Outline (Preliminary)

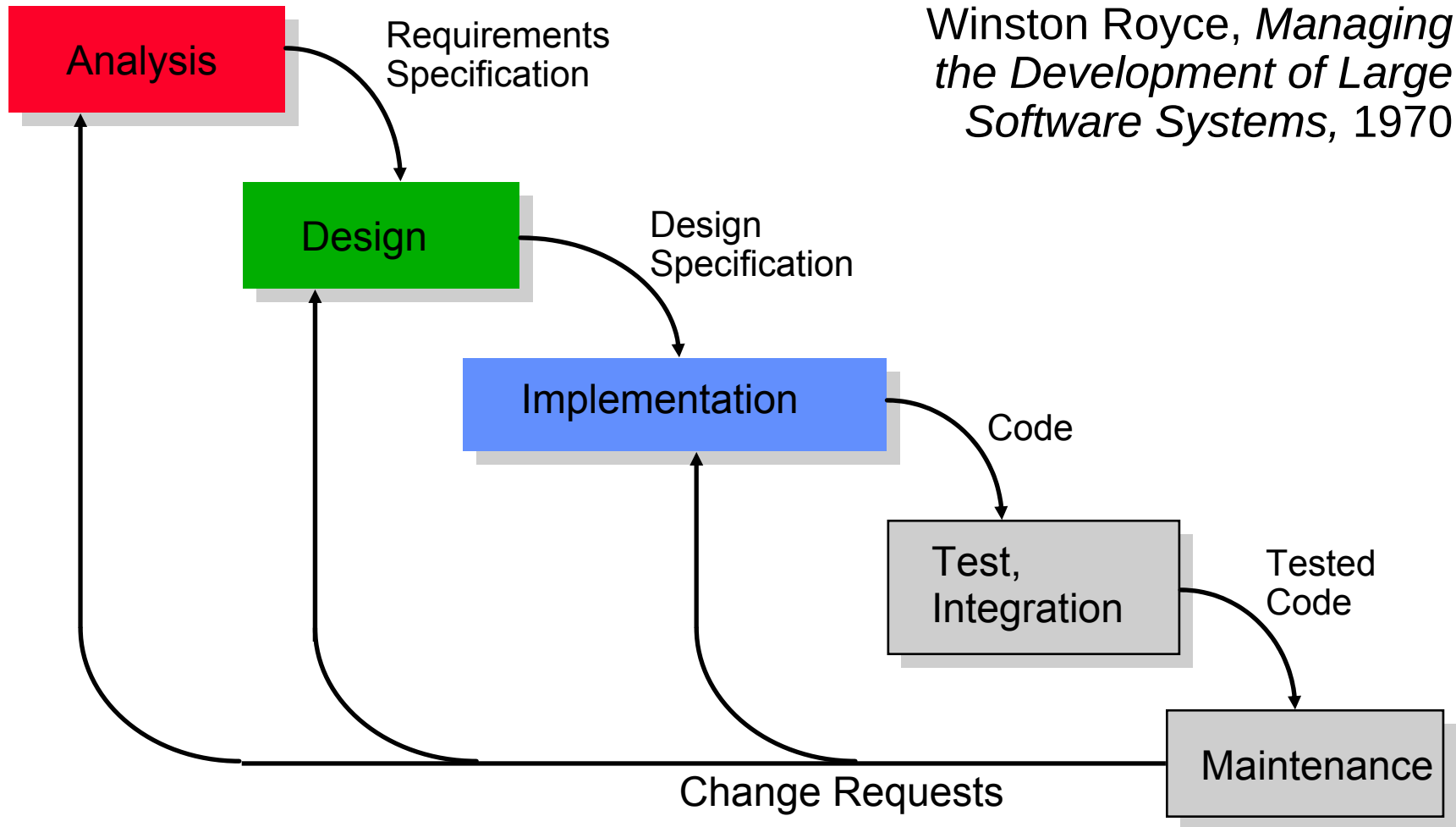
1. Example technology: Macromedia Flash & ActionScript
   - 1.1 Multimedia authoring tools - Example Macromedia Flash
   - 1.2 Elementary concepts of ActionScript
   - 1.3 Interaction in ActionScript
   - 1.4 Media classes in ActionScript
2. Development process for multimedia projects
   - 2.1 Classical models of the software development process
   - 2.2 Special aspects of multimedia development projects
   - 2.3 Example: The SMART process
   - 2.4 Agile development/Extreme Programming for multimedia projects
   - 2.5 Modeling of multimedia applications
3. Introduction to computer game programming
   - 3.1 Logic-based games
   - 3.2 Simulation-based games
4. Overview on approaches to multimedia programming
   - 4.1 History of multimedia programming
   - 4.2 Squeak and Smalltalk: An alternative vision
   - 4.3 Advanced multimedia authoring with Director
   - 4.4 Frameworks for multimedia programming
5. Development trends and outlook

2 Development process for multimedia projects

Literature:

