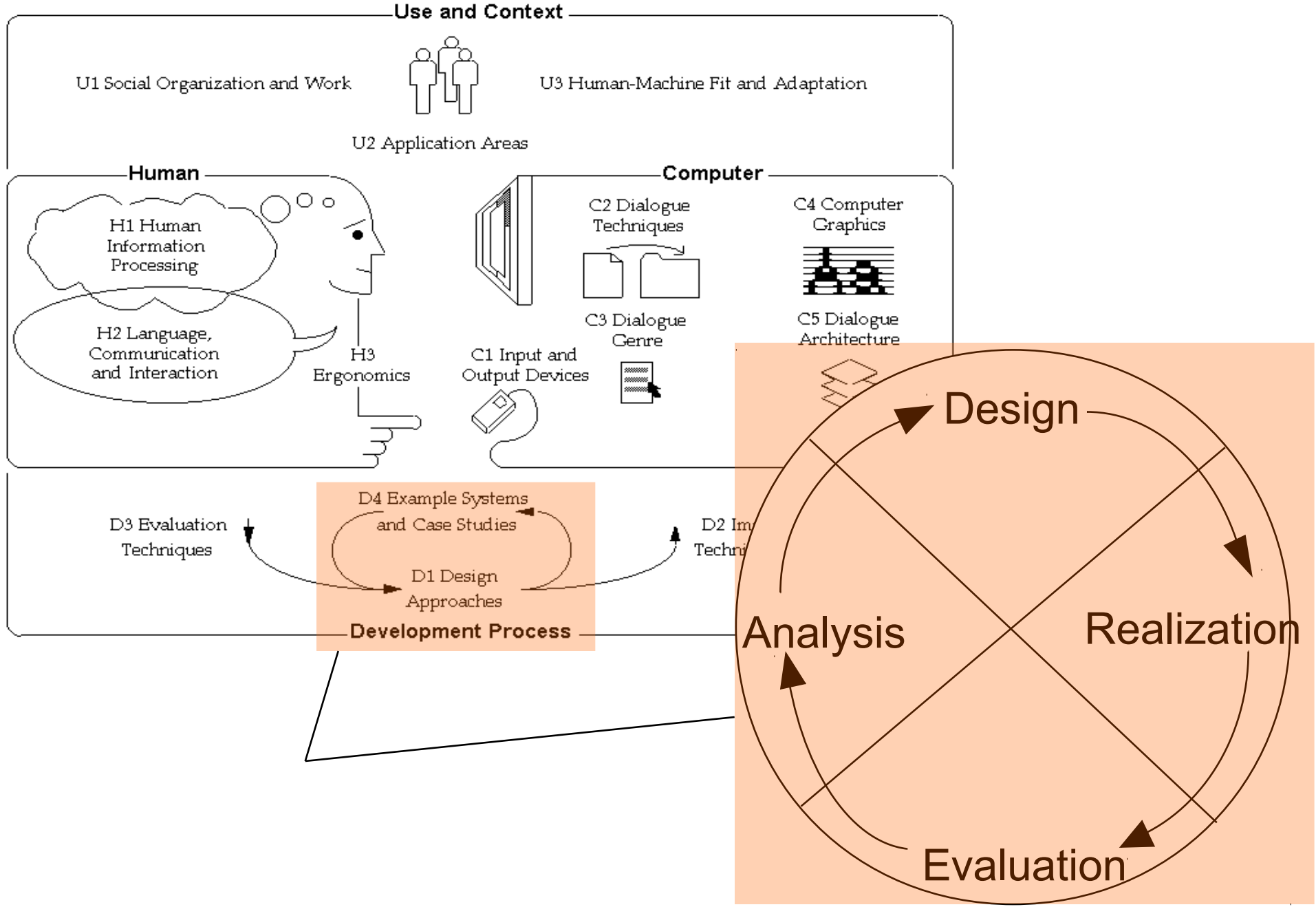


# Mensch-Maschine-Interaktion 1

Chapter 10 (July 5th, 2012, 9am-12pm):  
User-Centered Development Process

# Overview

- Introduction
- Basic HCI Principles (1)
- Basic HCI Principles (2)
- User Research & Requirements
- Designing Interactive Systems
- Capabilities of Humans and Machines
- User Study Design & Statistics
- Implementing Interactive Systems
- Basic HCI Models
- ***User-Centered Development Process***



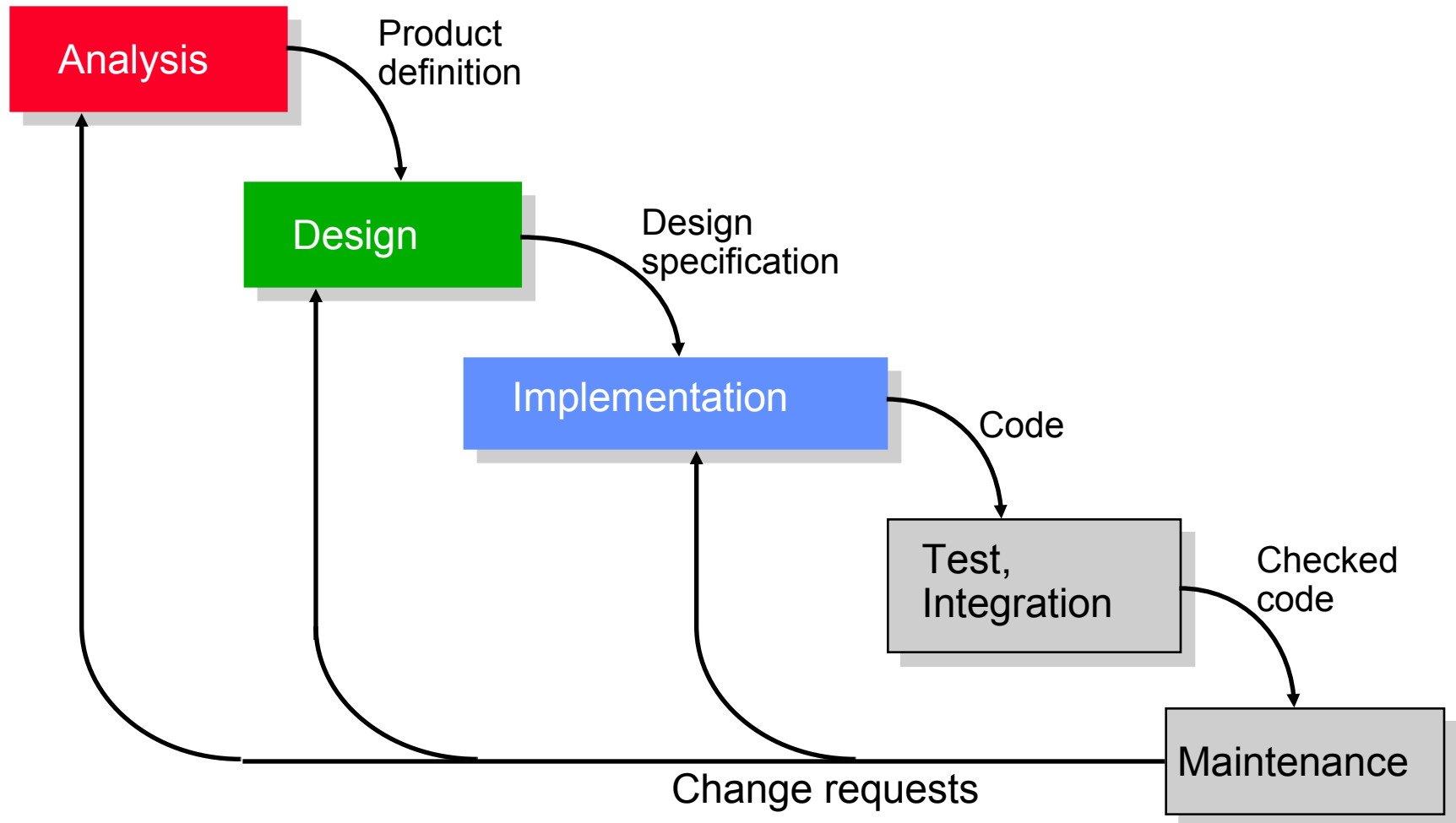
# User-Centered Development Process

- Software Development Process Models
- User-Centered Development
- Integrating Usability into the Development Process

