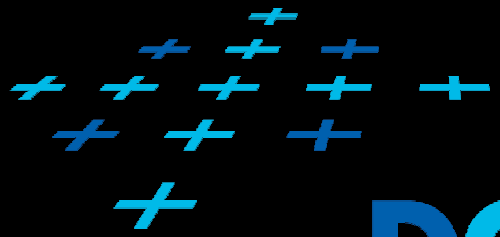


DCGI

DEPARTMENT OF COMPUTER GRAPHICS AND INTERACTION

NUR - Introduction to HCI

Big picture, design process, UCD, UI issues

NUR lectures

- Lectures – theoretical and practical
- Theoretical lectures
  - formalisms used for UI design
- Practical lectures
  - goal: to acquire knowledge necessary for successful completion of semestral projects
  - experience with industrial or EC funded projects
  - experts from industry
    - User research
    - Prototyping

Relation between NUR and TUR

- TUR
- teaching methods and techniques of UI testing
- some very basic info about UI design
  - necessary to acquaint students with the context in which the UI testing takes place
- https://cent.felk.cvut.cz/courses/Y39TUR/

- NUR
- systematic approach to the UI design
  - by means of modern methods developed in the field of HCI
- linked up with knowledge acquired in the TUR course

Motivation

UI in everyday life

- Buying a washing machine (what are USUAL criteria for buying such a machine?
- Do people (users) have some strategy?
- How UIs are designed?
- Give an example of a UI and particular user group for which the UI is not suitable

Why study HCI?

- You will be designing real applications
  - they will be used by other persons
- UI represents the majority of the IS code
  - over 50% (some authors speak about 80%)
  - more than 50% of implementation effort is UI!
- Costs related to bad UI design
  - financial (commercial success of IS is strongly dependent on UI quality)
  - life (airline crashes, explosions in the factory)
- Successful UI design requires
  - knowledge of the human capabilities and general requirements
  - knowledge of the UI design principles and lifecycle

Criteria for successful UI design

- We can consider being successful when we solved the problem
  - e.g. we developed UI for nuclear power plant control
- Metrics for quality of UI design – **usability** (TUR)
- Other points of view
  - robustness, easy maintenance, security (hackers etc.), compatibility, social acceptability
  - price

Figure 1.4 The Three Mile Island nuclear power plant.

Figure 1.3 Computer rage: Workers have started to become physically (and verbally) abusive toward IT.

Opinion of users is important

Traditional approach to software design

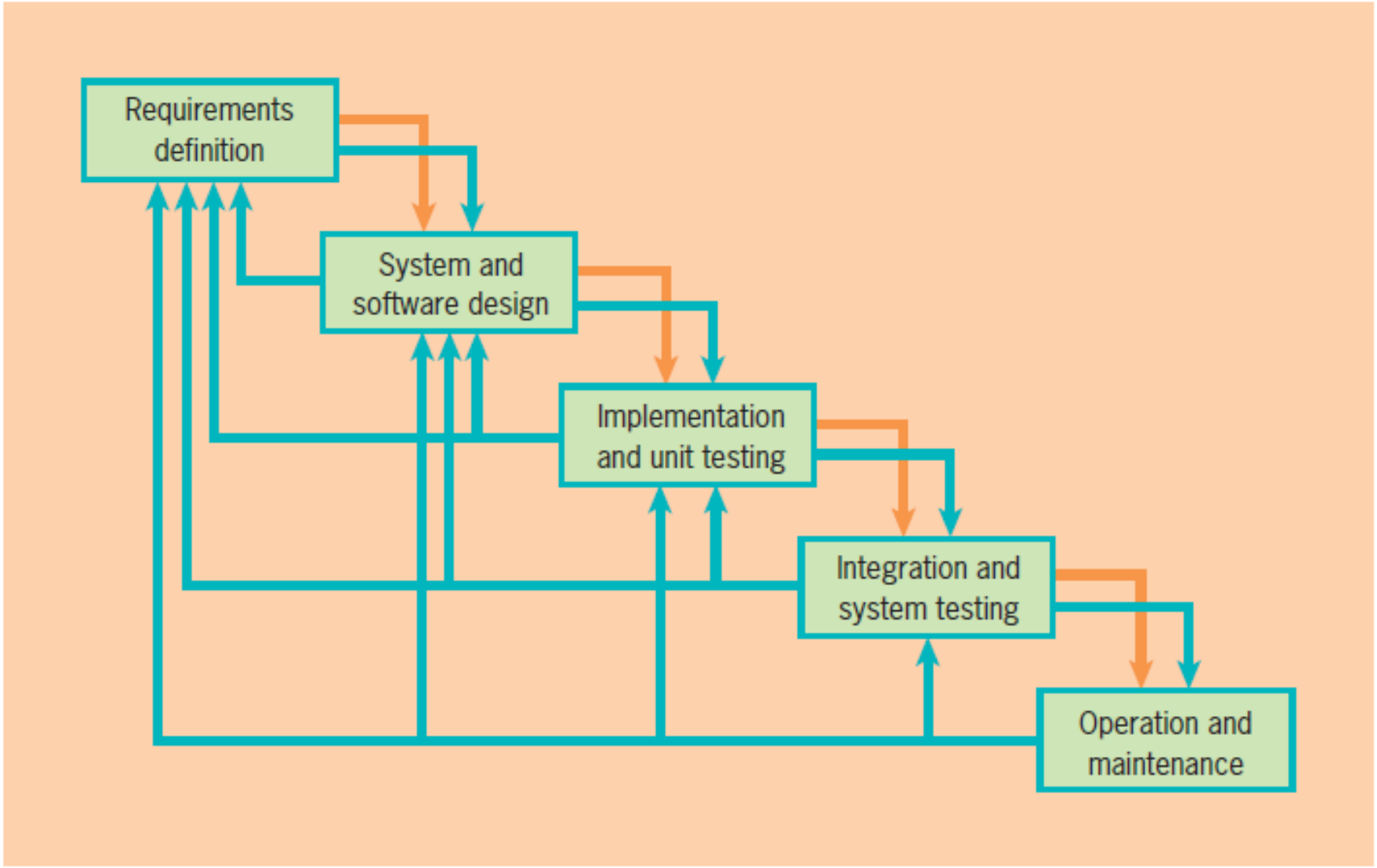
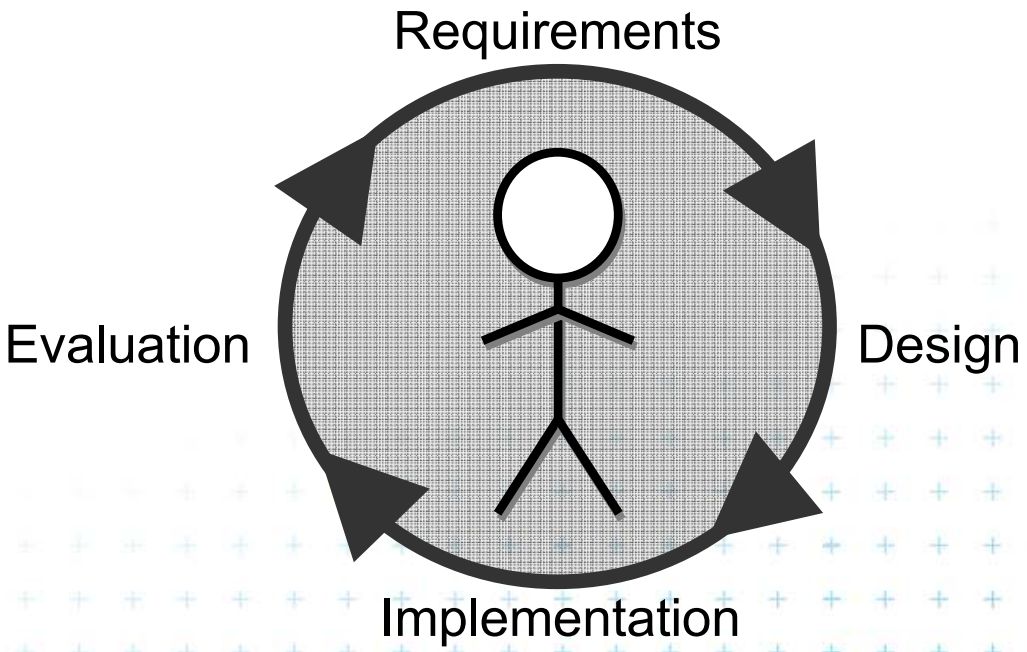


