

**DCGI**

**DEPARTMENT OF COMPUTER GRAPHICS AND INTERACTION**

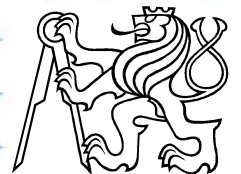
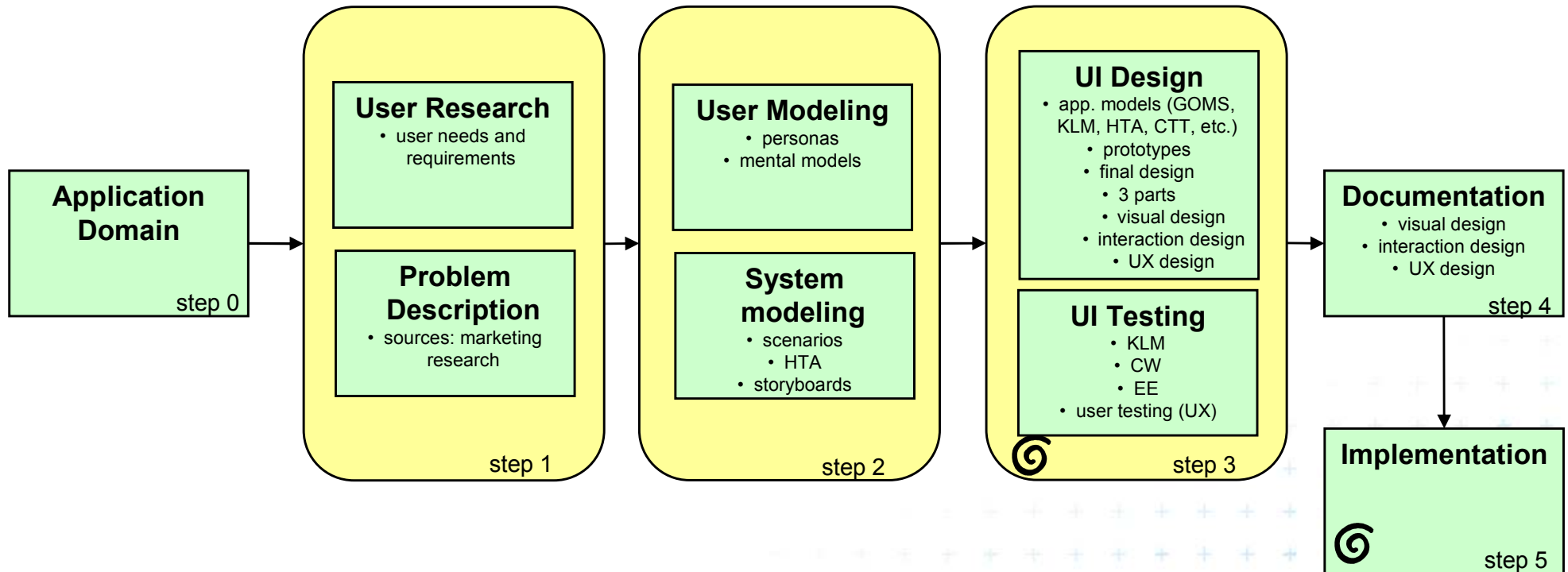
# User Interface Design and testing

**Zdenek Mikovec, Pavel Slavik, Martin Klima**



**Datakon 2010, [www.datakon.cz](http://www.datakon.cz)**

# User interface design - big picture



# Use-case: Problem description

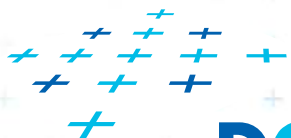
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- Develop a weather forecast application for specific target groups.
  - wind surfers
  - (housewives with children)
- Highly competitive market
  - 20+ already existing weather forecasting applications
- Distribution model: Android Market / Apple App Store

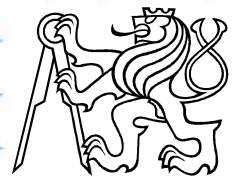


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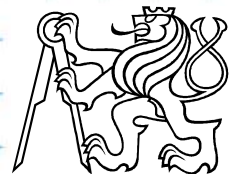
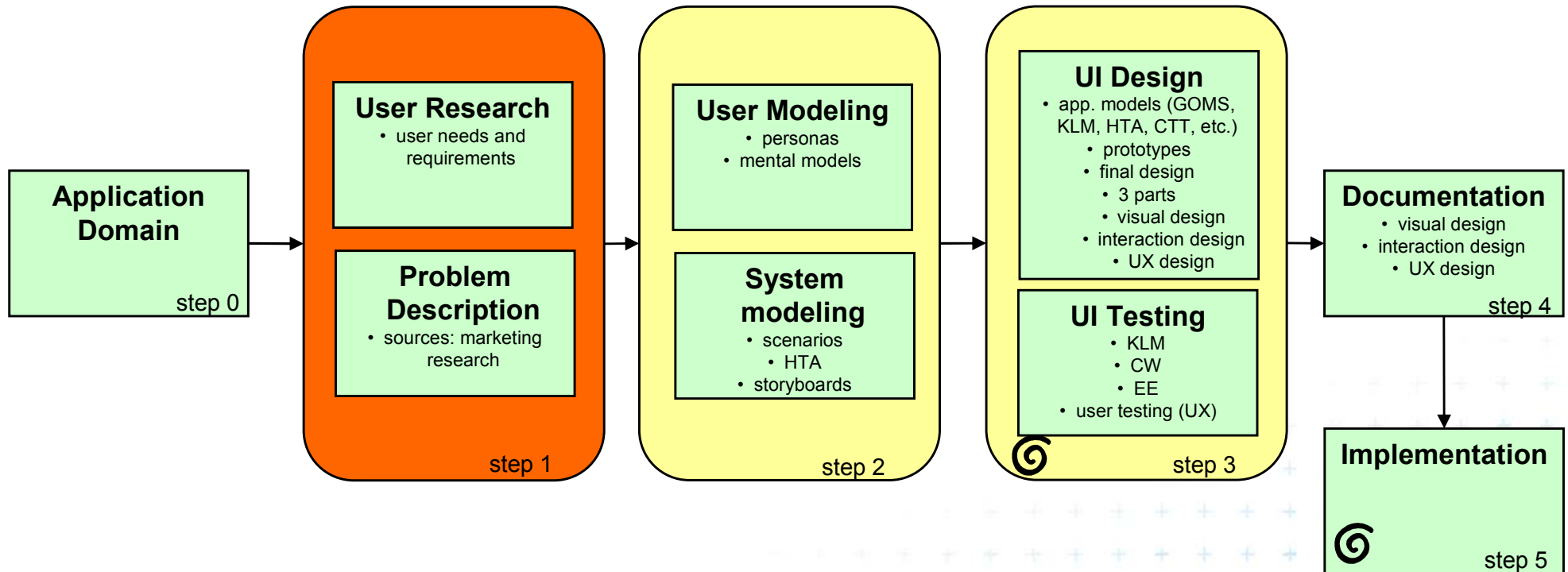
# User research



