INTERDISCIPLINARY APPROACHES TO USABILITY ENGINEERING – A FOCUS ON USER NEEDS ANALYSIS

Lecture 2
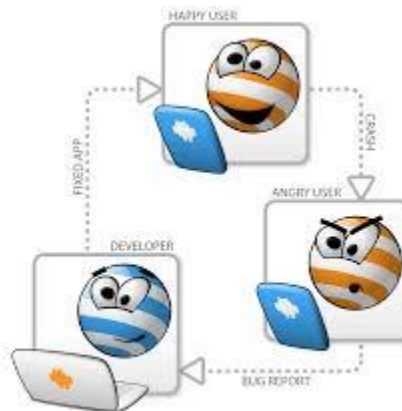
Agenda

- [Usability definitions](#)

- [Qualitative methods for user needs analysis](#)

- [Case studies](#)

Hierarchy of consumer needs

- Pleasure ⬆
- Usability ⬆
- Functionality ⬆

- **When people get used to something, they want more**

Software disasters

- Therac-25 radiation therapy machine

- **[Radiation Deaths linked to AECL Computer Errors](#)**

Software disasters

- Aegis radar system in USS Vincennes

- [How did user interface failures on board the USS Vincennes lead to 290 dead?](#)

Software disasters

- October 29, 2018: [Lion Air Flight 610](), Boeing 737 MAX 8
- March 10, 2019: [Ethiopian Airlines Flight 302](), Boeing 737 MAX 8,

Software disasters

- [Boeing is going to update the control software on the 737 Max that may cause the plane to nosedive](#)
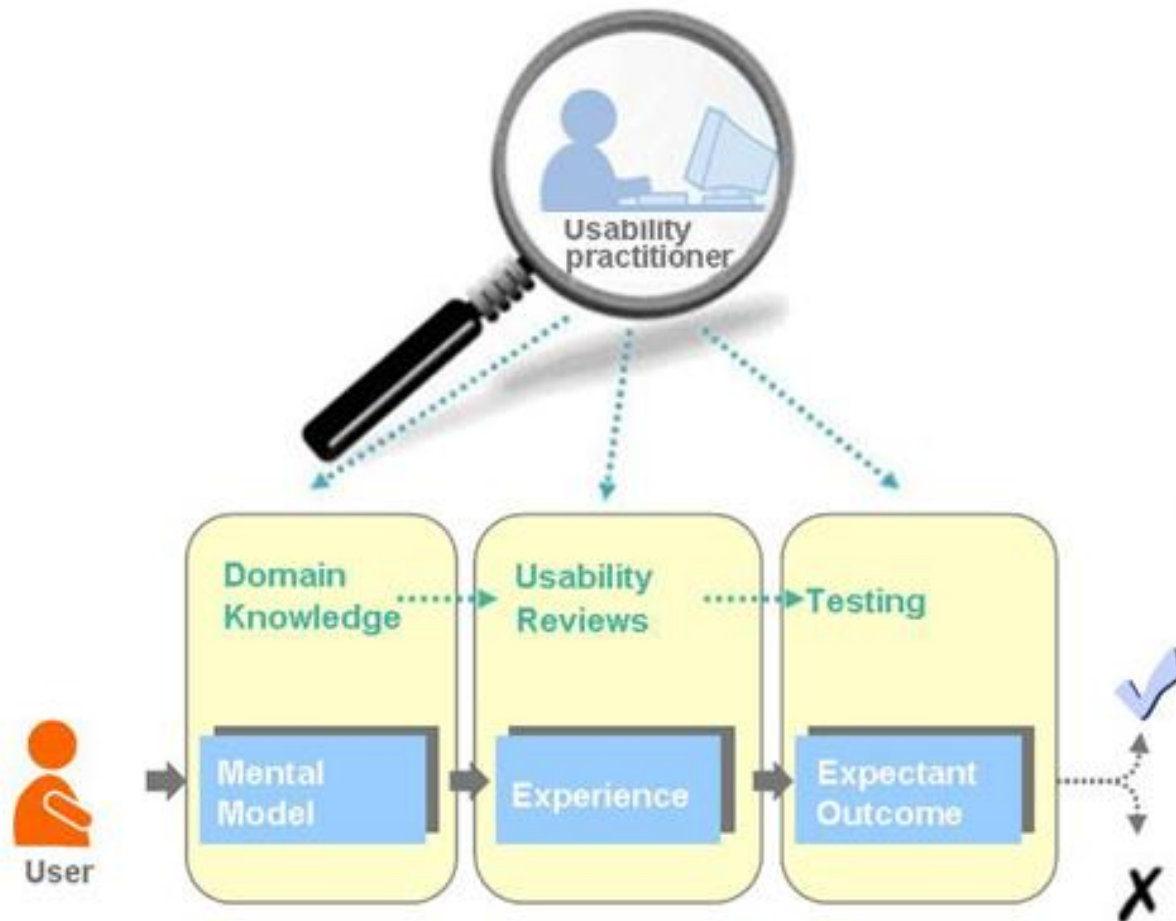
Usability

