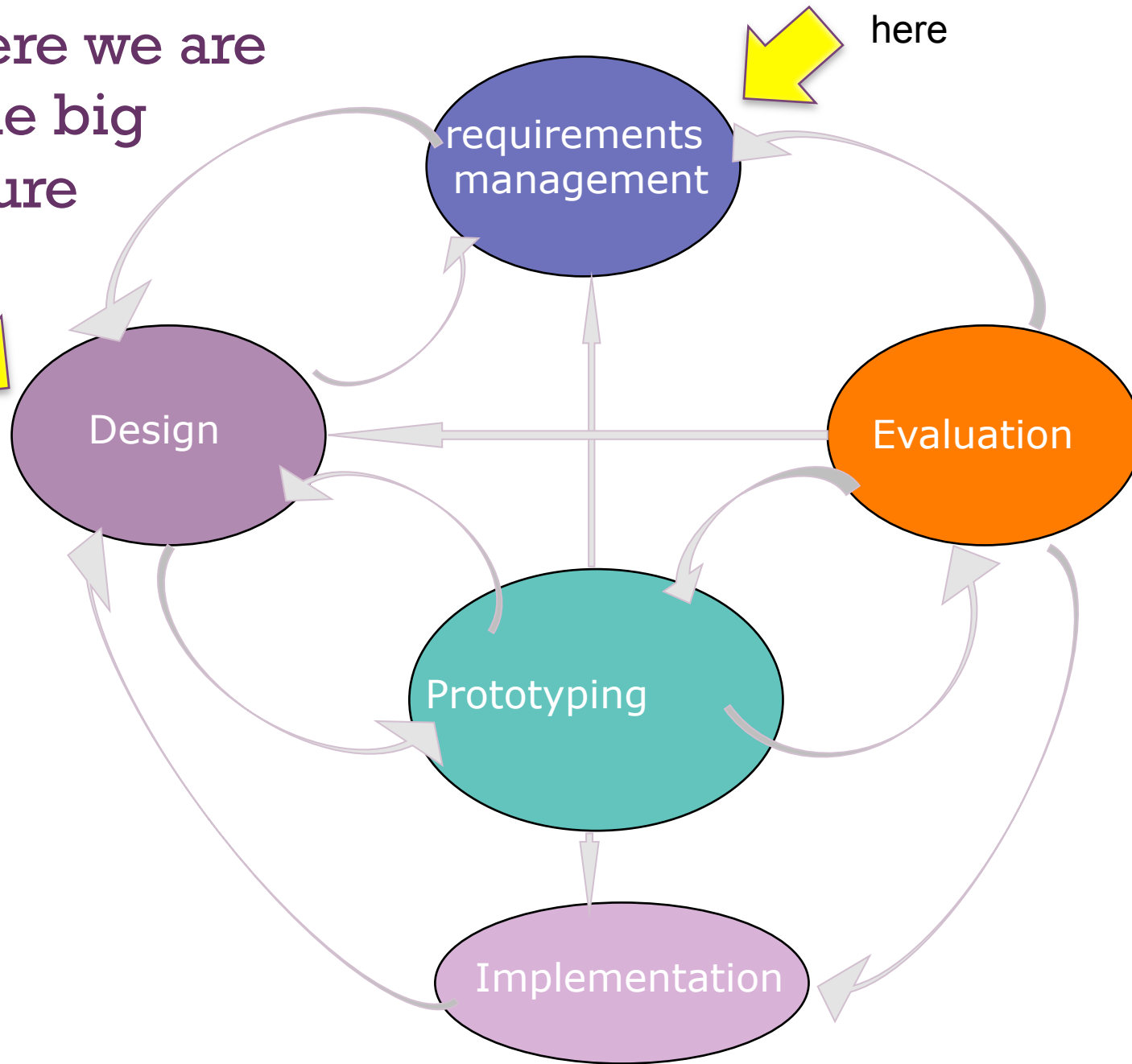
FROM REQUIREMENTS TO DESIGN
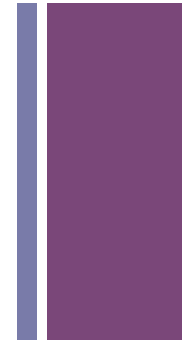
POLITECNICO MILANO

HOC HYPERMEDIA OPEN CENTER

Prof. Stefano Bruna
Prof. Franca Garzotto

Where we are in the big picture

here

requirements management

here

Design

Evaluation

Prototyping

Implementation

+ Key concepts to learn

- Stakeholders

- Goals

- Constraint

- Requirements

- Scenarios

+ What informs (i.e., is input to) design?

