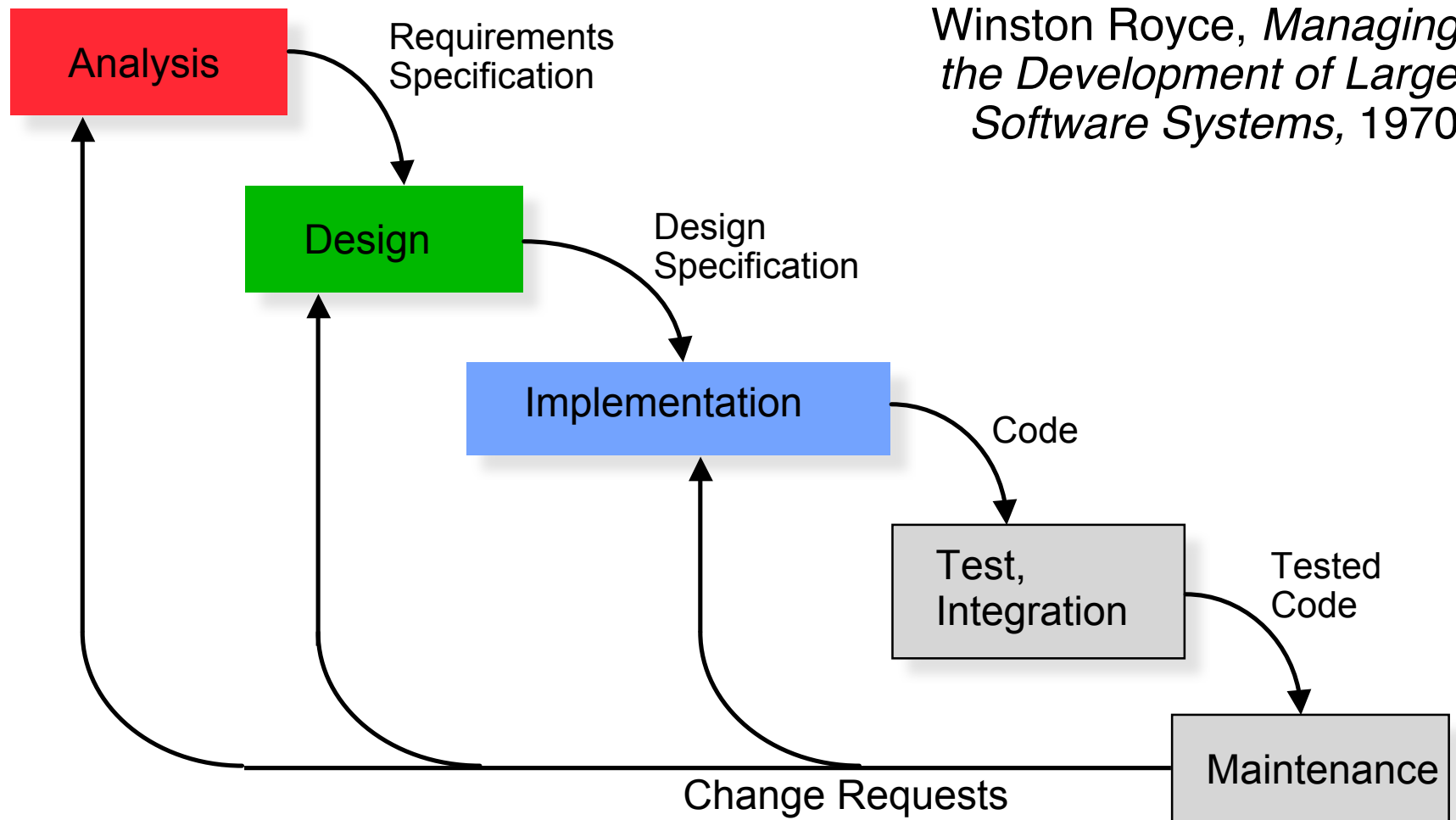# 9 Development Process for Multimedia Projects

Literature:
- Ian Sommervile: Software Engineering, 8. Auflage. Pearson 2007
- K. Osswald: Konzeptmanagement.Interaktive Medien – interdisziplinäre Projekte,   Springer 2003
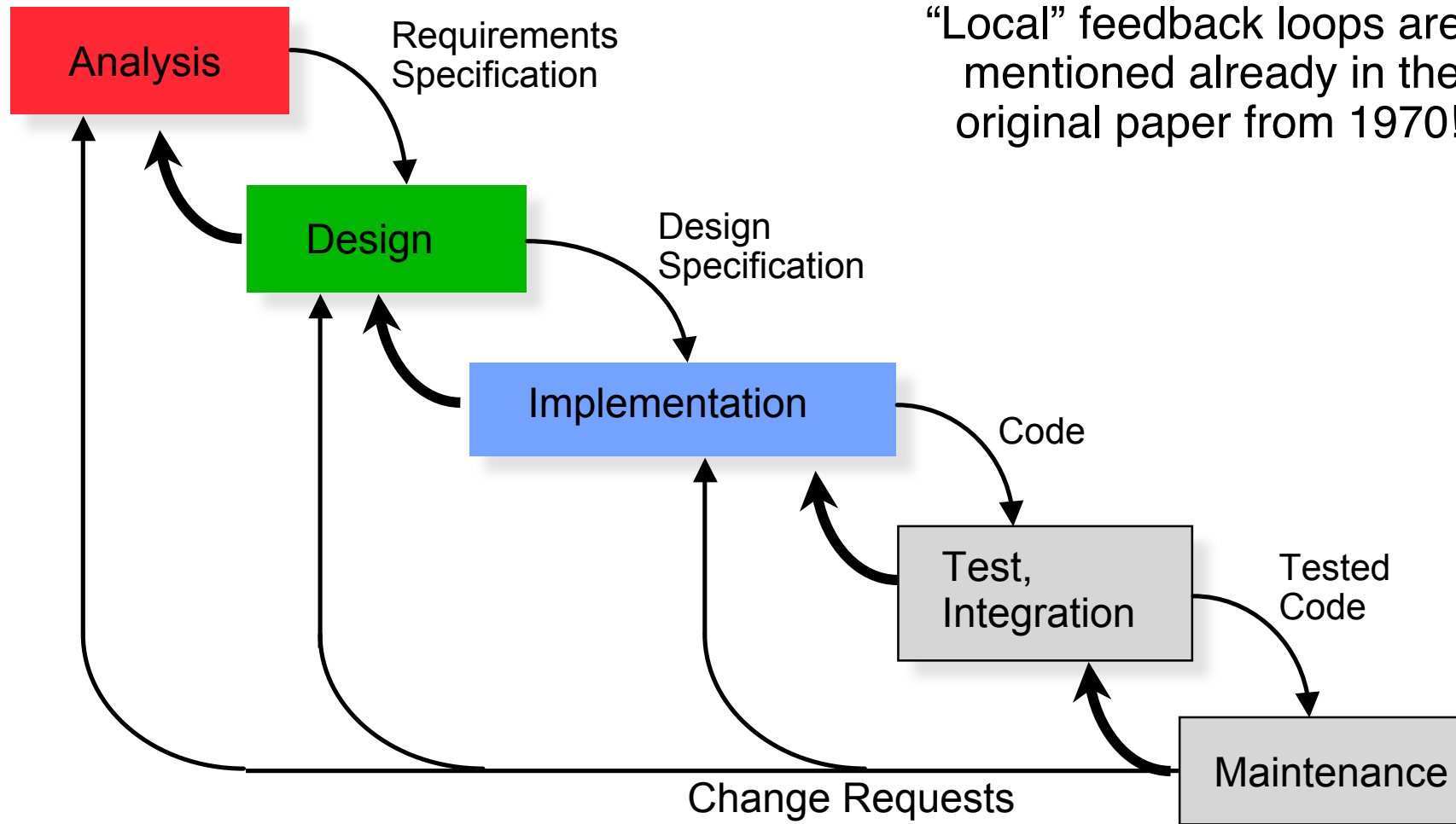
Models of the Development Process

- Which workflows and activities take place?
    - In which order?
- What are the results (artefacts) produced in the activities?
    - Which are the dependencies between activities?