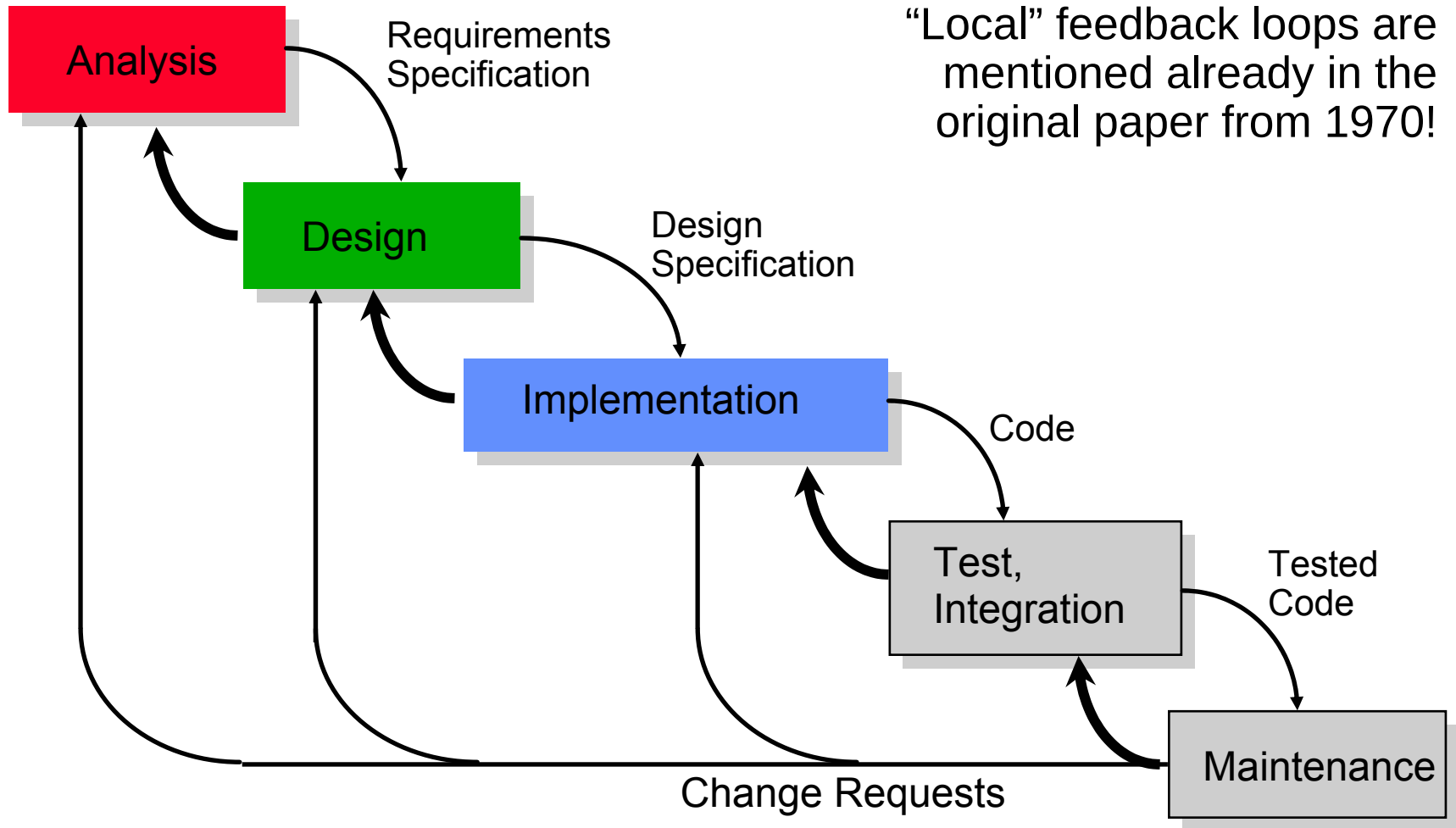
- Any textbook on Software Engineering.
- M. & T. Poppendieck: Lean Software Development, Addison-Wesley 2003

The “Waterfall” Model - Textbook Version



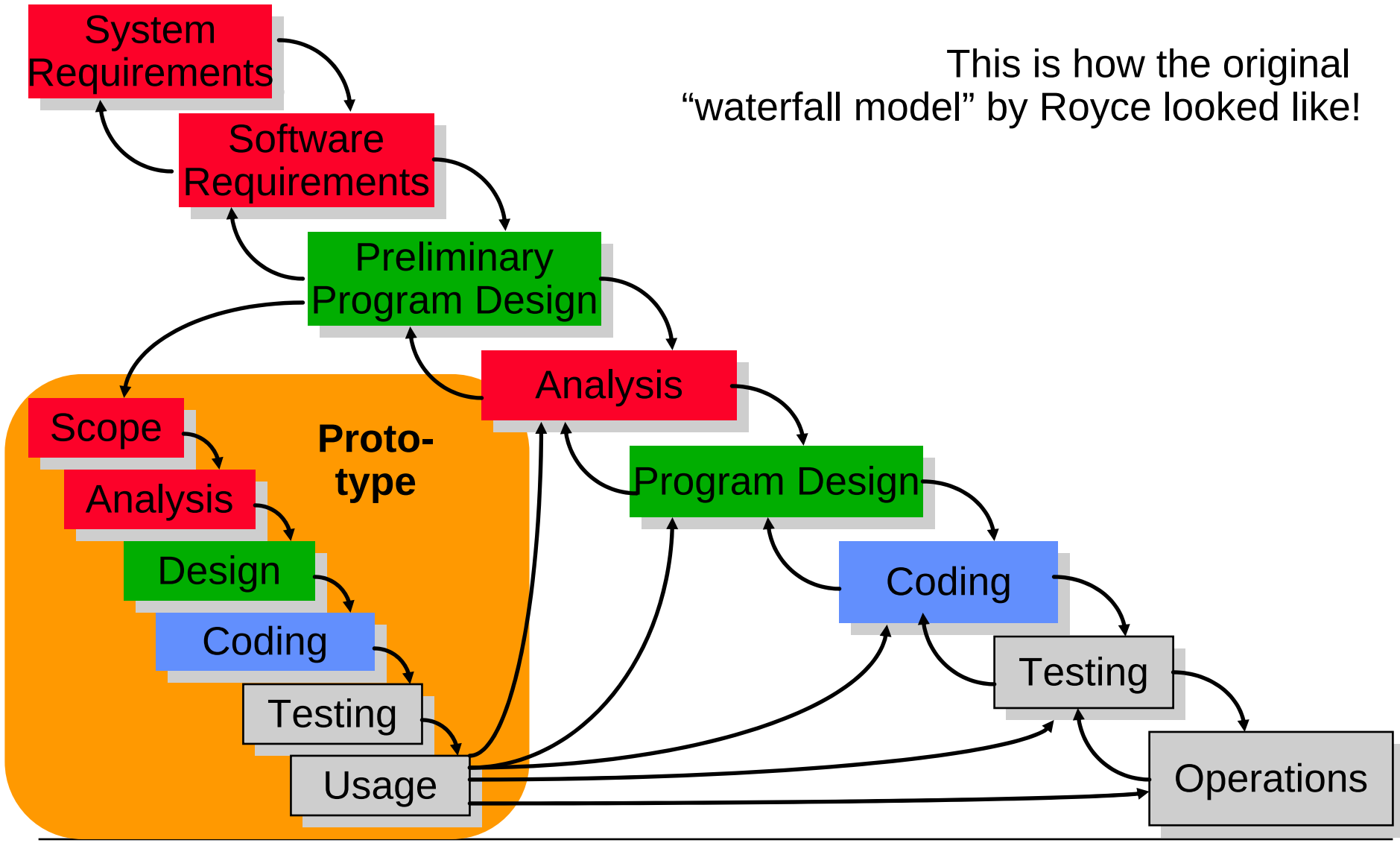
Winston Royce, *Managing the Development of Large Software Systems,* 1970