Figure 1.8 The classic life cycle. (From Sommerville, 1995.)

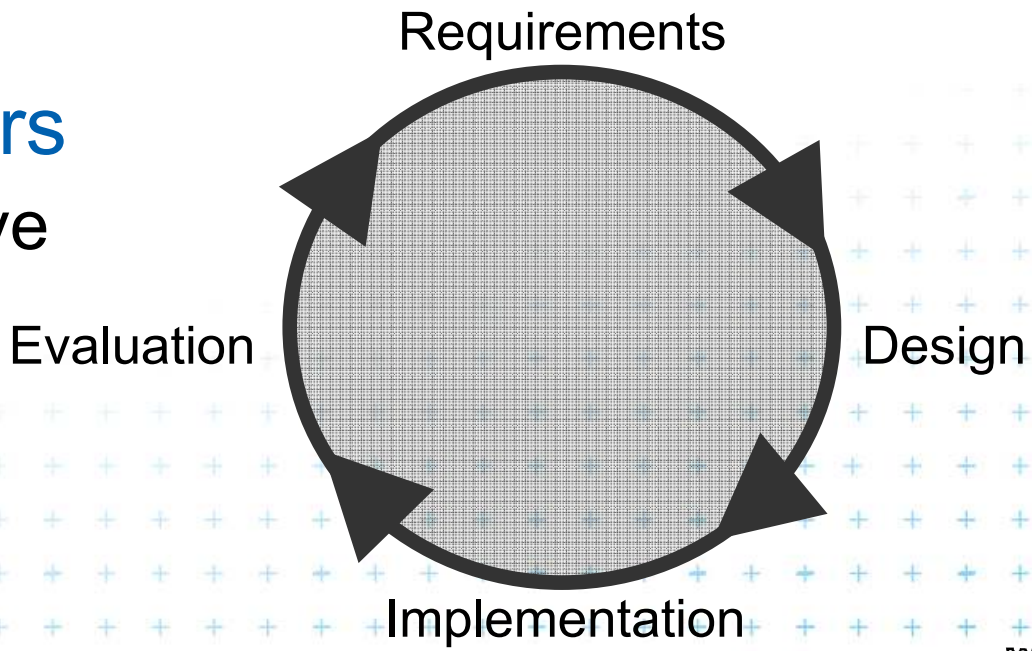
UI design

- User Centered Design (UCD)
  - Find what are user needs and take them into account
  - You should be in permanent contact with potential users during the whole design process
    - testing of UI prototypes



UI design cycle

- UI Design
  - Understanding users and their needs
  - Principles of design, usability heuristics
  - Design in cooperation with the user
    - User centered design
- Prototyping
- UI evaluation with users
  - quantitative & qualitative



What kind of users do we have in mind?

- People are different
- The particular design is always a compromise
  - we do not consider rare extremes (illiterate user)
- Usually 5% “outlier” cases are eliminated
  - the result of this strategy is that some potential users can be discriminated
- Examples
  - car: height, weight
  - computer: font size, use of colors (colorblinds)...

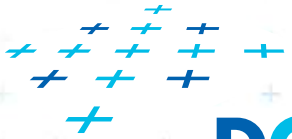
Classes of users

- Novices
  - very limited set of functions available
- Casual users
  - standard set of functions
- Advanced users
  - advanced functionality
- Experts
  - sophisticated functionality

- Consequence: necessity to split functions into individual categories
- How can influence particular class of users implementation of functions?

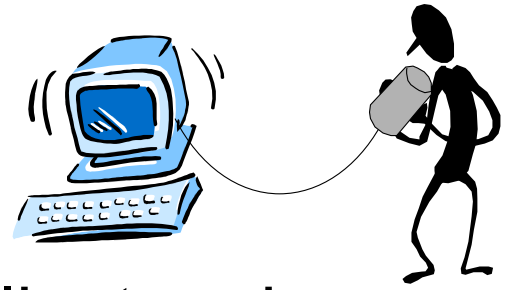
Introduction into HCI

Basic terms



Human-Computer Interaction (HCI)

- Human
  - End-user of an application
  - Collaborative environment
- Computer
  - The device running the application
  - Execution often distributed among client and server machines
- Interaction – two-way communication
  - User tells the Computer what to do (commands)
  - Computer tells the User what happened (results)