- **Usability** - a topic of great interest to researchers in the field of human computer interaction and interaction design due to an increasingly strong connection between usability and the overall success of a given product, be it an object, software or a website

Usability definitions

- Nielsen (1993) defines usability in terms of system attributes: **learnability, efficiency, memorability, errors and satisfaction**

- Dix et al. (2004) describe usability in terms of **learnability, flexibility and robustness**

- **Only internal characteristics** of the product are taken into consideration

- ISO (1998) - usability represents the measure in which **specified users** can use a product to achieve certain **goals** with **effectiveness**, **efficiency** and **satisfaction**.

- The characteristics the definition underlines (efficiency, effectiveness and satisfaction) refer as much to the product as to all the other elements of the system: users, their task and the environment in which they are performing their task
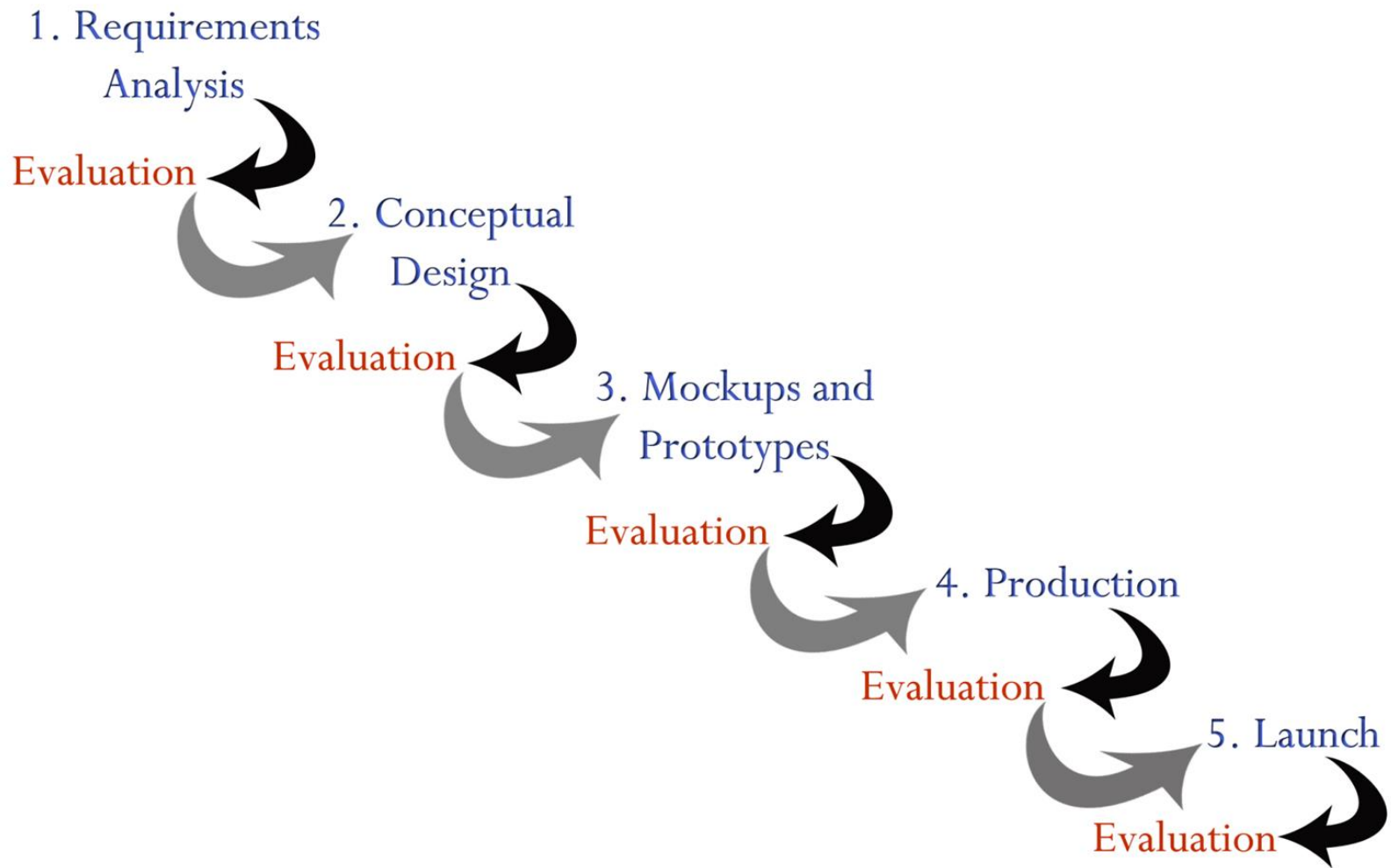
Usability