- Related issues:
    - Project management
        - » How to plan a project
        - » How to control a project
    - Quality assurance
        - » How to ensure that goals are met

- Process models:
    - Often rather informal sketches
    - Sometimes formal documents used as input to development support tools

The "Waterfall" Model - Textbook Version

Analysis

Requirements Specification

Winston Royce, *Managing the Development of Large Software Systems,* 1970

Design

Design Specification

Implementation

Code

Test, Integration

Tested Code

Maintenance

Change Requests

"Waterfall" Feedback Loop #1: Quality Control

"Local" feedback loops are mentioned already in the original paper from 1970!
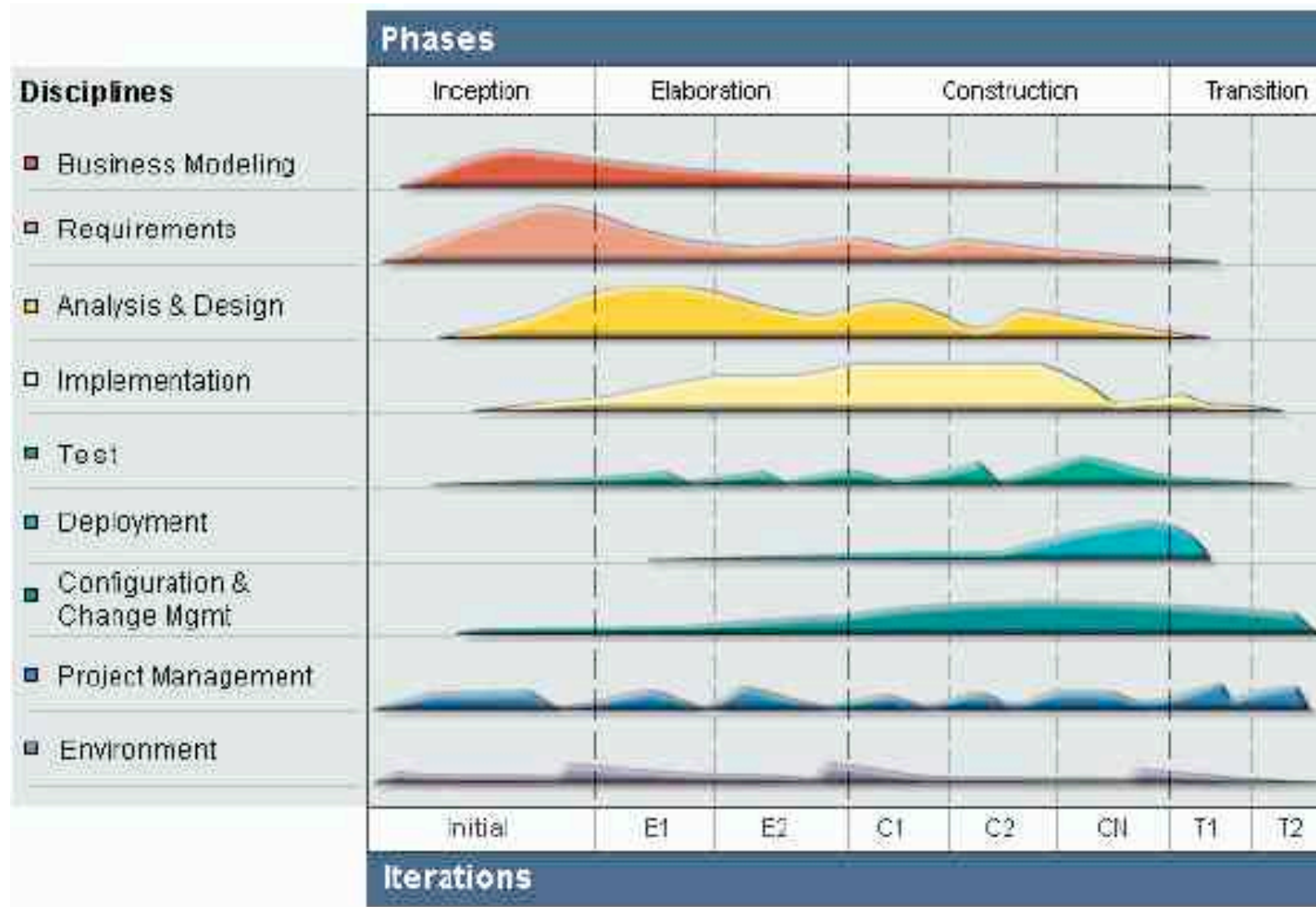
"Waterfall" Feedback Loop #2: Prototyping

This is how the original
"waterfall model" by Royce looked like!
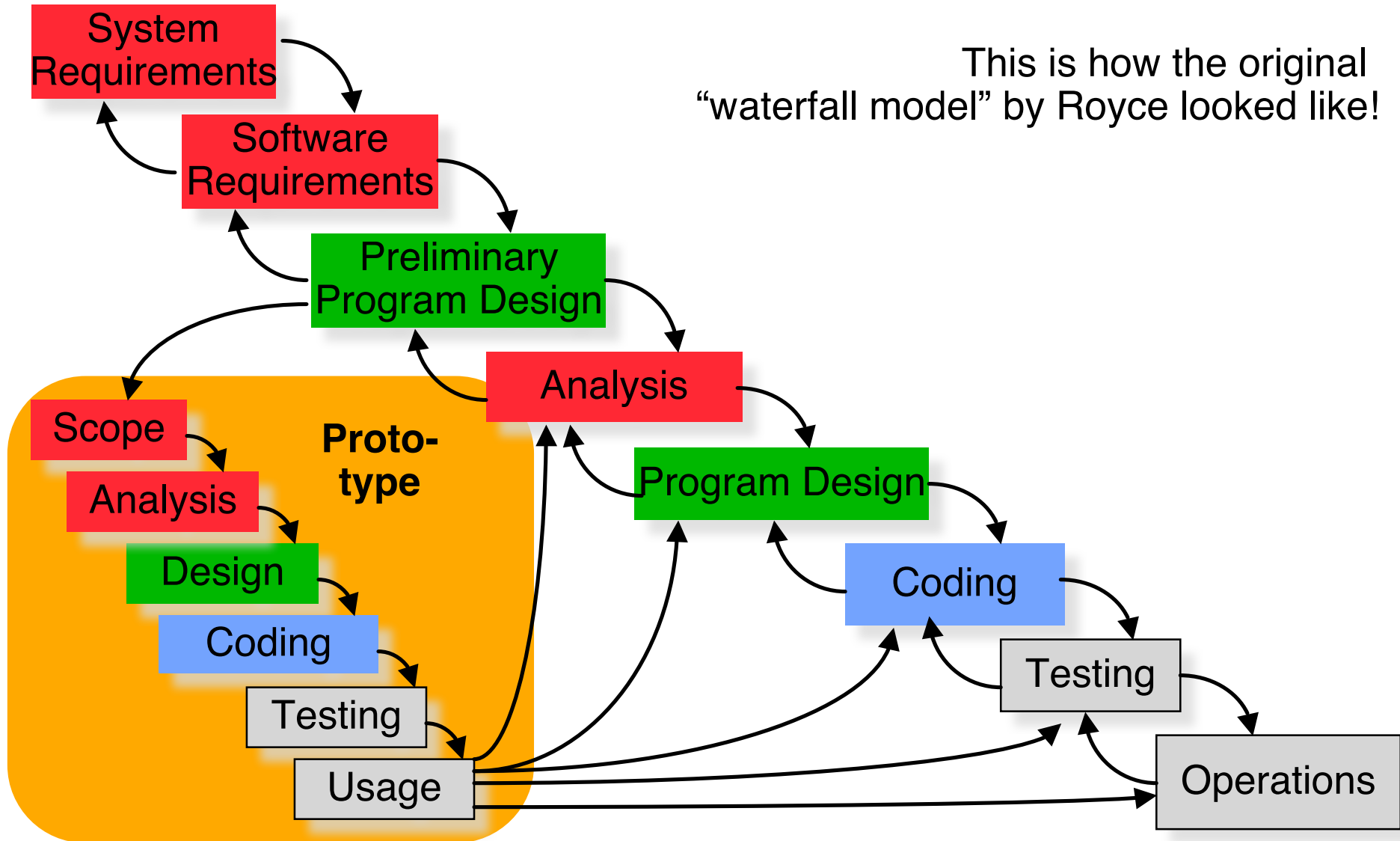
# A Modern Iterative/Incremental Process: Rational Unified Process

Source: IBM

Current Practice in Multimedia Industry?

