SOFTWARE DEVELOPMENT PROCESS

LECTURE 4:
AGILE SOFTWARE DEVELOPMENT

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GOING **AGILE**

- Traditional software processes are “heavy” and does not cope well with changes
- They emphasize
  - Planning
  - Requirement documentation
  - Design documentation
- **Problem**: We might not know what we will really require
- **Agile Alliance** is formed in 2001 to produce development framework that is efficient and adaptable
- As a result, they produced the **Agile Manifesto**
- **Agile Process** or **Agile Development** refers to any software process that captures the values in Agile Manifesto

AGILE **MANIFESTO**

We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value (aka **Agile Values**):

1. **Individuals and interactions** over processes and tools
2. **Working software** over comprehensive documentation
3. **Customer collaboration** over contract negotiation
4. **Responding to change** over following a plan

That is, while there is value in the items on the right, we value the items on the left more

1. INDIVIDUALS AND INTERACTIONS

- Agile promotes cooperation and communication among experts to enhance their efficiency
- The development team should be self-organized and self-motivated
- Skilled individual should be able to adapt the tools to their needs, not the other way round
- Creativity should be used to solve problems, not predetermined rules and for the team to adapt to these rules

2. WORKING SOFTWARE

- Working software is the best indicator how well the project is going, not documents presentations
- Agile practices emphasize producing working program as soon as possible
- As the project progresses, more functionality will be incrementally added
- Stakeholders can see the progress through the produced working codes
- However, appropriate documentation is still necessary

3. CUSTOMER COLLABORATION

- All stakeholders should work as the same team
  - From developers to customers
  - Sometimes they are split by organizational layers
- Because:
  - All requirements may not be determined only in the beginning
  - The software may have to be changed, fixed or revised many times during the development, their combined skills would be benefit to the development
- Although contracts are important, interaction is also important especially when dealing with changes

4. RESPONDING TO CHANGE

- Agile method embraces change and continuous development, even late in development
- Change is natural and inevitable
- When changes occur, we shall adapt to it rather than stick to the old plan
- An iteration in agile methods usually last one to six weeks to be able respond with change early

AGILE **LEVELS**

- **Agile Values**: Agile philosophy or core values of being agile. They are defined in the manifesto
- **Agile Principles**: Strategic approaches that support agile values. Also defined in the manifesto
  - What are the key elements of being agile?
  - What should we do/be to be agile?
- **Agile Methods**: Implementations of agile principles (e.g., UP, Scrum, XP)
- **Agile Practices**: Highly specific techniques employed in agile implementations (standup meetings, planning poker, product backlogs)

AGILE **PRINCIPLES**

- Our highest priority is to **satisfy the customer** through early and **continuous delivery** of valuable software.
- **Welcome changing requirements**, even late in development. Agile processes harness change for the customer's competitive advantage.
- **Deliver working software frequently**, from a couple of weeks to a couple of months, with a preference to the shorter timescale.

AGILE **PRINCIPLES**

- Business people and developers **must work together daily** throughout the project.
- Build projects around **motivated individuals**. Give them the environment and support they need and trust them to get the job done.
- The most efficient and effective method of conveying information to and within a development team is **face-to-face** conversation.

AGILE **PRINCIPLES**

- **Working software** is the primary measure of progress.
- Agile processes promote **sustainable development**. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
- Continuous attention to **technical excellence and good design** enhances agility.

AGILE **PRINCIPLES**

- **Simplicity:** the art of maximizing the amount of work not done is essential.
- The best architectures, requirements, and designs emerge from **self-organizing teams**.
- At regular intervals, the team reflects on **how to become more effective**, then tunes and adjusts its behavior accordingly.