Usability in Design Models

- The traditional way of thinking about usability is compatible to the traditional **waterfall-type** - usability is taken into consideration only at the end of the design process when the product is already finished and launched on the market

- **iterative design** - it is practically impossible to create perfect solutions from the beginning, so we need several design cycles in which to alternate activities such as problem description, creating solutions and evaluating

- more suitable for addressing the new perspective on usability as it is flexible and adaptable enough to incorporate different types of constraints that determine usability

- the only weak point of it was the fact that, in its initial form, the iterative design process did not make the involvement of users necessary in the design process

- **designers are not users, do not resemble the final user and cannot fully understand the user's needs and problems**
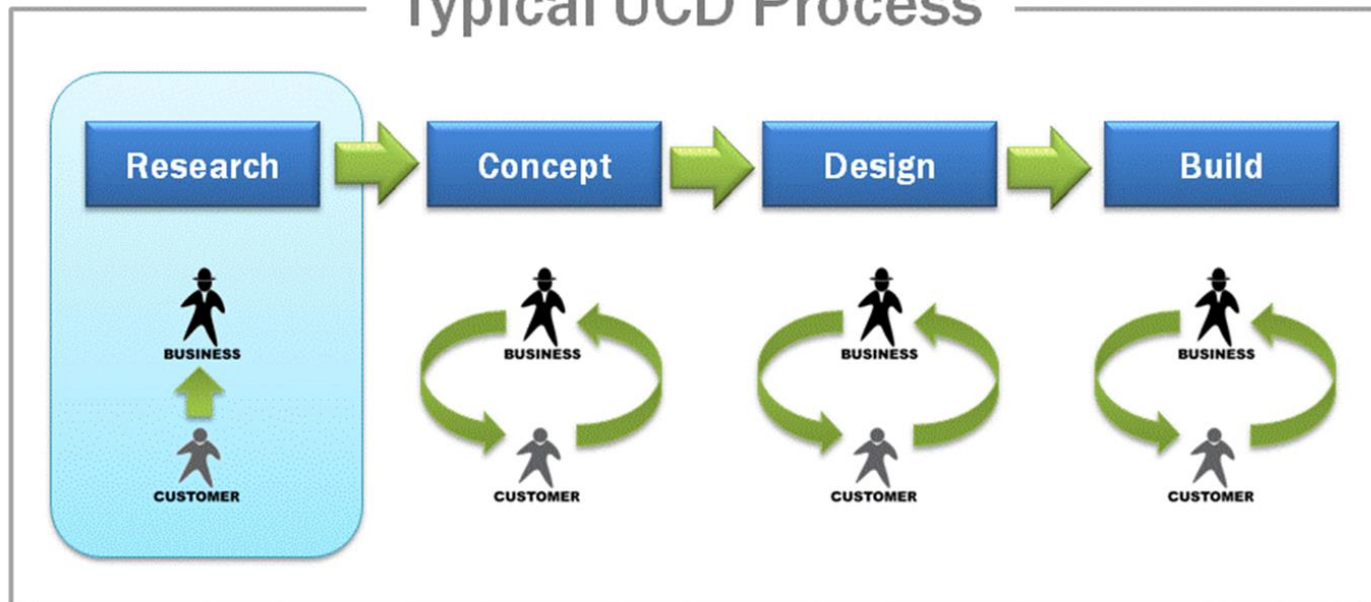
Usability in Design Models

- the user-centered design contributes to the shift in user interest from the end of the design process to the beginnings.

