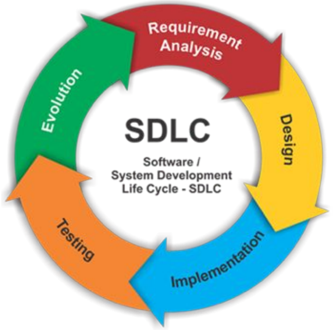
Introduction to Software Requirements

What is

Software **D**evelopment **L**ife **C**ycle

?

Software Development Life Cycle (SDLC) model is a simplified representation of a **"Software Development Process Models".**



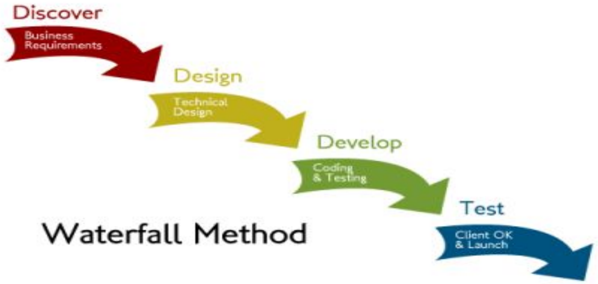
- SDLC is a framework defining tasks performed at each step in the software development process.

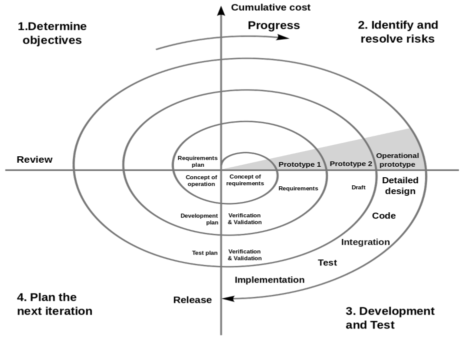
- The roadmap to building high quality software products is software process.

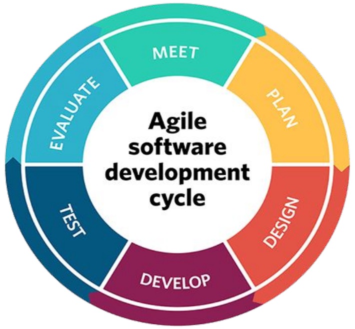
- Different life cycle models may plan the necessary development activities to phases in different ways.

- Following are the most important and **popular SDLC models** followed in the industry
  - Waterfall Model
  - V-Modell
  - Spiral Model
  - Iterative Mode