Role of HCI - the bridge

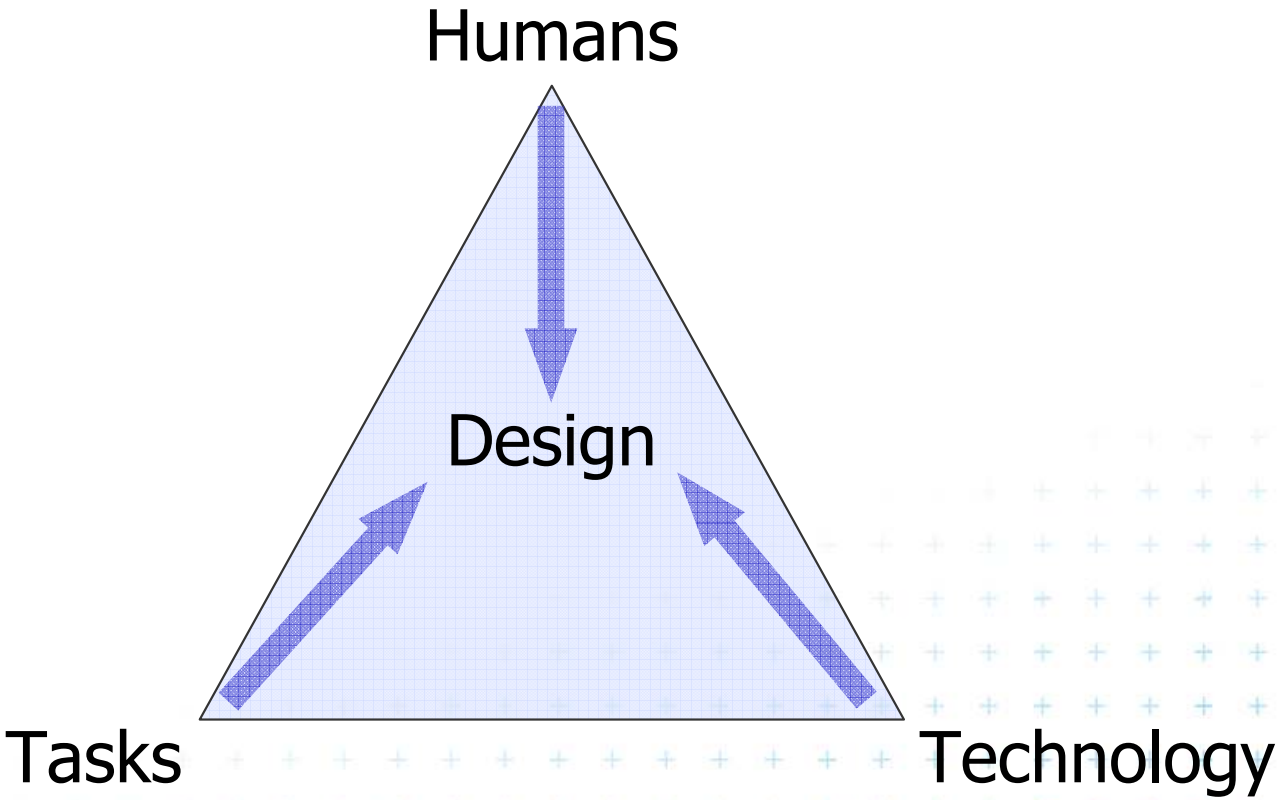
Psychology

Informatics

Human-Computer Interaction

What is HCI?

- Design, Implementation, and Evaluation of the interactive systems from the perspective of use by the human.

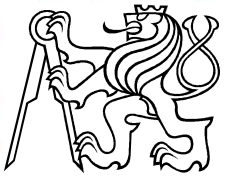


User Interface (UI)

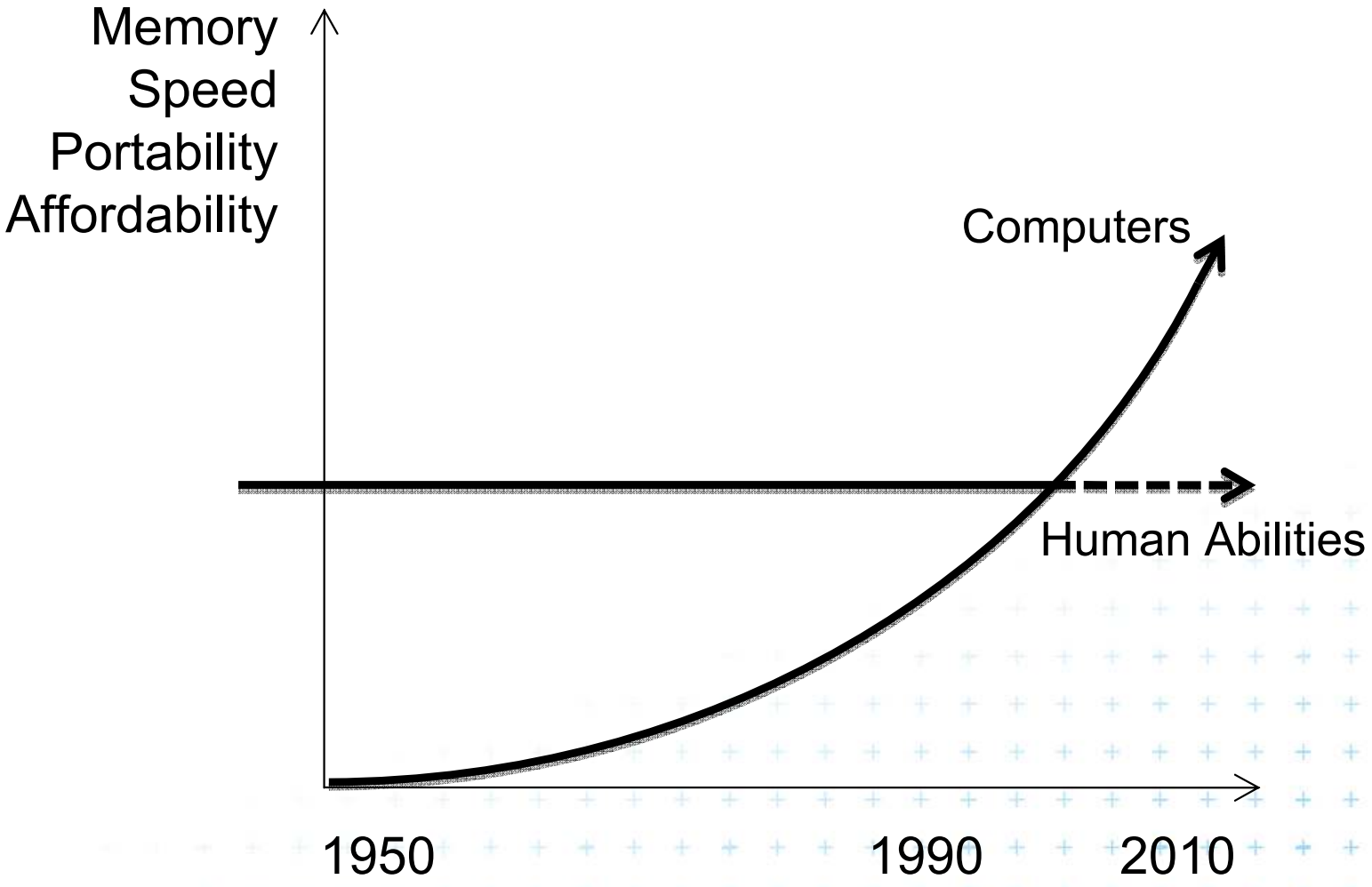
- The part of the technology, allowing people to:
  - Perform their own tasks
  - Interact with the technology
  - Both are indivisible

HCI is sometimes understood as the *design, prototyping, evaluation, and implementation* of the UIs for desktop computers.

Relation between capabilities of a user and capabilities of a computer



Moore's Law


Memory
Speed
Portability
Affordability
Computers
Human Abilities
1950
1990
2010

What are the interactive systems (IS)?