- Various factors to consider to properly inform and balance design decisions
  - Stakeholders
  - Goals
  - Needs
  - Constraints
  - Requirements

+ Stakeholders

- Design is not done in isolation

- In complex projects, many people are (more or less directly) involved

- It is important to consider the overall picture of all **stakeholders**

+ Stakeholders

- Anyone who has an interest in the application to be designed

- Different types and roles
  - Client
  - Project leader
  - Users
  - Financing partners
  - Content providers
  - Opinion makers
  - Experts
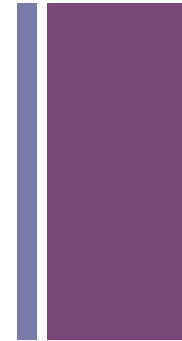 - …..

Stakeholders: Client

- Who is officially "signing the contract" (deciding to start off the project)

- Key person to elicit:
    - The starting/preliminary "vision" of the project
    - How the system fits in a global (business/communication) strategy
    - The context (in many senses) of the application

- Possibly, directly involved with the project

- Often difficult to contact and to talk to

Stakeholders: Project Leader

- Whoever is managing the project *on behalf of* the client

- Has or lacks own ideas or vision
  - may have own list of priorities
  - may be for (or against) the project
  - may have a specific background and previous experiences (good or bad)
  - may be willing to impose design decisions

- a working relationship must be established

Stakeholders: Users

- The persons „**in dialogue**" with the system

- Primary target for the design

- Not design for all

- Often difficult to know directly their opinion and needs

- Necessary to use profiling techniques (persona)
  - (niche) personas better than generic profiles
  - establish priorities (e.g. Must, Also, May be, Excluded, …)

Stakeholders: Financing Partners

- Those who provide financial resources (may or may not coincide with the client)
  - Sponsors, Agencies, Foundations, Institutions, …

- Somehow need visibility in the design

- Often not directly involved in the project, but …
  - Motivations and expectations to be understood and taken into account
  - Require milestones, checkpoints and reporting documentation (how and when their money are spent…)

Stakeholders: Content Providers

- Crucial for content-intensive systems

- „Keyholders" for the content – the most valuable asset for the user experience
  - The own the content
  - They develop it on purpose for the system

- Their contribution may strongly influence the final quality of the application

+ Stakeholders: Opinion Makers

- Those who can in anyway influence the public or local opinion about your system
  - Key players in social networks
  - Other traditional categories: journalists, key workers, management, …

- Build in advance preventive consensus
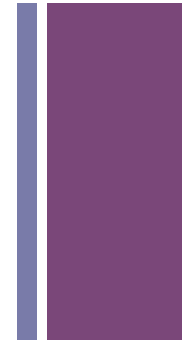
- Involve them in sharing ideas and requirements
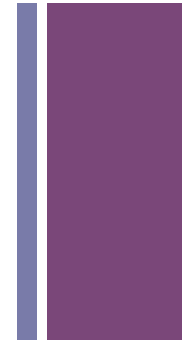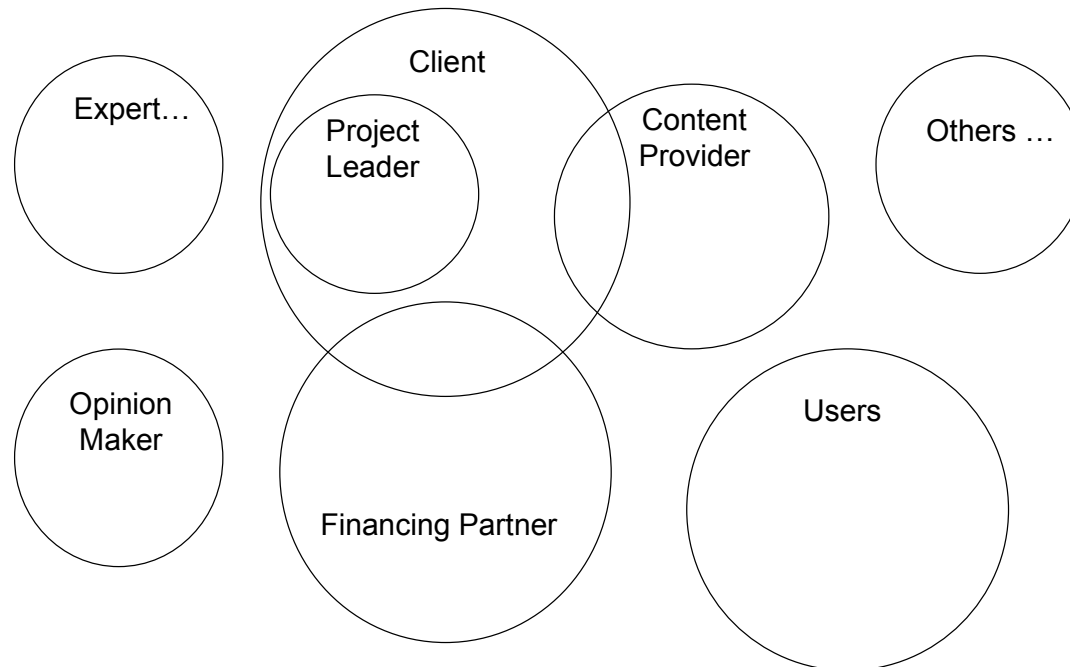
+ Stakeholders: Experts