- the traditional design process started with the specification of requirements for the new product

- user-centered design places the **needs analysis** as the first phase in the design process and further retains the adaptability and flexibility of iterative design

- all existing models of user centered design include a requirement analysis stage (or user analysis), conceptual design, prototype design and evaluation (mockups, prototypes, simulations), implementation and evaluation at every of these stages

1. Requirements Analysis
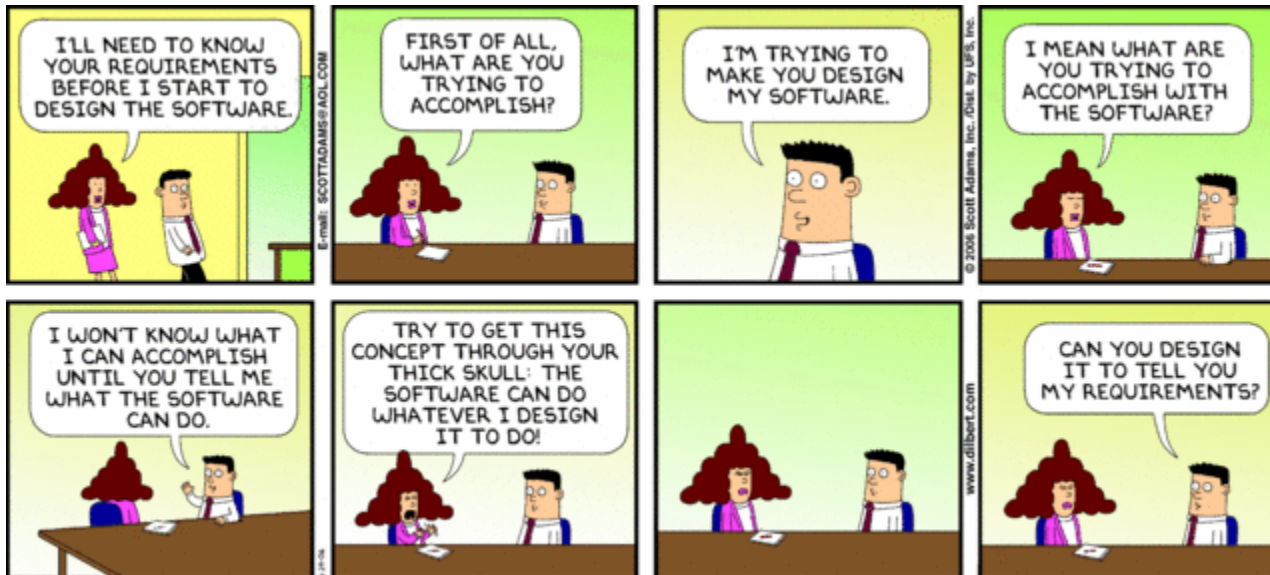
Evaluation

2. Conceptual Design

Evaluation

3. Mockups and Prototypes

Evaluation

4. Production

Evaluation

5. Launch

Evaluation

Pervasive Usability Design Process

Typical UCD Process

User needs analysis …


http://www.dilbert.com/

User needs analysis

- **Quantitative vs. Qualitative methods**

- the user research in the early stages of the design process can seem a very complex and difficult job (even more so for a designer not trained in this kind of research).

- the most common techniques imply **observing people, interviewing them, organizing focus group**s, in short, a **qualitative**, in depth approach to people involved and their needs, aspirations, experiences and problems.
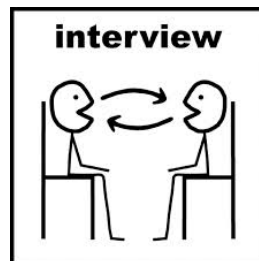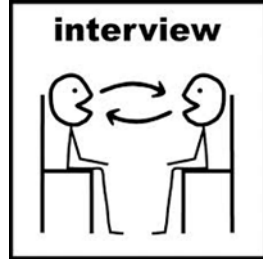
User needs analysis

- At the beginning, before any idea of the product is put forward, the user research has to stay **less structured and qualitative in essence.**

- At more advanced stages other more structured techniques such as the structured interview or surveys can be used.