- They support bidirectional communication between human and computer
- What kind of advantages they bring in comparison with batch processing?
  - IS support human activity
    - the results are available much quicker
    - they have higher quality – with few mistakes
  - It is possible to intervene in the course of the problem solution
  - Human can devote his/her capability to creative work
    - the routine work is performed by computer

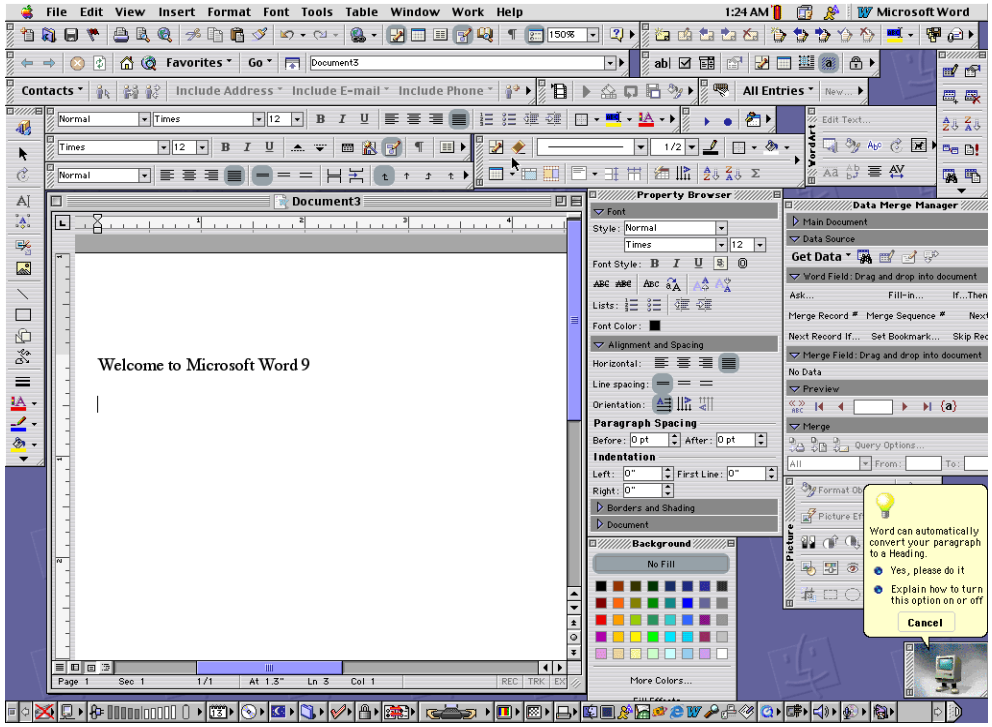
What we dislike when working with IS?

- We hate to spend our time with remedy of problems that were caused by IS
  - there is not enough time for the work – instead we fight with UI

- That is why we should design high quality UI

Examples of improper UI design

Examples of improper UI design



Presidential elections in the US

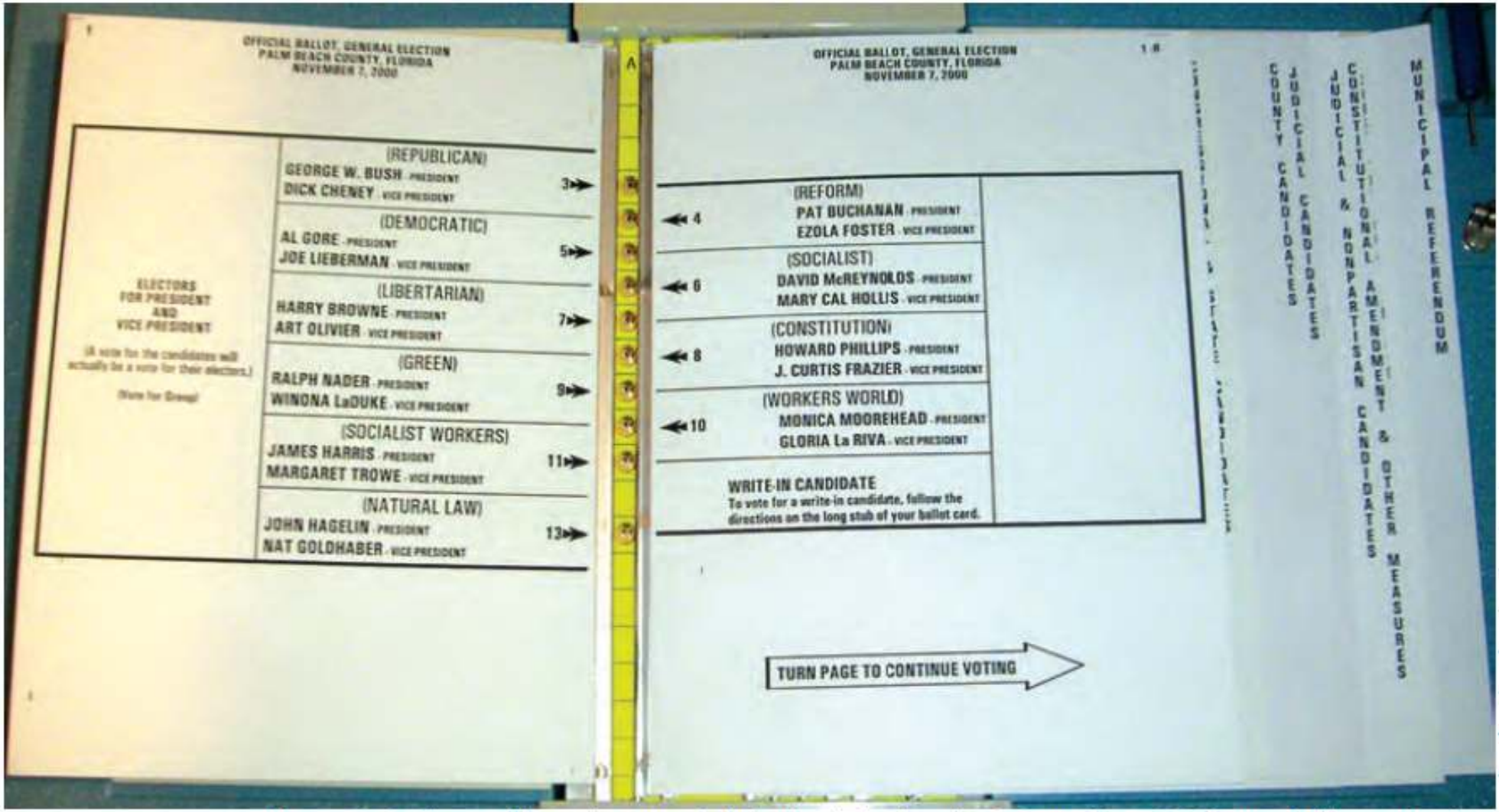
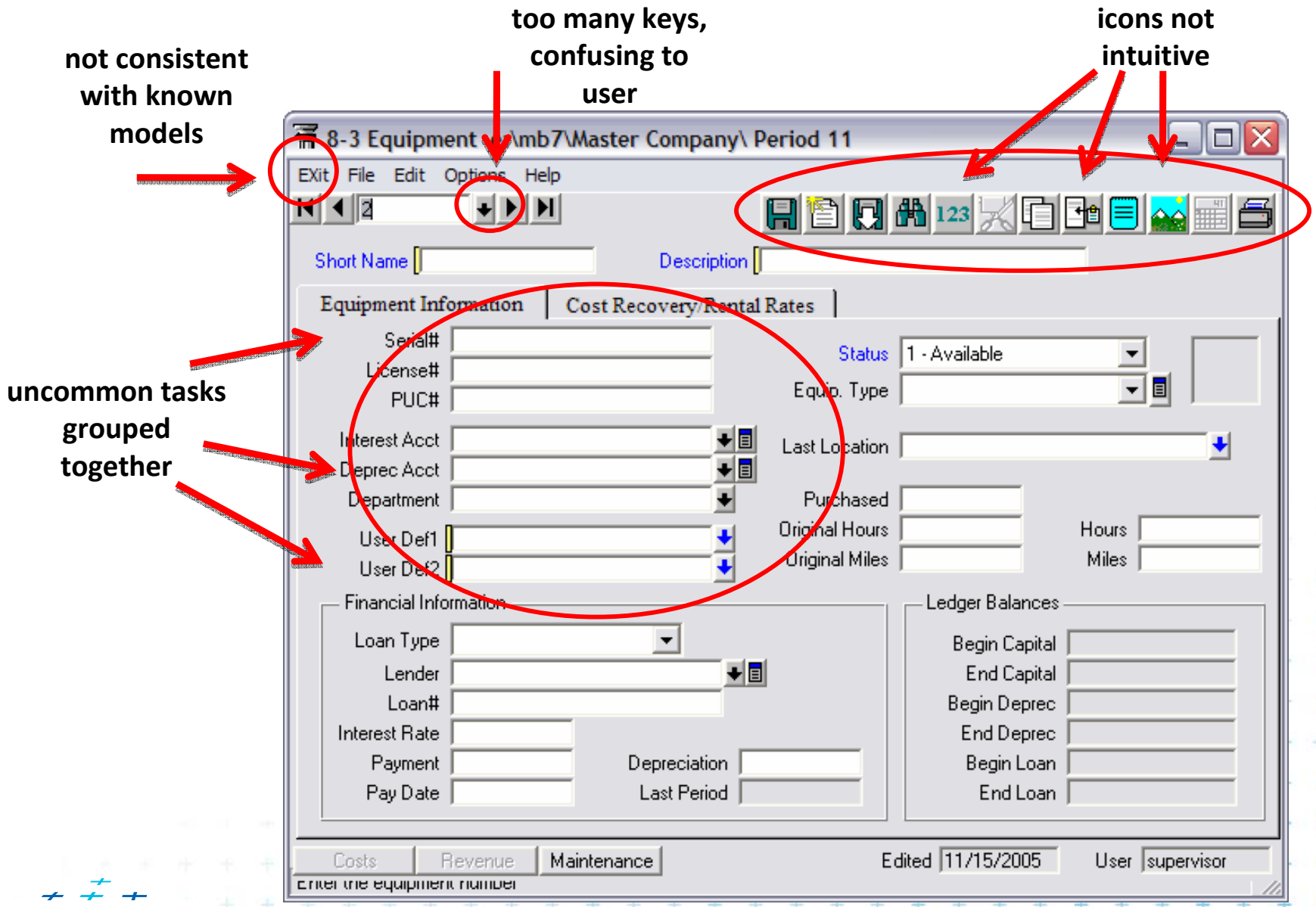