# Software Development Process Model

- ***Process model***
  - Segmentation of the overall (team) activity of software development into smaller portions of work
    - high-level structure: phases
    - low-level structure: steps, activities
  - Definition of an order for carrying out work units
  - Guideline for the production of intermediate results
- **Basic activities covered in all models:**
  - Analysis
  - Design
  - Implementation
  - Validation (in particular Test, Integration)
  - Deployment (in particular Maintenance)

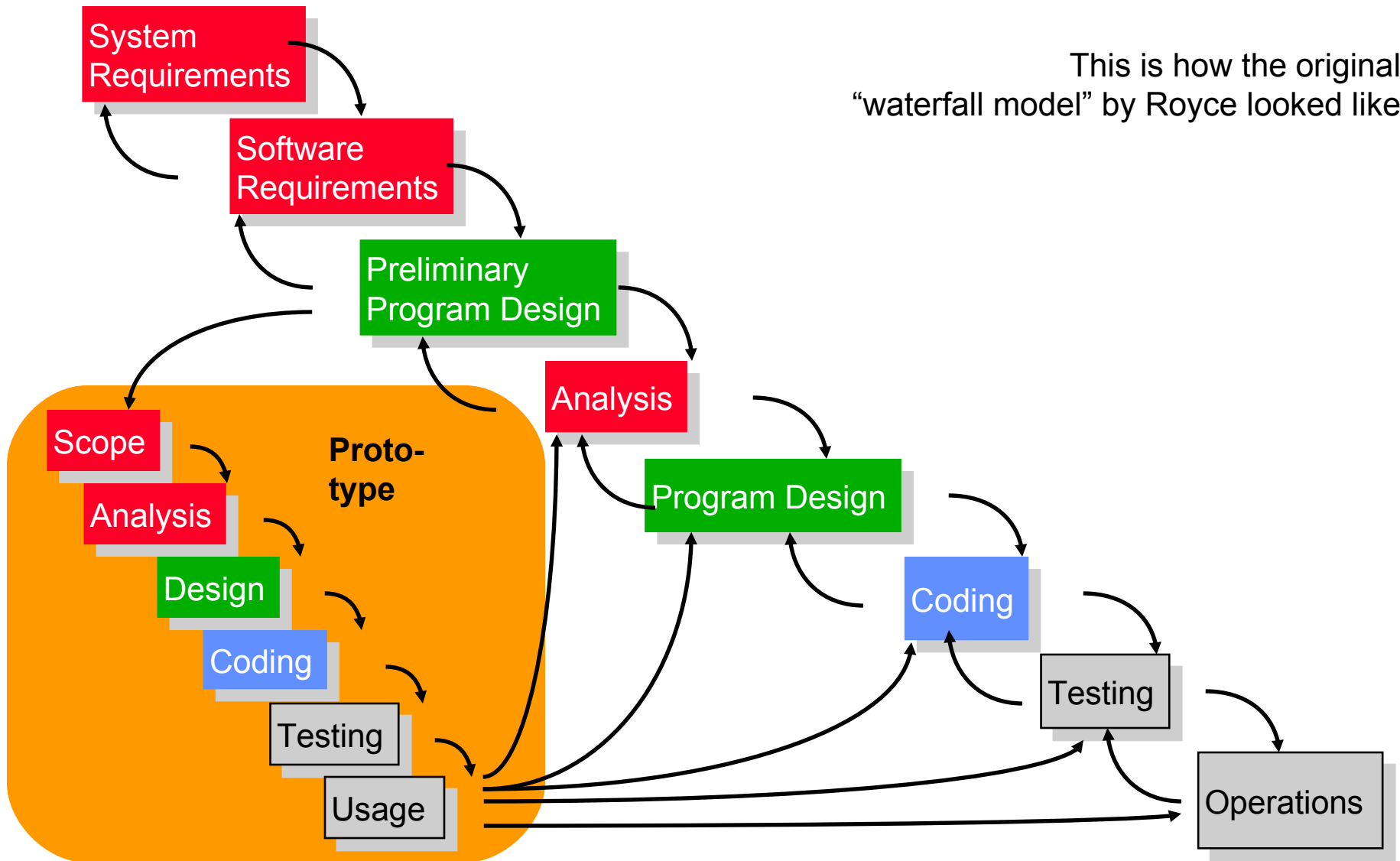
# “Pure” Waterfall Model



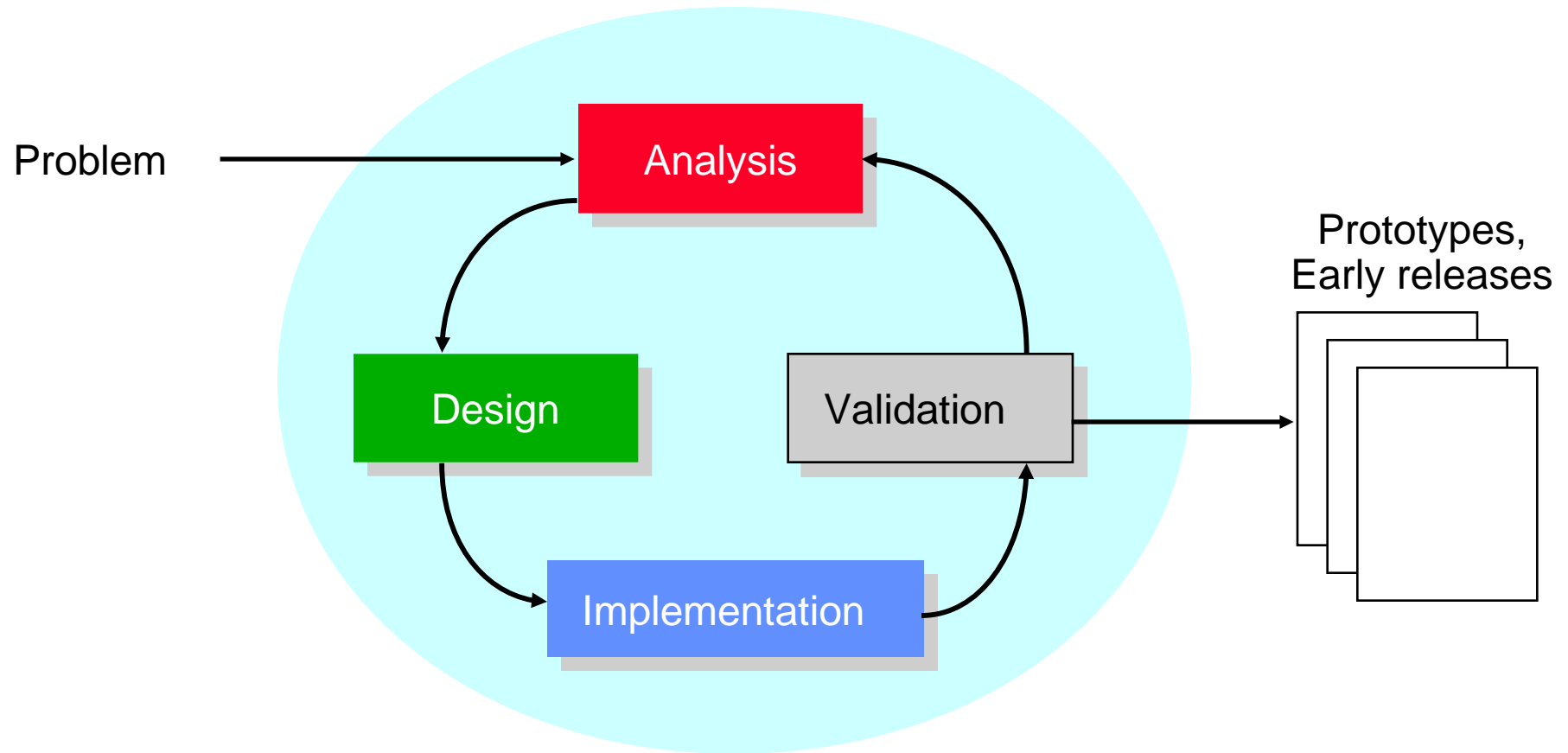
W. Royce (1970)