AGILE **METHODS**

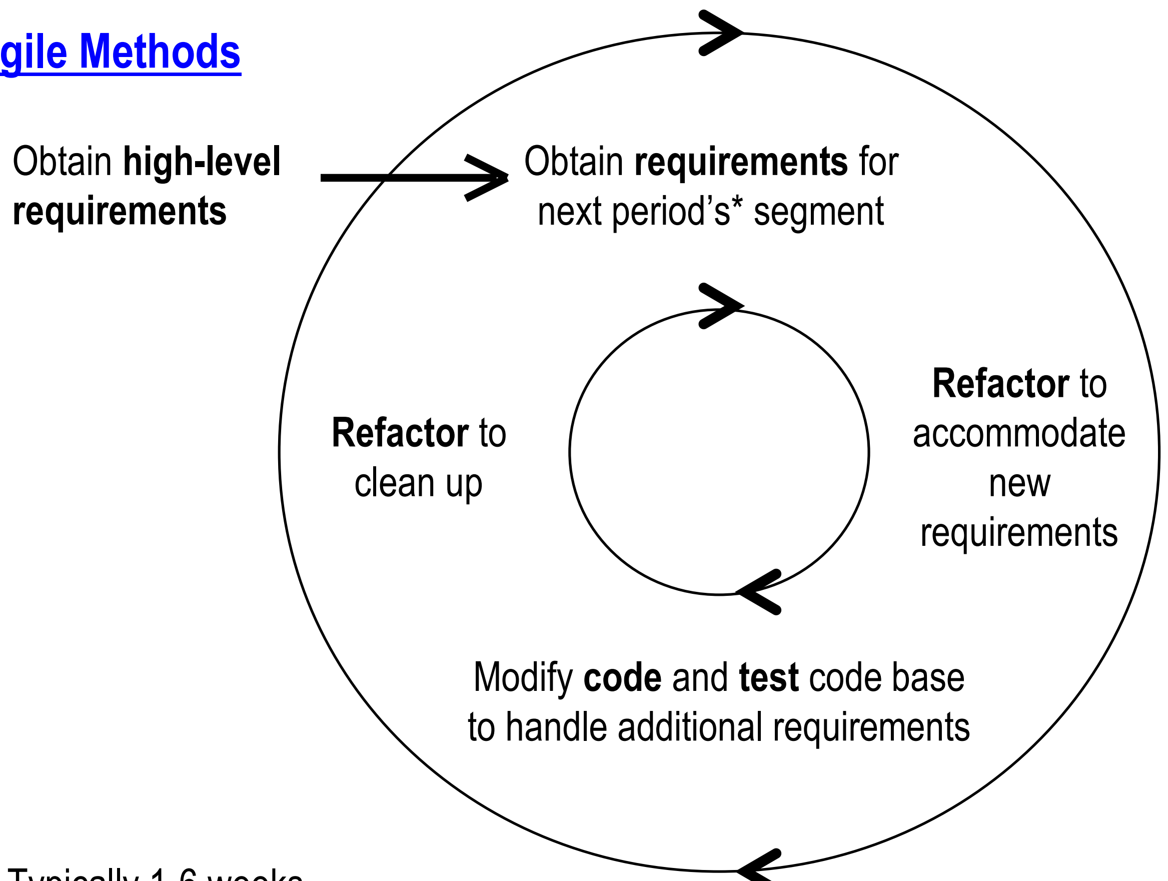
- The following table shows how agile methods implement the Agile Manifesto

Agile Processes MANIFESTO → **RESPONSES:**	1. Individuals and interactions over processes and tools	2. Working software over comprehensive documentation	3. Customer collaboration over contract negotiation	4. Responding to change over following a plan
a. Small, close-knit **team** of **peers**	y			y
b. Periodic **customer** requirements **meetings**	y		y	y
c. **Code-centric**		y		y
d. **High-level** requirements statements only			y	y
e. **Document as needed**			y	y
f. **Customer reps** work within team	y			y
g. **Refactor**				y
h. **Pair** programming and no-owner code	y			
i. Unit-test-intensive; Acceptance-**test-driven**		y	y	
j. **Automate** testing		y	y	

Table: Braude, E., Bernstein, M., Software Engineering: Modern Approaches 2nd Ed., John Wiley and Sons, 2011.