“Waterfall” Feedback Loop #1: Quality Control



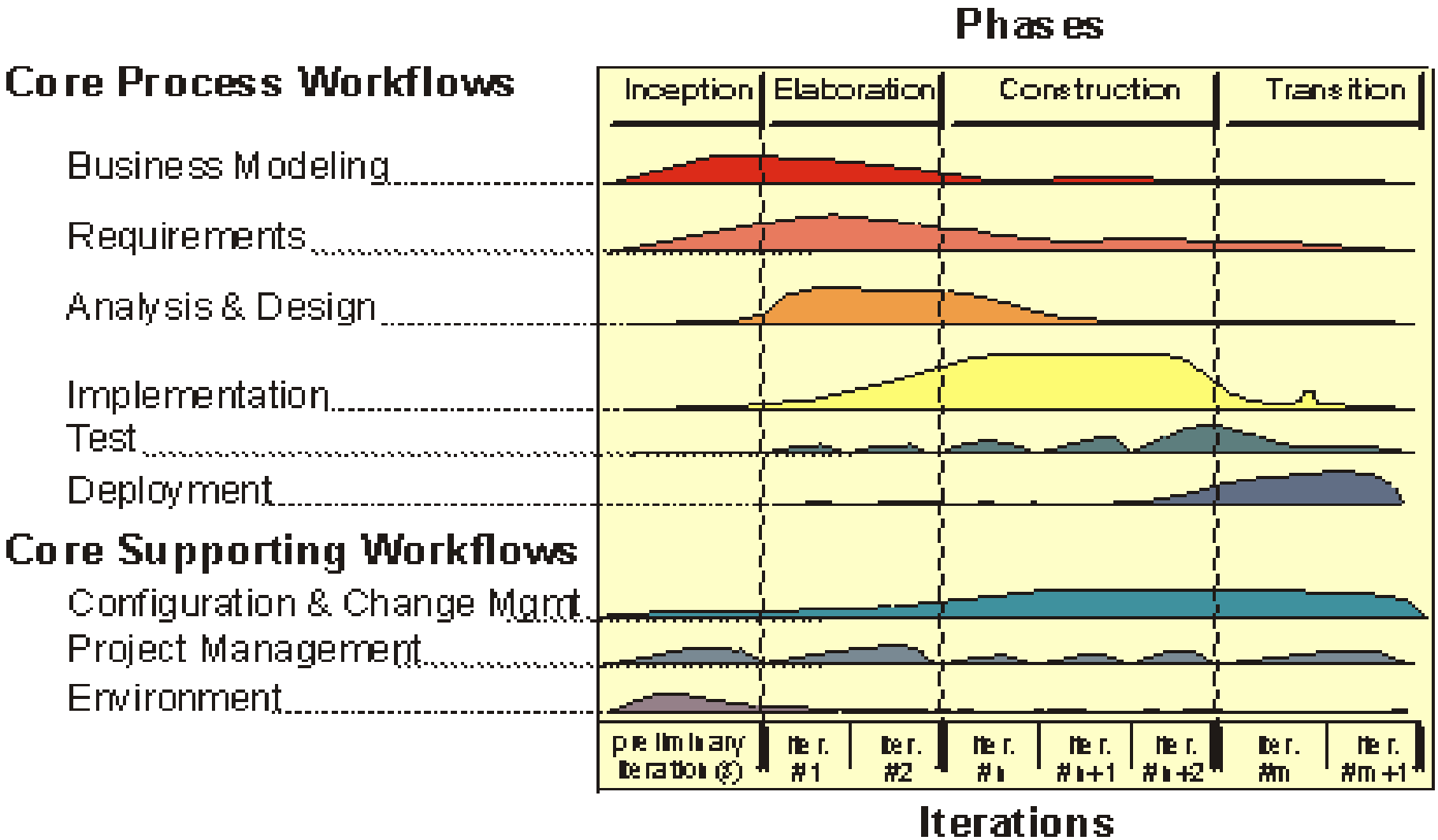
“Local” feedback loops are mentioned already in the original paper from 1970!

