Chapter 1 - Introduction to Software Design

- What is design?
- The role of the design activity
- Design as a problem-solving process
- Design as a 'wicked' problem
- What is Software/Software Design?
- Properties of software as major factors affecting its development
- General model of the software design process
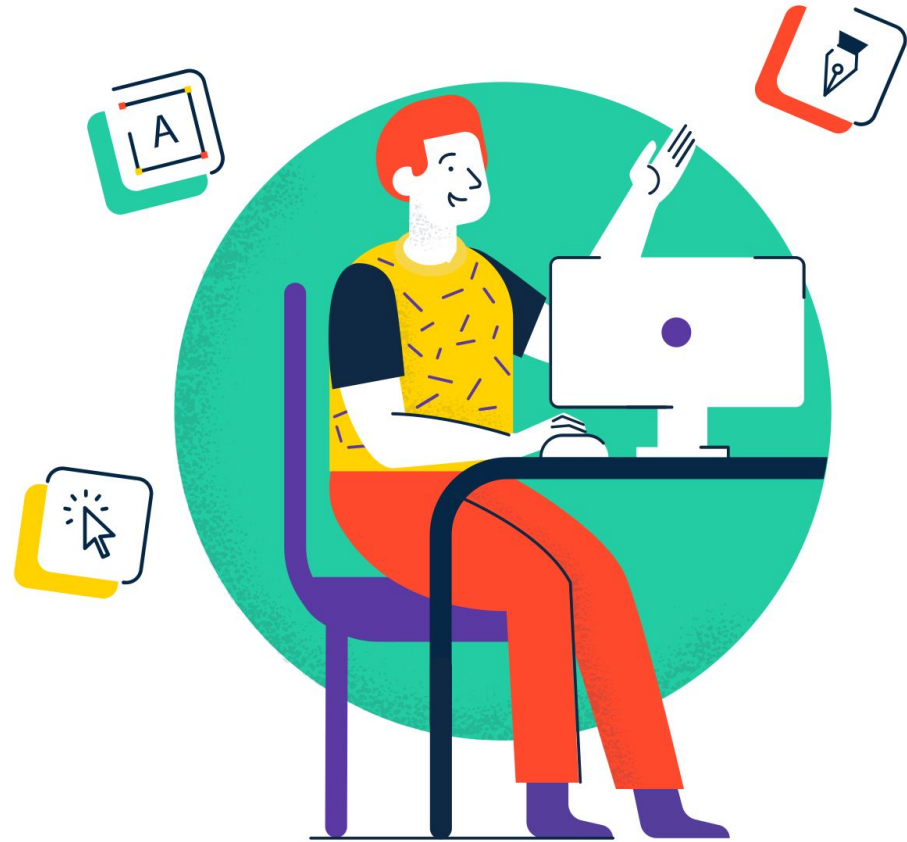- Major phases of the software design process

What is design?

A design is a plan or specification for the :

- construction of an object or system for the implementation of an activity

- process or the result of that plan or specification in the form of a prototype, product, or process.

What is design?

• Human characteristic: Making of, and the use of tools.