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# User interface design - big picture



# User research: What is it?

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- Applied interdisciplinary subject
- Cognitive Psychology
- Interaction Design
- Methodology of Social Sciences
- Computer Science



Jakub Franc



# User research: Goal

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- Acquiring, maintaining a presenting information about users
  - needs
  - habits
  - experience
  - skills
- Even potential users



# User research: approaches

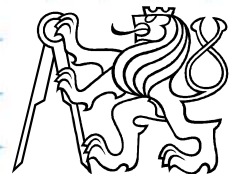
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## ■ Qualitative

- holistic picture
- small sample
- lot of various and in-depth information
- less structured
- interviews, ethnography studies, observations
- exploration of new phenomena, qualitative data

## ■ Quantitative

- reductionist
- large sample
- little very narrowed information
- highly structured
- surveys, tests, observations
- hypothesis testing, numerical data



# User research: phases

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- 1. research questions / hypotheses formulating
- 2. defining population and sampling
- 3. choosing the data collection method
- 4. pilot research
- 5. data collection
- 6. data analysis and interpretation



# User research: Screener

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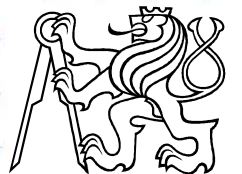
- used to recruit right persons for the research
- 2 parts
  - questionnaire (public)
    - Q1: How often are you doing windsurfing?  
Several times a week / Several times a month/ Occasionally / I do not windsurf
    - Q2: Do you use your mobile phone (besides calling and/or sending SMS) also for:  
Internet browsing / Navigation / Email checking / Nothing else / I do not own mobile phone / Other ...
    - Q3: How often do you use computer (desktop or notebook)?  
Daily / Several times a week / Occasionally / I do not use computer
  - selection criteria (private)
    - Q1: 2+ / 2+ / 1+ / 0
    - Q2: Any selection except "I do not own mobile phone"
    - Q3: Any selection except "I do not use computer"



# User research: Interview principles

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- Behavioral approach - concentrate on immediate experience, not extrapolations
- Words are not the only source of information
- !Restate, but do not interpret! Stay non-judgmental!
- Never say the participant is wrong
- Be aware of your own expectations



# User research: Interview questions

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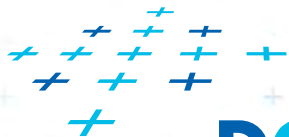
- Direct vs. Projective
  - “people's attitude”
  - Technique of unfinished sentences
  - Metaphors
- Keep questions open-ended
- Do not force opinions
- No leading questions
- Avoid binary questions
- Be curious!



# User research: Interview - exercise

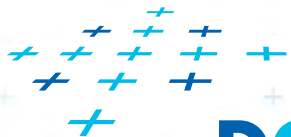
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- interview preparation (10 min)
  - topics
  - questions
  - (screeener)
- intervision of topics and questions (5 min)
- interview execution (15 min)
  - interviewer
  - notetaker
  - observers
- intervision (5 min)
- analysis and interpretation of collected data (15 min)
  - summary of knowledge gained
  - problem description + user requirements
- intervision (5 min)

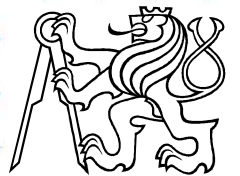


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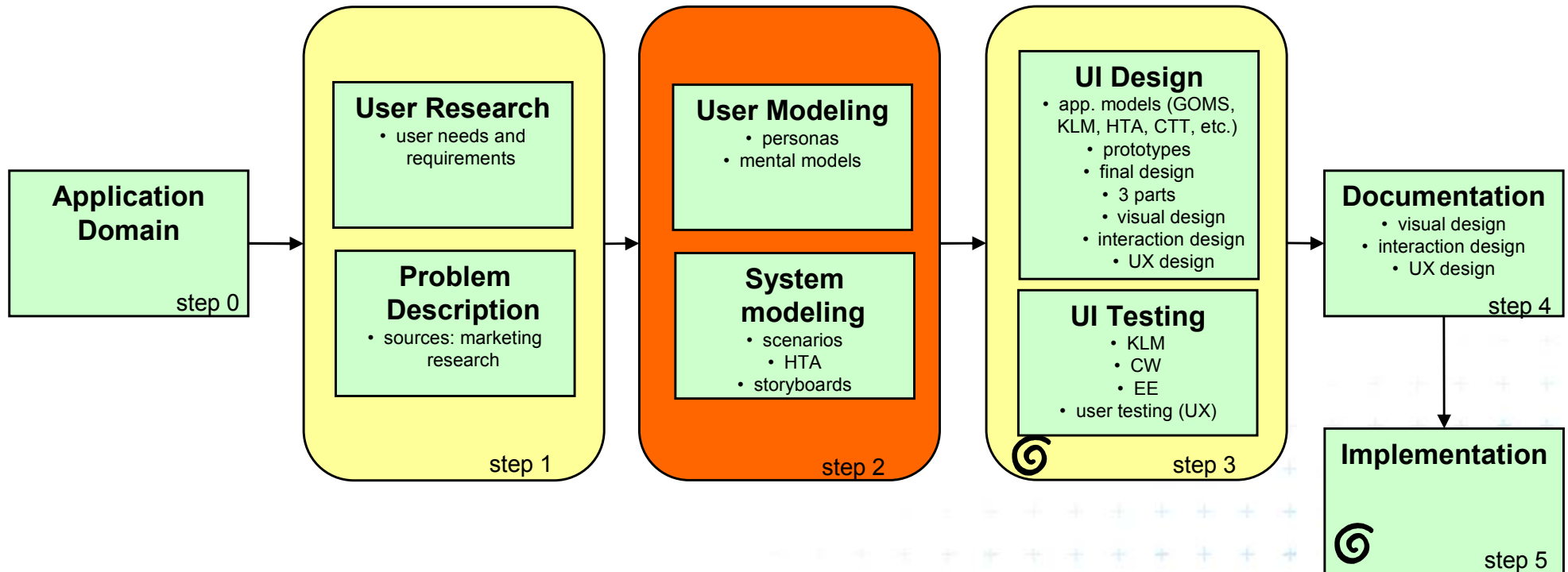
# System modeling