“Waterfall” Feedback Loop #2: Prototyping



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

A Modern Iterative/Incremental Process: Rational Unified Process



Planning for Change

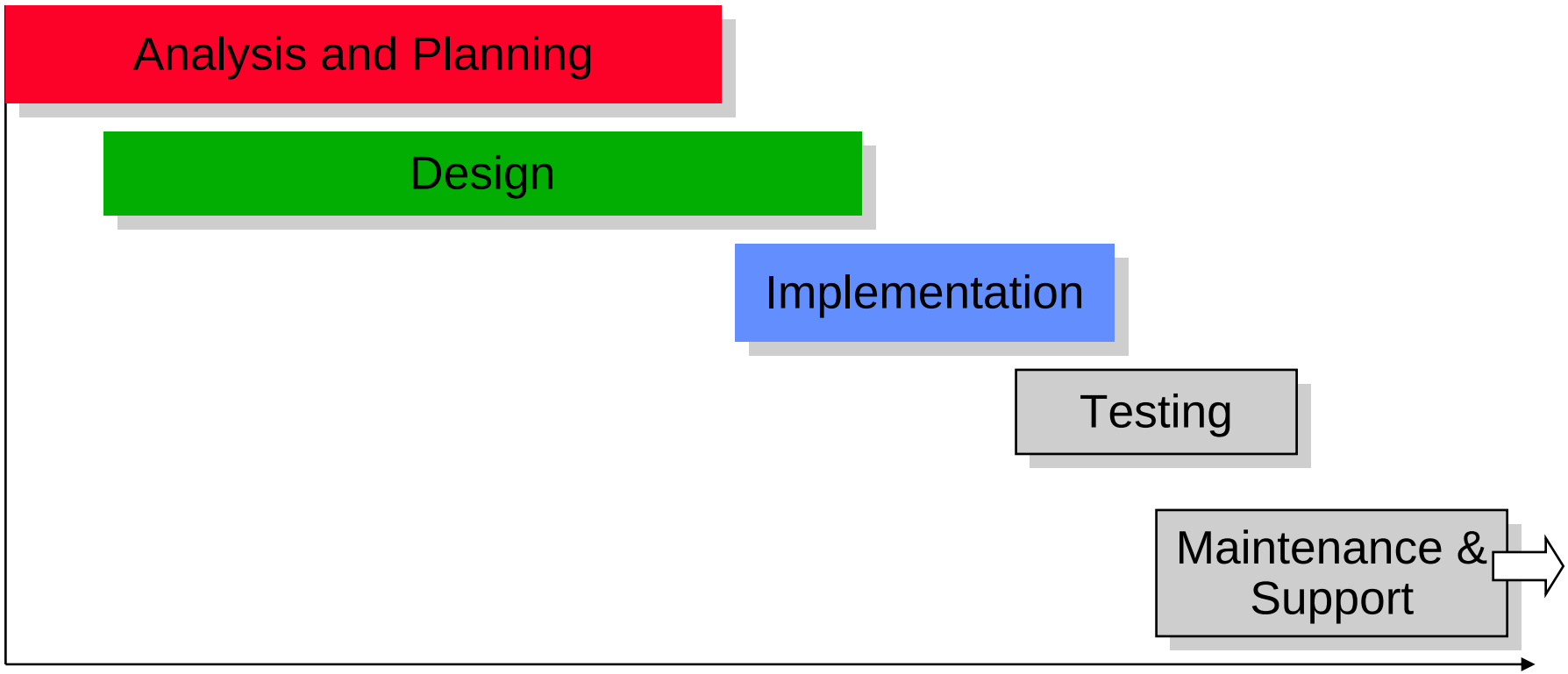
- Fred Brooks, 1975: “Plan to throw one away; you will anyhow.”
- David Lamb, 1988: Software engineering is “planning for change”
- Berry Boehm, 1988: “Spiral model” of development
- Lessons learnt from traditional software engineering at this point:
  - *Iteration* is a key principle in all variants 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?
  - See section 2.4 (next lecture)!

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



2 Development process for multimedia projects

Literature:

P. A. Henning, Taschenbuch Multimedia, Fachbuchverlag Leipzig, 2001, Kap. 9

Adrian Mallon: The Multimedia Development Process, http://ourworld.compuserve.com/homepages/adrian_mallon_multimedia/devmtpro.htm

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)
- 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

- 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

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

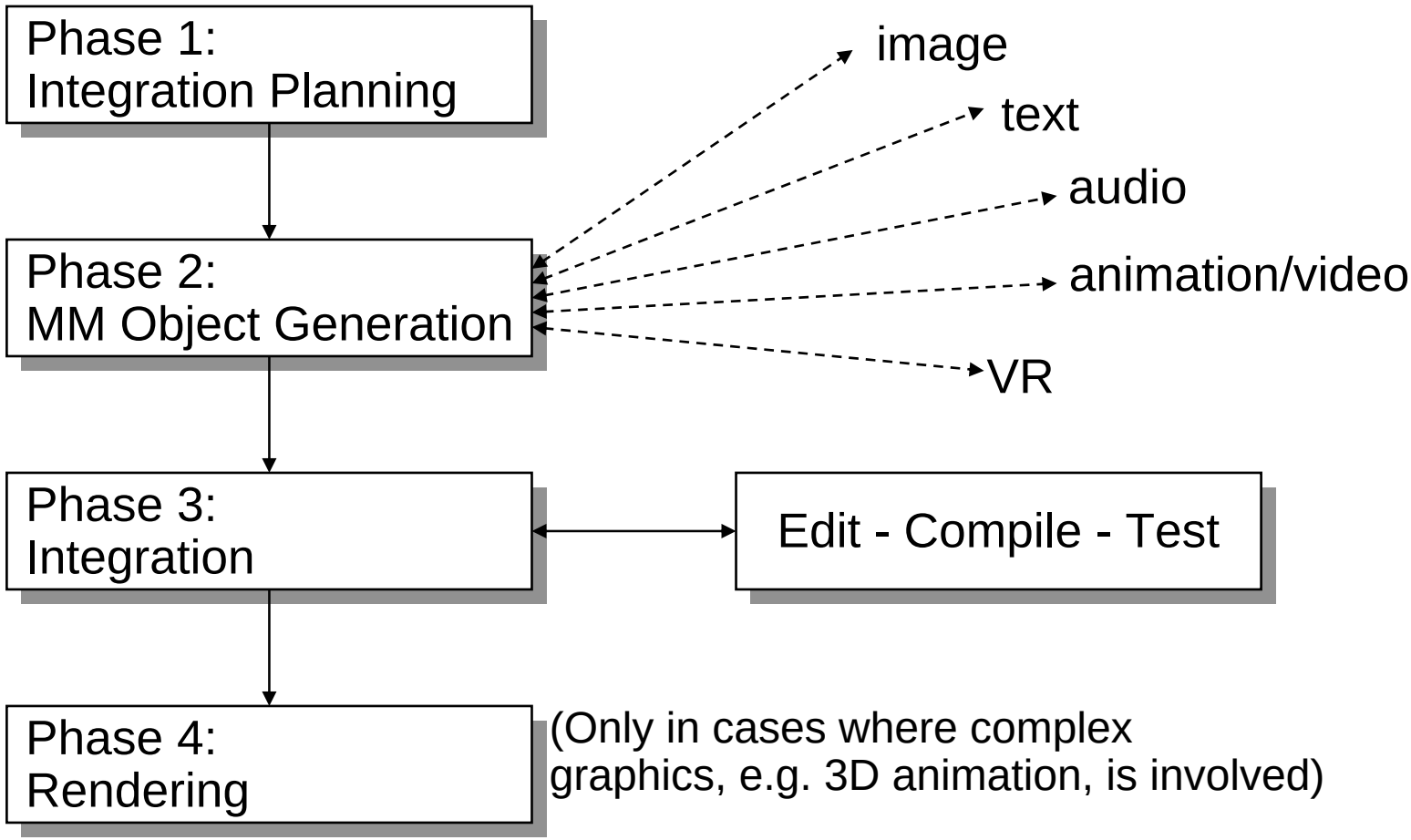
- Remarks:
  - Content of high value can be difficult to obtain for (academic & research) experiments!
  - Judge the results of experiments also due to the quality of the used content!