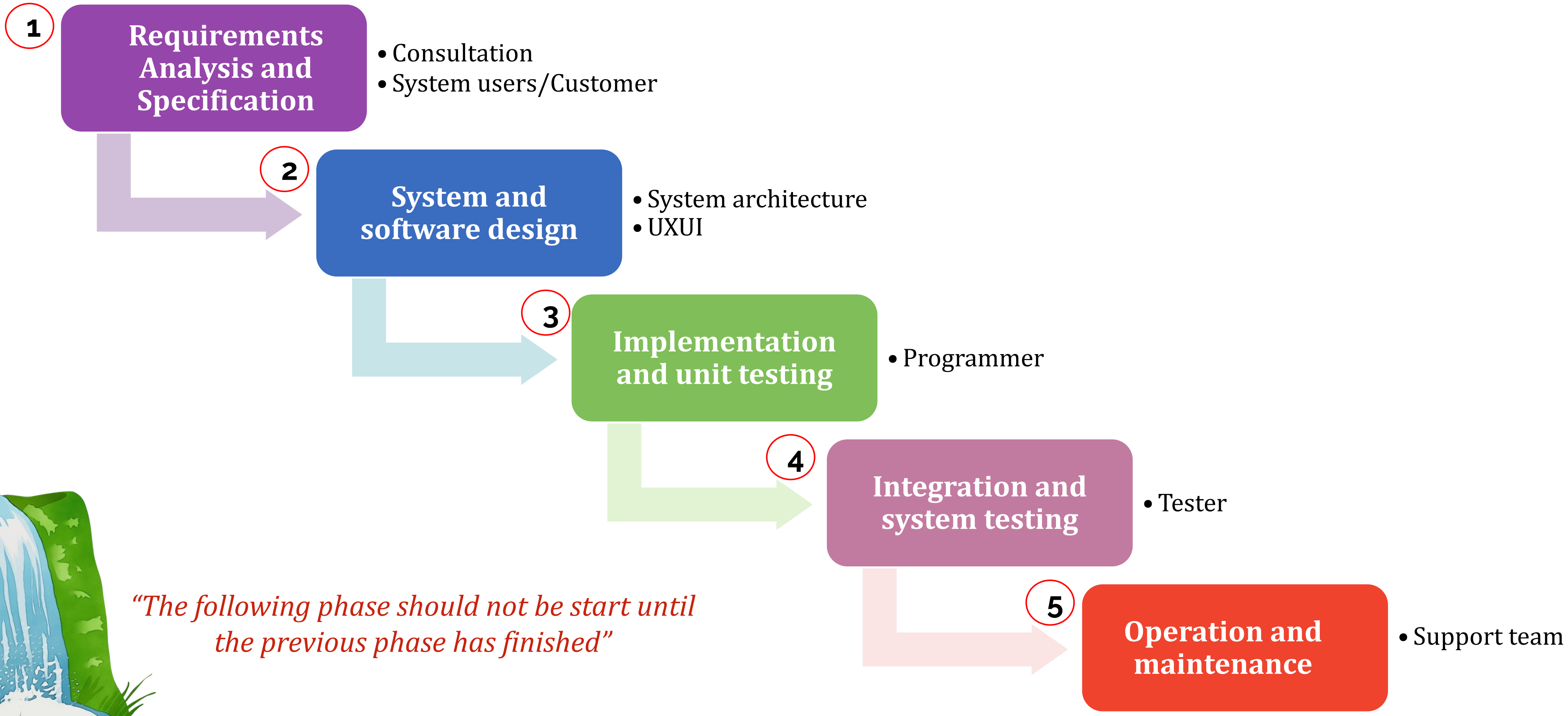
  Other related methodologies are Agile Model, Incremental Model, Rapid Application Development Model (RAD) Model, and Prototyping Models.







Waterfall Model



1 Requirements Analysis and Specification

- Consultation
- System users/Customer

2 System and software design

- System architecture
- UXUI

3 Implementation and unit testing

- Programmer

4 Integration and system testing

- Tester

5 Operation and maintenance

- Support team

“The following phase should not be start until the previous phase has finished”

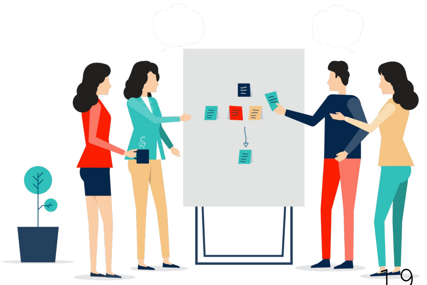
Waterfall Model

1 Requirements Analysis and Specification

The aim of the requirement analysis and specification phase is to understand the exact requirements of the customer and document them properly.

This phase consists of two different activities.

1. **Requirement gathering and analysis:** Firstly all the requirements regarding the software are gathered from the customer and then the gathered requirements are analyzed.
2. **Requirement specification:** These analyzed requirements are documented in a software requirement specification (SRS) document. SRS document serves as a contract between development team and customers.



https://www.geeksforgeeks.org/software-engineering-classical-waterfall-model/

Why do we need user research?

Customer insights

Understand what Problems customers want solved

Surveys Interviews Focus Group

Function Priority

Analyze how important These problems are to customers

Usability

What products and features we can develop to solve these problems

Resource from Slideshare :: Joan Lumanauw

Waterfall Model

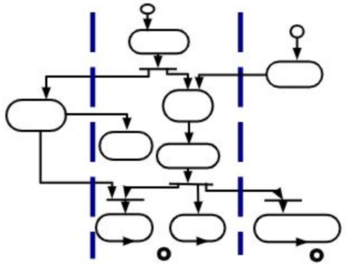
2

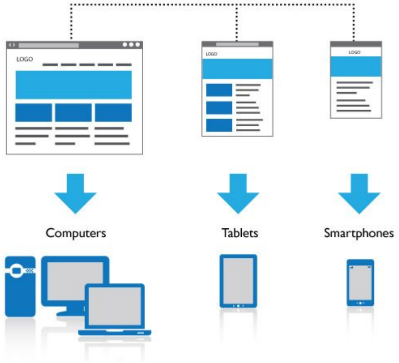
System and software design

The aim of the design phase is to transform the requirements specified in the SRS document into a structure that is suitable for implementation in some programming language. It defines the overall software architecture together with high level and detailed design. All this work is documented as a Software Design Document (SDD).

