

User Interface Design & Implementation

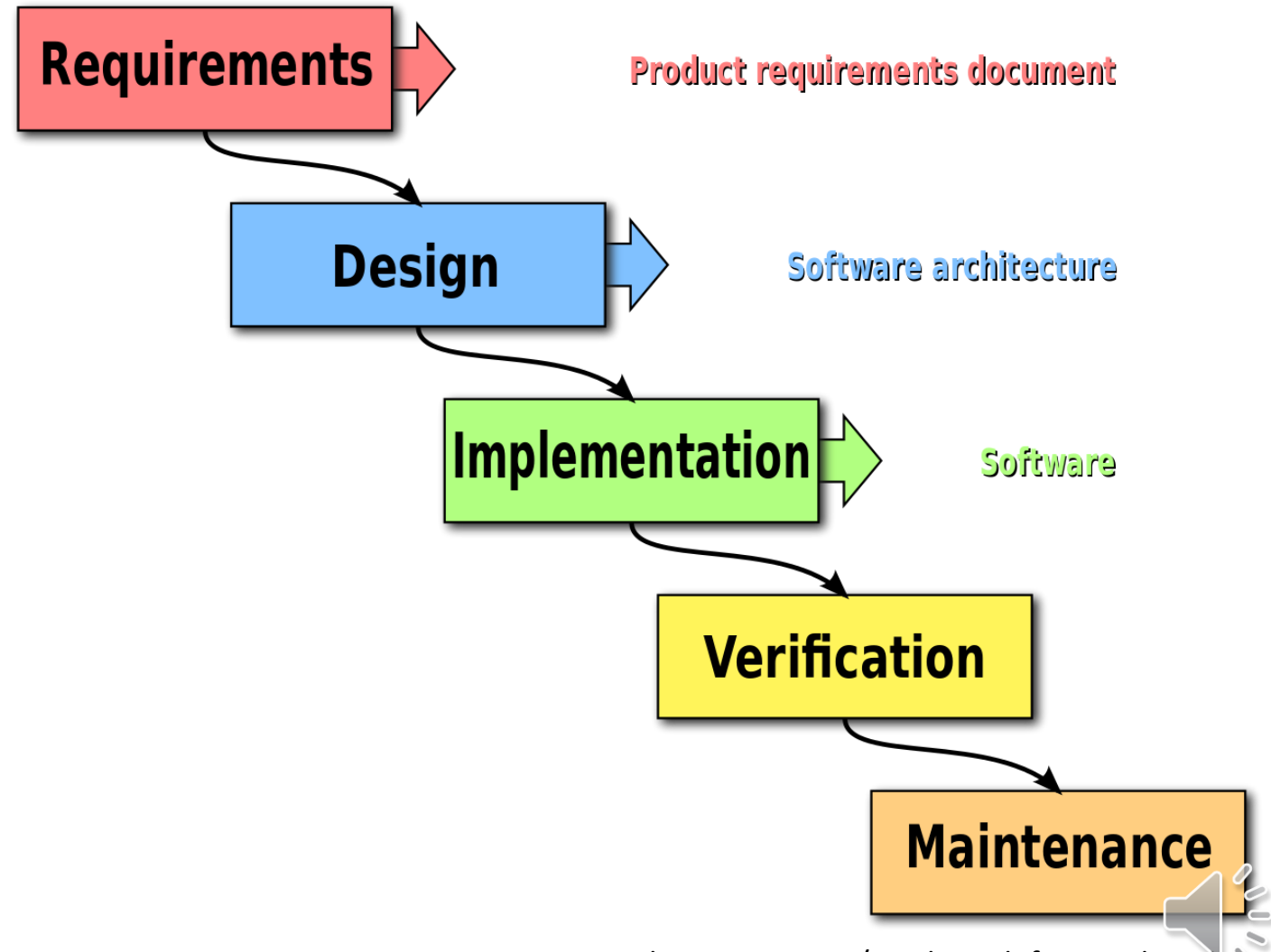
UI Design Process

Week 3 – Lecture 5



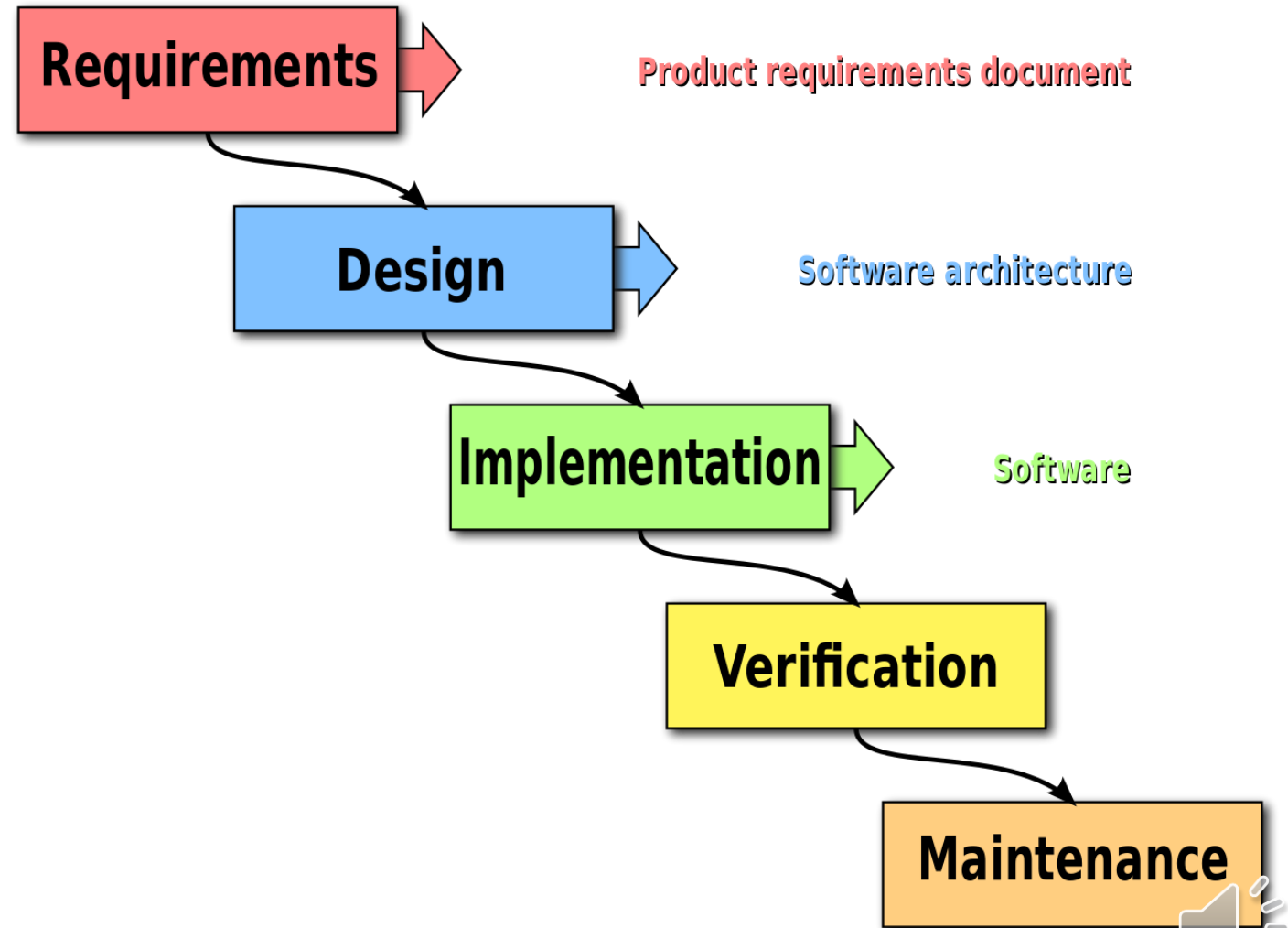
Traditional Software Engineering Process: Waterfall Model

- Each stage creates an outcome that directs the next stage.
- “Waterfall” means
 - Once a stage was completed and outcome generated, process moved on to the next stage.
 - **No going back**, otherwise project may never complete!
- Better than unstructured/unplanned software development.
 - *Think first before writing code!*
- *But, does this process work well?*



Traditional Software Engineering Process: Waterfall Model

- Waterfall model is **woefully inadequate** for UI Design and Implementation
 - Humans are very complex!
 - Hard to get user goals, tasks, profiles, etc., completely right the first time.
 - Uncover UI flaws only when testing software with users in verification stage.
 - **Too costly or too late to fix UI** flaws by verification stage (implementation stage is over!)