- Experts of…
  - The domain
  - The users
  - The content
  - The competitors
  - …

- May be important to involve to better understand requirements

Stakeholders: summary
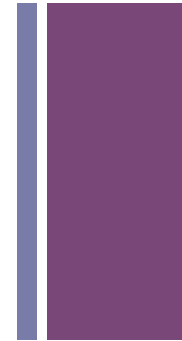
Project Stakeholders

+ Goals

- What each stakeholder expects from the system
  - Business advantage (over the past, over the competitions, …)
  - Gains
  - Visibility, Brand diffusion
  - Usefulness and needs' satisfaction
  - …

+ Goals

- Not what stakeholder "think" that the application should be
  - but their actual **needs and goals** they actually expect the application should satisfy

- Difficult to elicit – tacit knowledge and assumptions

- Deeply anchored to the domain and vision of the stakeholders

- Each stakeholder may have multiple needs and goals (priority is necessary)
  - The different goals may be contradictory (between different stakeholders and sometimes even for a single stakeholder)

- Solving goal conflicts is a "difficult art"

Stakeholders and Goals: example

Company (Client)

- Push over-stock products
- Evaluate performance of new products
- Distribute orders over local websites
- Provide visibility to partners
- Promote „Amazon Kindle"
- …

Users

- Buy latest book on „usability"
- Compare and buy „Cameras"
- Check book reference
- Find Christmas Gifts ideas
- Write book review
- …

Stakeholders and Goals: example

Institution (client)

Users

Support the information needs of patients and families

Fund Raising

Find Partners

Expand user base

. . .

Find someone to talk to

Understand treatments

Share experience

Understand cancer disease

Find out what to do

. . .

A matrix based representation: Stakeholders and related Goals

	Goal a	Goal b	Goal c	Goal d
Stakeholder 1				
Stakeholder 2				
Stakeholder 3				
Stakeholder n				

Relevance of a goal for a stakeholder

Example

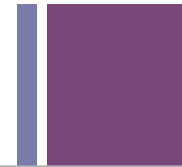|	Educate the visitor on the subject of the site	Optimise amount of visitors	Raise awareness on conservation	Make exhibits more entertaining – info-taining - edutaining	Provide content & interpretation	Segmenting and understanding customer needs	Develop tourism itineraries	Ensure sustainability of the site
Site operators							X	
Inbound operators			X					
Outbound tour operators			X					
Tourist Information Centres	X		X				X	X
Local Authorities					X	X	X	

X : not applicable
■ very relevant
■ quite relevant
■ not very relevant

Example

|	Educate the visitor on the subject of the site	Optimise amount of visitors	Raise awareness on conservation	Make exhibits entertaining	Provide interpretation	Segmenting and understanding customer needs	Develop tourism itineraries	Ensure sustainability of the site
Site operators	3	2	3	1	2	3	0	2
Inbound operators	1	2	0	2	3	2	2	1
Outbound tour operators	1	1	0	2	3	3	3	1
Tourist Information Centres	0	2	0	1	2	1	0	0
Local Authorities	2	2	3	1	0	0	0	3
TOTAL	7	9	6	6	10	9	5	7