Example:

- Plan the programming language, for Example Java, PHP, ASP.net
- or database like Oracle, MySQL, etc.
- Or other high-level technical details of the project





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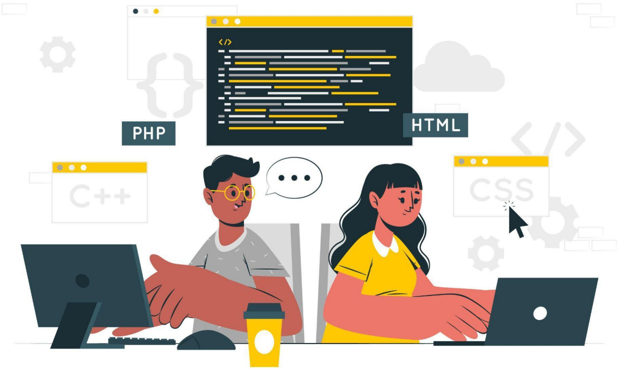
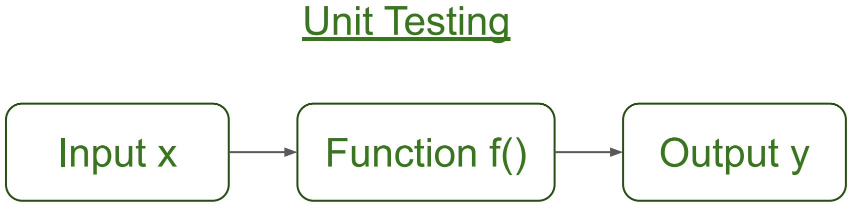
Waterfall Model

3 Implementation and unit testing

This phase aims to transform the requirements gathered in the SRS into a suitable form which permits further coding in a programming language.

With inputs from the system design, the system is first developed in small programs called units, which are integrated in the next phase. Each unit is developed and tested for its functionality, which is referred to as Unit Testing.




Unit Testing

Input x → Function f() → Output y

Waterfall Model

4 **Integration and system testing**

All the units developed in the implementation phase are integrated into a system after testing of each unit. Post integration the entire system is tested for any faults and failures.

System testing consists three different kinds of testing activities as described below :

- **Alpha testing:** Alpha testing is the system testing performed by the development team.
- **Beta testing:** Beta testing is the system testing performed by a friendly set of customers.
- **Acceptance testing:** After the software has been delivered, the customer performed the acceptance testing to determine whether to accept the delivered software or to reject it.

https://www.geeksforgeeks.org/software-engineering-classical-waterfall-mod

Waterfall Model

5 Operation and maintenance

Maintenance is the most important phase of a software life cycle. The effort spent on maintenance is the 60% of the total effort spent to develop a full software.

There are some issues which come up in the client environment. To fix those issues, patches are released. Also to enhance the product some better versions are released. Maintenance is done to deliver these changes in the customer environment.