Multimedia Objects and Productions

- According to Henning 2001 (“Four-Phase Multimedia Design Process”)

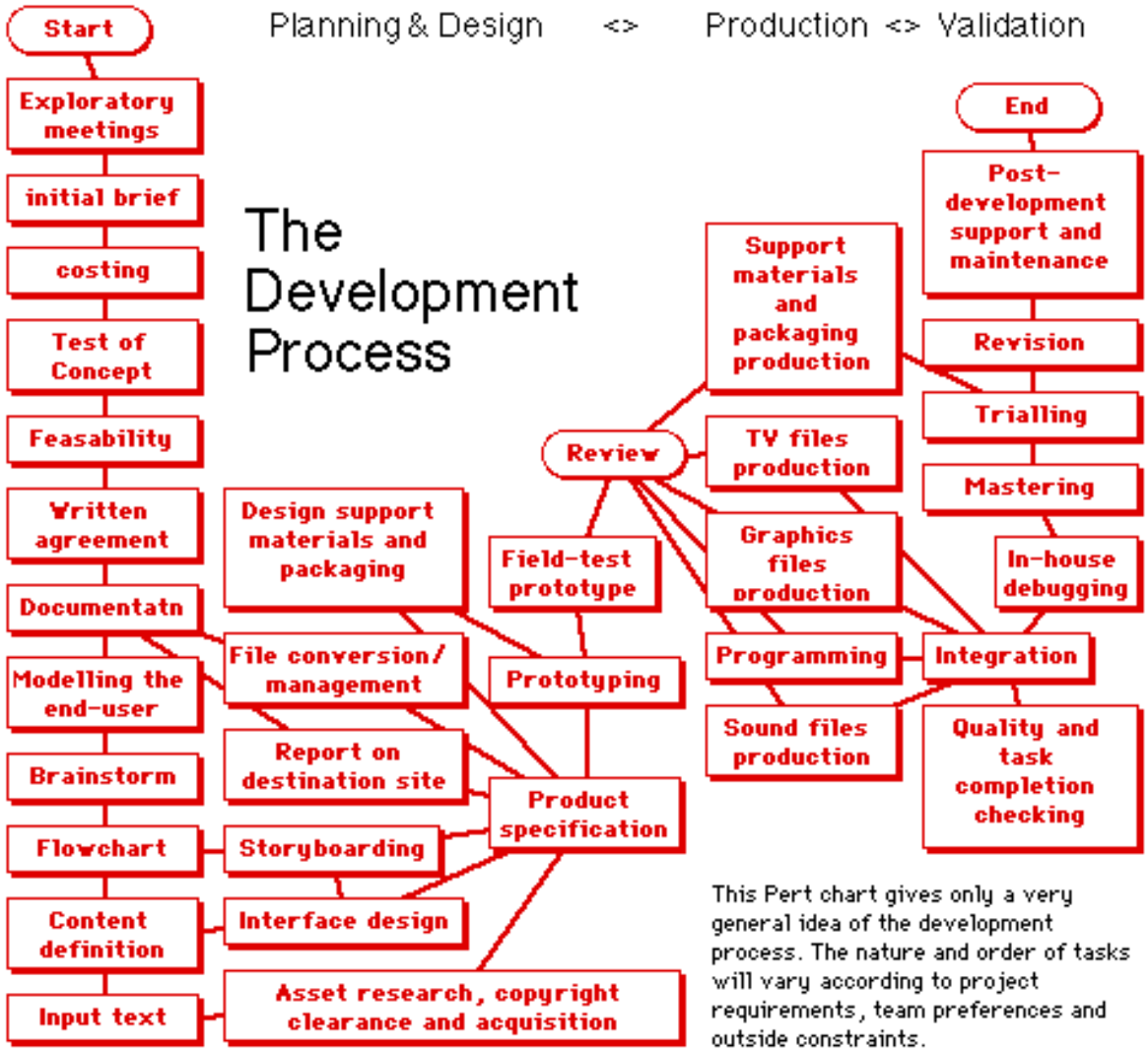
- ***Multimedia Object***
  - Informational unit that occupies one or more perception channels of the human being
  - E.g. text object, picture, audio sequence, VR object
- ***Multimedia Production***
  - Combination and integration of several multimedia objects into a stream of information which uses several perception channels of a human being
  - Process of combining media objects: *media integration, composing*

Four-Phase Multimedia Design Process: Overview



Henning 2001

Mallon's Multimedia Development Process



- Adrian Mallon
- Three phases
  - Planning/Design
  - Production
  - Validation

Multimedia Design Process Phase 1

Integration Planning

- Planning for the co-ordinated effect of the multimedia objects to be used
- High Level:
  - What is the desired effect on the end user?
  - Which role is played by multimedia technology?
  - Which media objects 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