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# User interface design - big picture



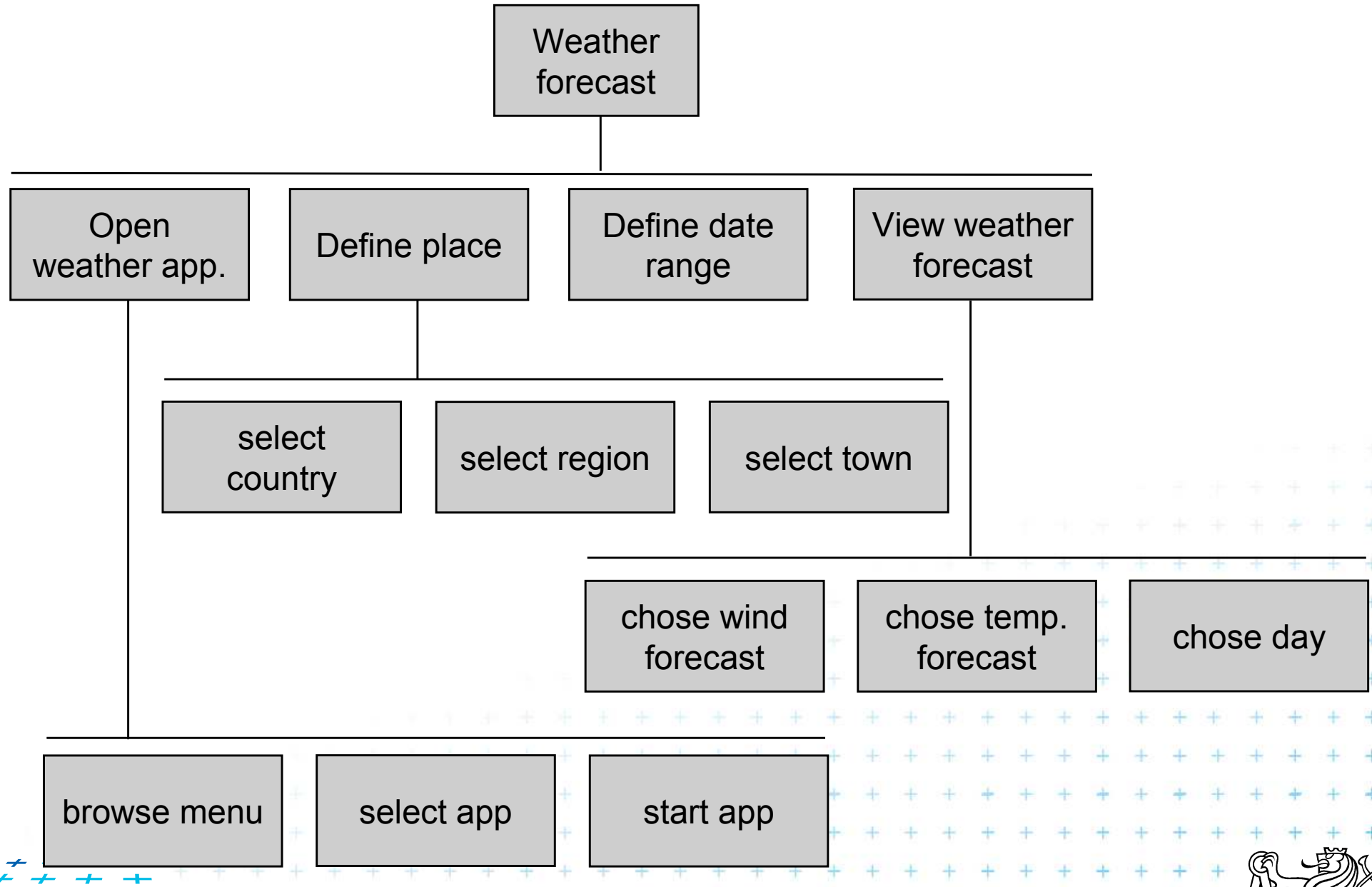
# System modeling

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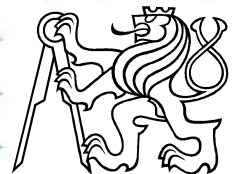
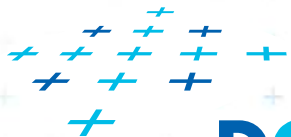
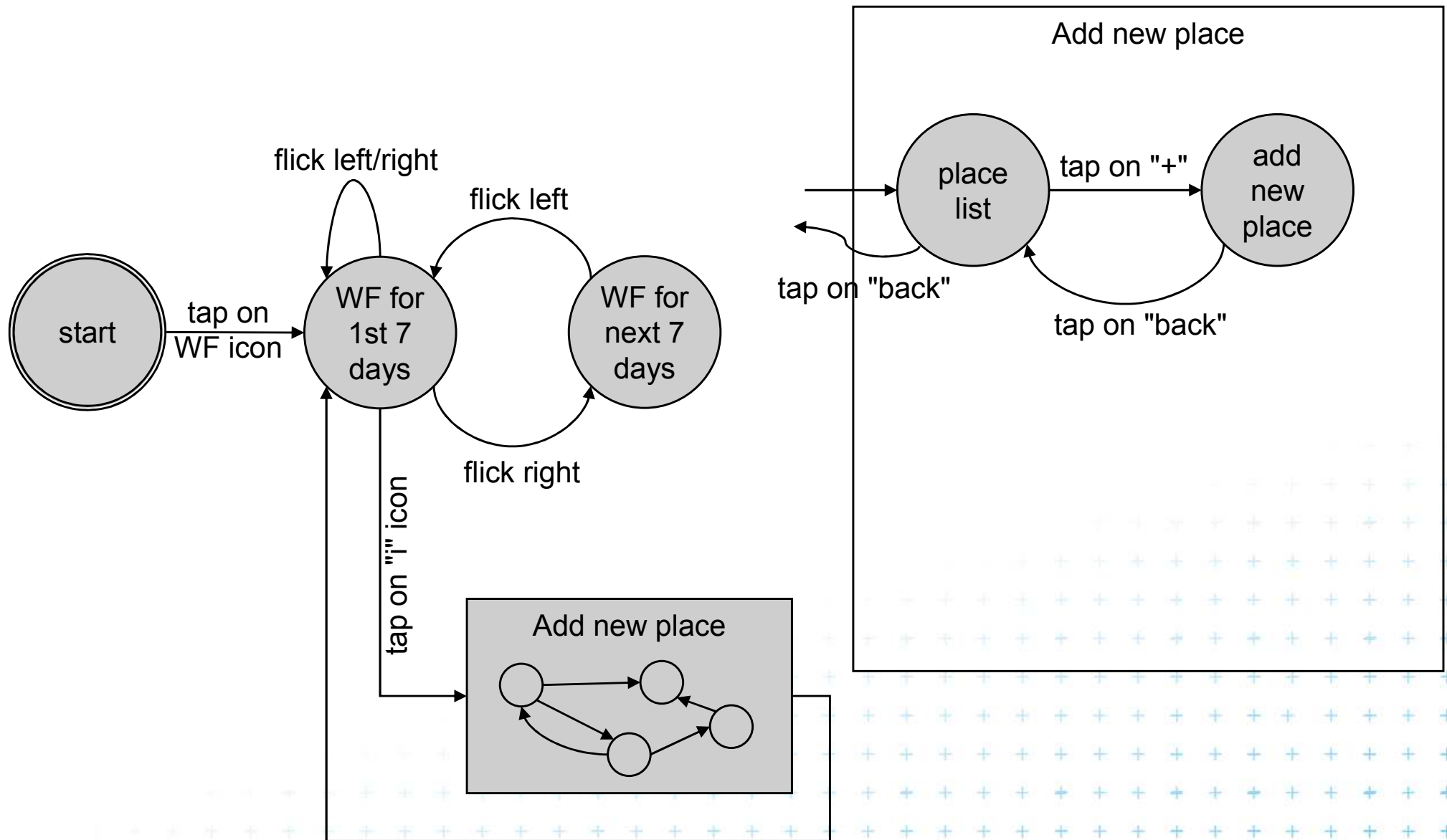
- Hierarchical task analysis (HTA)
- State transition network (STN)
- ConcurTask Tree (CTT)



# System modeling: Weather forecast HTA



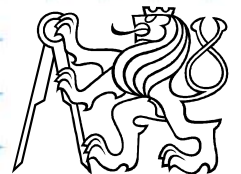