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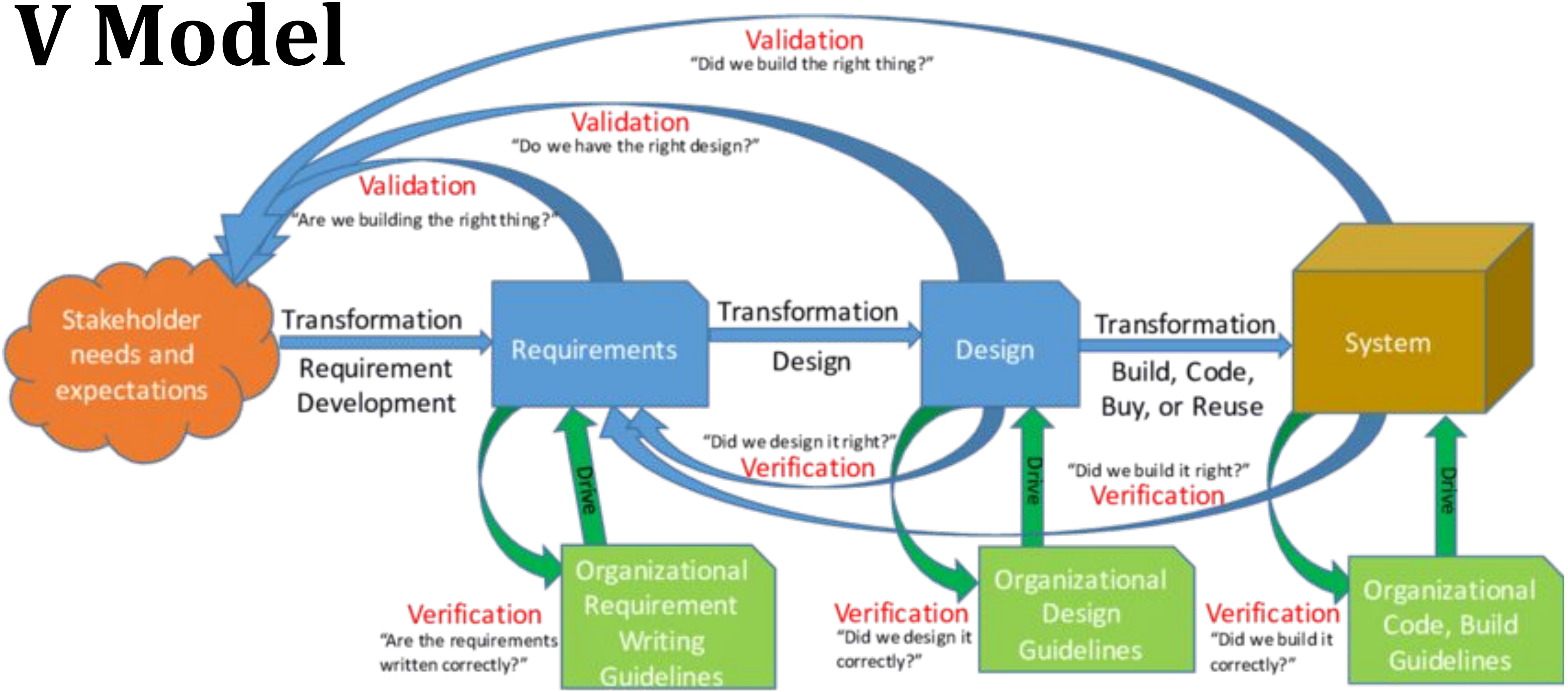
V Model