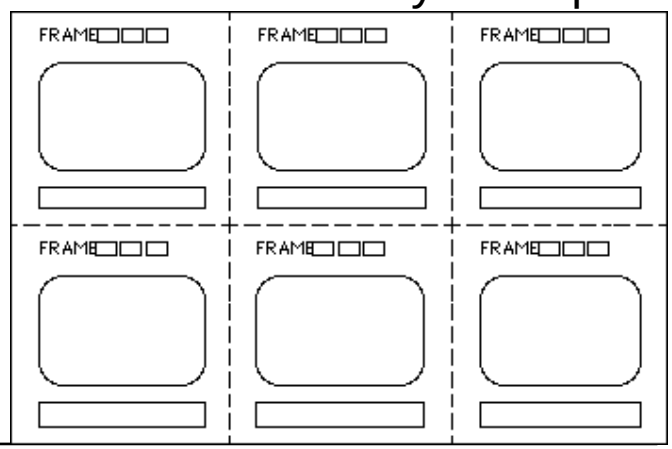
Modeling the End User

- 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

Object Generation

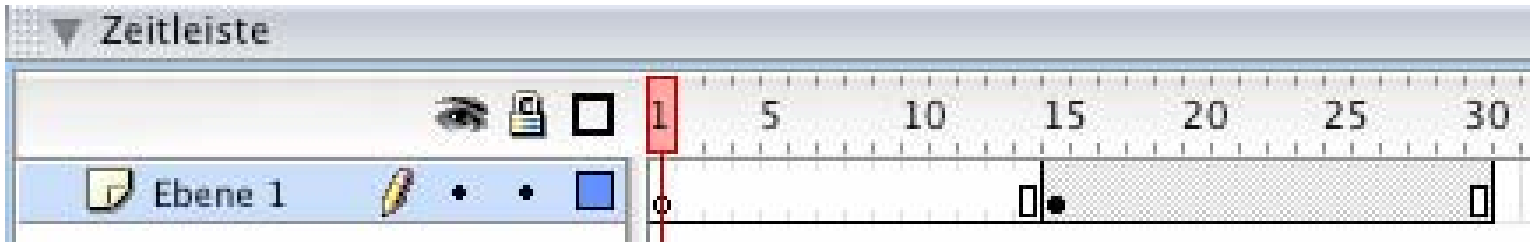
- Production of required media content
- Generation of a *media library* to be used in later steps
- New material:
  - Film production, music production, ...
- Legacy material:
  - Dealing with old formats
  - Dealing with copyright problems
- Adaptation of material:
  - Digital image/audio/video processing
  - E.g. (images):
    - » Format conversion
    - » Geometric, colour transformations
    - » Filtering (e.g. sharpness)

Multimedia Design Process Phase 3

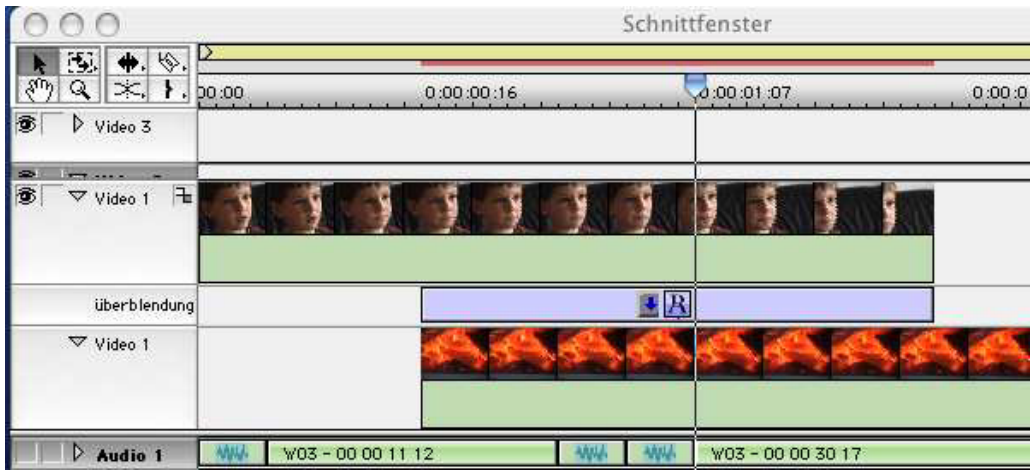
Integration, Composing

- Media objects are not modified anymore
  - “Virtual” composition (e.g. movie clips in video editing software)
- Creation of a common context for individual media objects
- Integration of navigation, control and information entry elements
  - Buttons, rulers, text fields, ...
- Paradigms for media object integration:
  - Timeline-based
  - Frame-based
  - Flowchart-based
  - Object-based