QUALITATIVE METHODS FOR USER NEEDS ANALYSIS

Interviews

- Interviews are one of the most used research methods in social sciences and one of the best suited to gain a thorough understanding of peoples' wants and needs.

- Interviews can also provide a very flexible structure that can allow us to address multiple categories of stakeholders involved in the design process.

- There are several types of interviews ranging from very structured interviews to unstructured ones

Structured Interviews

- closely resembles a survey as the researcher develops a fixed number of questions prior to the research.

- those questions will be addressed in exactly the same way to every participant.

- most of the time there are preset answers from which people have to choose.

- can be very useful when the researcher needs to verify things

- inappropriate when the focus is the in-depth understanding of people's needs and wishes as the high level of structure will not allow for unexpected responses and insights

Unstructured Interviews

- completely dependent on what happens and develops during the interview itself.

- the researcher will not structure anything before the interview and will have no preset topic agenda besides the general topic of the project which is the focus of research.

- can be very useful in projects which are less specified, for which there is very little information or when there is a great concern for putting aside the designer's preset solutions or preconceptions about the project.

Semi-structured Interviews

- somewhere in-between the other two types being a degree more structured than the unstructured interview

- still allowing for a great deal of unexpected, new information or insights to arise.

- the researcher will prepare in advance some questions or topics he/she will want to discuss during the interview, but the way in which these are brought into discussion is very flexible.

- if new, unaccounted aspects arise during the interview, these can be further analyzed and included among the topics of interest.

- this form of open interview can be demanding for the researcher but it can produce a lot of valuable data to inform the design.

When to use interviews

- they are suited to address the first stage of user needs analysis

- at this stage we will most probably use less structured or even unstructured interviews in order to uncover underlying experiences, beliefs and values.

- interviewing is also present in later stages of development when it is more probable to use more structured interviews as we are trying to find out specific information and reactions to the design we have proposed.

When to use interviews

- **Disadvantages:**
  - people do not always tell what they really believe but maybe the interpretation of this phenomenon could become relevant for our research project.

  - people sometimes answer a completely different question than the one addressed.

  - the researcher must very careful observe and assess these things in order to overcome this type of situation.

  - the data obtained using an interview is strongly dependent on the interviewer skills and mastery of the technique which is gained through exercising.

Focus Groups

- Focus groups - more or less structured group interviews

- based on creating a group **interactive setting where people can be asked about their attitudes and feelings towards an idea, a product or a service**

- people are allowed to talk with each other, to question or develop each others' statements

- appropriate to gain access to people's **needs, experiences, wishes and priorities**

- very suitable for the study of people in their natural setting even more if they are used together with participant observation in order to elicit unexpected thoughts and issues for further exploration

- **high validity** (the result are trusted, believable, as it is very easy to see how people came to those results) and very **easy to learn and inexpensive method**

Focus Groups

- Shortcomings

  - the power dynamics in group interaction that can affect the results obtained

  - the researcher usually has less control over the interviewees during this kind of approach

  - unwanted discussions can take a part of the interviewing time

  - appropriate for a stage in which there is yet no idea regarding the final product and the main concern is the understanding of people's needs, problems, priorities and way of thinking

  - appropriate for the stage in which some requirements are already translated into features and we need people to assess this translation or to prioritize these features

When to Use Focus Groups

- at the **very beginning** of the design process where, together with contextual inquiry and task analysis can build a very detailed picture of how people are behaving right now and of their perceptions regarding important issues

- can be used as a method for **analyzing the competition also** - can bring information related to the problems that our product is designed to solve, the reasons why it can be a more valuable resource than other similar products and **the features that consumers perceive to be critical in the competition**

- all this information will enable us to **set up requirements and features** for our product that will be closer to what people want and value, and save a lot of resources from the beginning

When to Use Focus Groups

- can be also used at a **later** moment in the development cycle in order **to identify and prioritize features or even in order to create or develop new features**

- can also be used in the **redesign** process in order to improve present designs

- We will **not use** focus groups as a **usability assessment** technique to generalize all the findings to a larger population or to justify a position or to prove a point