# “Waterfall” with Feedback Loops and Prototyping

This is how the original “waterfall model” by Royce looked like!



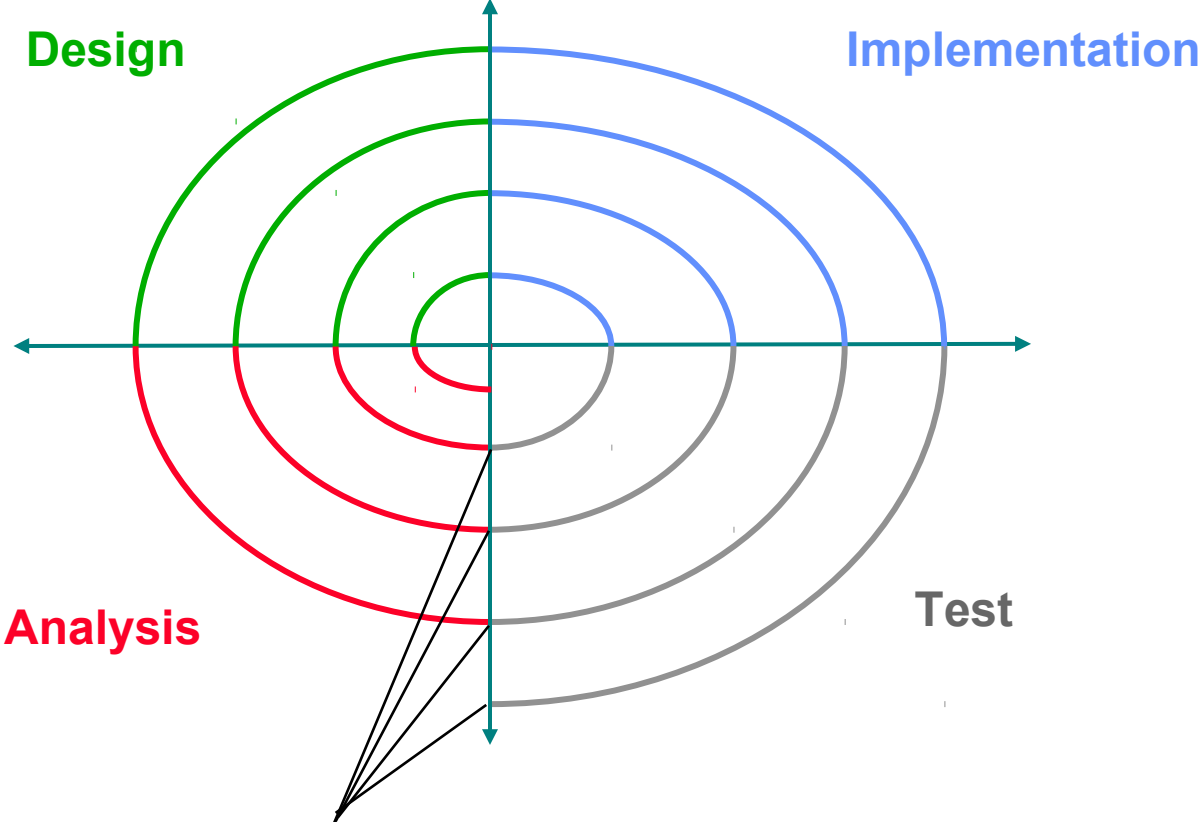
# Evolutionary Development



- Typical for small projects and experimental systems
- Technological progress (e.g. object orientation) may have improved scalability to large systems