Timeline-based Media Object Integration



Macromedia Flash

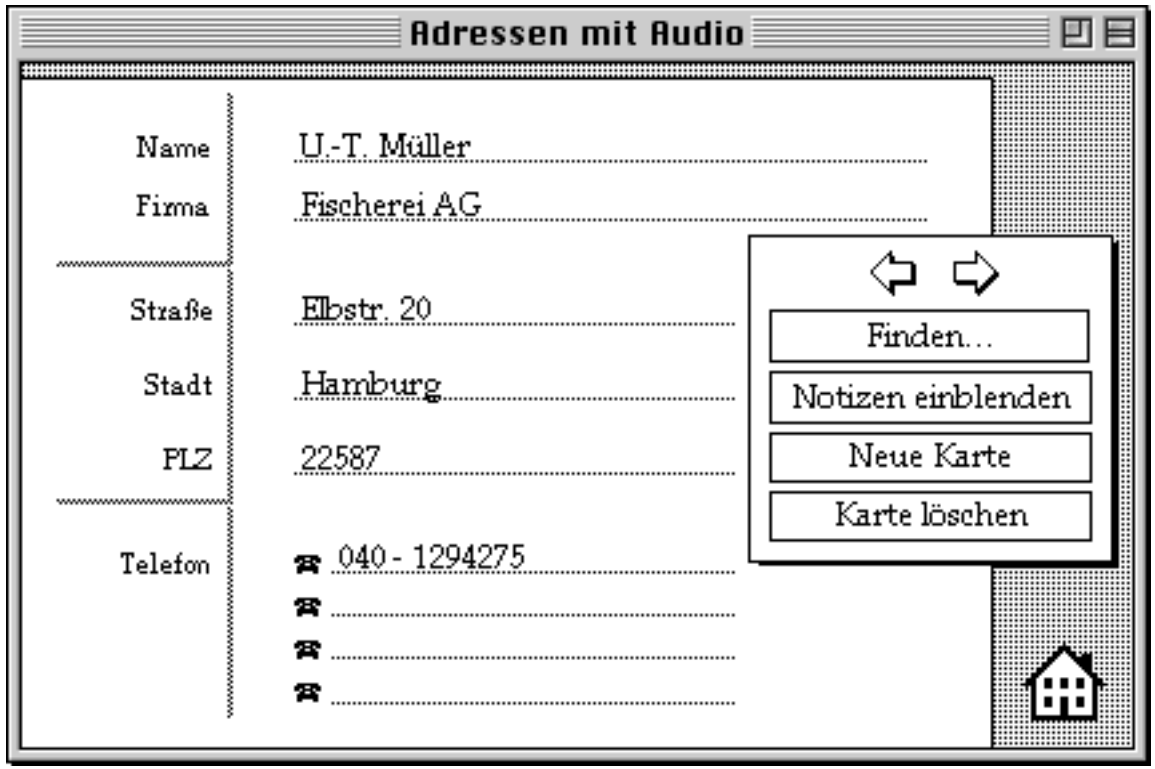


Adobe Premiere

- Supported by many different authoring systems, e.g. Macromedia Director
- Complete coverage of timeline (no gaps)
- Objects placed on timeline; mainly linear user interaction (VCR-like)

- Further details required for individual objects (instances): position on screen, movement, effects, …

Frame-based Media Object Integration

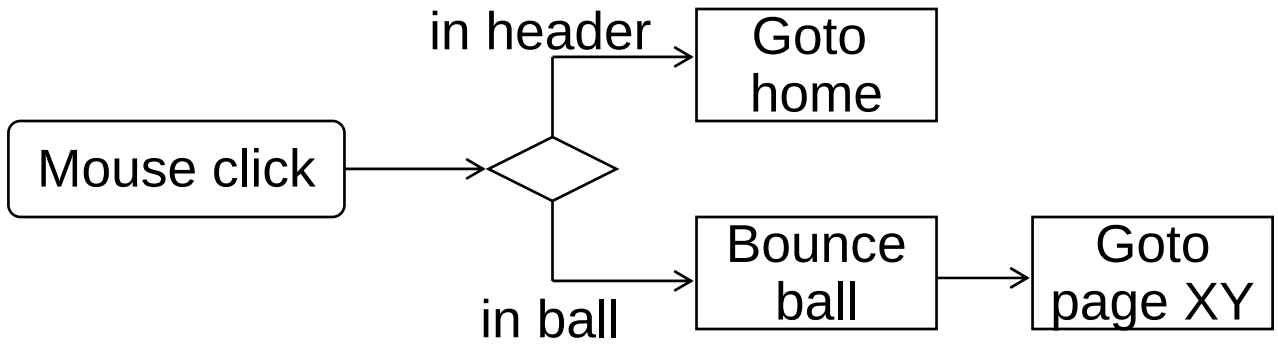


Apple HyperCard (1987)

- Used in text-oriented authoring systems, e.g. Asymetrix ToolBook
- Non-linear interaction: Programmed response to mouse interaction with specific regions
- Object-oriented approach

- Objects placed on screen
- Interaction carried out by event handlers
- Standard event handler components, e.g. for links
  - Hypertext-like information structure

Flowchart-based Media Object Integration



- Special case of frame-based media object integration
- Interaction style “more linear” (i.e. more limited in user options) than in hypertext style interaction
- Less object-oriented than in the frame-based approach
- Rarely used
  - Main authoring system product: Macromedia Authorware

Object-based Media Object Integration

- Traditional object-oriented programming
  - Objects paint themselves on the screen
  - Presentation sequence and interaction based on message exchange between objects
  - Graphical development metaphors unusual - mostly “pure code”
- Advantages:
  - Most powerful
  - Usage of standard programming languages
- Disadvantages:
  - Inadequate for graphical designers
  - Previewing of final product is missing - iterative development not well supported

2 Development process for multimedia projects

Literatur:

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

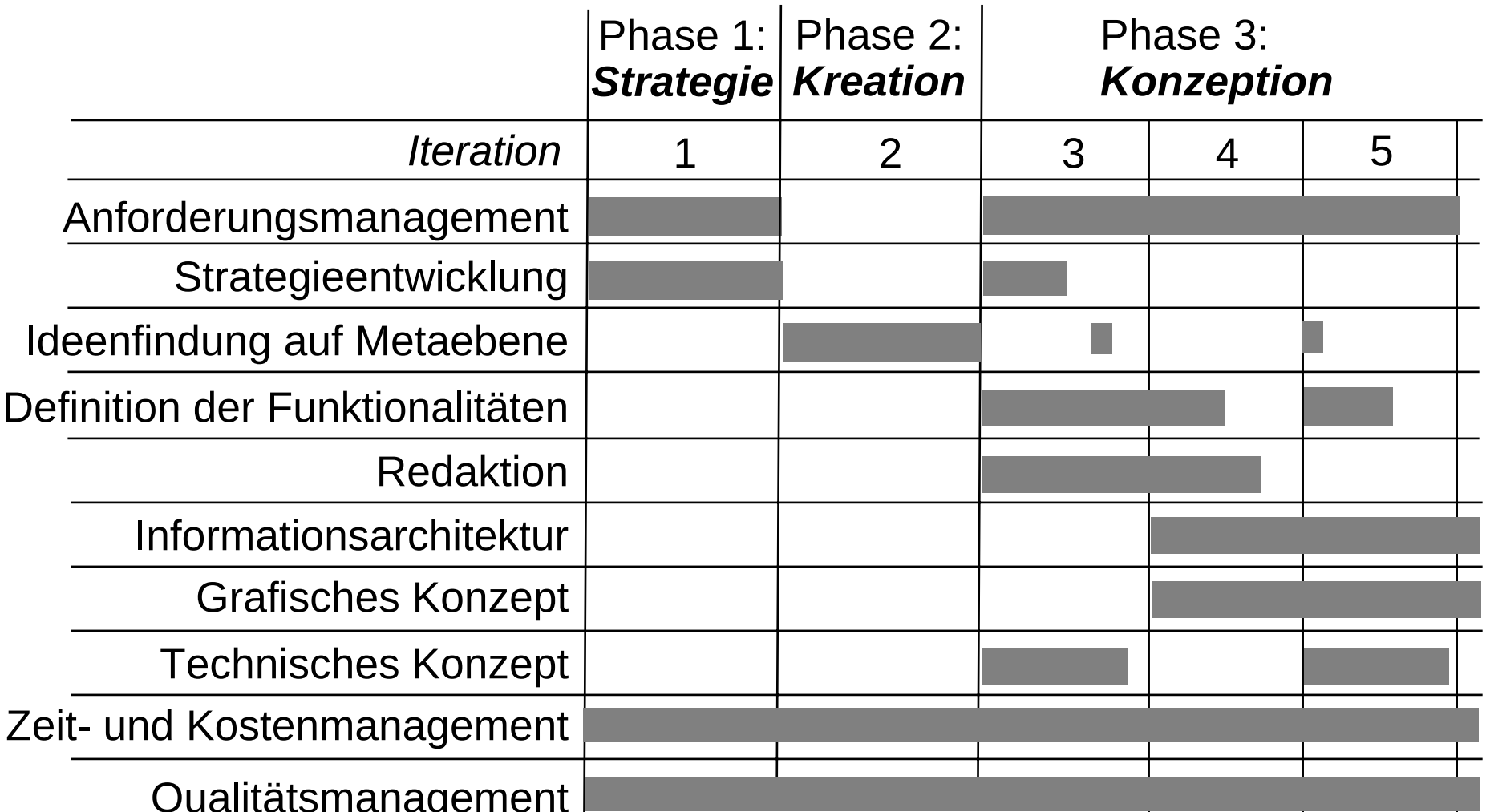
- Idee der Trennung von Grob- und Feinentwurf wegen laufender Änderungswünsche nicht realisierbar
- Bessere Trennung: Ziele, kreative Idee, Erarbeitung von Inhalten
- ***Strategie:***
  - Abstraktion, Zerkleinerung
  - Definition des (über die Projektlaufzeit stabilen!) Problems
  - Strukturierung, Hypothesenbildung
- ***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