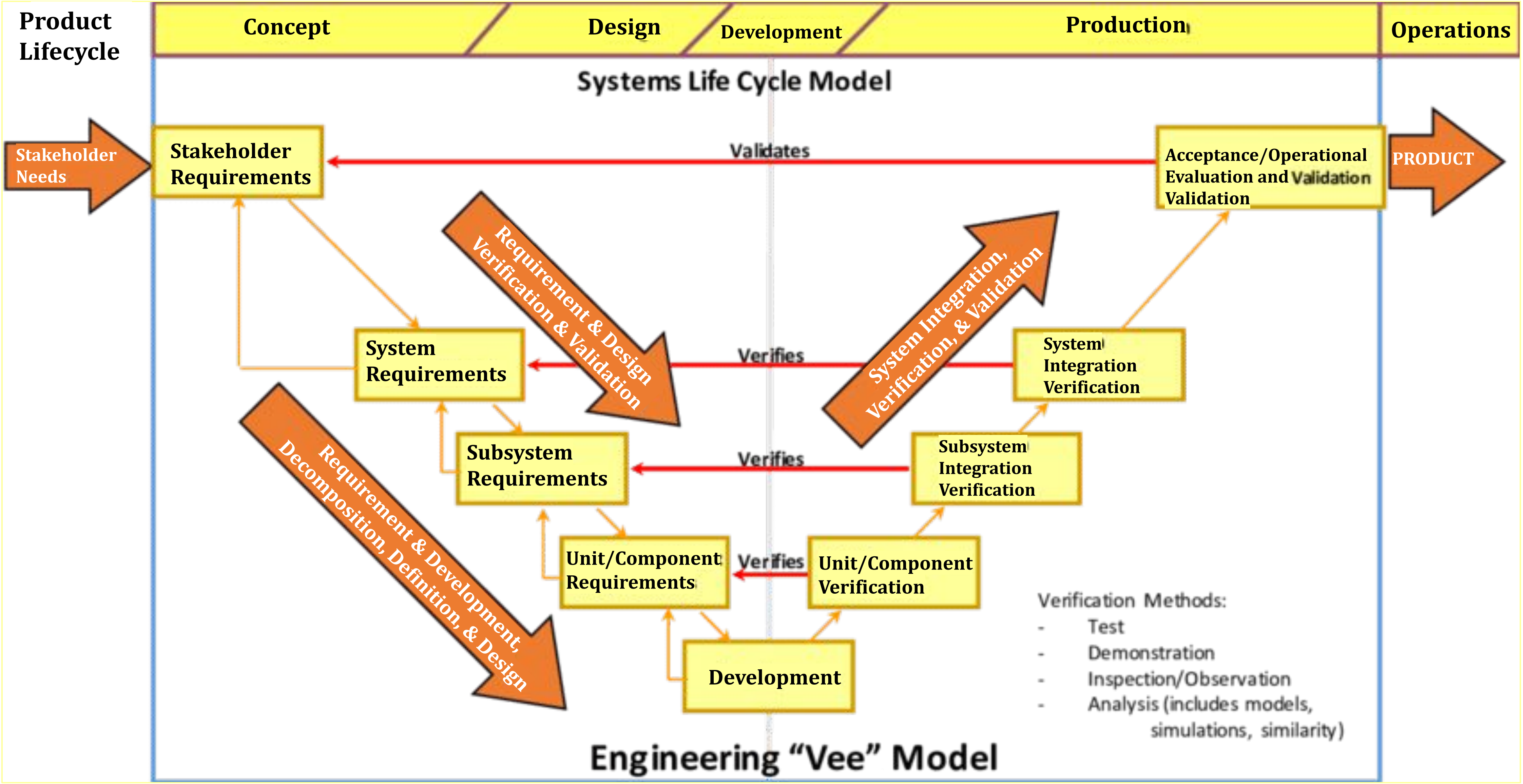

Validation
"Did we build the right thing?"
Validation
"Do we have the right design?"
Validation
"Are we building the right thing?"
Stakeholder needs and expectations
Transformation
Requirement Development
Requirements
Transformation
Design
Design
Transformation
Build, Code, Buy, or Reuse
System
"Did we design it right?"
Verification
"Did we build it right?"
Verification
Drive
Drive
Drive
Verification
"Are the requirements written correctly?"
Organizational Requirement Writing Guidelines
Verification
"Did we design it correctly?"
Organizational Design Guidelines
Verification
"Did we build it correctly?"
Organizational Code, Build Guidelines

Verification and validation are the processes of confirming that systems engineering artifacts generated during the transformation processes are acceptable

*Journal Reference by **Mike Ryan** and **Louis S Wheatcraft** On the Use of the Terms Verification and Validation : July 2017INCOSE International Symposium 27(1):1277-1290*

V Model

Verification and Validation and the Systems Engineering " V " Model



Product Lifecycle

Concept

Design

Development

Production

Operations

Systems Life Cycle Model

Stakeholder Needs

Stakeholder Requirements

Validates

Acceptance/Operational Evaluation and Validation Validation

PRODUCT

Requirement & Design Verification & Validation

System Integration, Verification, & Validation

System Requirements

Verifies

System Integration Verification

Requirement & Development, Decomposition, Definition, & Design

Subsystem Requirements

Verifies

Subsystem Integration Verification

Unit/Component Requirements

Verifies

Unit/Component Verification

Development

Verification Methods:

- Test
- Demonstration
- Inspection/Observation
- Analysis (includes models, simulations, similarity)

Engineering “Vee” Model

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Requirement Engineering

What is requirements engineering?