Example

	Understand content & intepretation	Look source for in-depth/ further references	Look for updates of info - tours	Choose-Plan visit – itinerary	Be able to shape/ Specialise tours	Exchange ideas & contacts	Get incentive-motivation to visit	Enjoy visit by learning & interacting	Retrieve practical info&tips
Domestic visitor	very relevant	X	very relevant	not very relevant	X	X	very relevant	quite relevant	quite relevant
International visitor	very relevant	not very relevant	X	very relevant	X	X	very relevant	quite relevant	very relevant
Kids	X	X	X	X	X	X	quite relevant	very relevant	X
School children	quite relevant	quite relevant	X	X	X	X	not very relevant	very relevant	X
Young people	very relevant	quite relevant	not very relevant	quite relevant	X	X	very relevant	very relevant	very relevant
Family	very relevant	X	X	very relevant	X	X	very relevant	very relevant	very relevant
Elderly	very relevant	X	X	very relevant	X	X	very relevant	not very relevant	very relevant
Group Tour	very relevant	X	X	not very relevant	X	X	quite relevant	quite relevant	not very relevant
Professional scientist	quite relevant	very relevant	quite relevant	very relevant	quite relevant	very relevant	not very relevant	X	very relevant
Professional guide / operator	not very relevant	very relevant	very relevant	X	very relevant	very relevant	X	X	very relevant

X : not applicable
very relevant
quite relevant
not very relevant

+

Constraints
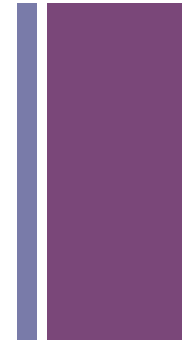
- Those elements that can't be changed and must be considered
  - Financial resources
  - Human resources
  - Time
  - Politics
  - Competition
  - Technology (availability, devices, …)
  - Delivery issues (availability, costs, …)
  - Special needs

- Captured from the beginning to stay in the right track

+ Requirements

What is a requirement?

- " What" the application must offer to meet the goals

A requirement is a statement that identifies a capability, characteristic, or quality factor of a system in order for it to have value and utility to a stakeholder *(adapted from Young 2001)*

  - Ex.: 'The application have to provide to the user detailed information about top-seller books'

- Requirements are **not** design solutions
  - Req: "provide detailed book info";
  - Design: "which details about the book information, how to structure them, how to navigate, how to interact…"

Requirements

- Requirements should not state the obvious (often incomplete), but salient aspects to take into account during design
  - ex: "the application must be usable" is an obvious requirement!

- They dictate recommendations to designers, concerning different design dimensions
  - Eg. for web sites: recommendations about
    - **Content**
    - **Information architecture**
    - **Interaction/Navigation**
    - **Operations**
    - **Graphics and layout**
    - …

- They are iteratively defined and refined

- They must be organized, pruned and prioritized

A matrix based representation for goal/requirements relationship

	Goal a	Goal b	Goal c	Goal d
Requirement 1				
Requirement 2				
Requirement 3				
Requirement N				

Mark a requirements related to a goal

Example: bio-food online marketplace (see .doc)

INFORMATION GOAL → / CONTENT REQUIREMENT ↓	Promote organic food	Promote the overall marketplace and the consortium	Promote the overall service	Promote individual producers and products	Getting information about bio food and bio production	Getting information about organic diet	Getting information about organic diet for special needs	Getting information about specific products	Getting information about the consortium	Getting information about specific producers	Getting information about the service
General information about organic food	●				●						
General information about organic production	●				●				●		
General Information about the consortium		●									

+Requirements and design

Stakeholders

Goals

?

Requirements

?

Design

+ Requirements and Design

- Requirements are a crucial input to design, but not the only one

- Several other input:
    - CONSTRAINTS
    - Knowledge of the domain
    - Obvious considerations
    - Expertise of the designer
    - Creativity of the designer
    - ….

Requirements vs. Design (cont.)