Iterative Design Process

- Iterative Design Process is a better approach
 - Hard to get UI design right the first time, so plan to repeat the process.
 - Uncover UI flaws early, when it is easier to fix/redesign, evaluate with users again and improve the design.
 - Design spiral is not simply repeating the waterfall model over and over:
 - Early iterations are preliminary, lower fidelity and usually faster.
 - Later iterations are progressively more detailed, higher fidelity/accuracy and may take longer.
 - Deploy/release product when
 - Out of time and/or resources
 - Met usability goals

Waterfall Model



Image by Jonathan Blackwell

Iterative Design Process

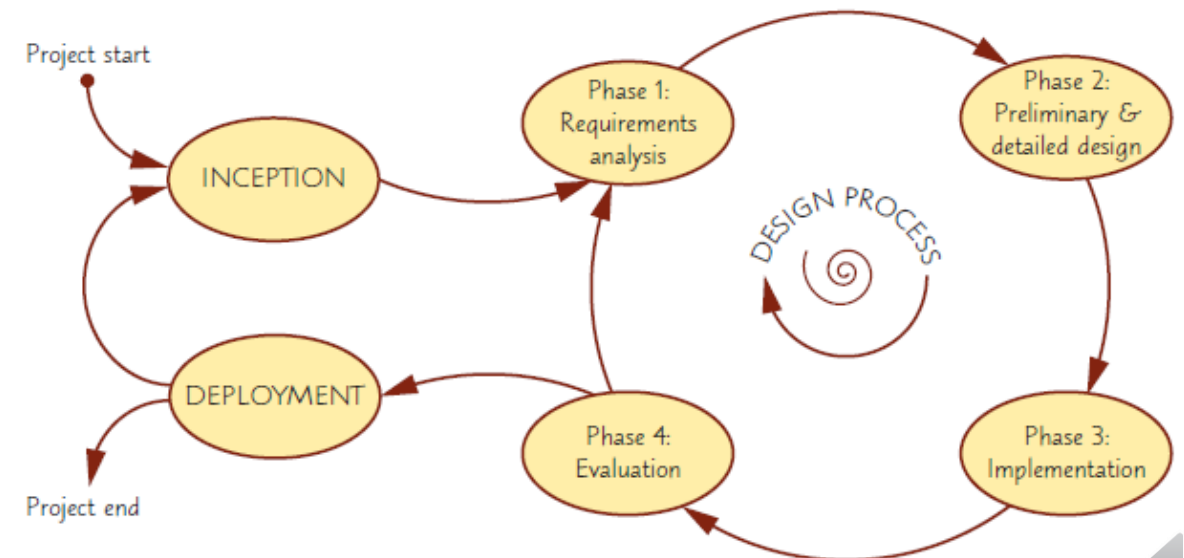


Image from *Designing the User Interface*, 6th Ed.

Requirements Analysis

- User Interface Requirements
 - Soliciting and clearly specifying user requirements is a key to success in any development activity
 - Laying out the user-interface requirements is part of the overall product/engineering requirements development and management process
 - User interface requirements describe system behavior
- Some methods to elicit requirements *(to be covered later in the course)*
 - Stakeholder meetings
 - Focus groups and user interviews
 - **Ethnographic observations**: identifying and observing users in action in their real world context

Functional requirements:

- **Website**: The website shall allow users to purchase items and shall provide other, related merchandise based on past visits and purchases.
- **ATM**: The system shall let users enter a PIN code as identification and shall ensure that the code matches the one on file.
- **Mobile app**: The app shall be able to send messages at all times, even when out of the service area (in which case they are saved for later sending).

Non-functional requirements:

- **Website**: The website shall give users the ability to access their user account at all times, allowing them to view and modify name, mail address, e-mail address, phone, etc.
- **ATM**: The system shall permit the ATM customer 15 seconds to make a selection. The customer shall be warned that the session will be ended if no selection is made.
- **Mobile app**: Messages should send within 2 seconds, returning the user to the new message window (continuing in the background if necessary).

User experience requirements:

- **Website**: The website shall always have a visible navigation menu in the same position on the screen.
- **ATM**: On-screen prompts and instructions shall be clear and accessible. The ATM should return the user's commands within half a second.
- **Mobile app**: The mobile app shall support customization such as color schemes, skins, and sounds.

Examples of requirements regarding system behavior for three distinct types of interactive systems: an e-commerce website, an ATM, and a mobile messaging app.