- K. Osswald, 2001: Systematic interviews with companies from the German multimedia (interactive media) sector
  - Out of a basis of 3000 enterprises, 30 were selected and asked (the most successful enterprises according to rankings)
  - 22 enterprises took part in the study
- Results regarding the development process:
  - More than 80% of the companies apply the "waterfall model"
    - » In almost all cases, there is a large overlap between neighbouring project phases
  - Frequently used technique: Prototyping
  - More than 80% of the interviewed specialists complain that customers demand changes at a very late point in project time, regarding information architecture and concrete content
  - 18% of the companies are working on the introduction of an iterative incremental process model (similar to the Rational Unified Process)
    - » None had completed the transition by 2001

Waterfall Model as Used in Multimedia Industry

- Roy Strauss: Managing Multimedia Projects, Focal Press 1997
- Waterfall model adapted to multimedia projects
  - Highly consistent with the result of the interviews with German companies
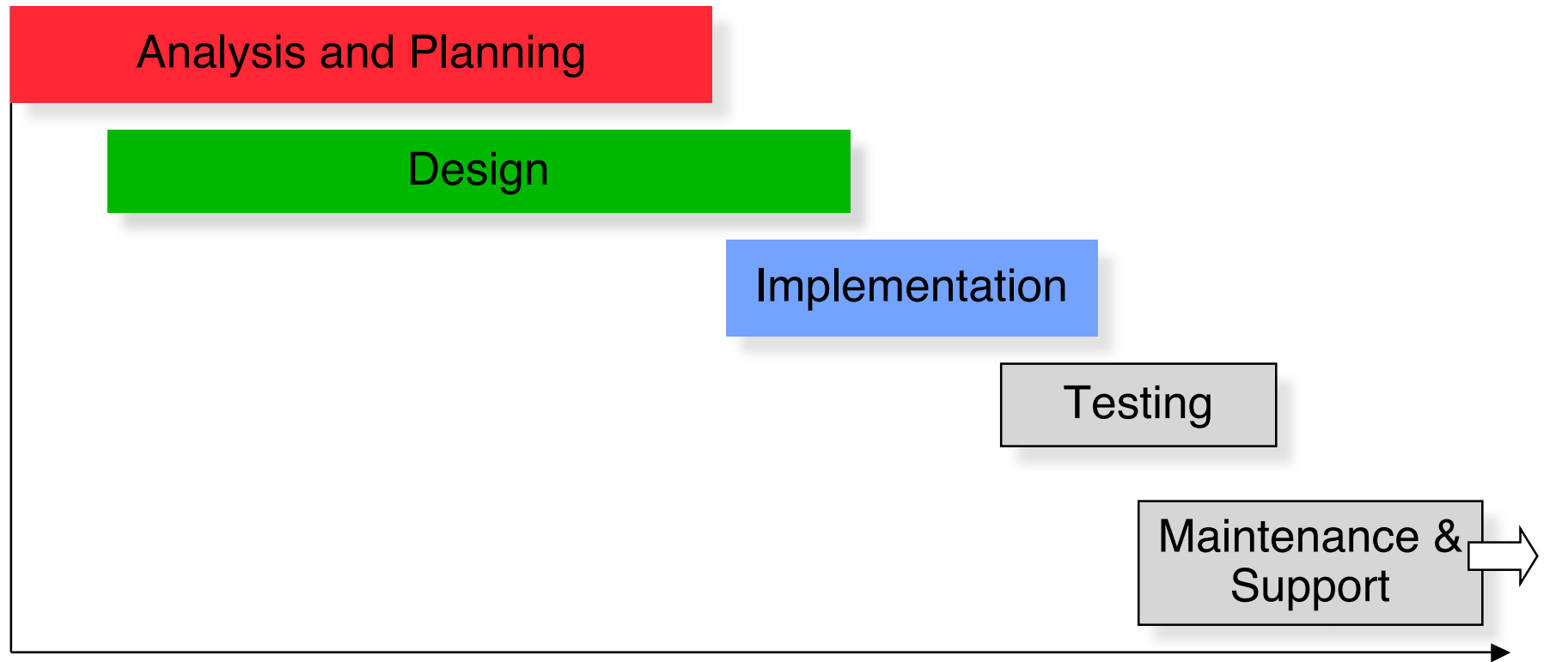
9 Development Process for Multimedia Projects

9.1 Classical models of the software development process

9.2 Special aspects of multimedia development projects ⬅

9.3 Example: The SMART process

9.4 Iterative Development of multimedia projects

Literature:
R. Malaka, A. Butz, H. Hußmann: Medieninformatik, Pearson,
    erscheint im Herbst 2009 (Kapitel 12)
P. A. Henning, Taschenbuch Multimedia, Fachbuchverlag Leipzig,
    2001, Kap. 9
E. England, A. Finney: Project Management for Interactive Media (2nd edition),
    Addison-Wesley 1998

Multimedia Development

- Scope: Interactive multimedia applications, including distributed applications
- Typically carried out by "multimedia agencies" (Multimedia-Agenturen)
  - Main target distribution media:
    - » CD/DVD-ROM
    - » Web presentations (HTML technology, Flash technology)
    - » Movie clips distributed via TV, cinema, Web
- Position in the value chain:

Content Production	Application Production	Distribution Platform Provision
• Media industry • Traditional industry (e-commerce)	• Multimedia agencies • System integrators	• Telcos • ISPs (Internet Service Provider)

Multimedia Development Team

- Executive Producer
- Producer
- Production assistant
- Creative director
- Interactive designer
- Instructional designer
- Industrial designer
- Project manager
- Copywriter/editor
- Content specialist
- Researcher
- Artistic Director
- Graphic designers
- Sound engineer
- TV crew
- Photographer
- File-transfer/network manager
- Programmer

A mixture of roles known from movie production & roles known from software projects

The Design Dilemma

Media
Design

Software
Design

Interaction
Design

- There are at least three different kinds of *design* involved in a multimedia project:
  - **Media Design**
    - » Visual Design (still image & video), Audio Design
    - » Extremely complex, specialists available
  - **Software Design**
    - » Software architecture, standard frameworks, design patterns
    - » Extremely complex, specialists available
    - » Intersection with media design specialists: almost zero
  - **Interaction Design**
    - » Man-machine interaction, usability, accessibility
    - » Complex, but only a few specialists available
    - » Intersection mostly *either* with Media Design *or* with Software Design specialists
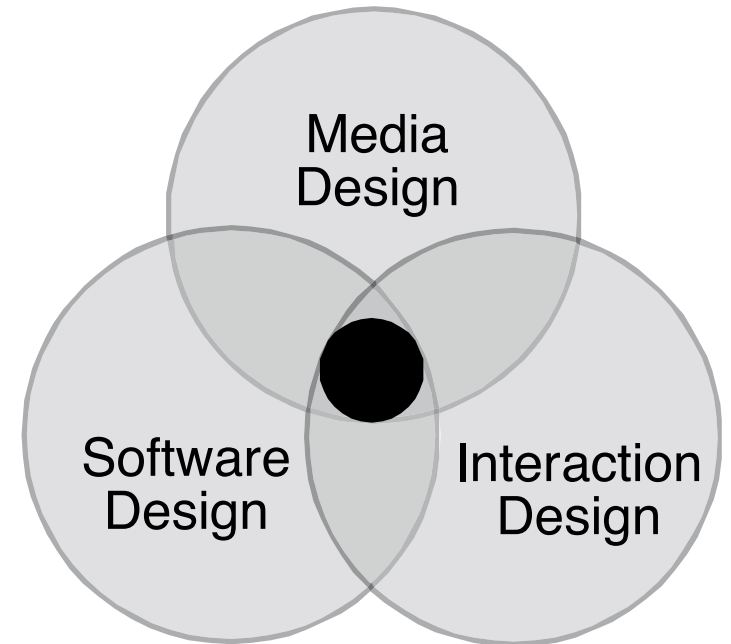
Three-Way Parallel Waterfall
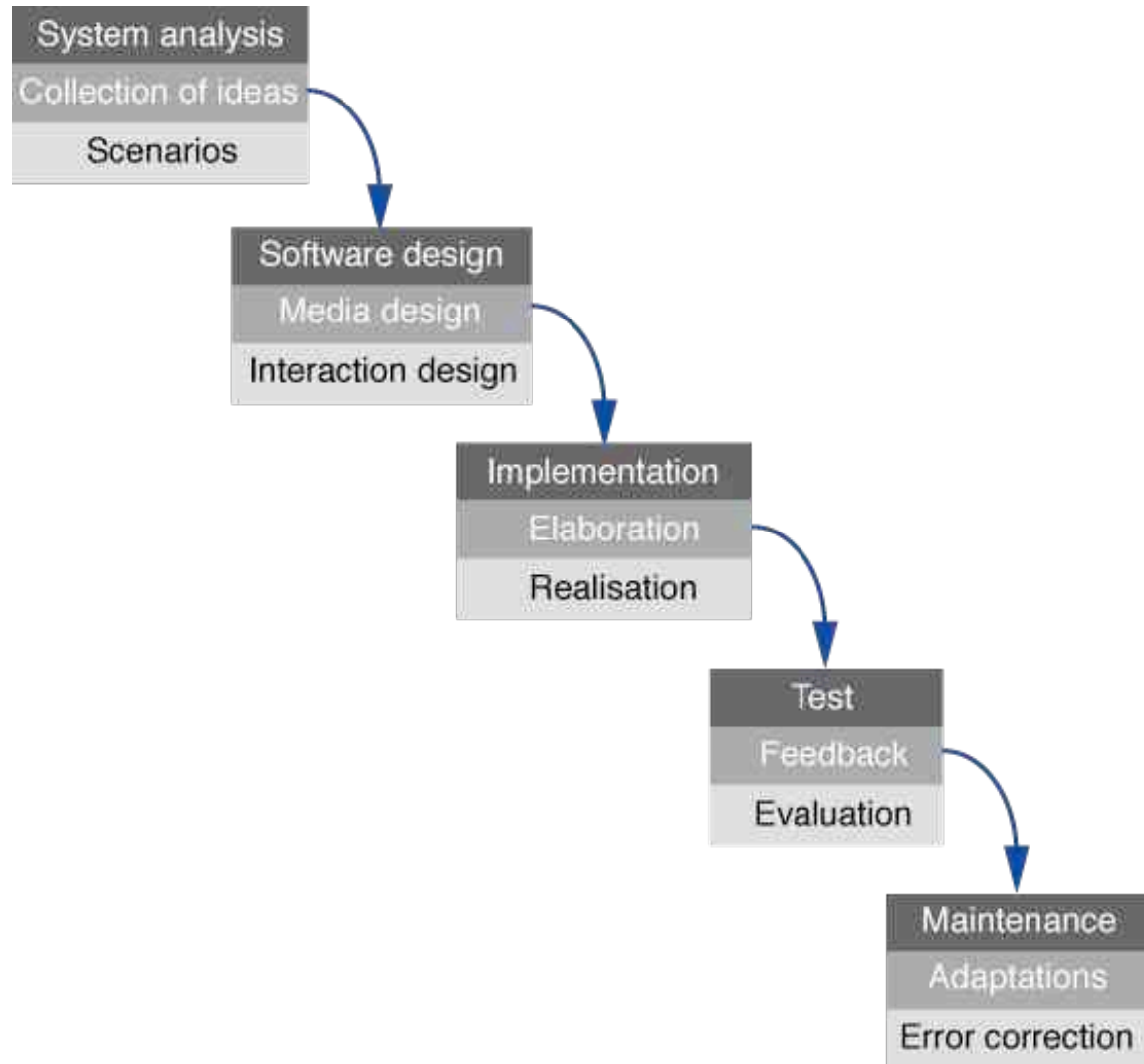
- Idealized view
- Emphasis on similarities among activities
- In practice, different running times of parallel activities within one phase
- Waterfall model is not necessarily applied in all three activities