AGILE DEVELOPMENT CYCLE

Agile Methods


Obtain **high-level requirements**
Obtain **requirements** for next period's* segment
Refactor to clean up
Refactor to accommodate new requirements
Modify **code** and **test** code base to handle additional requirements

* Typically 1-6 weeks

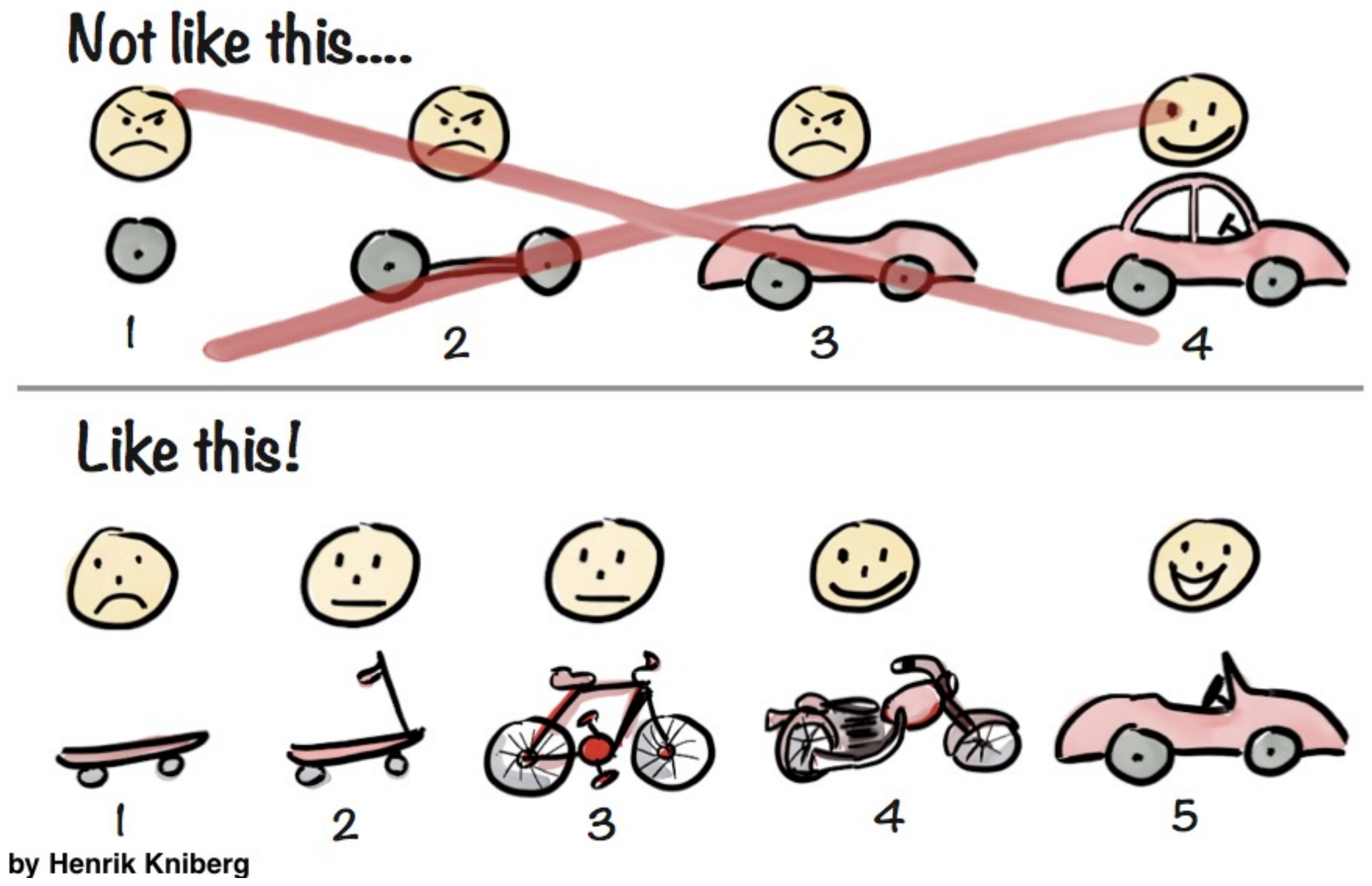
- Agile method does not have explicit design phase
- It relies on refactoring to improve the design after each iteration

MVP

- **Minimum Viable Product**: The smallest thing that you can build that delivers customer value (and as a bonus captures some of the value back).