# System modeling: Weather forecast STN



# System modeling: HTA - exercise

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- task hierarchy (10 min)
  - based on problem description + user requirements gained from the user research
- intervision (5 min)
- plans (10 min)
  - at least two plans following the typical behavior of the user gained from the user research
- intervision (5 min)

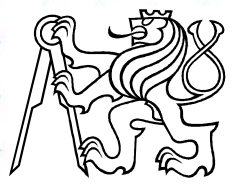


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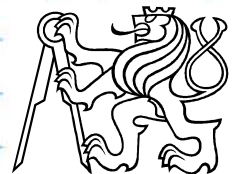
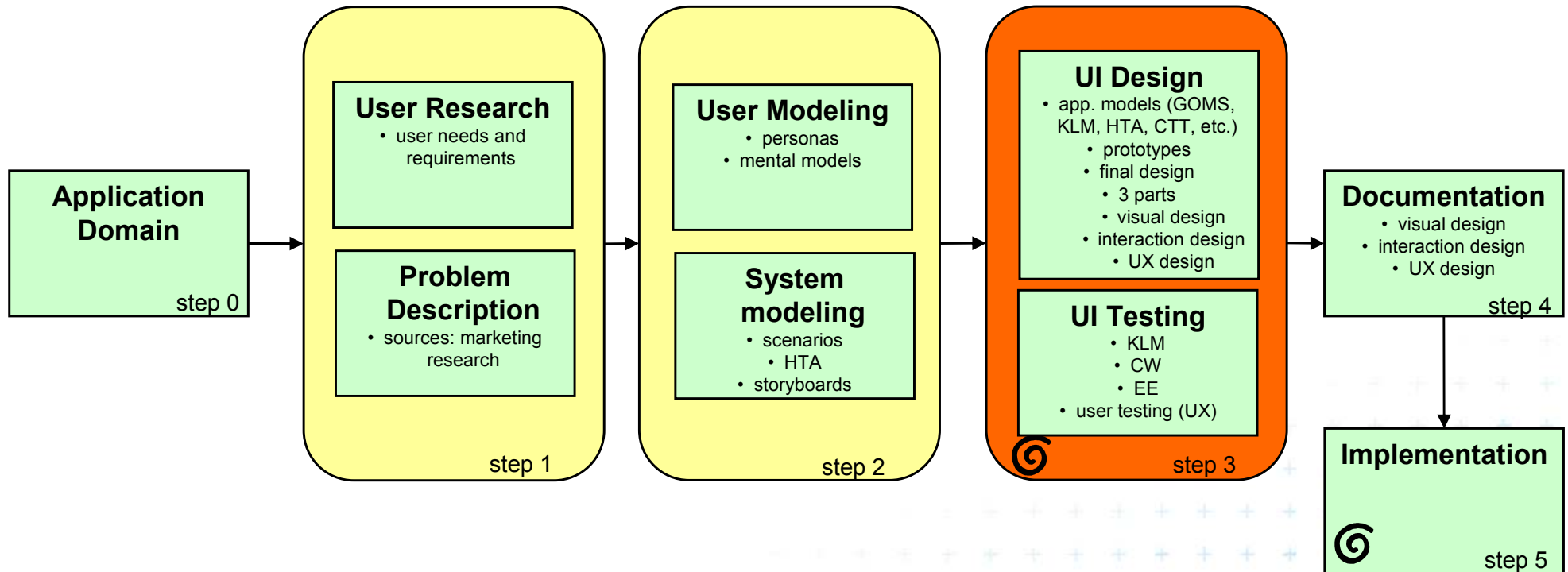
# Prototyping