• Producing any form of artifact is an act that implicitly incorporates some element of design activity, whether or not this is explicitly appreciated at the time.
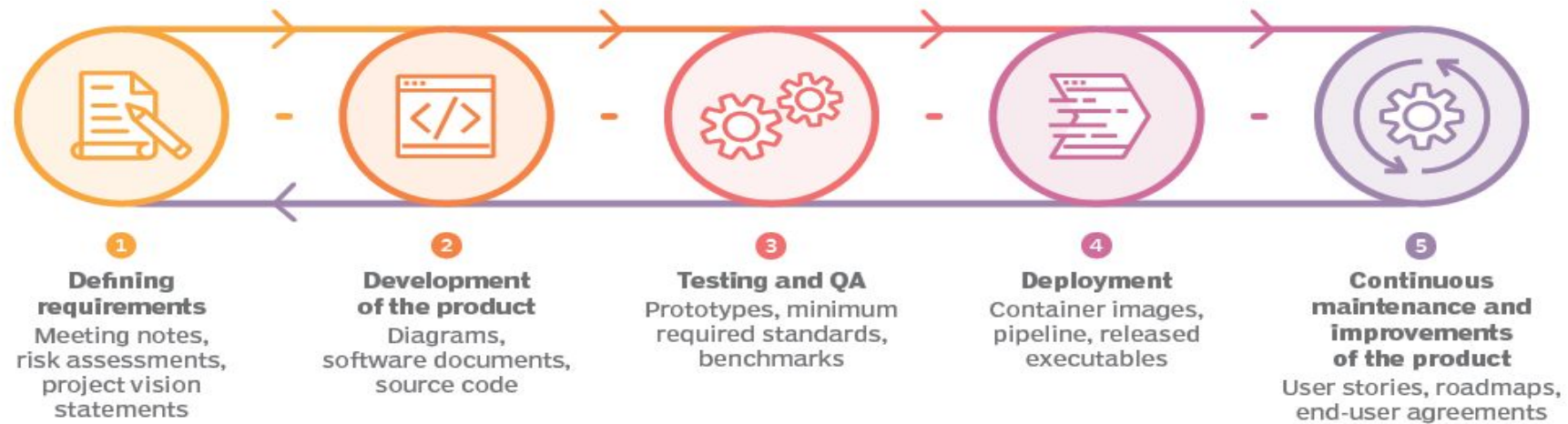
Artifacts created in the application lifecycle

1. **Defining requirements** — Meeting notes, risk assessments, project vision statements
2. **Development of the product** — Diagrams, software documents, source code
3. **Testing and QA** — Prototypes, minimum required standards, benchmarks
4. **Deployment** — Container images, pipeline, released executables
5. **Continuous maintenance and improvements of the product** — User stories, roadmaps, end-user agreements

An artifact is a byproduct of software development that helps describe the architecture, design and function of software.

Artifacts are like roadmaps that software developers can use to trace the entire software development process. Artifacts might be databases, data models, printed documents or scripts.