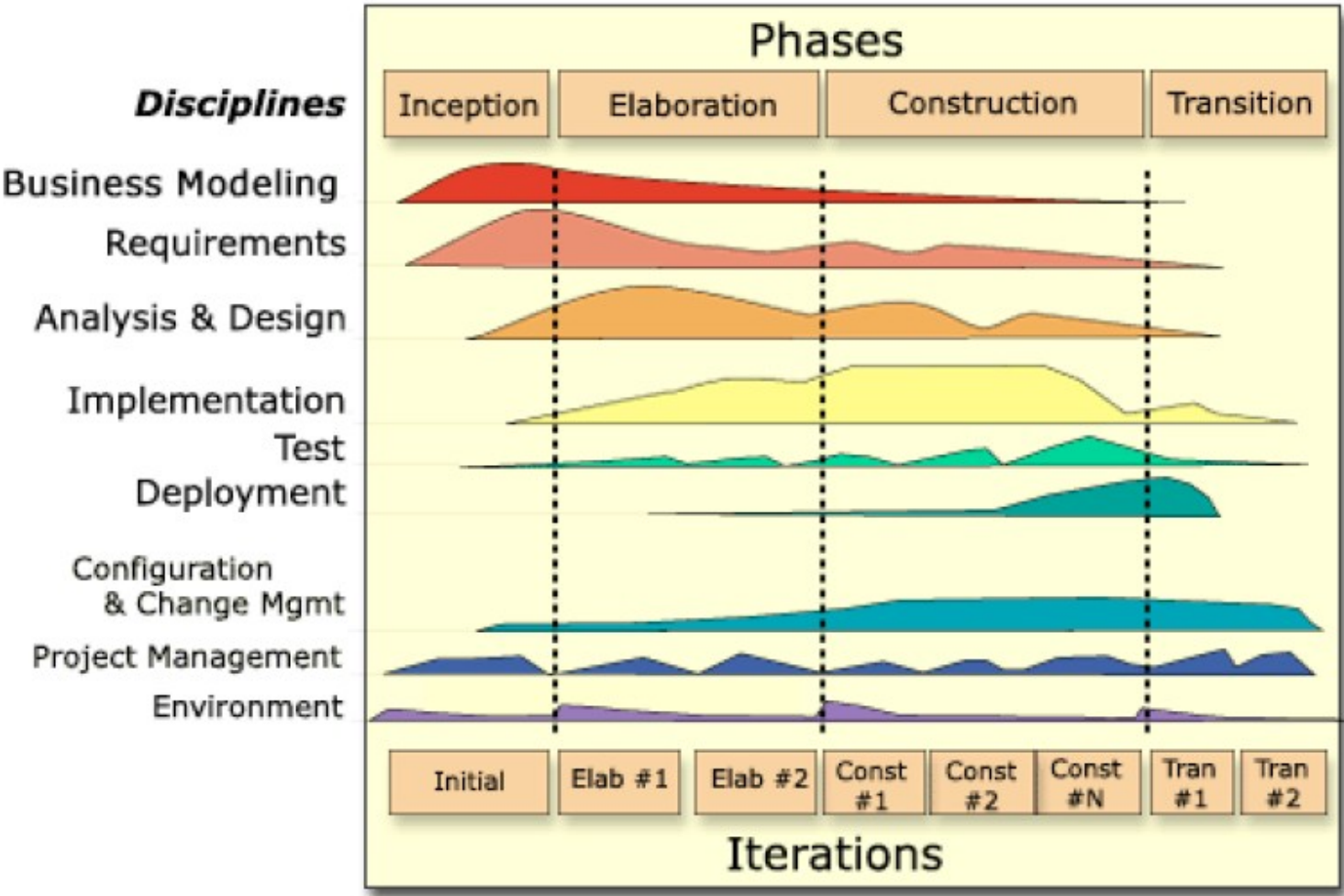


# Modern Adaptation – “Spiral Model”



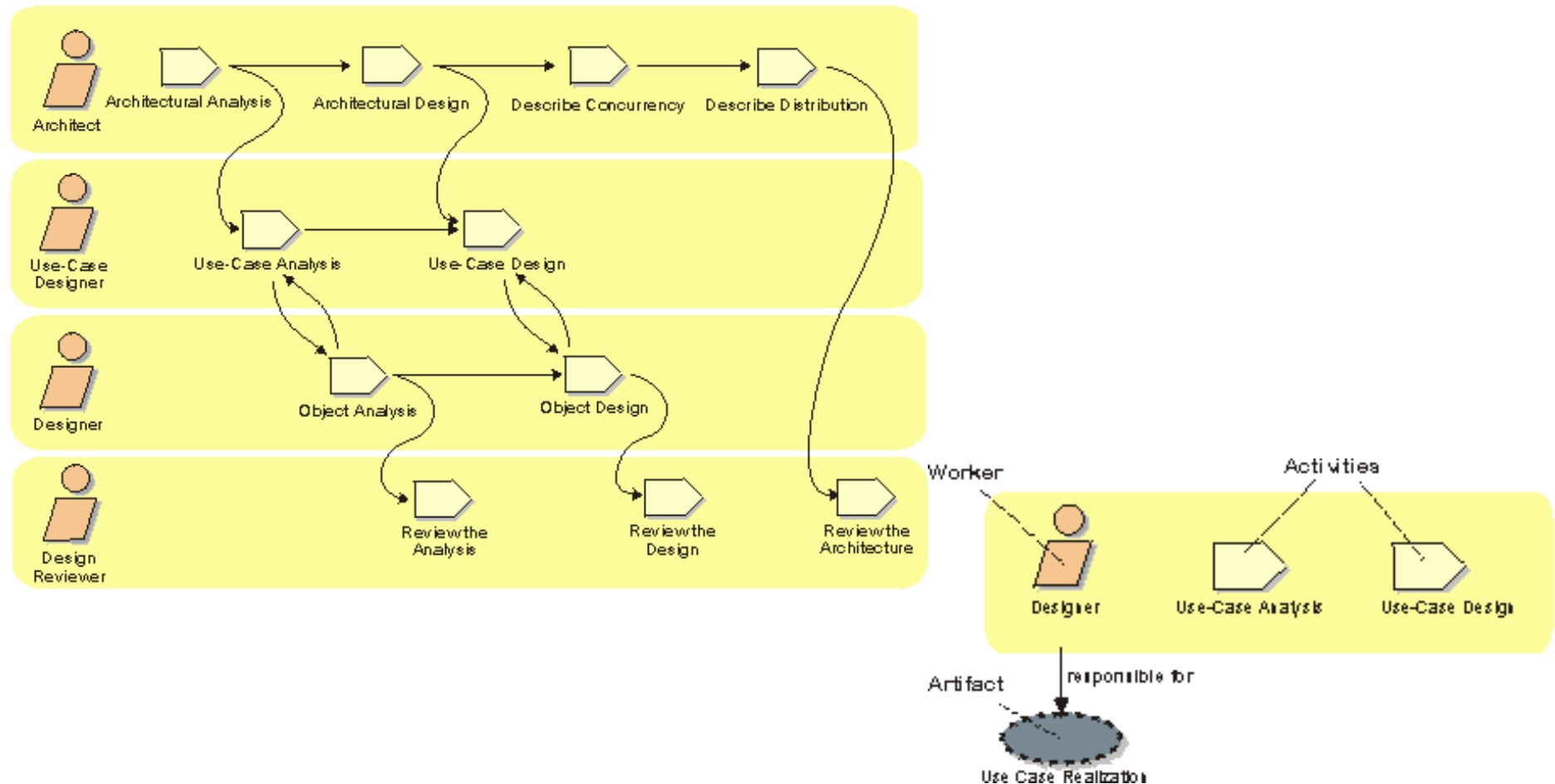
Products (Releases)  
including *Prototypes*

# Rational Unified Process (RUP)



Software Process framework is a commercial product of Rational, now IBM.

# Detailed Prescriptions in RUP



- Developers often consider this as not flexible enough for creative work.

Think different ... be creative ...



# Agile Development

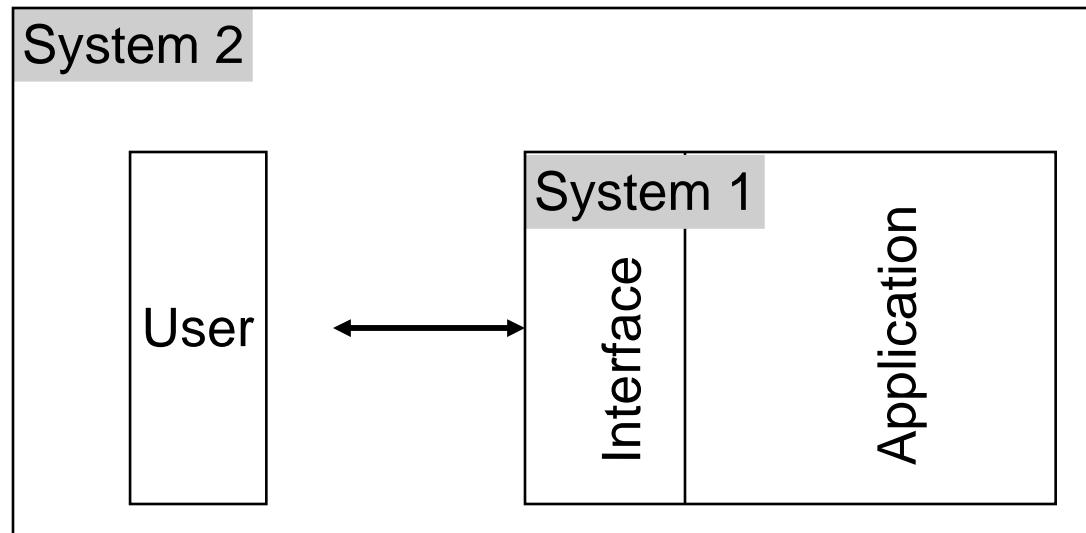
- "Agile" Software development ([www.agilemanifesto.org](http://www.agilemanifesto.org)):
  - E.g. Extreme Programming (XP), Crystal, Scrum
- Recent trend in software development processes
  - Radical evolutionary development
- Key characteristics of agile development:
  - Individuals and interactions (rather than processes and tools)
  - Working software (code rather than extensive documentation)
  - Customer collaboration (instead of contract negotiations)
  - Responding to change (instead of following a plan)
- Agile development is not just “hacking along”!
  - Clear and strict rules
- Mixed information about success in practice
  - Good experiences in small and innovative projects
  - Large-scale projects tend to stay “conservative”, mainly due to transparency for project management