Content

- Auch im deutschsprachigen Raum als Fremdwort benutzt!
  - „Inhalt" im Sinne eines zu übermittelnden Guts
- *Content* in media delivery chains:
  - Usually content has its own important market value (music, movie)
  - Often associated with products of commercial value
    (Product description in e–commerce)
  - Value chains within content production can be rather complex in themselves
- *Content Provider:*
  - Separate organisation specialized in delivering (and possibly also producing) content
- *Content Research:*
  - Finding sources for appropriate content, clarifying copyright issues

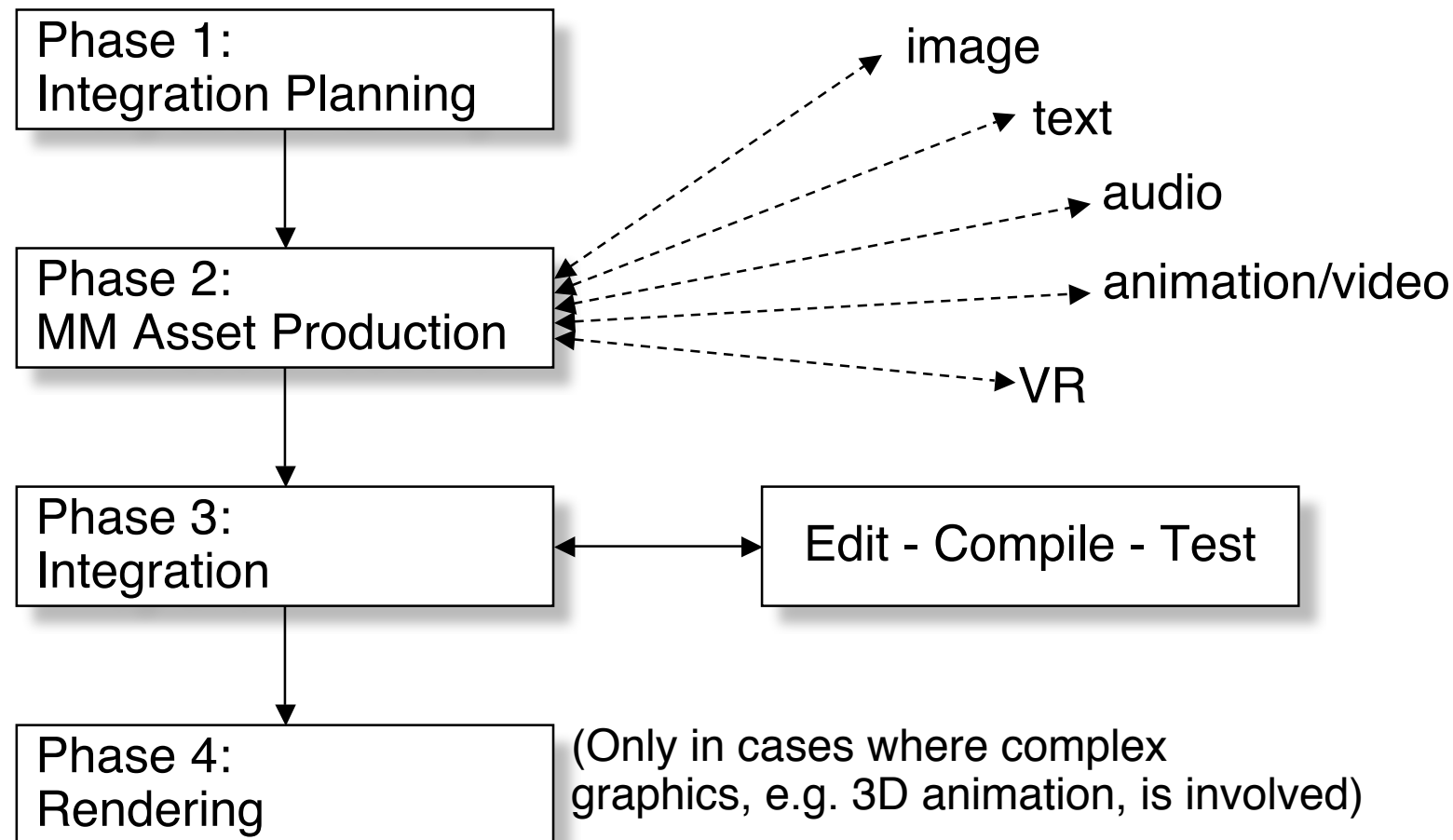# Topics in Multimedia Project Management

Topics from England/Finney 1998 (outline):

- Contract issues

- Agreeing the content

- Choosing the platform

- Selecting the media and techniques (video, audio, graphics)

- Interface design

- Audio asset production

- Video asset production

- Graphics asset production

- Rights, copyright, intellectual property

- Integration

- Testing

- Team management

Multimedia Assets and Products

- Adopted from Henning 2001 ("Four-Phase Multimedia Design Process")
- Process for a relatively detailed (micro) level, higher levels see later

- ***Multimedia Asset***
  - Informational unit that occupies one or more perception channels of the human being
  - E.g. text object, picture, audio sequence, video clip, VR object
  - Usually produced in separate specialized workflows
    - » Using specialized tools
- ***Multimedia Product***
  - Combined and integrated set of multimedia assets
  - Creates an interactive stream of information using several perception channels of a human being
  - Process of combining and integrating media objects: *media integration, composing*
    - » Using integration platforms/tools (e.g. Flash, SMIL etc.)