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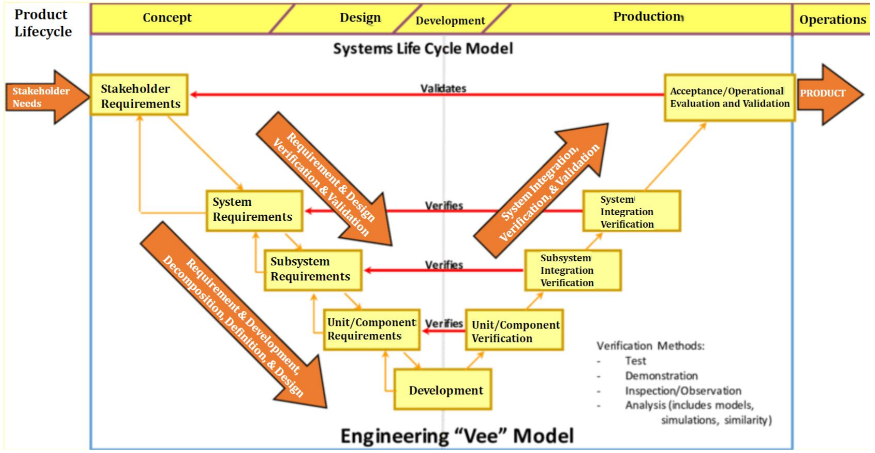
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System Integration Verification
Subsystem Requirements
Verifies
Subsystem Integration Verification
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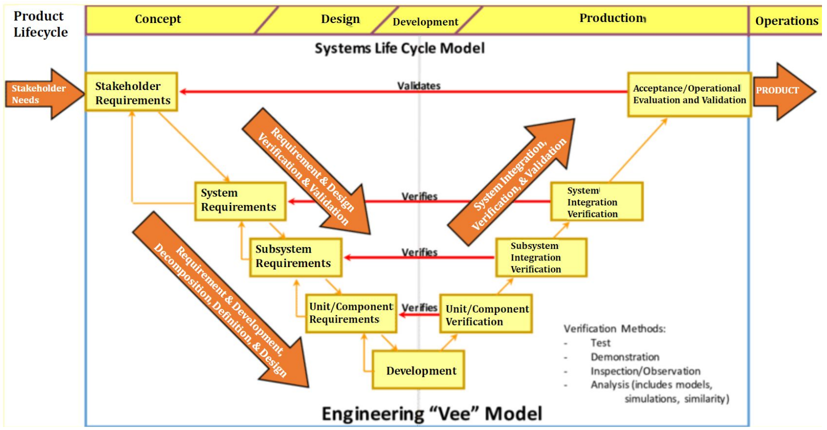
Engineering "Vee" Model

- Requirement engineering is usually the **first step** in any software development life cycle
- The process to **gather** the software **requirements** from client, analyze and document them is known as requirement engineering.
- The **goal** of requirement engineering is to create and maintain detailed **'System Requirements Specification' documents.**
- **Ensures** your **software** will **meet the user expectations,** and ending up with a high-quality software

Resource by https://medium.com/omarelgabrys-blog/software-engineering-process-activities-part-3-ca1ef6818fd6