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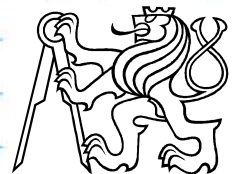
# User interface design - big picture



# Prototyping: Low vs High fidelity

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- LOW FIDELITY
  - hours/days to develop
  - many alternatives
  - no final interaction techniques
  - not on target devices
  - sketchy look&feel
    - paper/electronic paper
- lab tests
- HIGH FIDELITY
  - days/months to develop
  - few alternatives (if any)
  - final interaction techniques
  - on target devices
  - final visual and interaction look&feel
    - target framework or testing environment running on target platform with final look&feel
- lab or field tests



# Prototyping: Problems

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- skipping deep user requirements analysis
  - especially low-fid prototypes (very fast and funny)
- user confusion: prototype vs final project
  - especially high-fid prototypes
- expensive and time consuming
  - especially high-fid prototypes
  - highly interactive systems
  - real-time response to highly changing environment



# Prototyping: Types of prototypes

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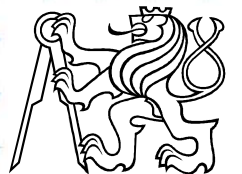
- Throw away prototyping
  - light-weight
  - short-time usage
- Evolutionary prototyping
  - very robust
  - constantly refined



# Prototyping: LoFi prototype - exercise

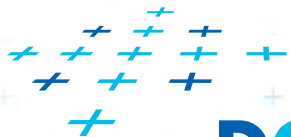
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- prototype creation (15 min)
- intervision (10 min)
  
- prototype preparation for testing (5 min)
  
  
- prototype testing (10 min)
- intervision (5 min)

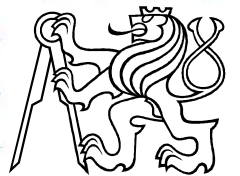


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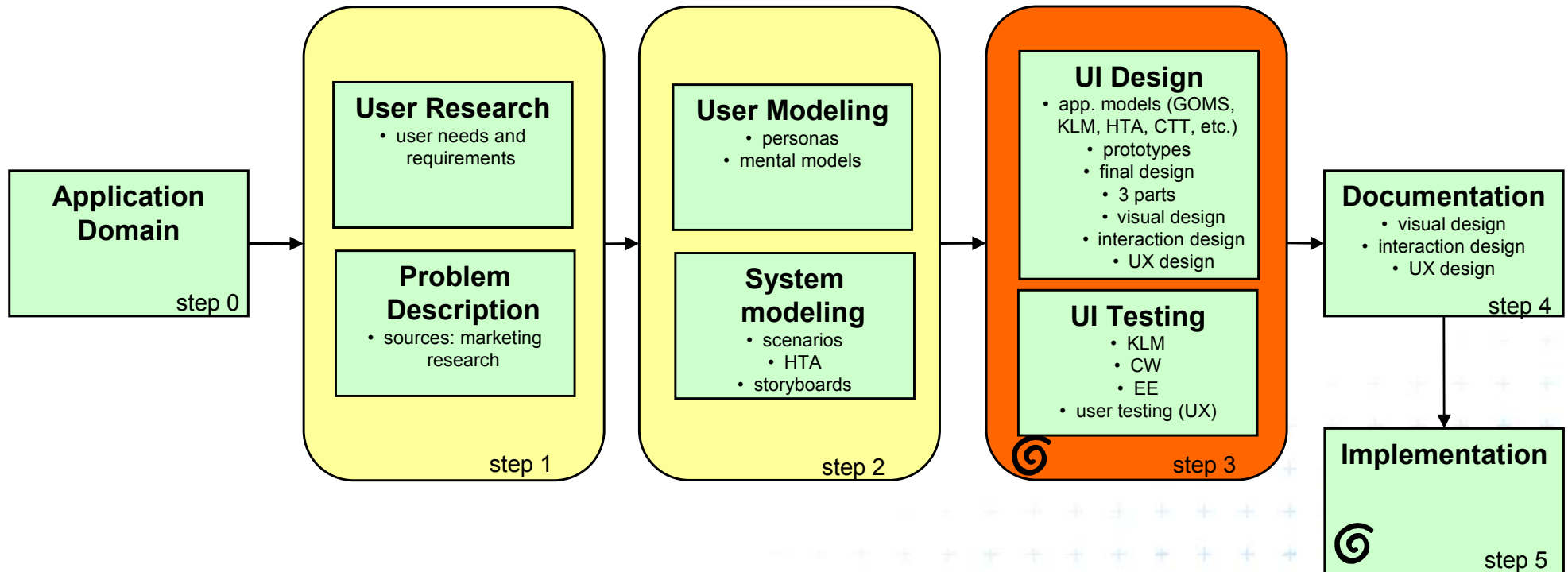
# Evaluation