Four-Phase Multimedia Design Process: Overview

```
┌──────────────────────────┐
│ Phase 1:                 │ ···············▶ image
│ Integration Planning     │ ············▶ text
└──────────────────────────┘ ·········▶ audio
              │
              ▼
┌──────────────────────────┐ ◀···········▶ animation/video
│ Phase 2:                 │ ◀···
│ MM Asset Production      │ ◀···········▶ VR
└──────────────────────────┘
              │
              ▼
┌──────────────────────────┐        ┌──────────────────────────┐
│ Phase 3:                 │ ◀─────▶ │   Edit - Compile - Test   │
│ Integration              │        └──────────────────────────┘
└──────────────────────────┘
              │
              ▼
┌──────────────────────────┐   (Only in cases where complex
│ Phase 4:                 │   graphics, e.g. 3D animation, is involved)
│ Rendering                │
└──────────────────────────┘
```

Henning 2001

Multimedia Design Process Phase 1

Integration Planning

- Planning for the co-ordinated effect of the multimedia assets to be used
- High Level:
  - What is the desired effect on the end user?
  - Which role is played by multimedia technology?
  - Which media assets do we need / can we afford?
  - When to show what?
  - What are the possibilities of the user to intervene?
    - » Interaction design
- Low Level:
  - Development of *story board*
  - Synchronisation planning
  - Planning of error handling

Henning 2001

Modeling the End User

- Age: what is the average age or age-range of anticipated users?
- Background, interests
- Skills: background skills and level of knowledge of users
- Media sophistication: background skills in multimedia and the use of computers?
- Special Needs
- Where is the resource to be used: home, classroom, workplace, public space?
- Contact Time: What is the expected contact time with the resource?
- Learning context: Is there to be only one type of end-user or will there be several? How will the system be used: by one user or by several users simultaneously? Is the resource to be used as a presentation device by a teacher/trainer, as an aid to group discussion, in single-user standalone mode, or across a network?
- Diagnostics: is diagnostic feedback about user performance desirable?
- Password protection, confidentiality, monitoring, data protection
- Distribution Medium
- Support Materials
- Will the needs of each user-type change over time, either as a result of interacting with the system or independently of the system?
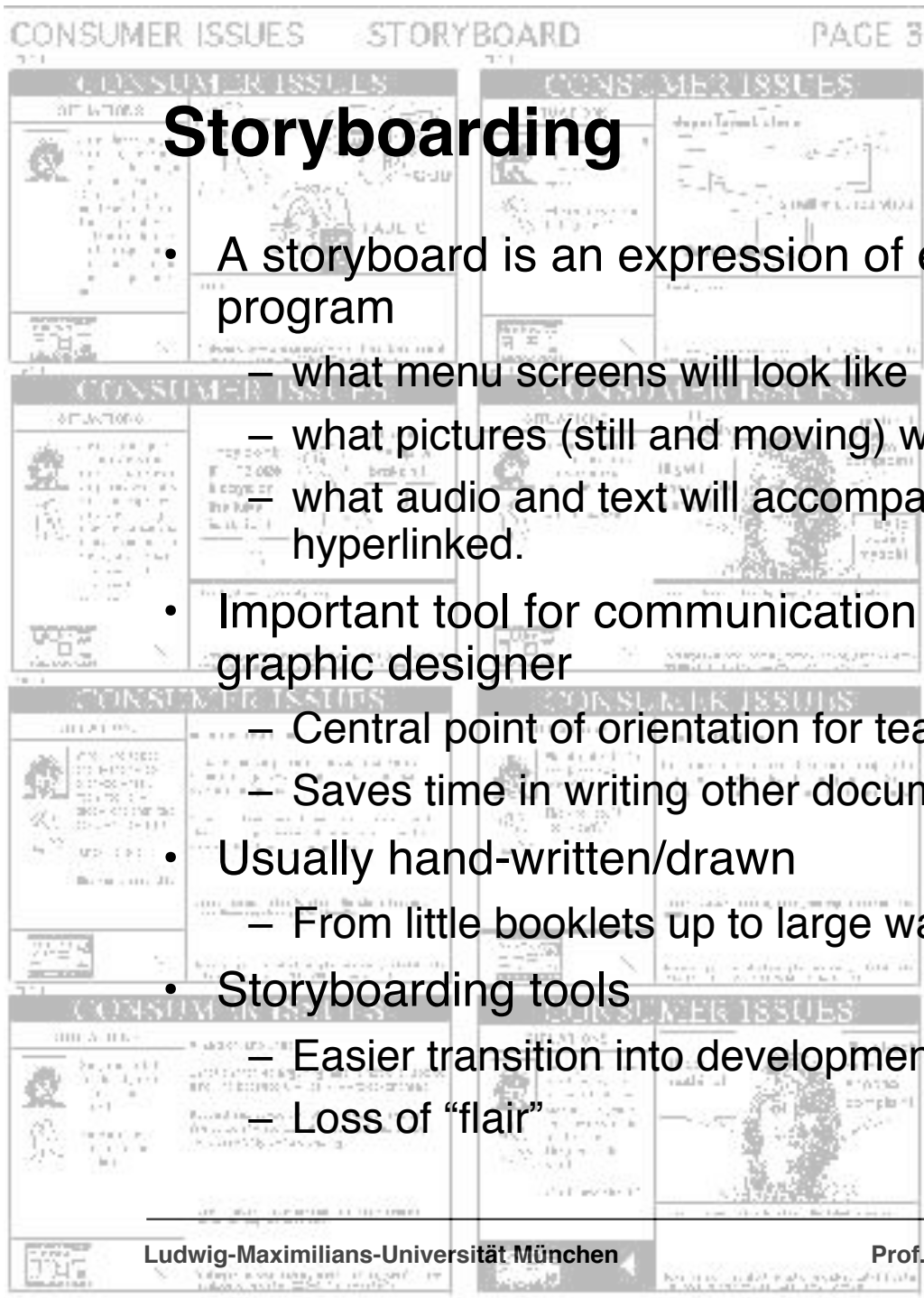
Storyboarding

- A storyboard is an expression of everything that will be contained in the program
    - what menu screens will look like
    - what pictures (still and moving) will be seen when and for how long
    - what audio and text will accompany the images, either synchronously or hyperlinked.
- Important tool for communication among client, interactive programmer, graphic designer
    - Central point of orientation for team
    - Saves time in writing other documentation
- Usually hand-written/drawn
    - From little booklets up to large wall-charts
- Storyboarding tools
    - Easier transition into development work
    - Loss of "flair"

A storyboard pad
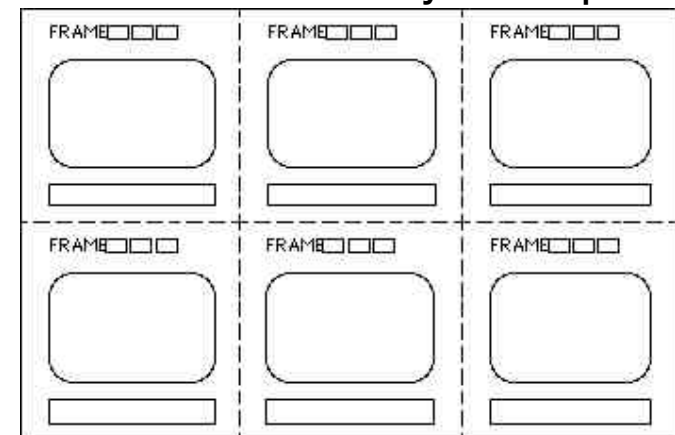
Multimedia Design Process Phase 2

Asset Production

- Production of required media content

- Generation of a *media library* to be used in later steps

- New material:

  - Film production, music production, ...

- Legacy material:

  - Dealing with old formats

  - Dealing with copyright problems

- Adaptation of material:

  - Digital image/audio/video processing

  - E.g. (images):

    » Format conversion

    » Geometric, colour transformations

    » Filtering (e.g. sharpness)

Multimedia Design Process Phase 3

Integration, Composing

- Media assets are not modified anymore
  - "Virtual" composition (e.g. movie clips in video editing software)
- Creation of a common context for individual media assets
- Integration of navigation, control and information entry elements
  - Buttons, rulers, text fields, ...
- Paradigms for media asset integration (tools):
  - Timeline-based (e.g. Flash)
  - Frame-based (e.g. ToolBook, also in Flash)
  - Flowchart-based (e.g. in AuthorWare - discontinued)
  - Object-based (e.g. in recent versions of Flash, Flex)
    - » High emphasis on textual code/script

9 Development Process for Multimedia Projects

Literature:
> K. Osswald: Konzeptmanagement. Interaktive Medien – interdisziplinäre Projekte, Springer 2003

> (Since this source is in German, the following slides are in German language as well.)

Schlüsselbegriff: Konzept

- „*Konzept:* 1. [stichwortartiger] Entwurf, erste Fassung einer Rede oder einer Schrift. 2. Plan, Programm"

  (Duden-Fremdwörterbuch, 1994)

- Begriff aus der Literaturwissenschaft, übertragen auf die Medien- und Werbebranche

- Konzeption = Erstellen eines Konzepts:

  – Aufbauend auf nur wenigen Grundinformationen

  – Kernaspekte einer konkreten Anwendung festlegen und veranschaulichen

  – Beschreibung aller Komponenten, die für die Realisierung notwendig sind

- Formalisierung:

  – Konzept kann „in den Köpfen" der beteiligten Mitarbeiter existieren

  – Konzept kann detailliert, z.B. als Antwort auf eine Ausschreibung, ausgearbeitet sein

- Erfolgreiche Konzeption ist nur im Zusammenspiel der verschiedenen Design-Arten möglich!