- Without the MVP, your product is not the product you want anymore
- In other words, they are the features that you cannot cut or ignore, otherwise, the product will not function at all

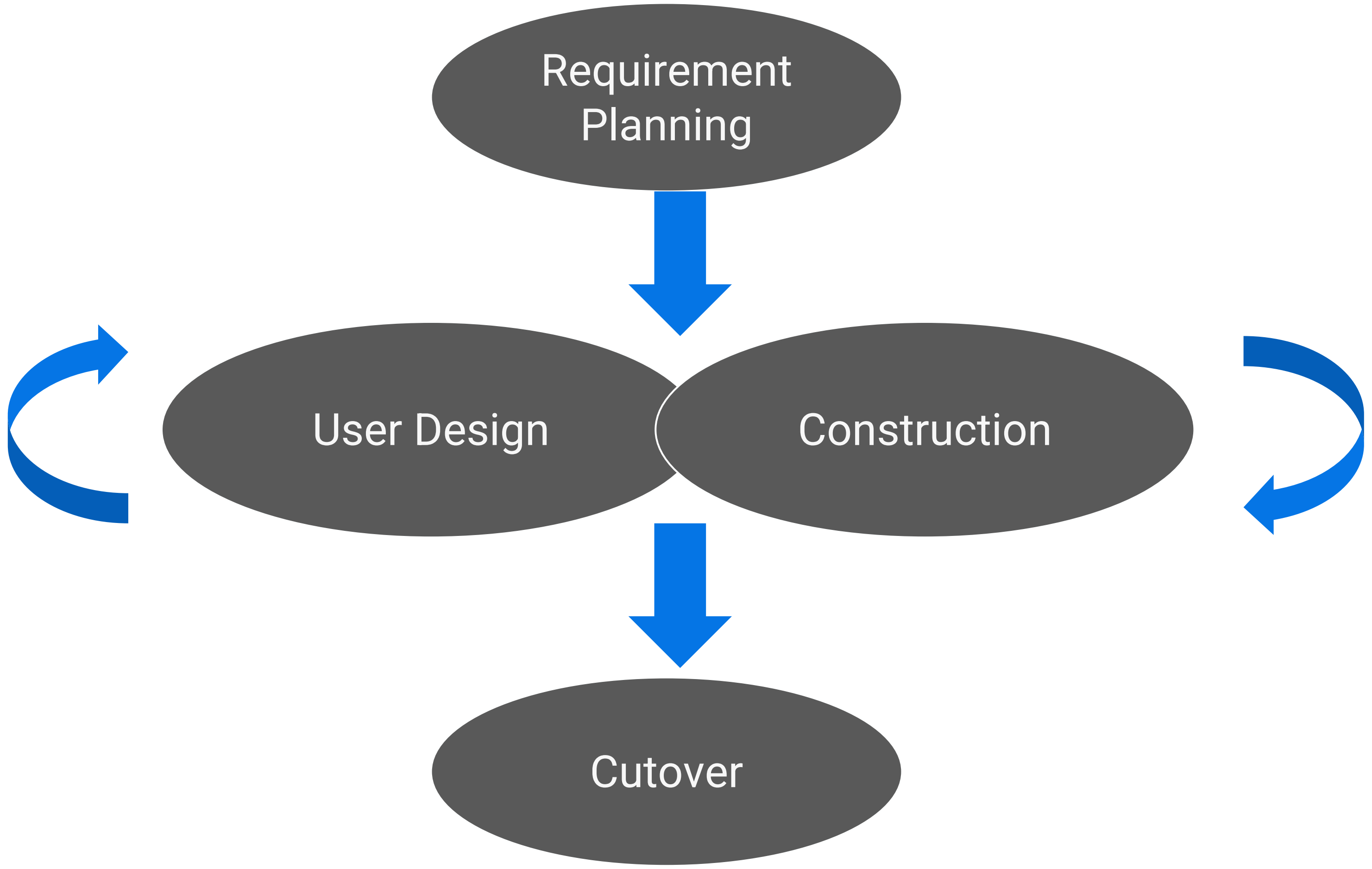
MINIMUM **VIABLE**



RAPID APPLICATION DEVELOPMENT (RAD)