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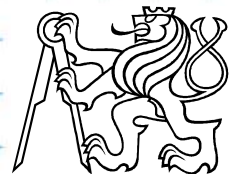
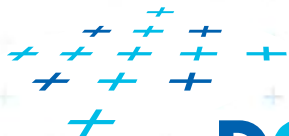
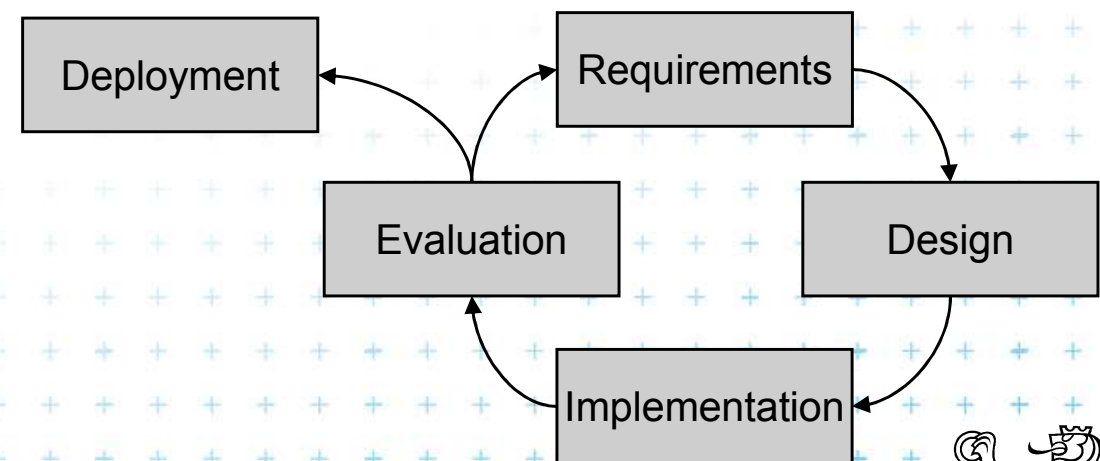
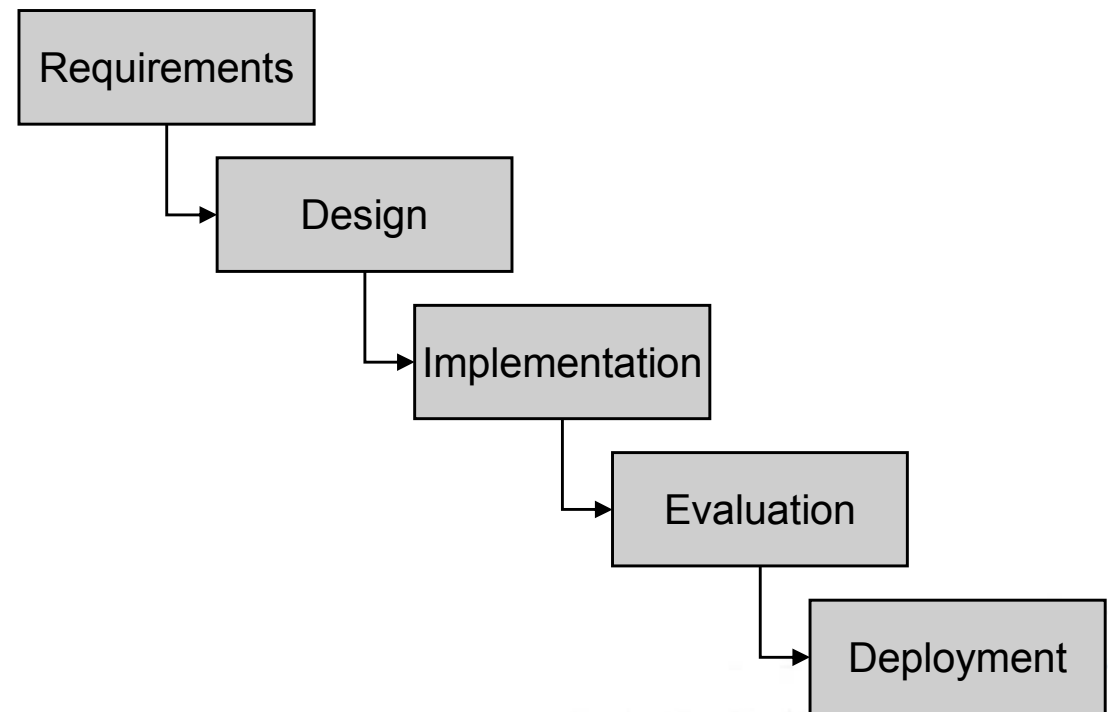