- Requirements have a complex relationship with design elements

- A requirement may influence several design decisions

- The same design decision may originate from several requirements (or from other factors)

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Scenarios

- A useful conceptual tool during the requirements and design phases

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Scenarios

- A scenario is „a story about use" (Carroll, J.M. **Scenarios and Design Cognition**, 2002

- An example of how a "typical" user (persona) is going to use the application
  - Not a list of possibilities but the description of one usage
  - Story of an interaction with a system

- It must be salient and realistic

- Typically more than one (2-3) for each persona

- Developed by design team and iteratively refined also with stakeholders

- Specified at different levels of abstraction according to the needs, the shared knowledge, and and the project stage

+ Parts of a Scenario

- **Setting** - situation, context

- **Persona** - characters who use the system

- **Goals** - intentions/motivations

- **Actions** – detailed tasks, observable behaviour

- **(optional)**
  - **Events** - external events of actions of system(s)
  - **Outcome** – the final result(s) for the user

They are not syntactic elements but semantic ones

+ Scenarios: Example

Harry is interested in bridge failures; as a child, he saw a small bridge collapse when its footings were undermined after a heavy rainfall. He opens the case study of the Tacoma Narrows Bridge and requests to see the film of its collapse. He is stunned to see the bridge first sway, then ripple, and ultimately lurch apart. He quickly replays the film, and then opens the associated course module on harmonic motion. He browses the material (without doing the exercises), saves the film clip in his workbook with a speech annotation, and then enters a natural language query to find pointers to other physical manifestations of harmonic motion. He moves on to a case study involving flutes and piccolos.

Fig. 1. A usage scenario for a multimedia education project.

+ Scenarios: Example

- The website for the Munch's drawing and prints exhibition in Berlin (2003)

A **high-school art teacher from Milan** comes to know about the exhibition of the Munch collection at the Gemaldegalerie in Berlin.
She has never been there but her colleagues and friends told her that it might be interesting for the pupils to visit outstanding Munch's works that were rarely made available to the public.

During lunchtime, she connects to the website from school.

She wants to find out more, to get a clearer idea of the opportunities for her class and to build an introductory lesson about Munch to prepare the pupils for the visit.

She reads the introduction to the collection overview and checks for the famous works of Munch. She browses the details and importance of some works exhibited in the museum and finds some interesting works that would be really worth visiting.
To give an introductory lesson about Munch, she searches for an explanation of four representative famous works, background information and references useful as teaching material and she bookmarks the pages for future refinding.

A „legendary“ scenario - 1

[…]
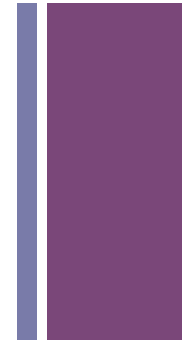
The owner of the Memex, let us say, is interested in the origin and properties of the bow and arrow. Specifically he is studying why the short Turkish bow was apparently superior to the English long bow in the skirmishes of the Crusades.

He has dozens of possibly pertinent books and articles in his Memex. First he runs through an encyclopedia, finds an interesting but sketchy article, leaves it projected.

Next, in a history, he finds another pertinent item, and ties the two together. Thus he goes, building a trail of many items.

A „legendary" scenario - 2

Occasionally he inserts a comment of his own, either linking it
[…] into the main trail or joining it by a side trail to a particular
item.

When it becomes evident that the elastic properties of
available materials had a great deal to do with the bow, he
branches off on a side trail which takes him through
textbooks on elasticity and tables of physical constants.

He inserts a page of longhand analysis of his own. Thus he
builds a trail of his interest through the maze of materials
available to him.

A „legendary" scenario - 3

[…]
And his trails do not fade. Several years later, his talk with a friend turns to the queer ways in which a people resist innovations, even of vital interest. He has an example, in the fact that the outraged Europeans still failed to adopt the Turkish bow. In fact he has a trail on it.

[…] Tapping a few keys projects the head of the trail. A lever runs through it at will, stopping at interesting items, going off on side excursions. It is an interesting trail, pertinent to the

discussion.

So he sets a reproducer in action, photographs the whole trail out, and passes it to his friend for insertion in his own memex, there to be linked into the more general trail. [...]

Vannevar Bush, As We May Think, The Atlantic Monthly, July 1945
http://www.theatlantic.com/doc/194507/bush.