Communication

• Distinguishing characteristic of human beings

• Translating a 'design' into

a 'product' almost always

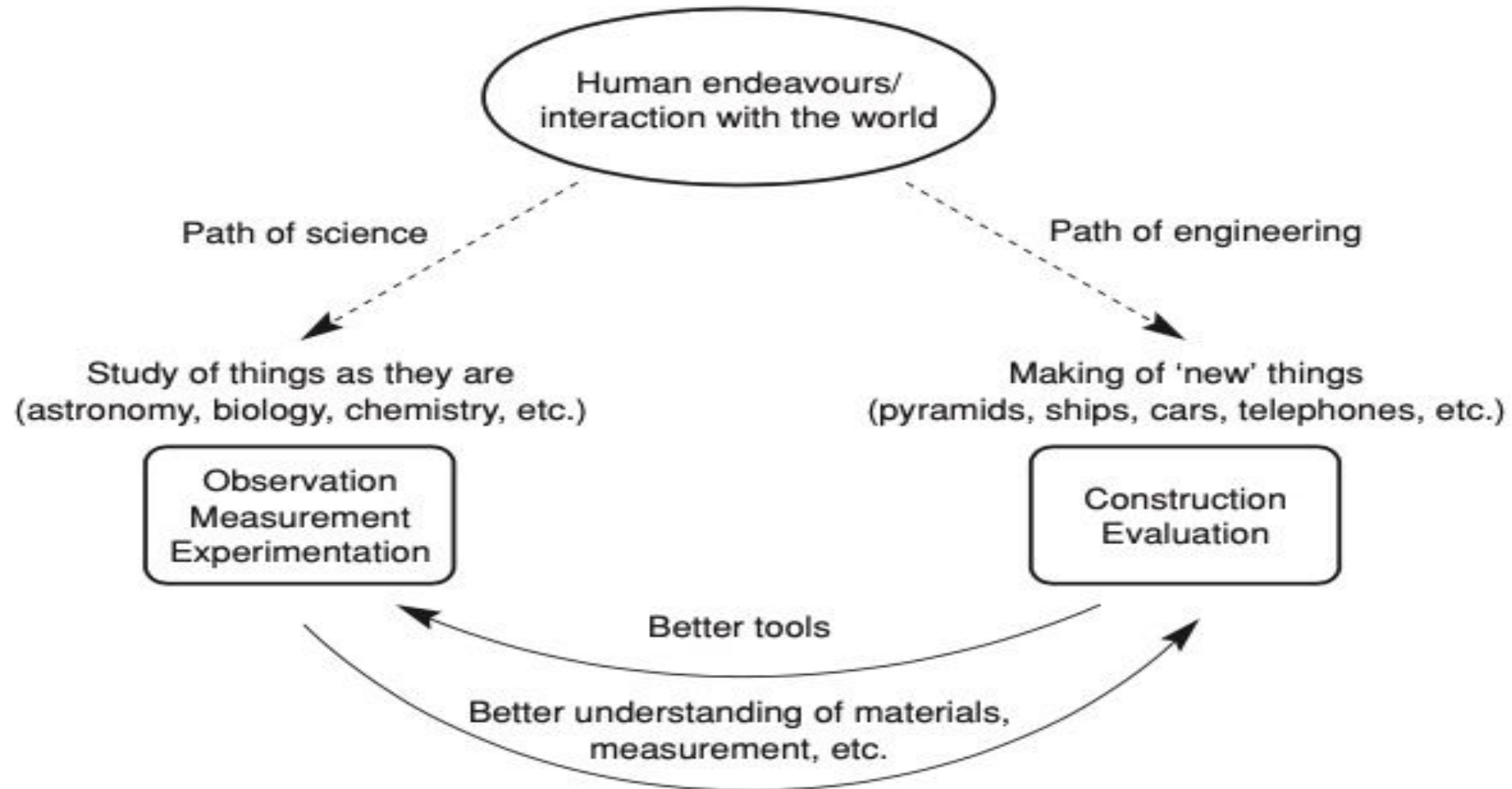involves communicating the designer's ideas to the development team
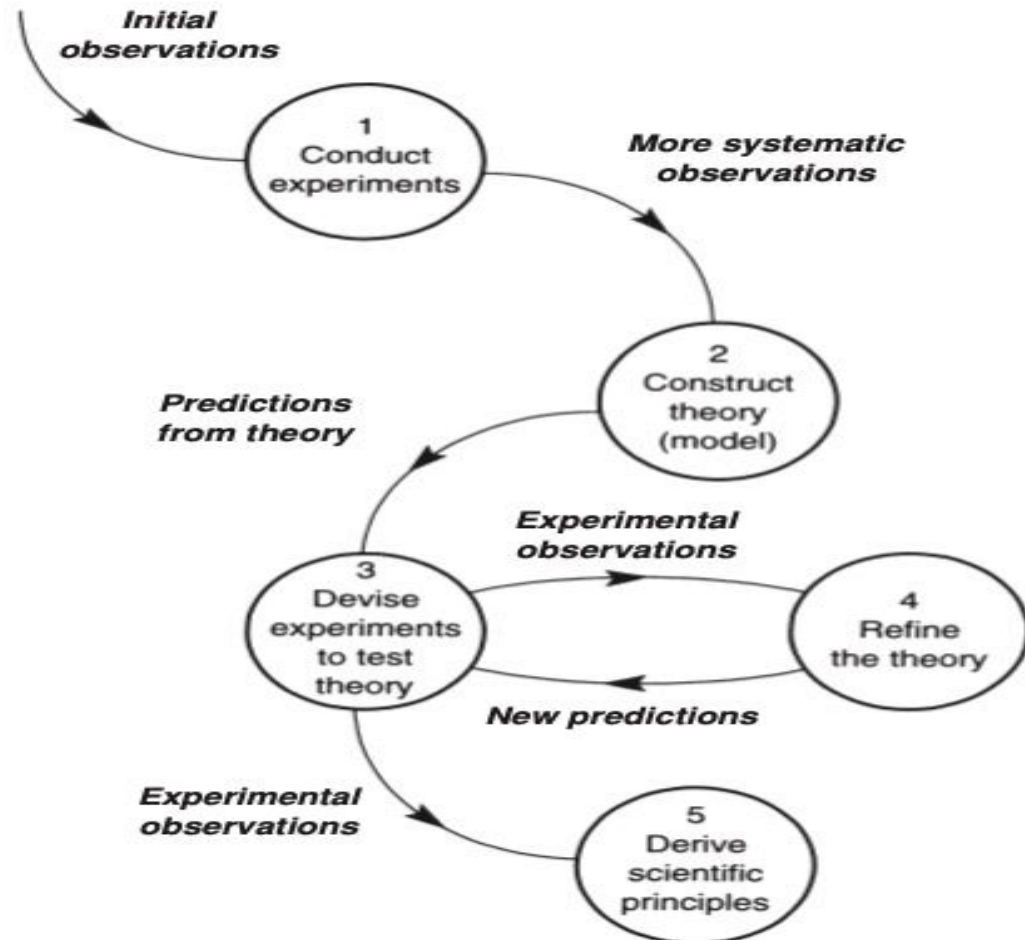
Products of some design process