Preliminary and Detailed Design

- Preliminary designs
 - High-level architectural or conceptual design (the desired user mental model)
- Detailed designs
 - Specifics of each interaction (gestures, sequences, shortcuts, etc.)
 - Screen layout, labels, icons and graphics
 - Input and output devices
 - Error handling and recovery; help and tutorials
- Examples of design methods *(to be covered later in the course)*
 - Brainstorming, affinity diagramming and card sorting
 - Sketching, paper mockups and low-fidelity prototypes
 - Design guidelines and patterns



Implementation & Evaluation

- Paper mockup and low-fidelity prototypes
 - Good for preliminary designs
 - Fast and low cost to implement
 - Rough and incomplete look-and-feel encourages critique and feedback
 - “wizard-of-oz” to fake functionality for testing before actual implementation
- High-fidelity prototypes
 - Good for detailed designs
 - Higher realism to more rigorously express and test designs
 - UI wireframe/prototyping tools (examples):
 - Balsamiq
 - Mockplus
 - Invision
 - Adobe Experience Design
- Actual software/product
 - Programming languages, software development toolkits (SDKs), user-interface toolkits.
- UI Evaluation (to be covered later in the course)

Watch videos on paper mock-up and wizard-of-oz technique:

<https://www.youtube.com/watch?v=yafaGNFu8Eg>

https://www.youtube.com/watch?v=WtrO6b_oUYI



Iterative Design Process

- Solutions considered during the iterative design process will grow (diverge) and shrink (converge) iteratively
 - Early iterations **explore** and test more **varied** design ideas
 - Later iterations focus on smaller number of selected/**proven** design ideas
 - Until it eventually fixates on a single point, the finished product
- This example shows three iterations, but each project may have more or fewer iterations.

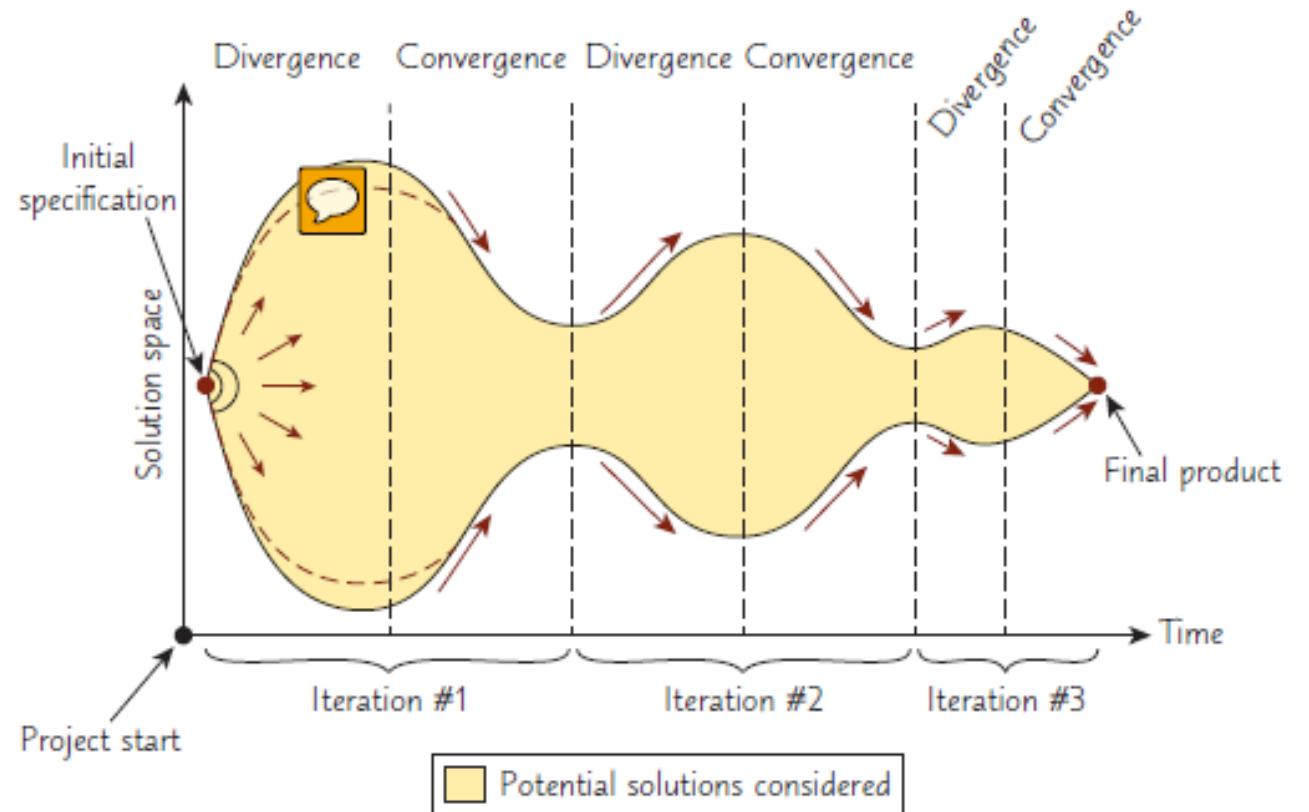


Image from *Designing the User Interface*, 6th Ed.