Figure 1.6 The problematic page of the ballot in the booth. © Steve Krug 2004, used with permission.

Examples of improper UI design

- What problem we can encounter with Apex RC?
- Why the TiVo RC is designed in much better way?
  - We can hold it more comfortably in hand
  - The layout has some logic and the keys can be distinguished by means of color coding
  - We can easily distinguish keys (shape)

What's wrong with this UI?



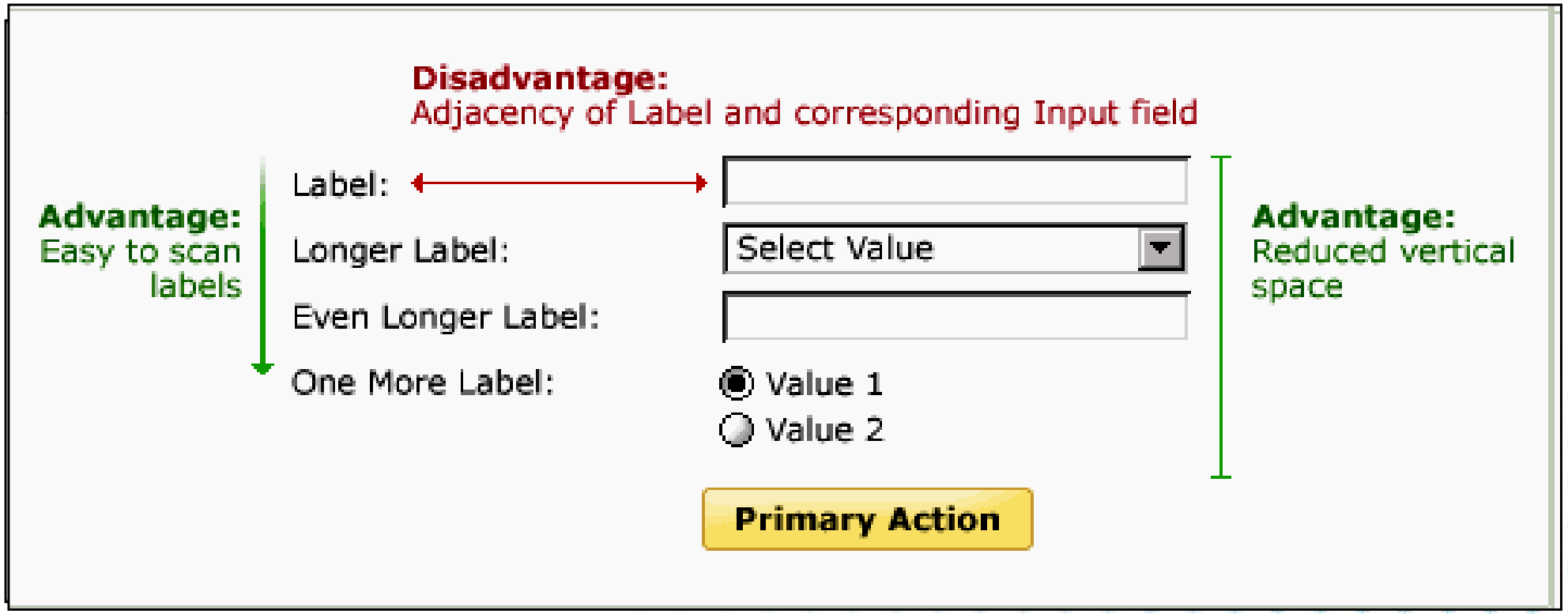
UI design is more and more complex

- Increasing number of devices we can control
  - radio set in a car: AM, FM1, FM2, 5 pre-sets, station selection, balance, fader, bass, treble, distance, mono/stereo, Dolby, CD changer
  - What about driving in the dark?
- Feedback is more and more fine, more and more complex and it is getting more and more unnatural
  - e.g. setting digital alarm clock
- The impact of wrongly designed UI is more and more serious
  - medical applications, airplane disasters