What is requirements engineering?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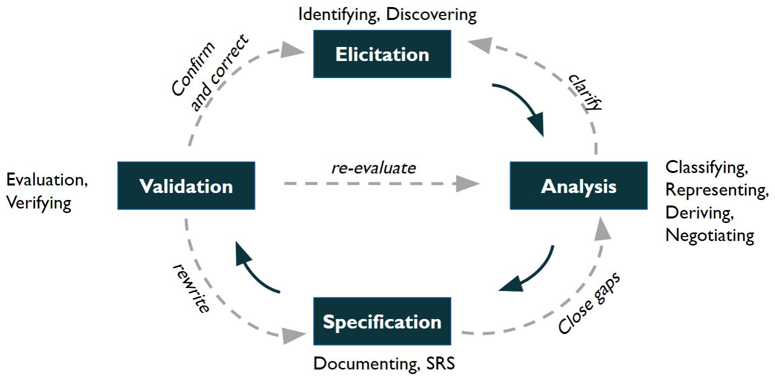
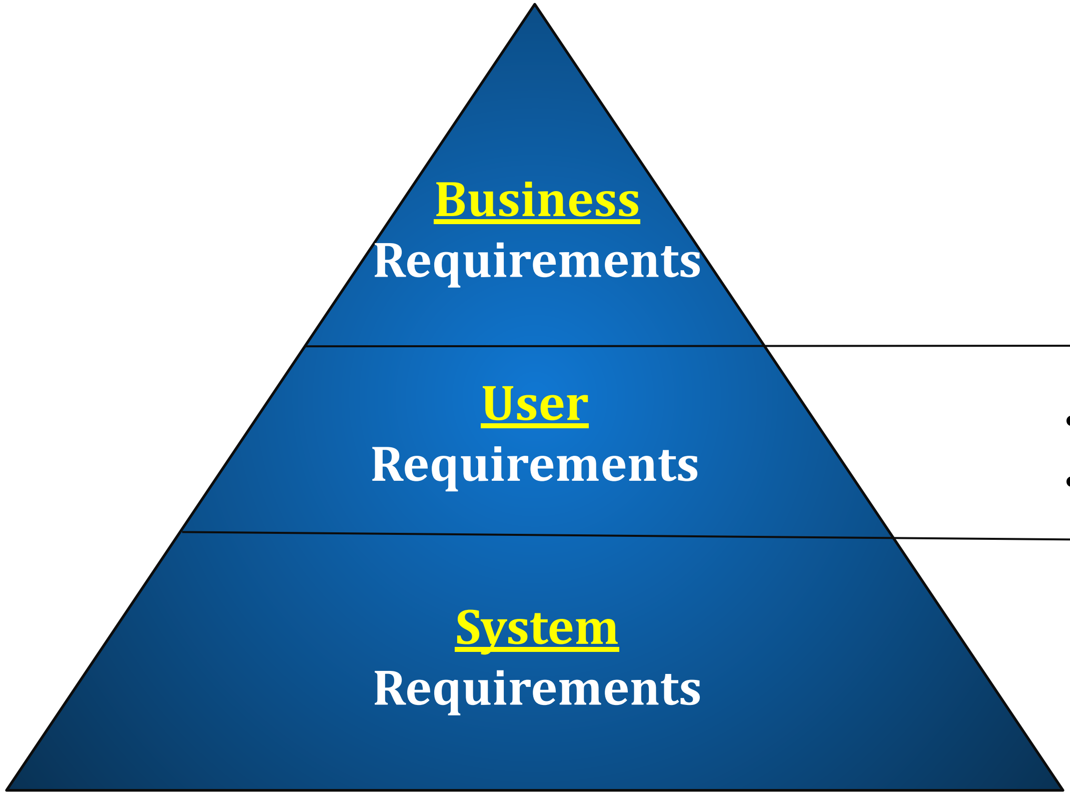


- Software requirements engineering is the **process of determining** what will be developed in a software system.
- The **4 steps** of software requirements engineering are
  - Requirements **elicitation**,
  - Requirements **analysis**,
  - Requirements **specification**,
  - Requirements **validation**.

Understand Requirements Types



Business Requirements

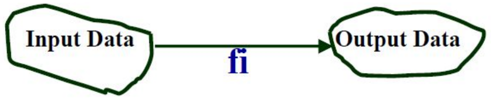
- Stakeholders point of view
- Project scope
- Business objectives

User Requirements

- Users point of view (UI)
- User Goals

System Requirements

- Functional Requirements
- What the system does
- Non-Functional Requirement



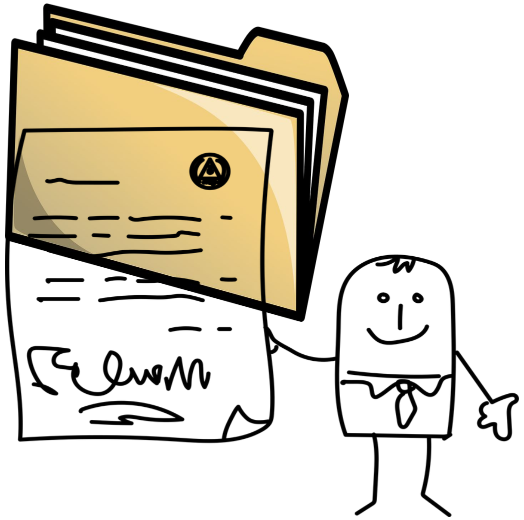
What is Requirements Engineering?