# User-Centered Development Process

- Software Development Process Models
- User-Centered Development
- Integrating Usability into the Development Process

# Usability Aspects are Mostly Ignored by Software Engineers

- Example:
  - IEEE “SWEBOK” body of knowledge definition for SE mentions HCI as “related discipline” under the name “software ergonomics”
- System perspectives
  - SW Engineers take the “System 1” perspective
  - Usability Engineers take the “System 2” perspective (following examples)



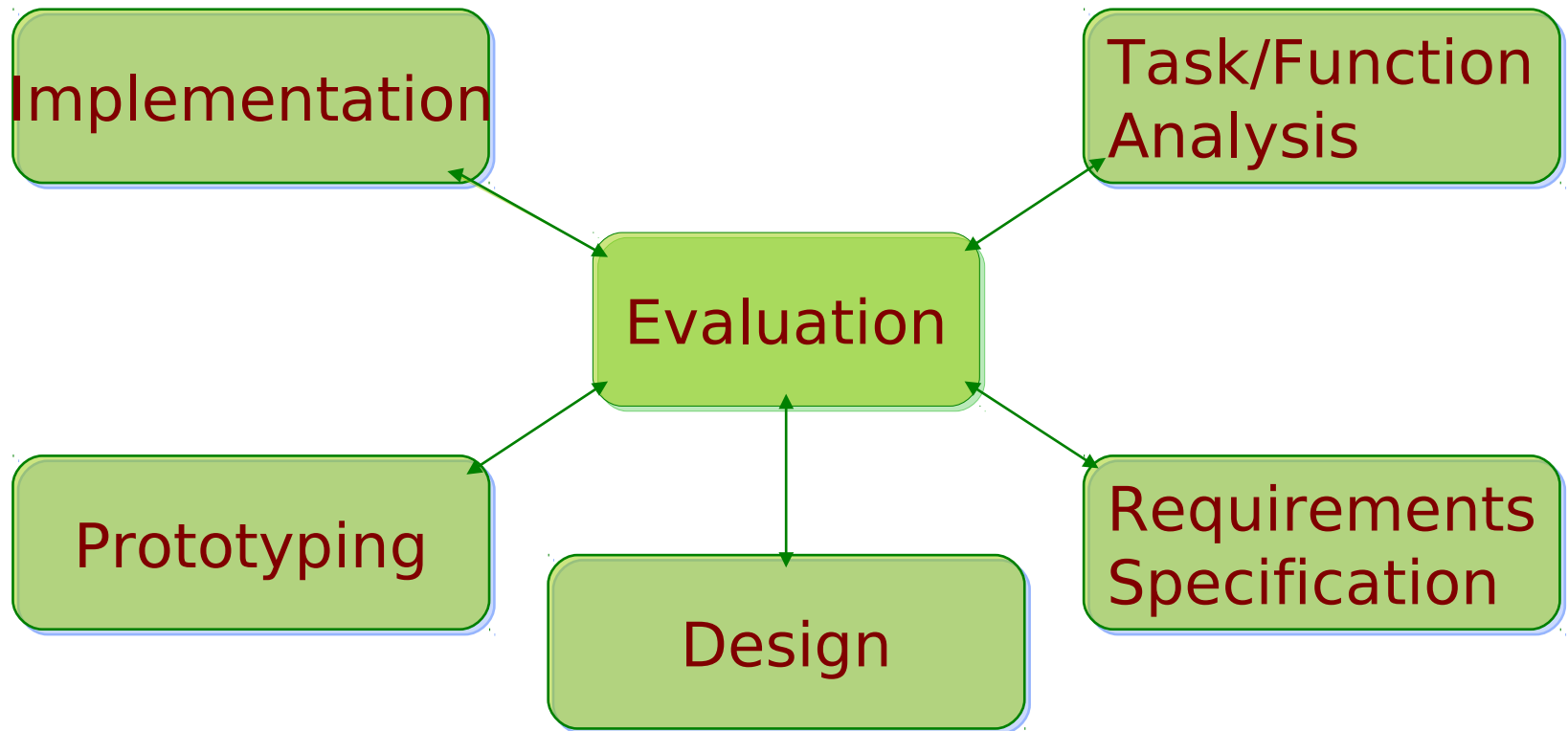
Seffah/Desmarais/Metzker

# Separation between Interaction Design and Technical Design

- For interactive applications a separation into a two stage process is often advisable
- 1st – Interaction design (iterative)
  - Concept
  - Interaction analysis
  - Prototypes
  - Evaluation
  - Stable and tested design
- 2nd – Technical realization
  - Technical analysis
  - Technical specification (e.g. architecture, platform)
  - Implementation
  - Evaluation and Quality management



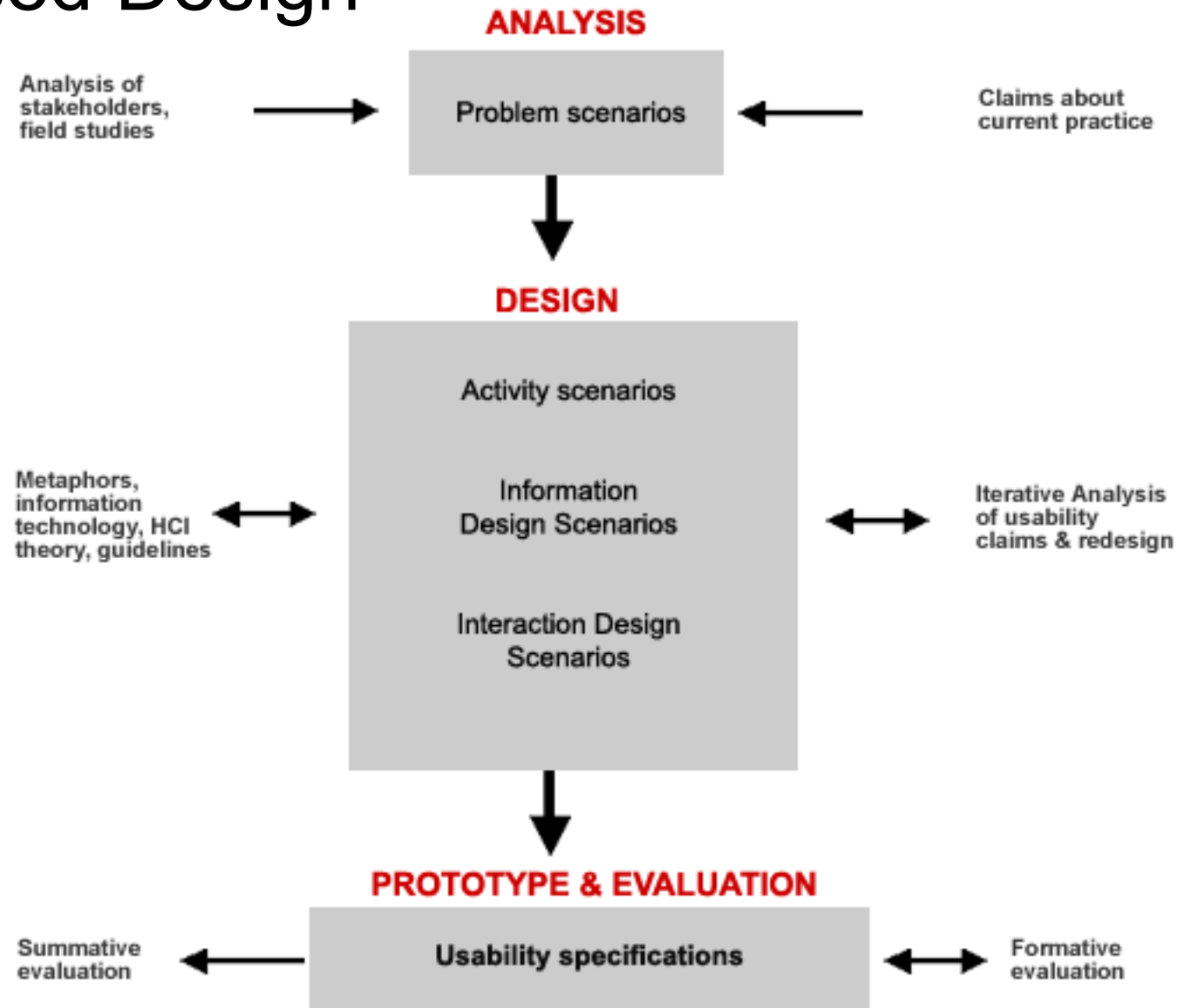
# Star Lifecycle



- Hix, Hartson 1993
  - Non-sequential: any order of activities
  - Evaluation-centric: every activity is evaluated
  - Interconnected: evaluation connects everything