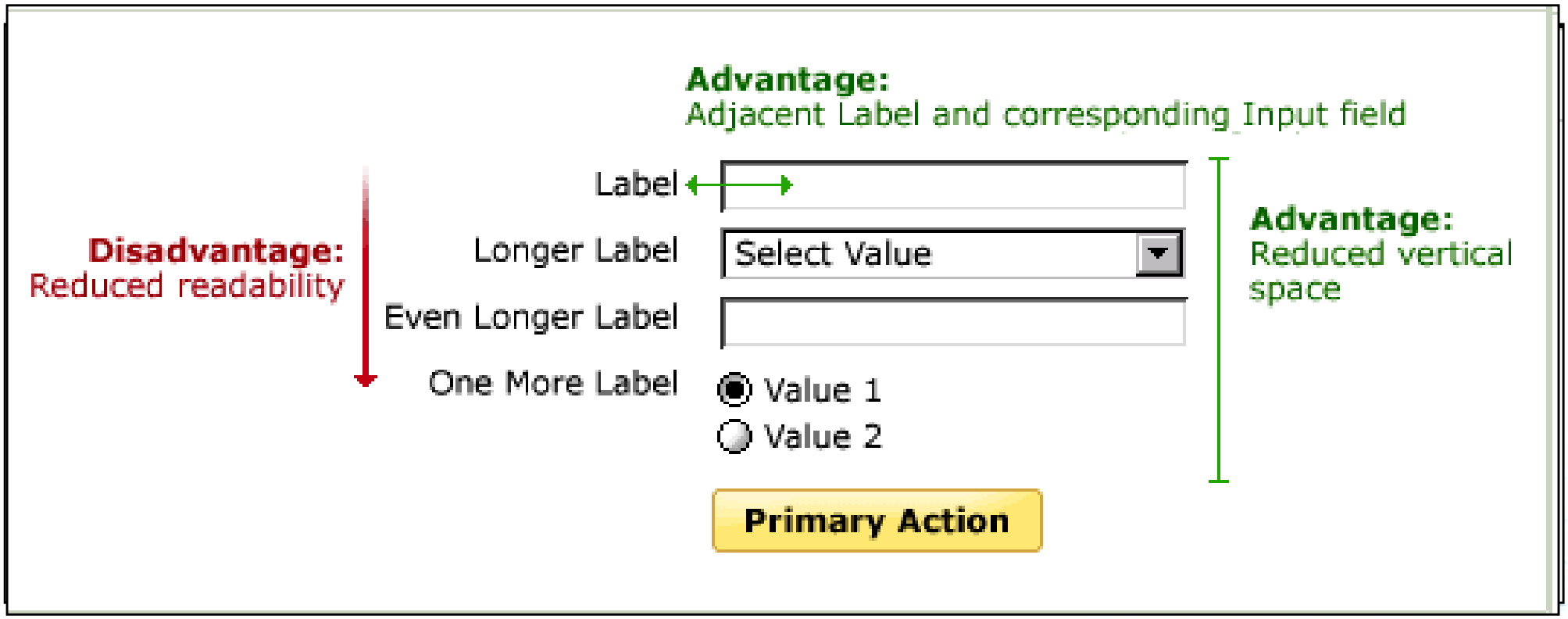
UI design is more and more complex

Too wide choice

Assessment of UI



Assessment of UI



How to deal with design

- Many user errors are in fact errors in design
  - Do not blame users!

- The initial step in UI design should be a good conceptual model that includes
  - affordances (dostupnost)
  - causality (návaznost)
  - constraints (omezení)
  - mapping (individual steps of our problem solution onto individual functions available)
  - behavioral patterns of target users

- The design should take into account individual properties of a specific class of users
  - we have to determine what the target user group is

Who are the stakeholders?

- Users
- Engineers and designers
- Sales and marketing personnel
- Managers

What users expect?

- Support from the system
- Easy available functions
- Manageable cognitive load

What Engineers and Designers expect?

- They would like to finish the product ASAP
- They do not want to explain to users how the product (or its part) works

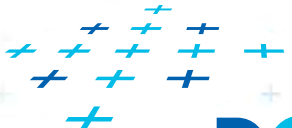
What Sales and Marketing People expect?

- They would like to have financially successful product
- They should take into account many external and internal factors
- E.g. database of current customers, public media and related PR, competing companies with similar product, product maintenance expenses etc.

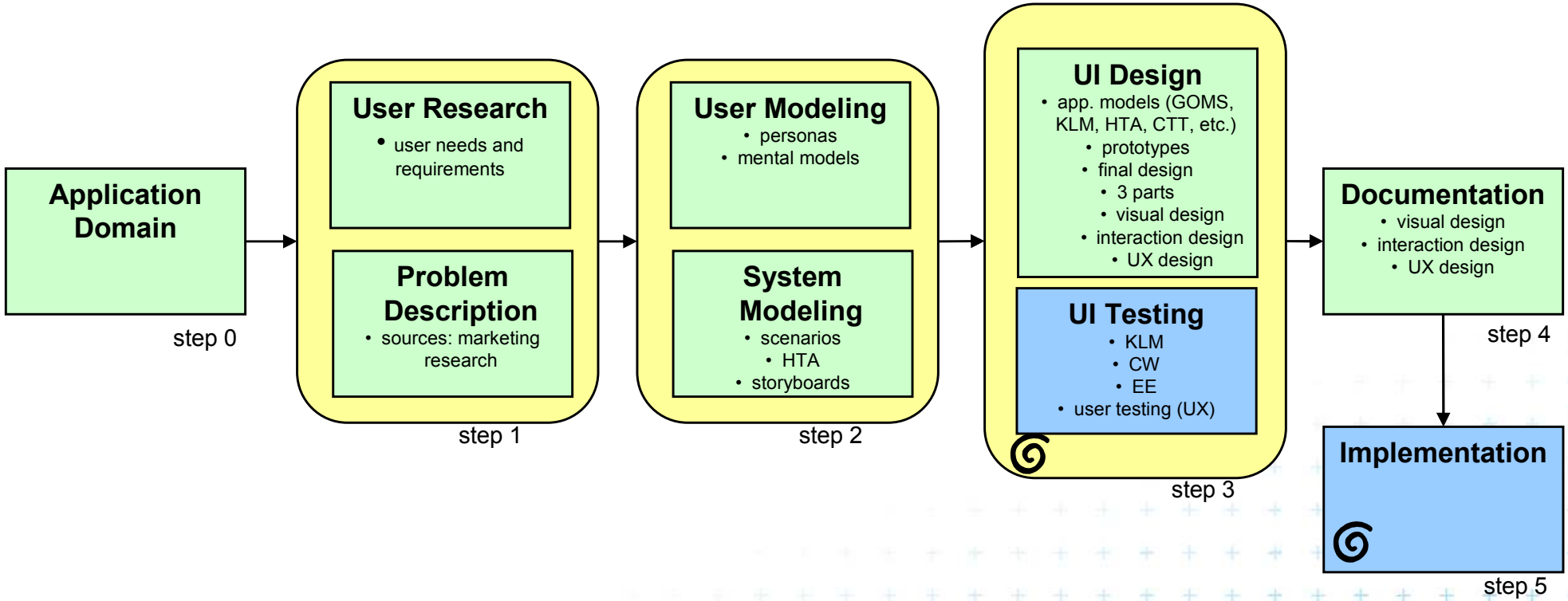
What Managers expect?