# User interface design - big picture



# Evaluation: role in the SW development process

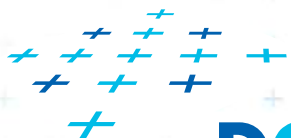
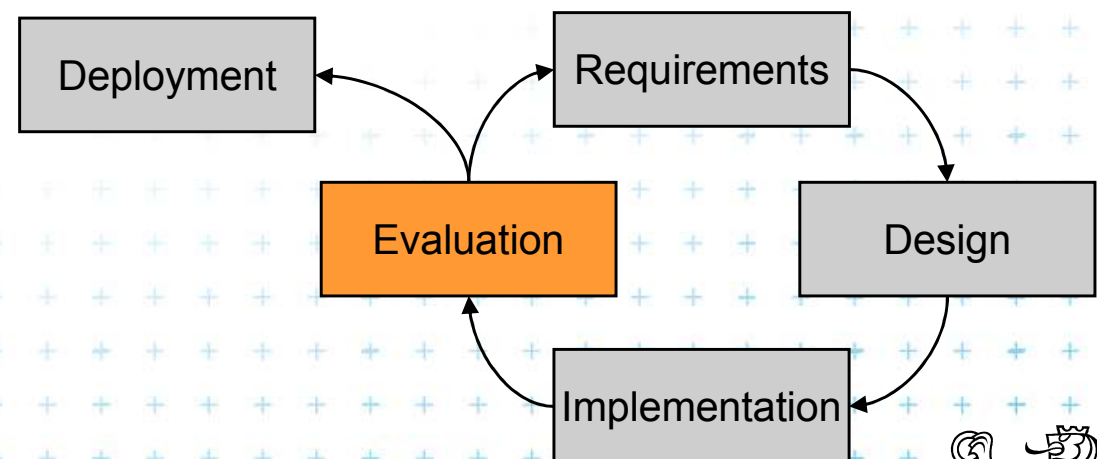
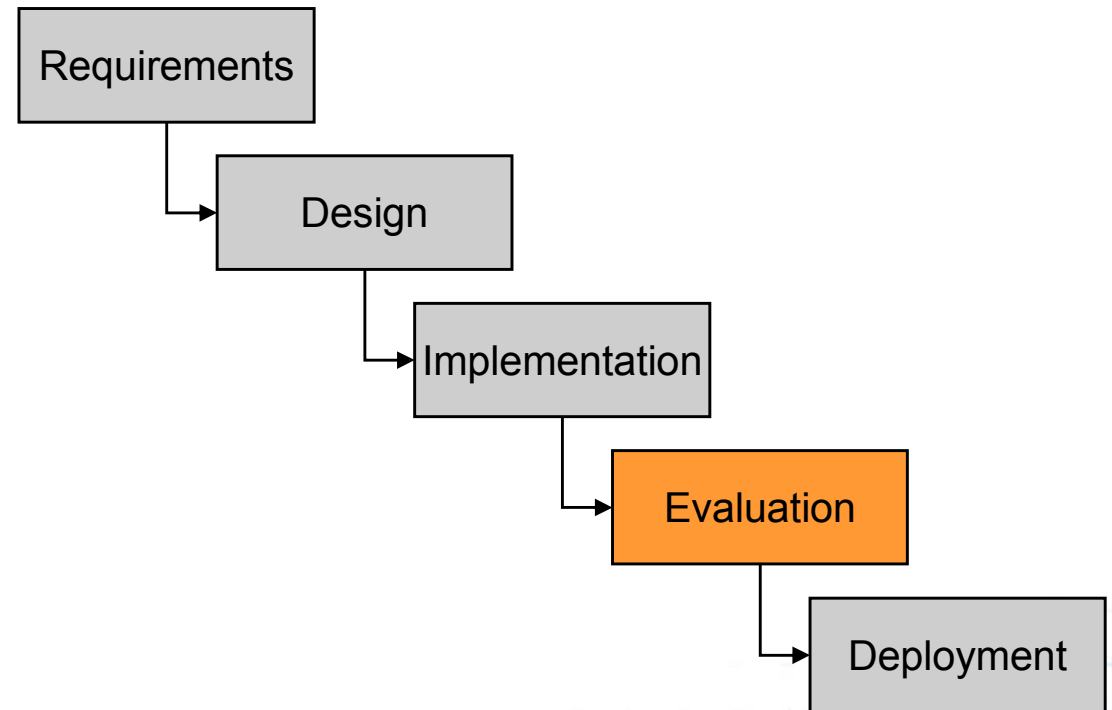
- Waterfall
  - in design phase
  - not evaluated
  - serves as specification
    - rather than text description
- Iterative
  - in implementation phase
  - can be evaluated
- In fact we can/should do prototyping in every stage continuously
- HOW? The role of evaluation must be revised?



# Evaluation: supporting the design process

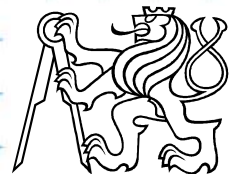
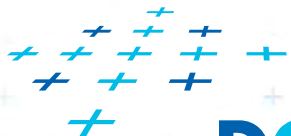
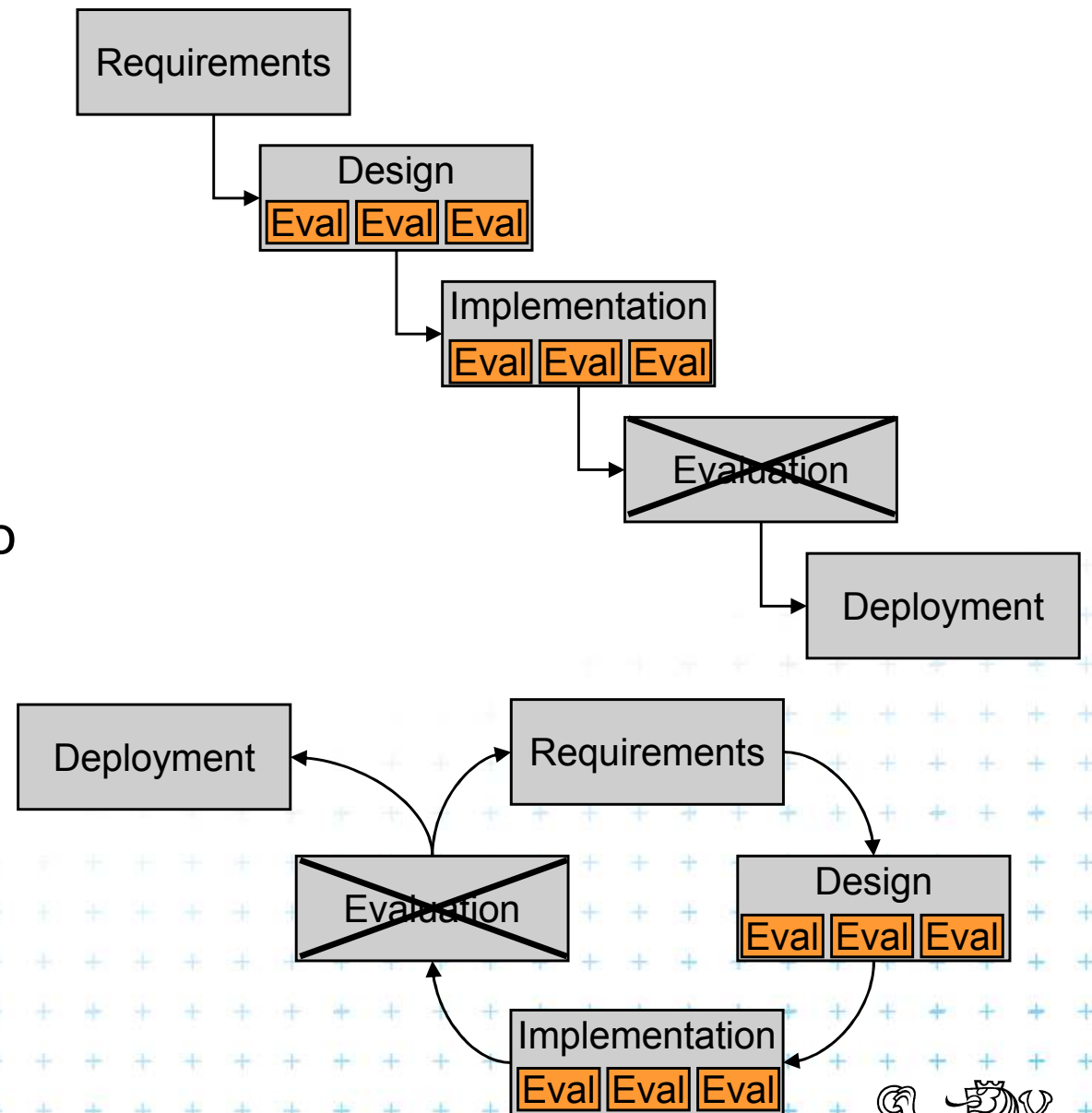
## ■ Summative