User-centered Design

Takes the needs, wants, and limitations of end-users into account during each phase and spiral of the design process.

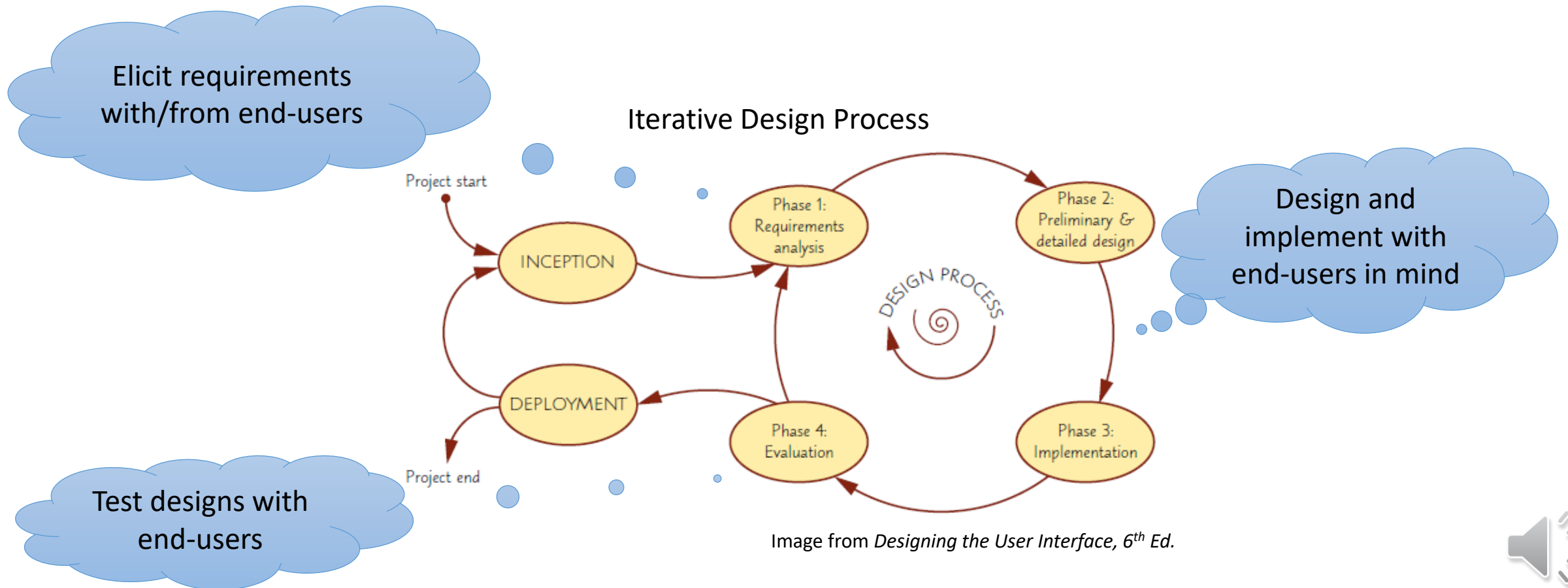
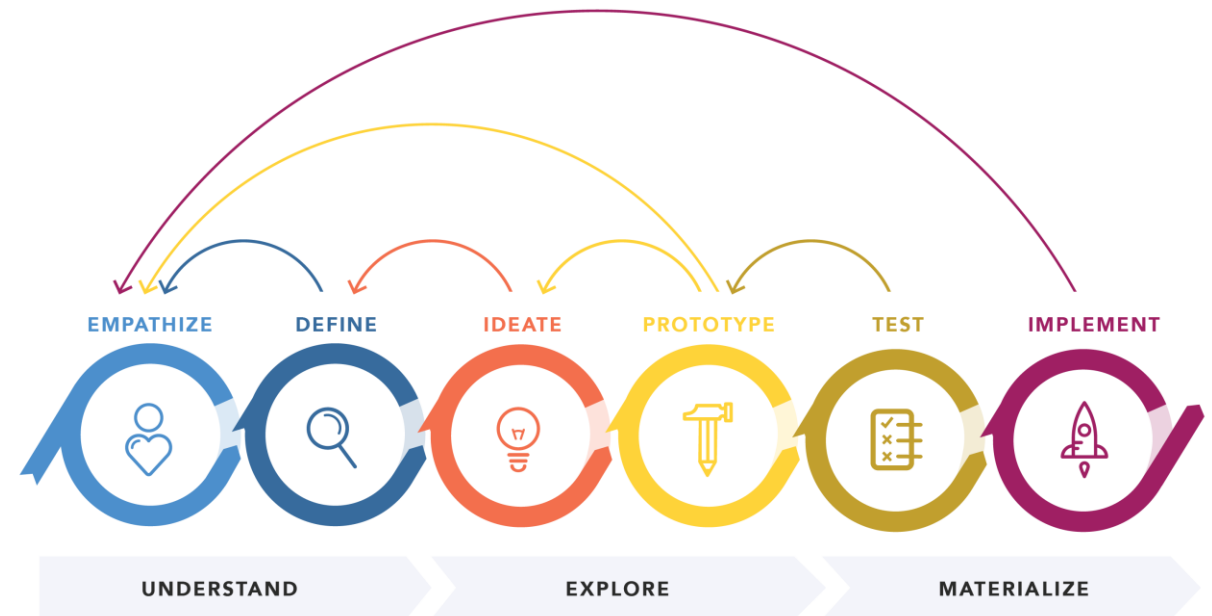
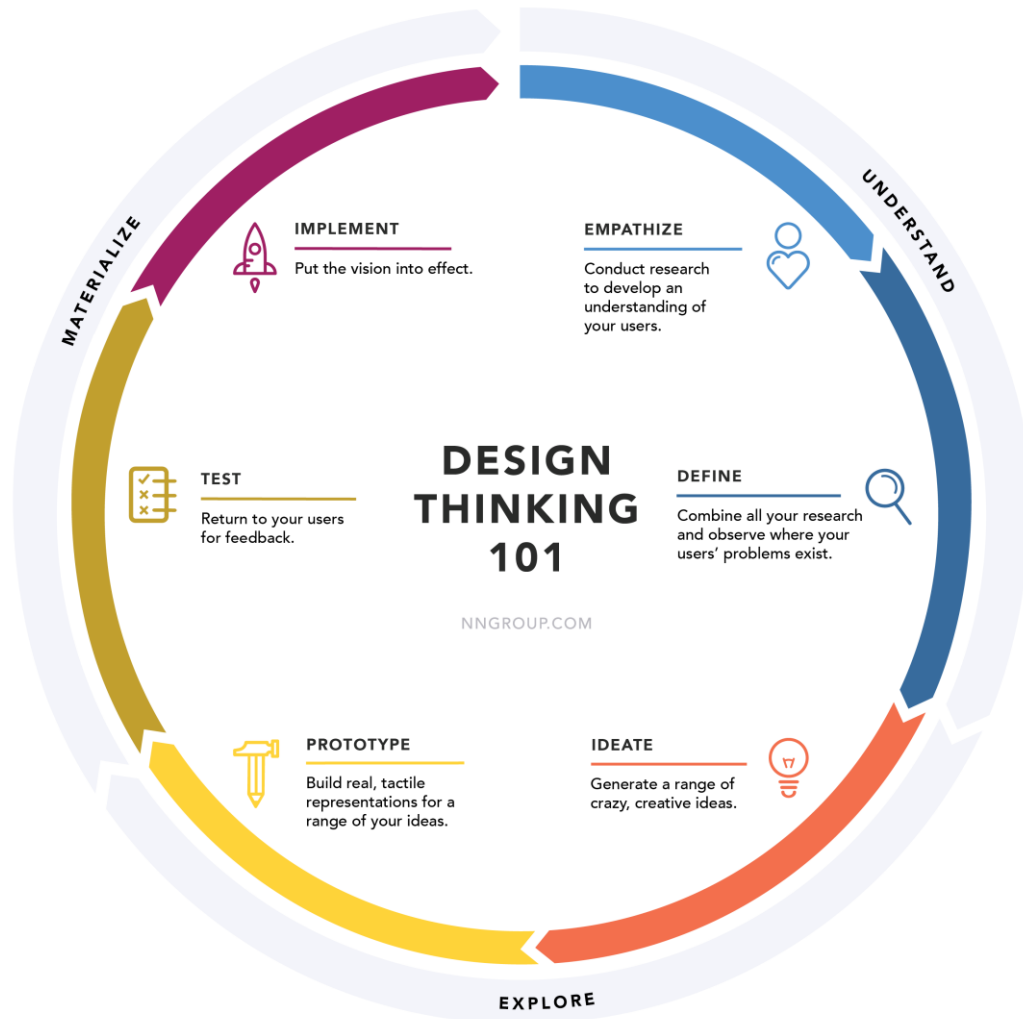