- They are interested in expenses spent on product development
- E.g. how much design and testing will cost, what will be tested (just the product or support web page or both), how many resources will be needed (time, money, number of people involved …)

Systematic approach to the UI design

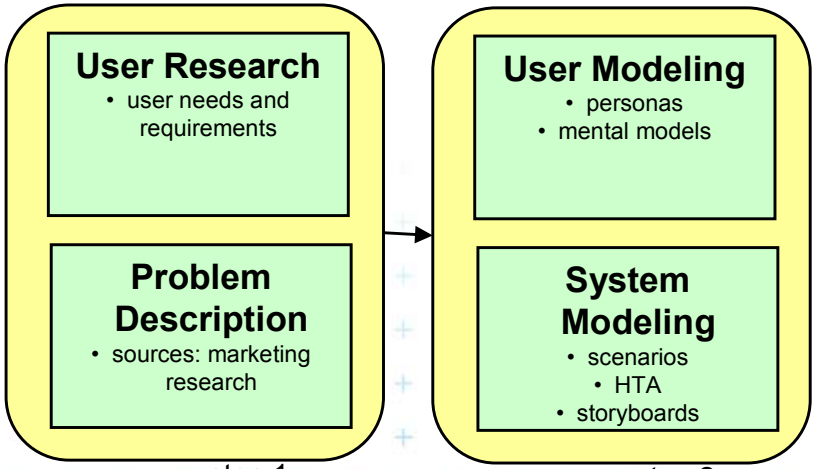


User interface design - big picture



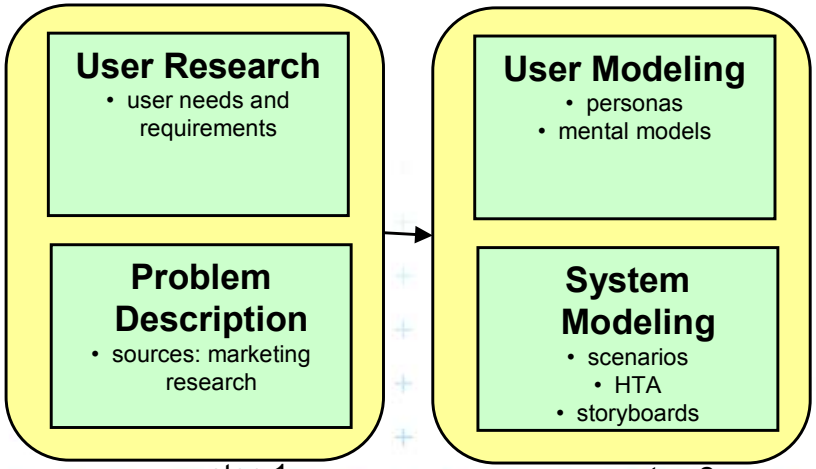
Analysis of the problem to be solved by IS

- Identification of activities
  - which will be supported by IS
- Identification of the users
  - those, who will perform the activities
- Definition the level of support (usability)
  - support the IS will provide
- Selection of the form of solution of the problem



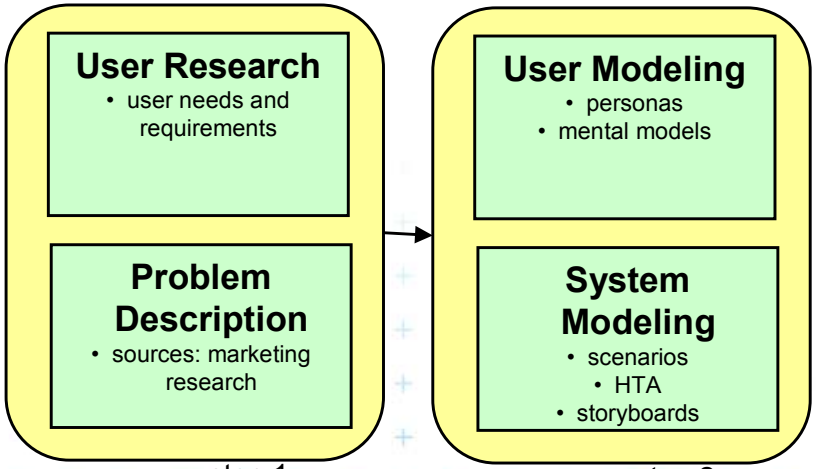
Users

- User requirements
  - general user requirements
    - physical, cognitive, social
  - specific user requirements (related to the problem solved)
- User models
  - KLM, personas



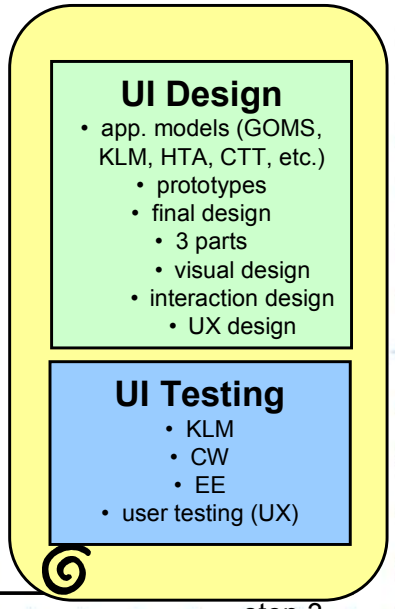
Level of support

- Designed solution must fulfill the user requirements
- Usability - see TUR course