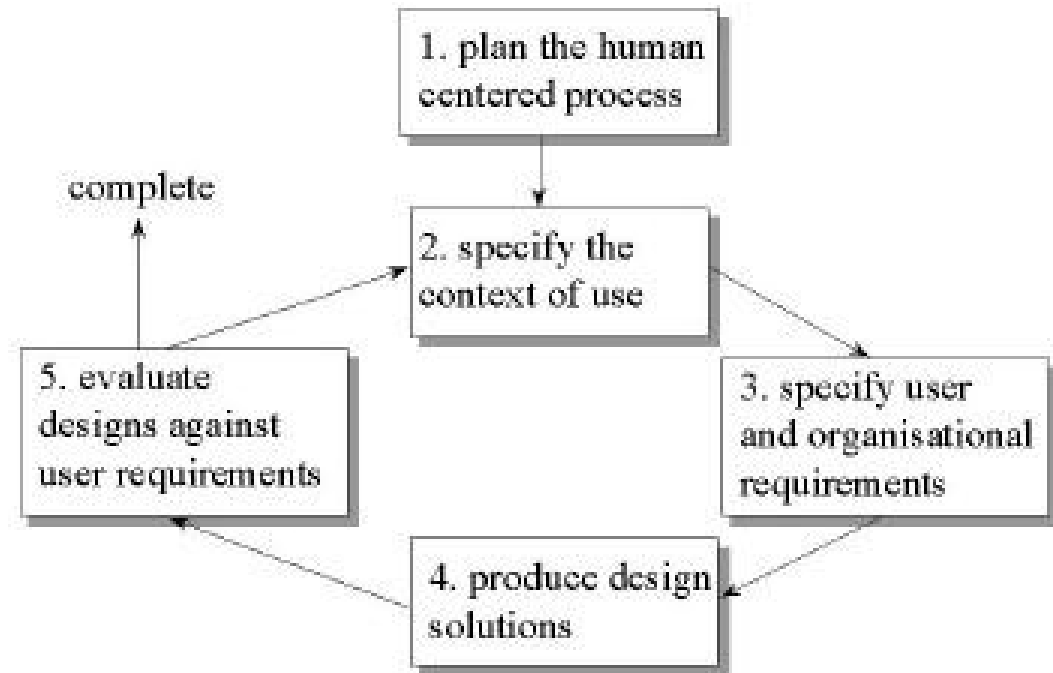
# Scenario-Based Design

- Mary Beth Rosson, John M. Carroll: Usability Engineering - Scenario-Based Development of Human-Computer Interaction, Academic Press 2002



# ISO 13407

## ISO 13407 Model Overview



- Guidelines for integrating usability aspects into the development process
  - Proposes iterative process
  - Stresses evaluation
  - Design solutions cover also lightweight prototypes, mock-ups etc.
- See e.g. <http://www.ucc.ie/hfrg/emmus/methods/iso.html>

# Problems of User Centered Design

- Users may be wrong
- Users may be resistant to change
- Users may expect disadvantages (e.g. being replaced by software)
  
- Be aware – you are expected to create an optimal system with regard to ***the goals specified***
  - this is unfortunately NOT necessarily the system users would like to have (e.g. trade-off between employers and employees)

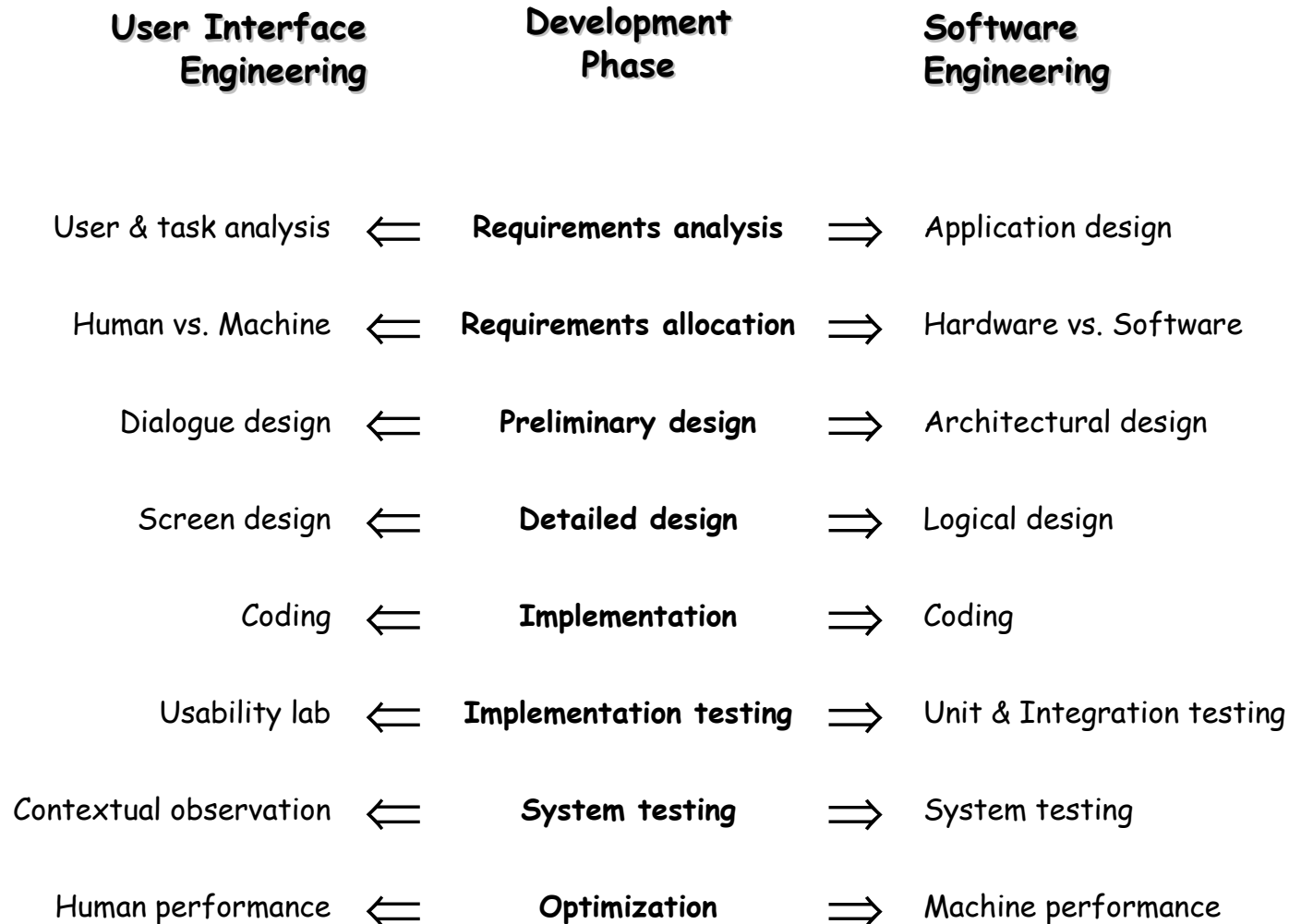
# User-Centered Development Process

- Software Development Process Models
- User-Centered Development
- Integrating Usability into the Development Process