Nicht-technische Tätigkeitsfelder in Multimedia-Projekten

- Konzeption
  - Hoch kreative Tätigkeit
  - Grobkonzept entwickeln und Umsetzung in Feinkonzept betreuen
  - Typische Aufgabe für ein interdisziplinäres Team
- (Medien-)Design
  - Gestalterische Umsetzung der Anwendung in Bild und Ton
  - Durch moderne Interaktionstechnologien Grenze zum Interaktions- und Softwaredesign verschwimmend
- Redaktion
  - Verfassen und Zusammenstellen von Content-Bestandteilen
  - Content-Akquisition, Lizensierung
- Information Broking
  - Recherche von spezifischen Fragestellungen in Datenbanken und Bibliotheken

Technische Tätigkeitsfelder in Multimedia-Projekten

- Projektmanagement
  - Koordination und Abwicklung einer Produktion
  - Management und Controlling
  - Schnittstelle zwischen Kunde und Produktionsteam
  - Häufig auch intensiv an der Konzeption beteiligt

- Programmierung
  - Umsetzung der Konzepte in Programmiersprachen und Autorensystemen
  - Klassischer (und eher für Großunternehmen geeigneter) Ansatz:
    » Technische Spezialisten erst in späten Projektphasen beteiligt
  - Trend:
    » Technische und grafische Sichtweisen möglichst früh in die Konzeptarbeit integrieren (Osswald S. 29)

SMART-Modell

- Rahmenwerk zur Vorgehensplanung bei Multimedia-Projekten
  (Kerstin Osswald 2003)

- **S**kalierbar

- **M**ultimedia

- **A**ufgabenplanung

- **R**essourcenplanung

- **T**ool

- Iterative Entwicklungsmethode, am Rational Unified Process orientiert

SMART: Phasen

- Idee der Trennung von Grob- und Feinentwurf wegen laufender Änderungswünsche nicht realisierbar

- Bessere Trennung: Ziele, kreative Idee, Erarbeitung von Inhalten

- *Strategie:*
  - Abstraktion, Zerkleinerung
  - Definition des (über die Projektlaufzeit stabilen!) Problems
  - Strukturierung, Hypothesenbildung

- *Kreation:*
  - Produktion möglichst vieler verwertbarer Ideen (unabhängig vom Kunden!)
  - Entwicklung einer interdisziplinären Vision für den Projektverlauf

- *Konzeption:*
  - Kritische Prüfung entstandener Ideen
  - Disziplinübergreifende Ausarbeitung von ausgewählten Ideen

SMART: Workflows

- Anforderungsmanagement
- Strategieentwicklung
- Ideenfindung auf Metaebene
- Definition der Funktionalitäten
- Redaktion
- Informationsarchitektur
- Grafisches Konzept
- Technisches Konzept
- Zeit- und Kostenmanagement
- Qualitätsmanagement

(prinzipiell anpassbar an spezifische Gegebenheiten)

SMART: Zuordnung von Workflows zu Phasen

Iteration	Phase 1: Strategie	Phase 2: Kreation	Phase 3: Konzeption		
	1	2	3	4	5
Anforderungsmanagement	▮		▮	▮	▮
Strategieentwicklung	▮		▮		
Ideenfindung auf Metaebene		▮	▮		▮
Definition der Funktionalitäten			▮	▮	▮
Redaktion			▮	▮	
Informationsarchitektur				▮	▮
Grafisches Konzept				▮	▮
Technisches Konzept			▮		▮
Zeit- und Kostenmanagement	▮	▮	▮	▮	▮
Qualitätsmanagement	▮	▮	▮	▮	▮

Beispielhaft, aber typisch!

SMART: Typische Rollen (Auswahl)

- Art Director:
  - Überwacht Konzeption und Gestaltung, erstellt Interaktionskonzepte
  - Arbeitet eng zusammen mit Screendesigner, Konzepter, Softwareentw.

- Creative Director:
  - Überwacht die Stimmigkeit aller Konzepte und hinterfragt Entscheidungen
  - Inhaltliche Verantwortung für kreative Arbeit, sorgt für innovativen Input

- Screendesigner:
  - Entwickelt „Masterscreen"-Beschreibung und „Look and Feel"
  - Erstellt visuelle Konzepte und grafische Content-Elemente
  - Setzt Corporate Design des Kunden um

- Frontend/Backend Programmierer:
  - Frontend: Clientseitige Programmierung, meist Dialogdummies
  - Backend: Anwendungslogik, Datenbankanbindung, Middleware

SMART: Artefakte (1)

- Angebot
- Anwendungsfallprotokoll
- Anwendungsfallübersicht
- Benchmark-Analyse
- Benutzerprofil
- Brand Bible
- Change Request
- Containerprofil
- Content Management Plan
- Contentogramm
- Content Writing Styleguide
- Creative Brief
- Datenbankarchitektur
- Designvorschlag
- Modulprofil

- Moodboard/Komposition/Skizze
- Navigationskonzept
- Phasenplan
- Production Board
- Prototyp
- Programmierspezifikation
- Rebriefing/Strategic Brief
- Risikoanalyse
- Screenverzeichnis
- Seitengrundraster
- Seitentypdefinition
- Site Map
- Storyboard/Drehbuch
- Dialogdummy
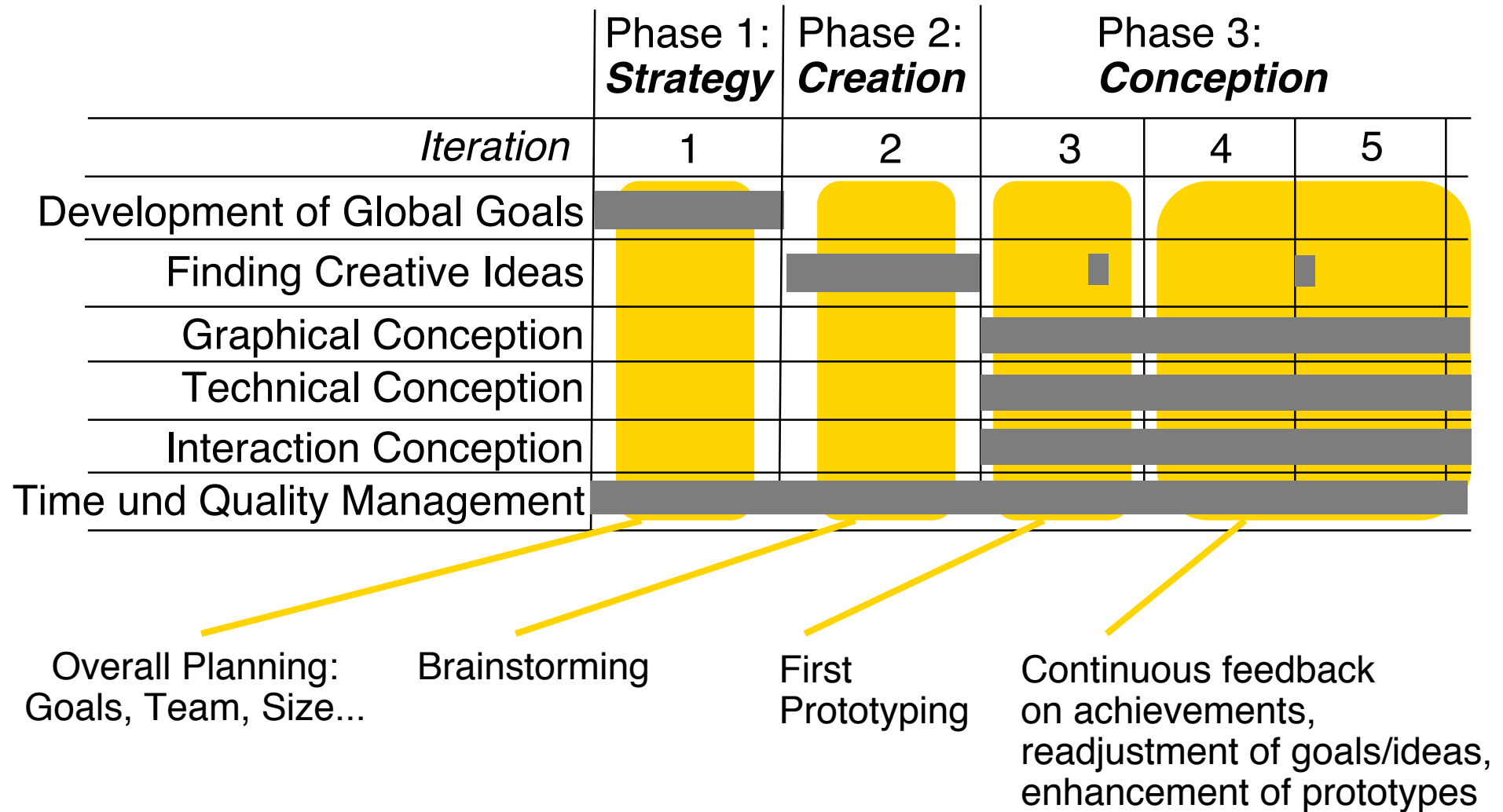- Dienstleistermotivation