Form of solution

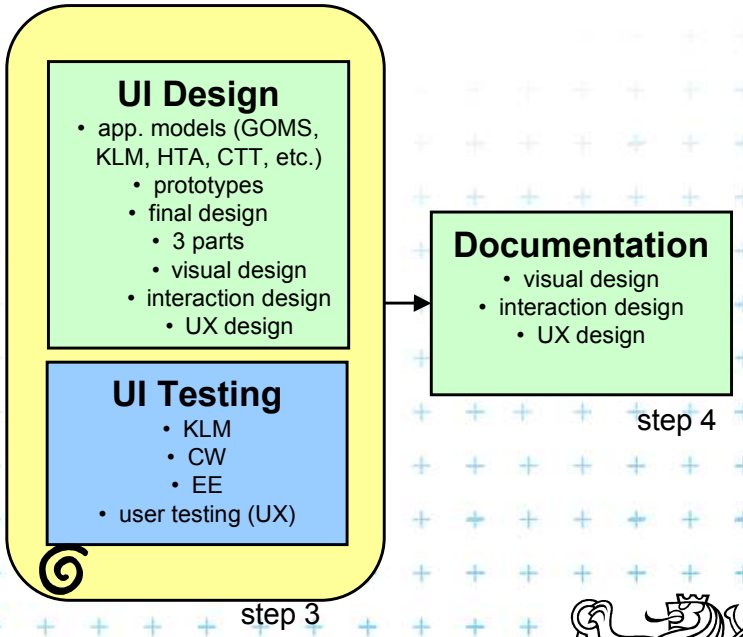
- Influenced by technology and resources
  - form of user interface
  - application SW supporting the UI
  - operating system
  - system resources (memory, network bandwidth, etc.)
  - hardware



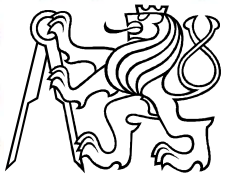
step 3

IS design process

- 1. Problem description
- 2. UI design
- 3. UI testing
- 4. Documentation for further implementation



Application design example



Example of application design process

- Application domain: Personal Weather Forecast

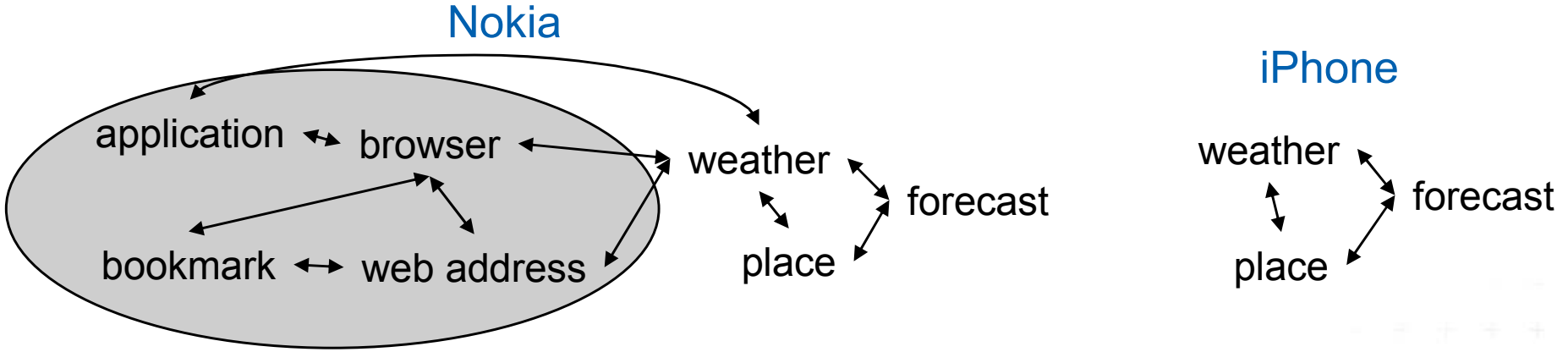
- Design process phases
  - user research (ethnography study)
  - user modeling (persona)
  - prototyping (low-fid, high-fid)
  - testing (qualitative/quantitative; with/without users; expert evaluation, cognitive walkthrough; lab/field study)
  - evaluation (summative/formative)

Weather forecast - Nokia

Weather forecast - iPhone

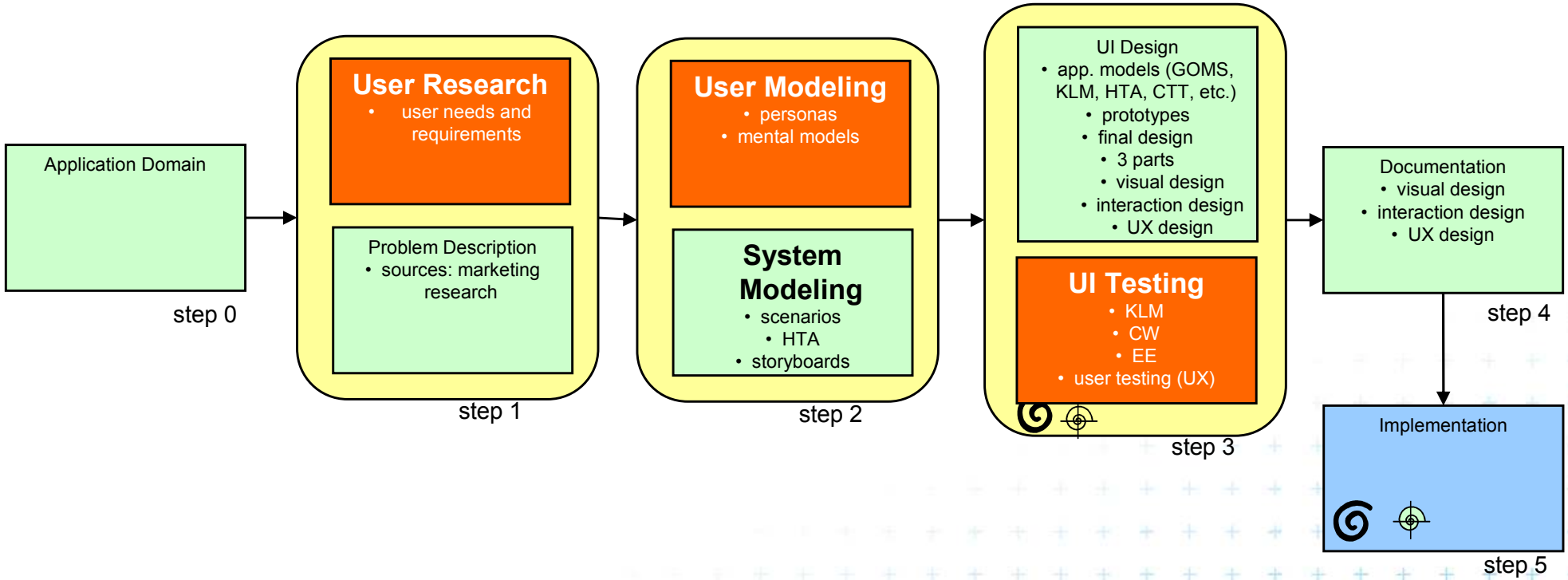
Weather forecast: What is the main difference?

- Number of "clicks"?
  - NOT necessarily
- User's mental model?



- Is there anything wrong?
  - complexity of mental model - NO
  - unknown terms and relations (coming from system mental model)
    - What is the weather in Prague for tomorrow?
- What are the consequences?

What was underestimated in the design process?



Questions?

- Course organization
- HCI topics

- Pictures in this presentation are either from departmental projects or from public resources and the book User Interface Design and Evaluation – D. Stone, C. Jarrett, M. Woodroffe, S. Manocha

Thank for your attention