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Design Thinking

A formalised framework for user-centered design by IDEO



DESIGN THINKING 101 NNGROUP.COM

Read article and watch videos on Design Thinking:
<https://www.nngroup.com/articles/design-thinking/>



Participatory Design

- Direct involvement of stakeholders in the collaborative design of the product. People who:
 - use the product: end-users
 - own and sell the product: management, manufacturer
 - support the product: marketing, sales, technical support
- Pros
 - more accurate information about users' goals and tasks
 - more opportunities for users to influence design decisions
 - potential for increased user acceptance of final product
- Cons
 - lengthen the design process and more costly
 - antagonize people not involved or whose suggestions were rejected
 - compromised design to satisfy participants (fear of change, threaten existing jobs/roles, unfamiliarity with new technologies)

Watch video on Participatory Design:

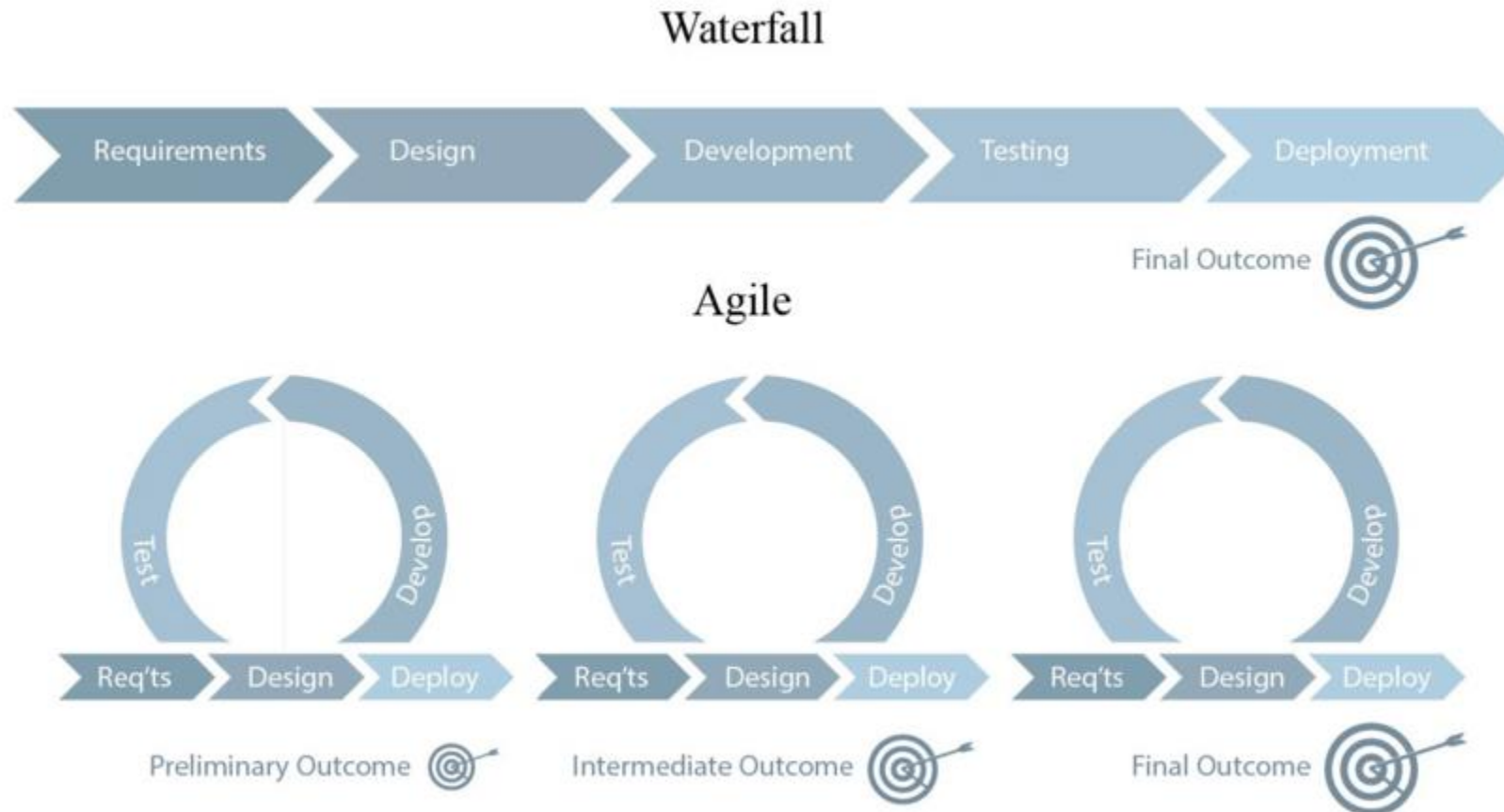
<https://www.youtube.com/watch?v=U3Hn-sONiRg>