SMART: Artefakte (2)

- Erfolgsmatrix
- Feasibility-Analyse
- Flussdiagramm
- Funktionsspezifikation
- Geschäftszieltabelle
- Graphical Strategic Brief
- Interactive Media Storyboard
- Investitionsempfehlung
- Iterationsplan
- Kostenvoranschlag
- Mission Statement
- Mitarbeitermotivation
- Szenario
- Technical Strategic Brief
- Technischer Überblick

- Technische Spezifikation
- Usability-Analyse
- Vision
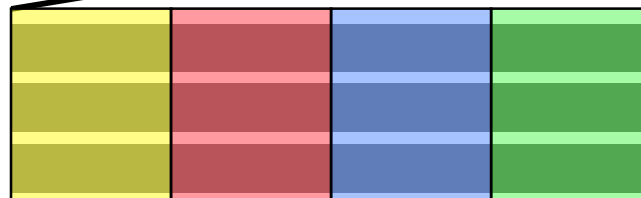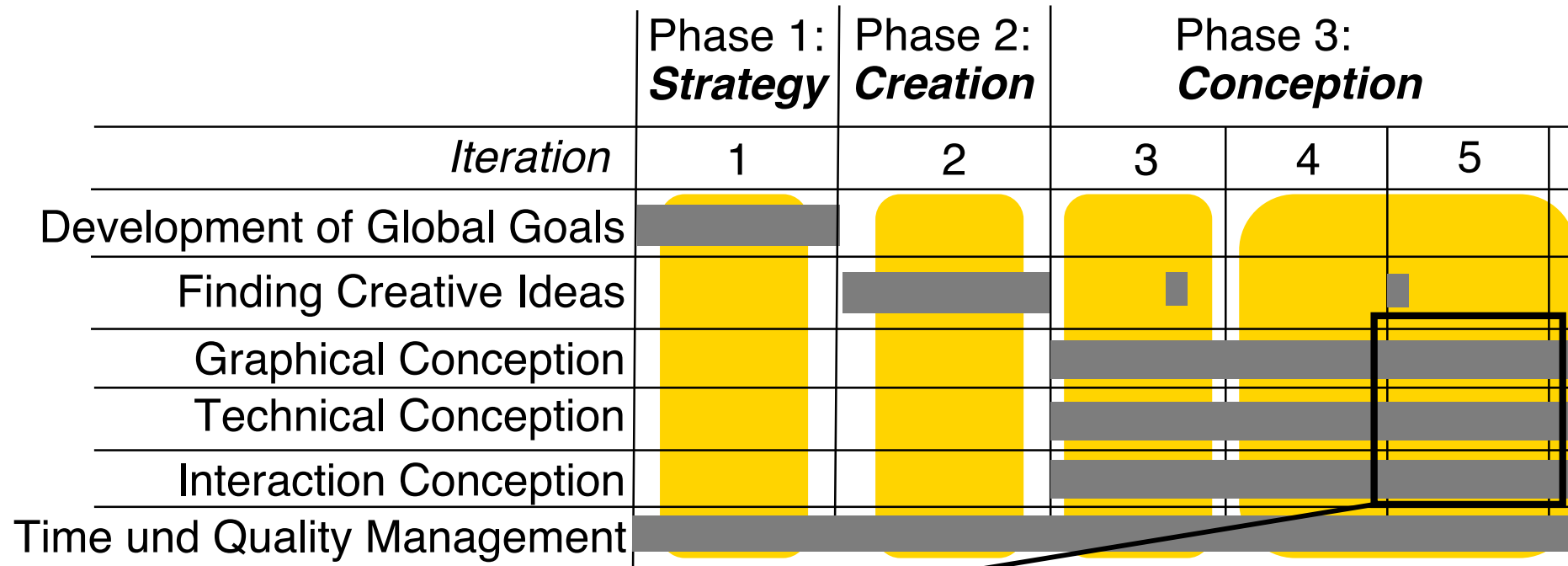- Visual Design Styleguide
- Zieldefinition

SMART-Konfiguration

- Für eine Organisation bzw. ein Projekt werden festgelegt:

- Welche Artefakte werden benötigt?

  – Abhängig von Anwendungsgebiet und Komplexität in den verschiedenen Aspekten

  – Beispiele von Projektcharakteristika: Statisch/Dynamisch/Prozesse/Bewegtbild

- Welche Rollen werden benötigt?

  – Jedes Artefakt ist (fest definiert) mit bestimmten Qualifikationen zu seiner Herstellung verknüpft.

- Definition der Zuordnung von Workflows zu Phasen

  – Anpassung des beispielhaften Basis-Modells (siehe oben)

  – Berücksichtigung der zu erstellenden Artefakte

- ... Für Details siehe Osswald 2003!

Practical Conclusion:
A Simple Multimedia Development Process

	Phase 1: *Strategy*	Phase 2: *Creation*	Phase 3: *Conception*		
Iteration	1	2	3	4	5
Development of Global Goals					
Finding Creative Ideas					
Graphical Conception					
Technical Conception					
Interaction Conception					
Time und Quality Management					

Overall Planning:
Goals, Team, Size...

Brainstorming

First
Prototyping

Continuous feedback
on achievements,
readjustment of goals/ideas,
enhancement of prototypes

Integration with Four-Phase Development Process

Iteration	Phase 1: *Strategy*	Phase 2: *Creation*	Phase 3: *Conception*		
	1	2	3	4	5
Development of Global Goals					
Finding Creative Ideas					
Graphical Conception					
Technical Conception					
Interaction Conception					
Time und Quality Management					

Integr. planning   Asset production   Rendering   Integration

9 Development Process for Multimedia Projects

9.1 Classical models of the software development process

9.2 Special aspects of multimedia development projects

9.3 Example: The SMART process

9.4 Iterative Development of multimedia projects

Literature:
R. Malaka, A. Butz, H. Hußmann: Medieninformatik, Pearson,
erscheint im Herbst 2009 (Kapitel 12)

Changing Requirements

- Key problem in software development
 - Requirements change during course of project
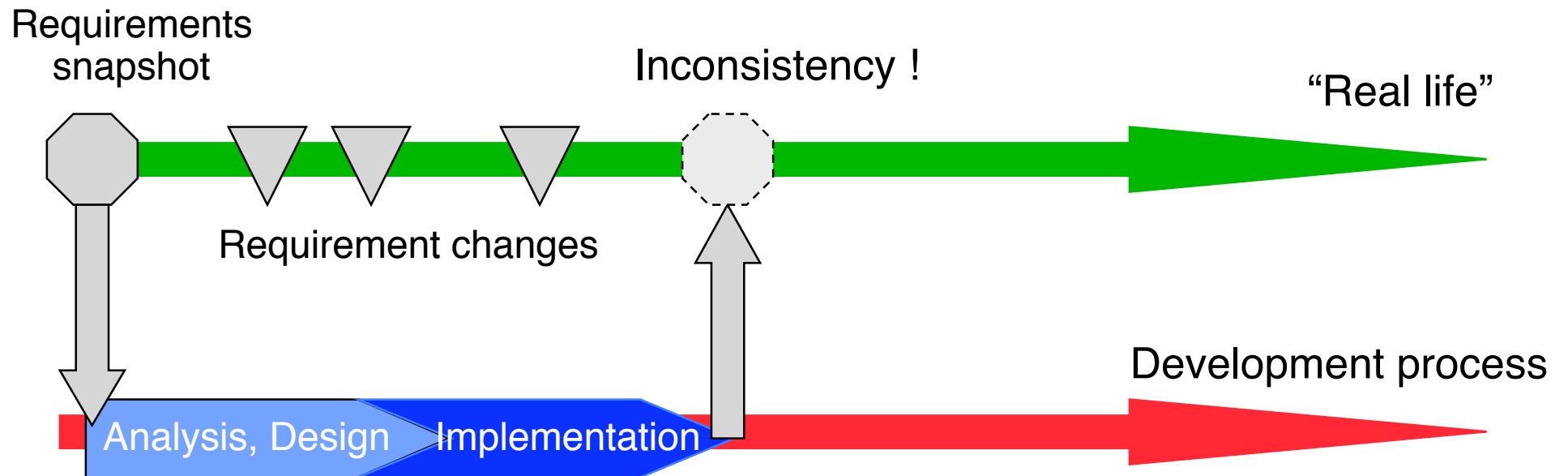
Specific drivers for requirement changes in multimedia projects:
- New technologies & devices, new (corporate) design rules, new services, …
- Feedback from non-technical reviewers (designers, customers)

Planning for Change

- Fred Brooks, 1975: "Plan to throw one away; you will anyhow."