- **RAD**: A software development process that aims for short development time
- Introduced by James Martin in 1991
- RAD Emphasizes
  - User involvement
  - Rapid prototyping
  - Use of automated development tools
  - Reusing resources
  - Small development teams
  - **Time box**: Fixed time frame in which activities are done. **Not scope box**!

RAD **LIFE CYCLE**



REQUIREMENT PLANNING PHASE

- In this phase, requirement elicitation and other project planning are carried out
- **Joint Requirement Planning** (**JRP**) workshop is organized in this phase
  - The goal of JRP is to obtain correct requirements right from the start
  - Key stakeholders, especially the end user, must participate in JRP
  - In JRP, requirements are gathered and prioritized
  - Result: Requirements that are sorted in **MoSCoW** manner

MoSCoW

- **MoSCoW prioritization** is used in software development to determine importance of requirements or functionalities
- MoSCoW categories:
  - **Must haves**: The functionalities must be implemented in current iteration
  - **Should haves**: The functionalities are important but is not an absolute necessary
  - **Could haves**: Desirable functionalities that are not necessary but preferred to have
  - **Won’t haves**: Unimportant requirements that can wait until later releases

USER DESIGN PHASE

- The goal of this phase is the initial system design
- In RAD, **Joint Application Design** (**JAD**) workshops are organized
  - Users must present in the workshop and get involved in the design process
  - The system analyst and developer brainstorm with the users and translate their requirements into models
- CASE tools maybe used to communicate with the users
- Then, a prototype is developed evaluated by the users during ***second*** JAD
- The users and developers may iterate the designs and prototype many times

CONSTRUCTION PHASE

- The construction is done by a **Skilled With Advanced Tools** (**SWAT**) team
- The SWAT estimate the project time and its time boxes
- They also assign themselves what to do within each time box
- Because SWAT assign their own time and scope, they would be more responsible to deliver good product in short timespan
- SWAT constructs a number of prototypes within the agreed time box
  - The users continue to closely involve in the development process
  - Time box cannot be postponed!

CUTOVER PHASE

- **Product delivery phase**: System testing, deployment and user training

- There are many variations of RAD but key components are the same
  - User involvement
  - Prototyping (may not always be a “software”)
  - SWAT teams
  - Time boxes

DYNAMIC SYSTEMS DEVELOPMENT METHOD (DSDM)

- It is an agile method which builds on RAD
- Maintained by DSDM Consortium
- DSDM Principle
  - Fixed time and resources (time box)
  - Requirements are prioritized using MoSCoW
  - Embraces agile development
- Complete set of DSDM practices are available only to consortium members

DSDM **STAGES**

- **Feasibility**: Delivers feasibility report and outline plan, optionally fast prototype (few weeks)
- **Business study**: Carry out high-level description of business process through workshops (e.g., JSR). High-level architecture is also determined
- **Functional model iteration**: Produce analysis models and functioning prototypes
  - Time-boxed in 2-6 weeks
  - Four activities in an iteration: What to do, how will we do, do it, check if we have done it
- **Design and build iteration**: Integrate the functional components from the previous phase into one system
- **Implementation**: System testing, product deployment and train the user

DSDM **PRACTICES**

- Active user involvement is imperative
- Empowered teams
- Frequent delivery of products
- Acceptance determined by fitness for business purpose
- Iterative, incremental development
- All changes are reversible
- Requirements baselined at high level
- Testing integrated in life cycle
- Collaborative, cooperative approach shared by all stakeholders is essential