- at the end of SW design process



# Evaluation: supporting the design process

- Summative
  - at the end of SW design process
- Formative *[Hix and Hartson, 1993]*
  - supports the overall SW design process
  - helps form the solutions to the design problems
  - continuous evaluation



# Evaluation: Usage of prototypes

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- Analytical evaluation
  - based on simulation
  - GOMS, KLM, CW, HE
- Empirical evaluation
  - user tests
  - prototypes needed



# Evaluation: Formative methods

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- Learning from designing prototypes
- Informal user tests of low-fid prototypes
- Laboratory user tests
  - all kinds of prototypes
  - controlled conditions
  - statistical evaluation possible
- Field tests with users
  - mid/high fidelity prototypes
  - some tests can be done here only
    - collaboration
    - intensive interaction with the dynamically changing environment



# Evaluation: phases

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- Focus evaluation on few specific requirements
  - performance requirements are easy to evaluate
- 1. Usability properties identification (specific requirements)
- 2. Prototype creation
- 3. Experiment design
- 4. Test run and data collection
- 5. Data analysis
- 6. Conclusions and recommendations statement



# Evaluation: problems

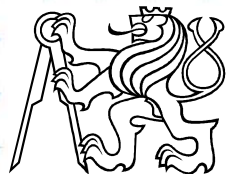
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## ■ 3. Experiment design

- poor choice of task mix => indistinguishable results
- wrong choice of participants => misleading results
  - unaware mixing novice and expert users can seem like design improvement
- accidental changes in the test conditions => insignificant or misleading results
  - large spread of measured values => insignificant results
  - shift of measured values => misleading results

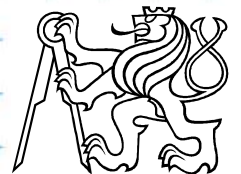
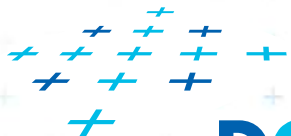
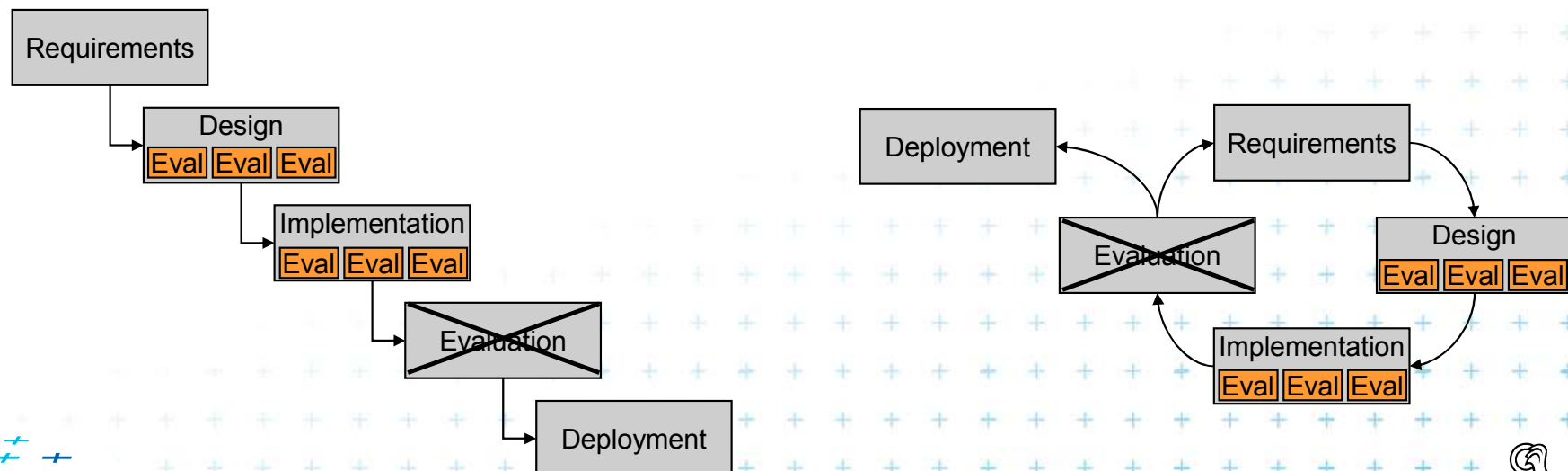
## ■ 5. Data analysis

- analysis of test condition influence on the data measured
- analysis by more evaluators



# Evaluation: role of prototype

- Do we need prototypes for evaluation?
- YES. Why?
  - user testing needed (empirical evaluation)
  - without prototypes it is impossible
- => Formative evaluation involves prototyping in all stages of the SW design process



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# Thank for your attention!



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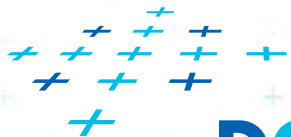


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