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)

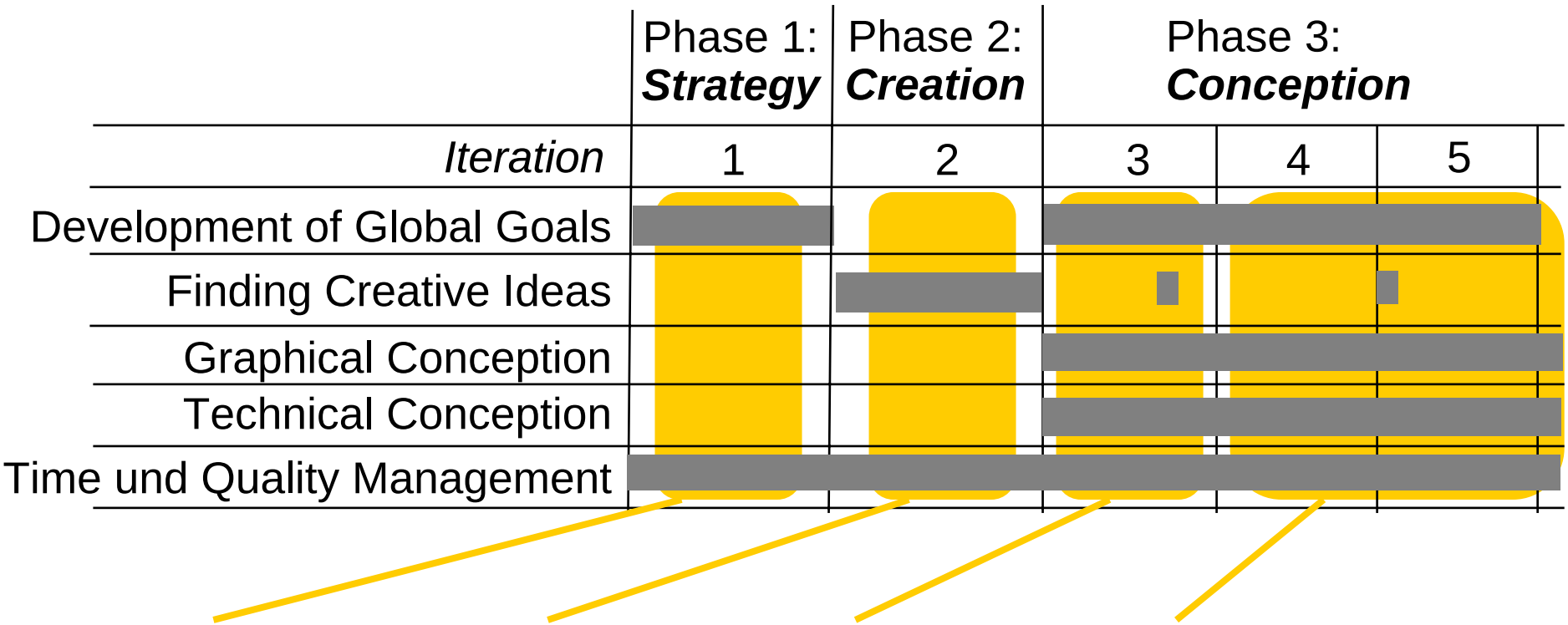
- Erfolgsmatrix
- Feasibility-Analyse
- Flussdiagramm
- Funktionsspezifikation
- Geschäftszieltabelle
- Graphical Strategic Brief
- Interactive Media Storyboard
- Investitionsempfehlung
- Iterationsplan
- Kostenvoranschlag
- Mission Statement
- Mitarbeitermotivation
- Szenario
- Technical Strategic Brief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



Suggestion to be used for the practical projects!

Preliminary Conclusion

- Multimedia projects involve significantly more workflows and roles than traditional software development projects.
- The integration among various disciplines is particularly important during the early phases (strategy and creative conception).
- Even the most advanced, iteratively organized, development methods stay relatively close to the waterfall idea.
- It is a commonly accepted truth that requirement changes of all kinds take place during the development period of any project, in particular a multimedia project.
- Consequence:
  - Let’s try to “embrace change” (Quotation: Kent Beck)
  - Technology shall be helpful in managing continuous change.