# Concurrent Workflows, Competing Cultures

- User Interaction Design and Software/System Design are concurrent activities
  - One depends on the other, one influences the other
- Separate cultures led to competing models of the development process
  - Software Engineering: Artefact-centric (e.g. design documents), disciplined order of steps, quantitative evaluation (metrics, tests), highly compatible to project management needs
  - User-Centred Development: Interdisciplinary, loose (e.g. rough guidelines), flexible in order of steps, open to late changes, continuous qualitative evaluation (e.g. user tests with prototypes), difficult to “sell” to project managers
- Ambiguous overlaps in terminology
  - The same terms are used in many methods with differently defined or weakly defined semantics
    - E.g. “scenario”, “use case”, “test”
- Integration of process models
  - “Interface development is transitioning from an artistic exercise into an engineering discipline.” (Curtis/Hefley)

# Concurrency of UI and SW Engineering



(Curtis/Hefley)

# User Experience “Plugin” for the RUP

- Extensions of roles, activities and (UML) artifacts
  - Use cases extended by “use case storyboards”
  - UI Prototyping as a specific activity
  - Screens as special cases of classes  
(derived from Conallen’s UML-based Web Design Method)
- Steps to create User Experience Storyboards:
  - Add actor characteristics to the use case.
  - Add usability guidance and usability requirements to the use case.
  - Identify UX elements.
  - Model the use-case flows with the UX elements.
  - Model screen navigation for the use case.

[http://www-128.ibm.com/developerworks/rational/library/content/RationalEdge/nov03/f\\_usability\\_jh.pdf](http://www-128.ibm.com/developerworks/rational/library/content/RationalEdge/nov03/f_usability_jh.pdf)



# User Experience “Plugin” for the RUP

## Actor characteristics

Usability guidance / requirements

UX elements

Use-case flows

Screen navigation

<p><b>4.3 Actor Characteristics</b></p> <p><b>4.3.1 BUYER</b></p> <p>4.3.1.1 FREQUENCY OF USE</p> <p>4.3.1.1.1 The typical Buyer will bid on an item three times per week.</p> <p>4.3.1.1.2 Near the end of an auction, bidding activity may be very intense.</p> <p>4.3.1.2 GENERAL LEVEL OF COMPUTER EXPERIENCE</p> <p>4.3.1.2.1 The typical Buyer only uses his/her computer on a casual basis.</p> <p>4.3.1.3 ENVIRONMENT</p> <p>4.3.1.3.1 The typical Buyer uses the system from his/her home.</p> <p>4.3.1.4 NUMBER OF USERS</p> <p>4.3.1.4.1 The targeted number of users is 50,000.</p>
---

Figure 5: Actor characteristics for the Bid on Item use case

# User Experience “Plugin” for the RUP

Actor characteristics

**Usability guidance / requirements**

UX elements

Use-

Scree

## 4. Special Requirements

### 4.1 User Experience Guidance

*4.1.1 At AF PENDING PAYMENTS, pending payments normally occur in only 10% of the cases.*

*4.1.2 At AF INVALID BID ENTERED, Invalid bids are normally entered 15% of the time.*

*4.1.3 At BF BUYER CONFIRMS BID, the legal statement will be approximately 150 characters in length.*

*4.1.4 At BF ENTER AMOUNT the system should automatically provide choices at the next three bid increments.*

### 4.2 Usability Requirements

*4.2.1 The Buyer must be able to confirm his/her bid with a single mouse click.*

*4.2.2 The system must update the current bid within 5 seconds of the Buyer confirming his/her bid.*

*4.2.3 The system must return confirmation of an accepted bid within 2 seconds.*

Figure 7: Usability requirements for the Bid on Item use case

Figure 6: Usability guidance for the Bid on Item use case

# User Experience “Plugin” for the RUP

Actor characteristics

Usability guidance / requirements

## UX elements

Use-case flows

Screen navigation

OOAD Modeling	Ux Modeling
Classes	Screens
Class Diagrams	Navigation maps
Objects	Screen instances
Sequence Diagrams	Screen flow diagrams

Figure 8: Mapping between OOAD and UX modeling elements

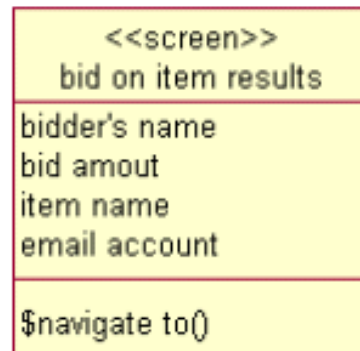


Figure 12: UML representation of a screen for Bid on Item use case (basic flow)