Intergenerational and interdisciplinary design teams working on new UI designs using paper prototypes

Agile Development

Contemporary software development process that facilitates flexible, adaptive, and rapid development that is responsive to changing requirements and needs.



Agile Development

- Iterative development process
 - Parts of solution built, tested, and deployed throughout project.
 - **Prioritise on core** or more important functionalities first.
 - Early and regular delivery of value to customer helps build trust with customer.
 - Earlier to market!
 - Get data and feedback from users, on what worked and what didn't, for next iteration.
- Iterative design process and design thinking are becoming mainstream
 - Compatibility with industry processes like Agile development
 - *Half the battle won!*

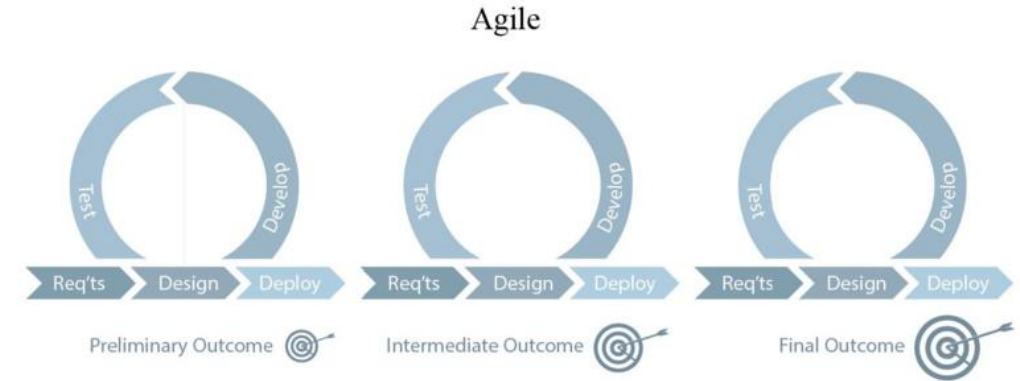


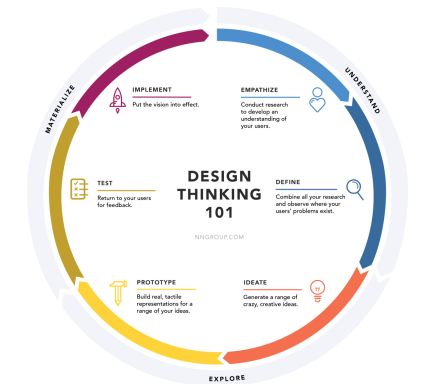
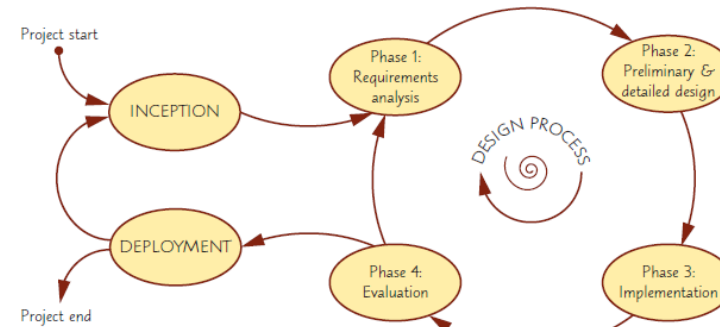
Image by Jonathan Blackwell



HICL Hackerspace at University of Maryland

UI Design Process

- Rosson and Carroll (2002) characterization of design:
 - Design is a **process**, not a state.
 - The design process is *nonhierarchical*.



Darn, this design doesn't work! Back to the drawing board...

- The process is *radically transformational*.
- Design intrinsically involves the *discovery of new goals*.