An „legendary" scenario - 4

- Scenarios are powerful to envision „requirements" (needs and strategies to address goals), rather than design solutions.
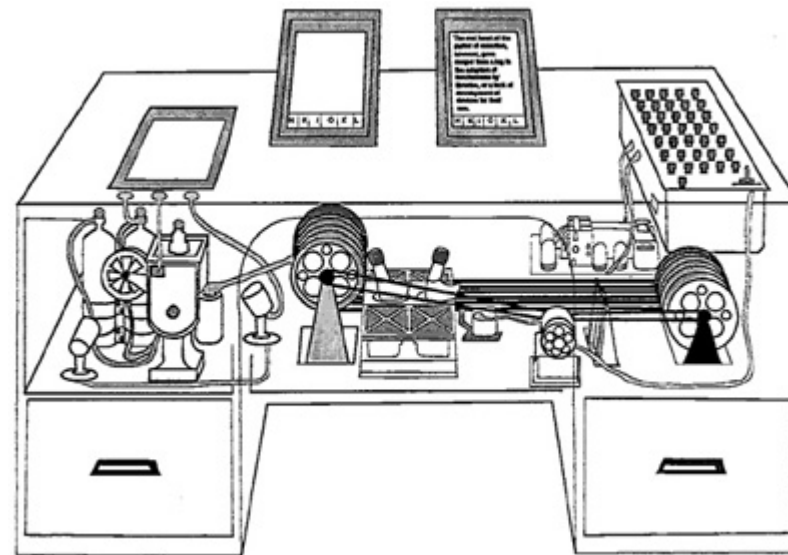
Memex, VB, 1945

Scenarios and User Goals
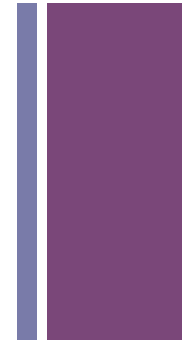
- User goals lie on a continuum of granularity levels:
  - Information seeking
    - Fact-finding, known-item search
    - Directed browsing
    - Exploratory browsing
  - Unfocused, open-ended goals
  - „Don't know what I need to know"
  - Re-finding (quickly re-locating previously seen items)

- Can be refined into tasks or sub-goals

Scenarios: questions

- Questions to extract from a scenario during requirements analysis:
  - Is it relevant, salient, important?
  - Is it appropriate, realistic for the person described?
  - Is it desirable for the stakeholder?
  - What requirements does it involve? (what content, structures, main functions)

The many uses of scenarios

- Scenarios may be used for different purposes in the lifecycle:
  - To support requirements analysis
  - To stimulate, validate, challenge design
  - To evaluate the implemented system

+
Advantages of scenarios

- Vivid: anticipate situations

- Highlight interaction issues

- Facilitate communication (with stakeholders and in the team)
  - Make discussion less abstract

- Provide a synthetic vision of the requirements "in action"

- Help
  - Master complexity of design
  - Check goals
  - Check requirements

Scenarios: multiple levels of abstraction

- During requirements, scenarios can be described textually, at a high level of abstraction – see previous examples

- During design, scenarios can be used as design specifications, to give concreteness to the design solutions
  - Goals are more fine-grained
  - For each goal, user tasks are described using concrete interfaces and highlighting user's interactions with the system
  - Oftentimes referred to as **INTERACTION SCENARIOS**

+ **Example of INTERACTION SCENARIO:**

A web site for a primary school

A parent is accessing the school web site from home.

She wants to look at the educational projects of her son's class

This symbol indicates the choosen link

From the home page, she first identify son's class

She selects her son's class, 2°B

Scuola Elementare Nolli Arquati

Attività extra

Contatti

Elenco di tutte le classi:

Le prime:
1° A   >>Vedi<<
1° B   >>Vedi<<
1° C   >>Vedi<<

Le seconde:
2° A   >>Vedi<<
2° B   >>Vedi<<
2° C   >>Vedi<<

Le terze:
3° A   >>Vedi<<
3° B   >>Vedi<<
3° C   >>Vedi<<

Le quarte:
4° A   >>Vedi<<
4° B   >>Vedi<<
4° C   >>Vedi<<
4° D   >>Vedi<<

Le quinte:
5° A   >>Vedi<<
5° B   >>Vedi<<
5° C   >>Vedi<<

From the class presentation, she looks for projects (extra-curricular activities)
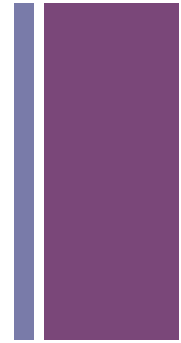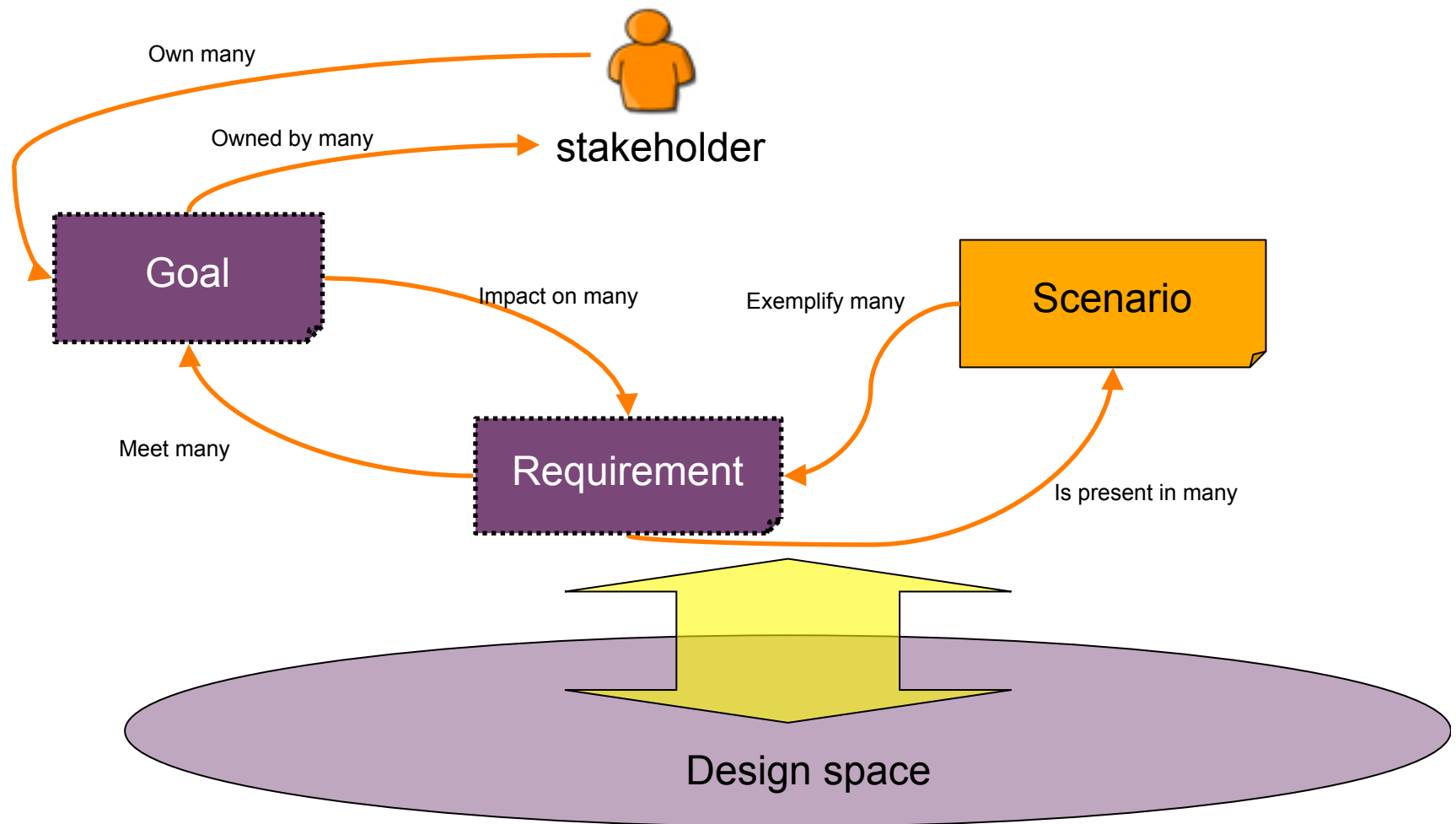
She looks at the list of activities and selects one

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Scenarios and Design

- Design with scenarios in mind

- Monitor design with scenarios

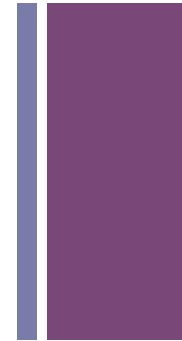- Scenarios should provoke reflections on design alternatives

Complex Relationships

+ Wrap up

- Design emerges from a complex tension between different goals, requirements and constraints

- The picture of the stakeholders should always be kept in mind

- Scenarios are a powerful tool for defining, communicating and clarifying requirements and design solution

+ END