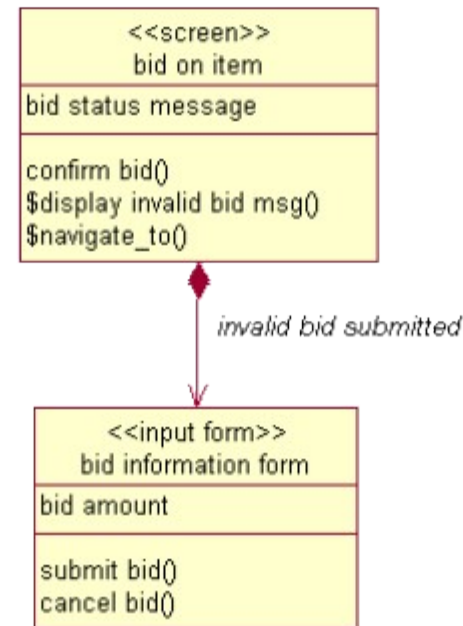


Figure 18: UML representation of a screen with an input form

# User Experience “Plugin” for the RUP

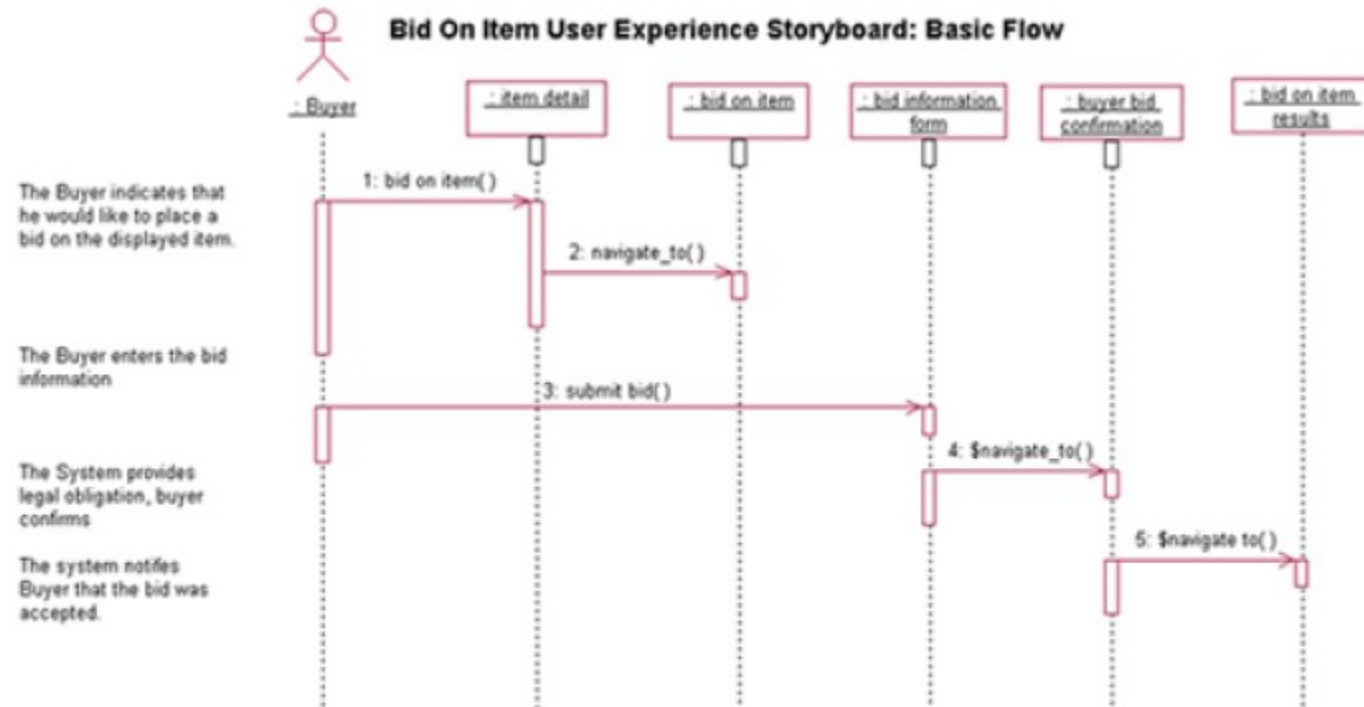
Actor characteristics

Usability guidance / requirements

UX elements

**Use-case flows**

Screen navigation



**Figure 19: Sequence diagram showing the basic flow of events for the Bid on Item use case**

# User Experience “Plugin” for the RUP

Actor characteristics

Usability guidance / requirements

UX elements

Use-case flows

**Screen navigation**

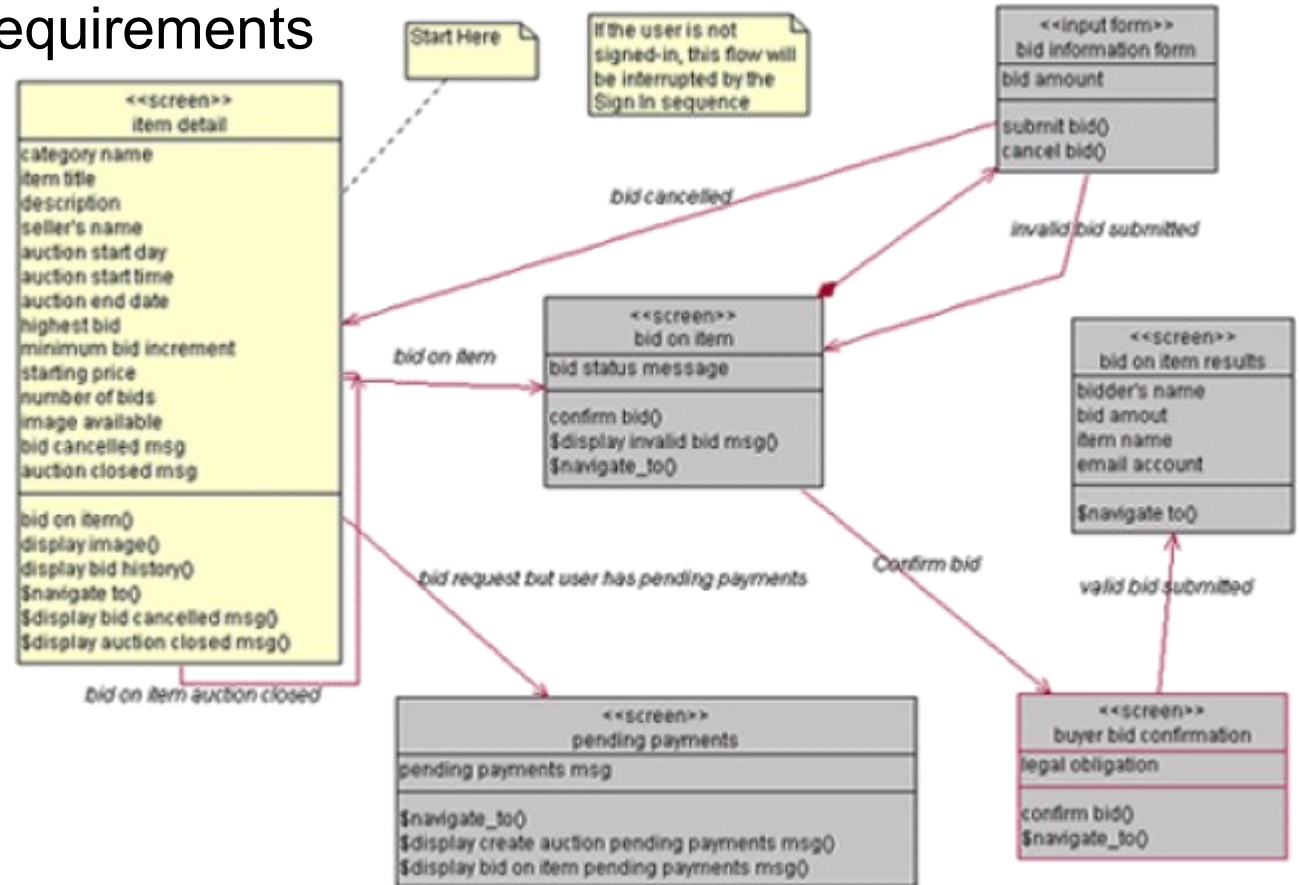


Figure 20: Navigation diagram for the Bid on Item use case

# Wrap-Up & Outlook

- Mensch-Maschine-Interaktion
  - Informationsverarbeitung des Menschen
  - Ein- und Ausgabeeinheiten für Computer, eingebettete Systeme und mobile Geräte
  - Grundlagen und Beispiele für den Entwurf von Benutzungsschnittstellen
  - Prinzipien, Richtlinien und Standards für den MMI-Bereich
  - Designgrundlagen und Designmethoden
  - Methoden zur Modellierung von Benutzungsschnittstellen
  - Evaluierung von Systemen zur Mensch-Maschine-Interaktion
- 
- **Mensch-Maschine-Interaktion 2:**
    - HCI and the Web
    - Mobile and Ubiquitous User Interfaces
    - Information Visualization
    - Interactive Surfaces

# References

- Ahmed Seffah, Jan Gulliksen, Michel C. Desmarais (eds.): Human-Centered Software Engineering - Integrating Usability in the Development Process, Springer 2005
- Mary Beth Rosson, John M. Carroll: Usability Engineering - Scenario-Based Development of Human-Computer Interaction, Academic Press 2002
- Deborah Hix and H. Rex Hartson: Developing User Interfaces Ensuring Usability Through Product & Process, John Wiley 1993
- Bill Curtis, Bill Hefley: A WIMP no more: the Maturing of User Interface Engineering, *ACM interactions* 1(1), January 1994, 22-34
- John M. Carroll, Mary Beth Rosson: Getting Around the Task-Artifact How to Make Claims and Design Cycle: by Scenario, *ACM Transactions on Information Systems*, Vol. 10, No. 2, April 1992, 181-212