Agreement

Understanding

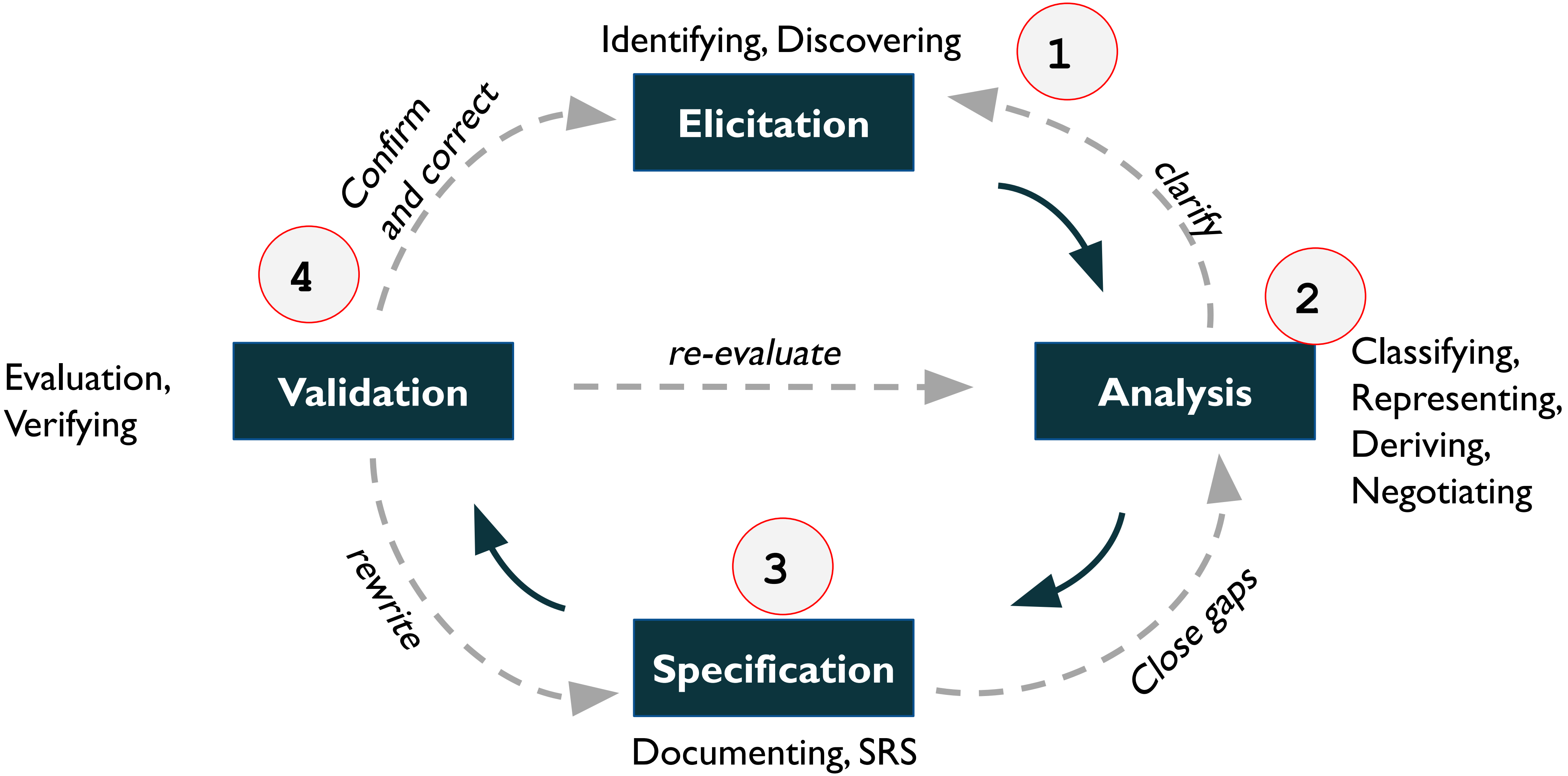
+

Systematic



Documenting

The Requirement Development Processes



Resource by D. Monett-Europe Week2015, University of Hertfordshire, Hatfield

Requirement Engineering

We will learn……

- Software Requirements Fundamentals
- Software Process Model
- Requirement Elicitation
- Requirement Analysis
- Requirement Validation
- Practical Consideration
- Requirement Documentation