Surveys

- surveys are very structured interviews: a very structured way of asking questions that enables us to **address a large group of people** and record their answers

- allows the researcher to use statistical tools to examine the characteristics of the targeted population

- The types of information that can be obtained using surveys cover the characteristics of users groups and eventually, **the identification of several user subgroups**

Surveys

- Used to find out which of the **features of the product are more appealing or more important for the targeted users**, the information and features that people look for in our product, **problems** that people have encountered while using our product, the level of user **satisfaction**, suggestions for **improvement**

- most of this information relates to a stage where **we have already designed a product** and we want to test it or when we want to redesign our products

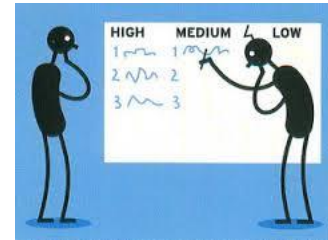ARE PROFESSIONALS READY FOR WEARABLE TECH?

Appealing Feature

48% would like to be able to access smartphone functions without having to dig into their pockets or bags—a key characteristic of wearable tech.

**Base**line

When to use surveys

- surveys are used when we want to **test the preferences and needs** of a broader population about a product or a potential product

- it is recommended to be used in design stages when in-depth information is not needed so much

- we will use surveys when passing from the user needs analysis towards requirement specification in order **to structure and prioritize** the findings from interviews, observations and other less structured methods

- surveys can be very effectively used in testing preliminary ideas and designs as well as **assessing** the characteristics of the final product.

Summary

Design step/method	Motivation
User needs analysis	
Observation	To get information about people's observable actions and the work environment
Unstructured interviews	To explore underlying experiences, beliefs and values
Focus-groups	To elicit unexpected thoughts and issues for further exploration
Surveys	To identify groups of users, to prioritize findings from the qualitative methods
Requirements	
Focus-group	To gain access to people priorities and wishes
Surveys	To find out which of the features are more important
Conceptual design	
Interviews	To derive design ideas or to test design ideas
Focus groups	To assess the translation of requirements in features and to prioritize the identified features
Prototyping	
Structured interviews	To find specific information/reactions to the proposed design
Focus-groups	To identify new features
Surveys	To identify which product features are more appealing
Evaluation	

A model for early usability integration
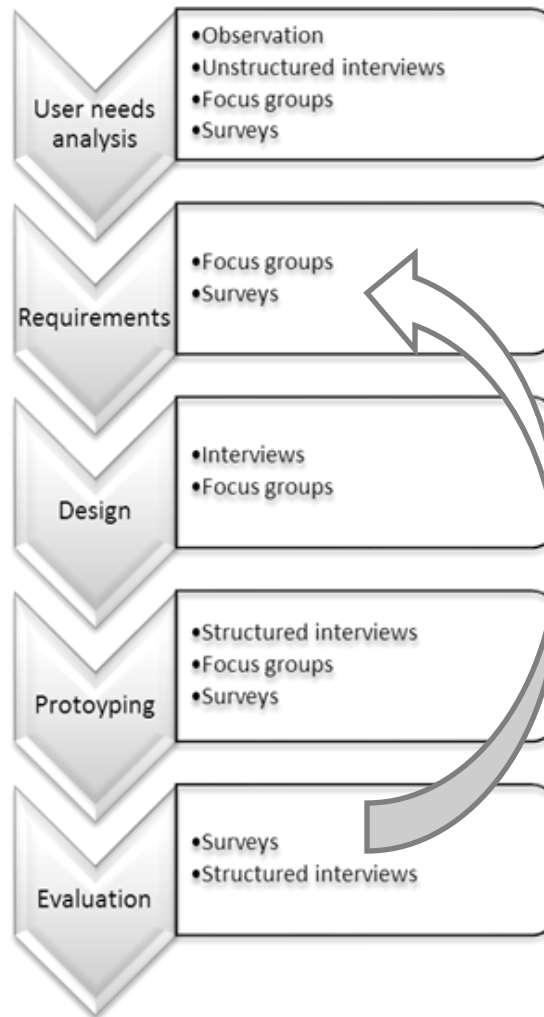
User Needs Analysis - Case Studies

- Development of a theatre/opera website design pattern

User Needs Analysis - Case Studies

- Development of an intelligent web assistant for career decision

Resources