- David Lamb, 1988: Software engineering is "planning for change"

- Berry Boehm, 1988: "Spiral model" of development

- Lessons learnt from traditional software engineering at this point:

  - *Iteration* is a key principle in all variants of the development process (from waterfall to modern process definitions)

  - *Continuous feedback* is important

  - *Incremental* development is suitable for small projects with volatile requirements

- "Extreme" continuation of the idea of iterative development: Agile Development/Extreme Programming

  - Mainly suitable for volatile requirements and small projects

    » Of which kind is the *majority* of projects?

# Iteration in Three Parallel Activities
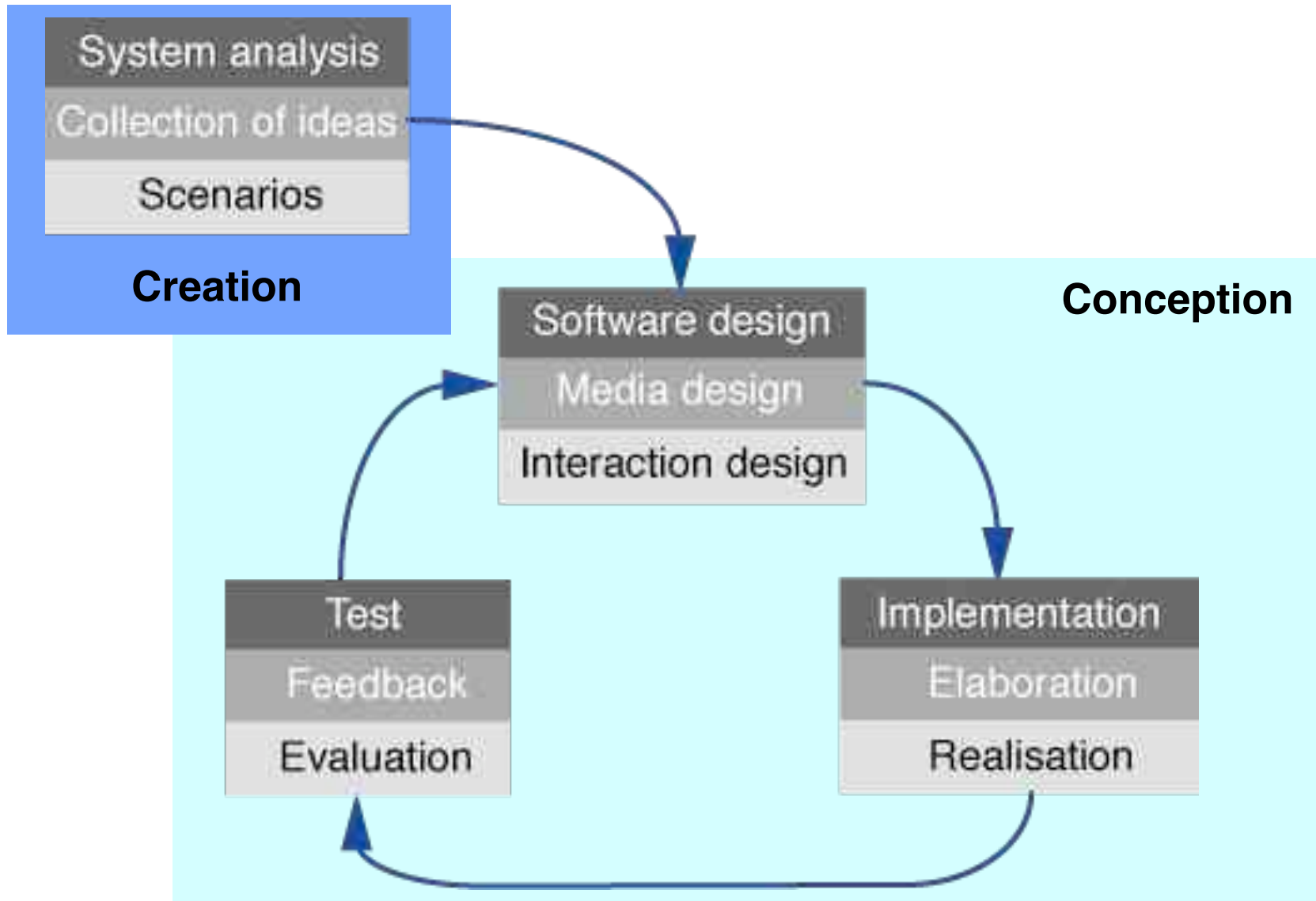
Problems in Iterative Multimedia Development (1)

- Change of general requirements

- Examples (functional):
  - Introduction of new use cases
  - Introduction of new user types

- Examples (non-functional):
  - Change of platform
  - New security requirements

- Changes of most functional and some non-functional requirements may be dealt with by *agile development*:
  - Radical deviation from waterfall idea
  - Continuous update of integrated and executable prototype

- Details see "Praktikum Multimediaprogrammierung"
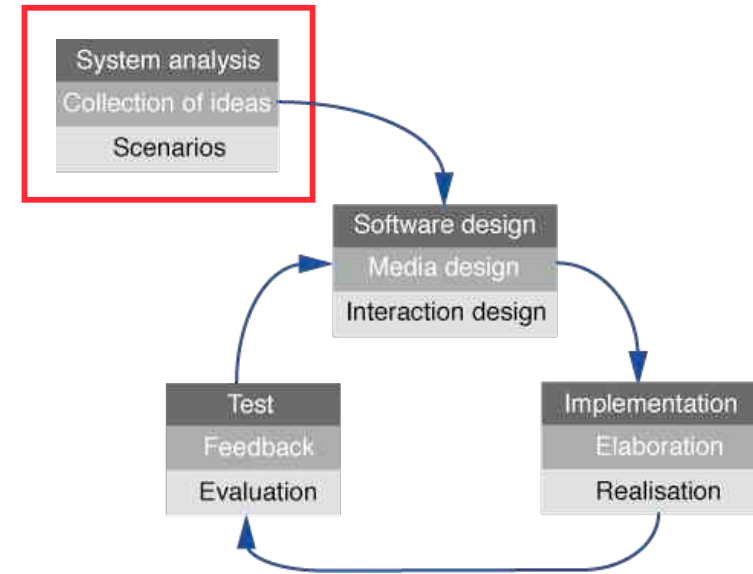
Problems in Iterative Multimedia Development (2)

- Updates in media assets
  (audio, video, photography, external
  graphical work)

- Examples:
  - Introduction of new corporate design
  - Change to different location in scenes
  - Change to different language
  - Change of device brand

- Already produced media assets are
  difficult to change or cannot be
  changed at all

- Only way out:
  - Delay media asset production until
    requirements are stable
    (waterfall!)
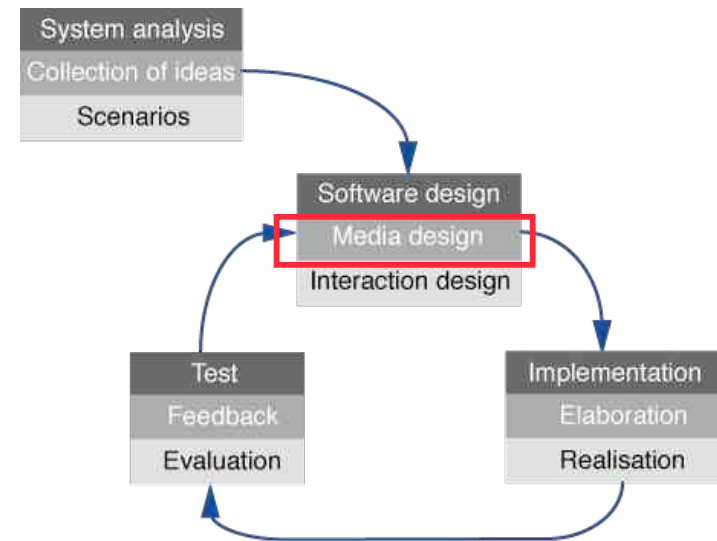
Problems in Iterative Multimedia Development (3)

- Testing of multimedia interaction (animations, interactive controls, visual/auditive feedback)

- Examples:
  - Testing an interactive game
  - Testing sound feedback (sound mix)

- Testing involves using interface channels (graphics card, sound card, operating system)

- Testing involves human activity

- Fully automatic testing is difficult to achieve

- Research area: Using image/sound analysis techniques