• various artifacts that are the outcome of many different applications of the design process extensively influence our lives.
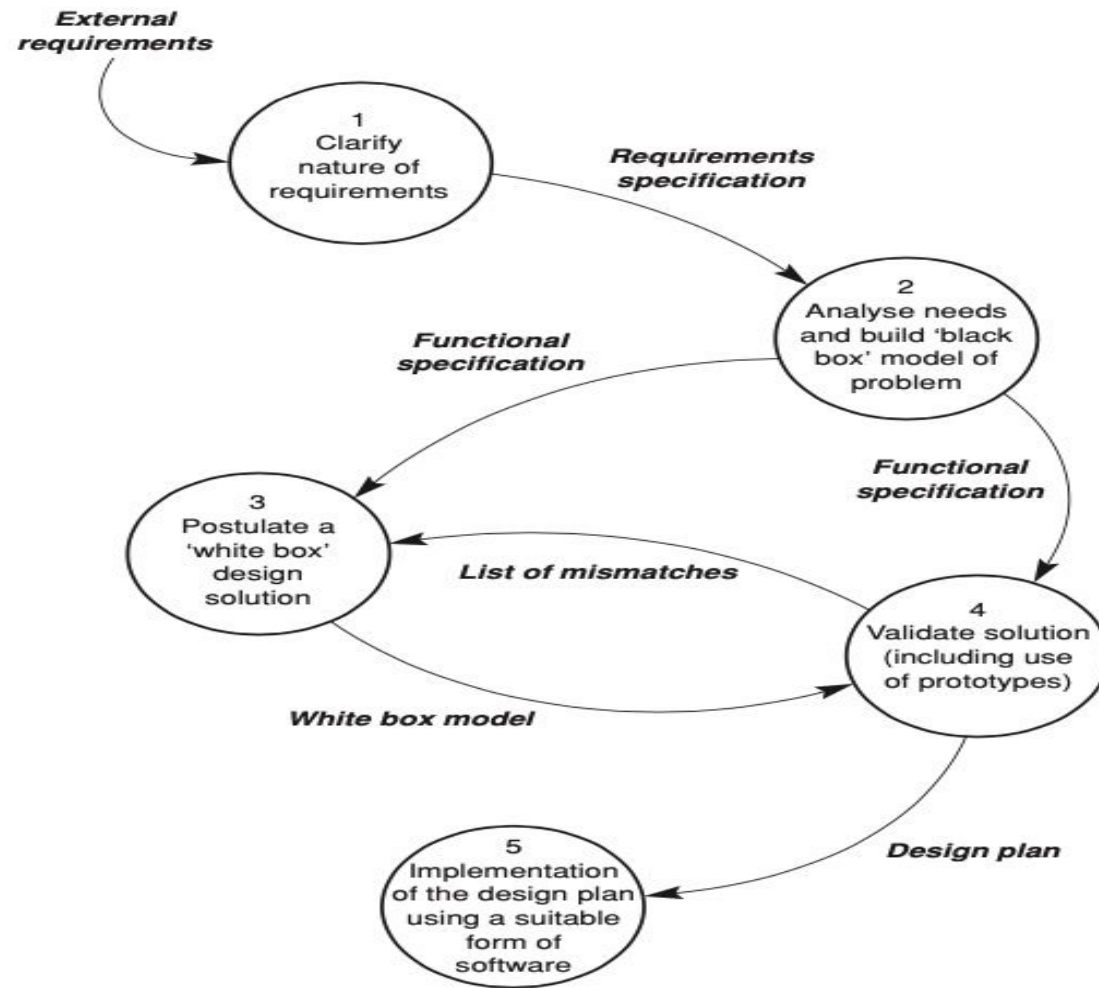
• devised and created by human beings.

The complementary nature of scientific and engineering activities
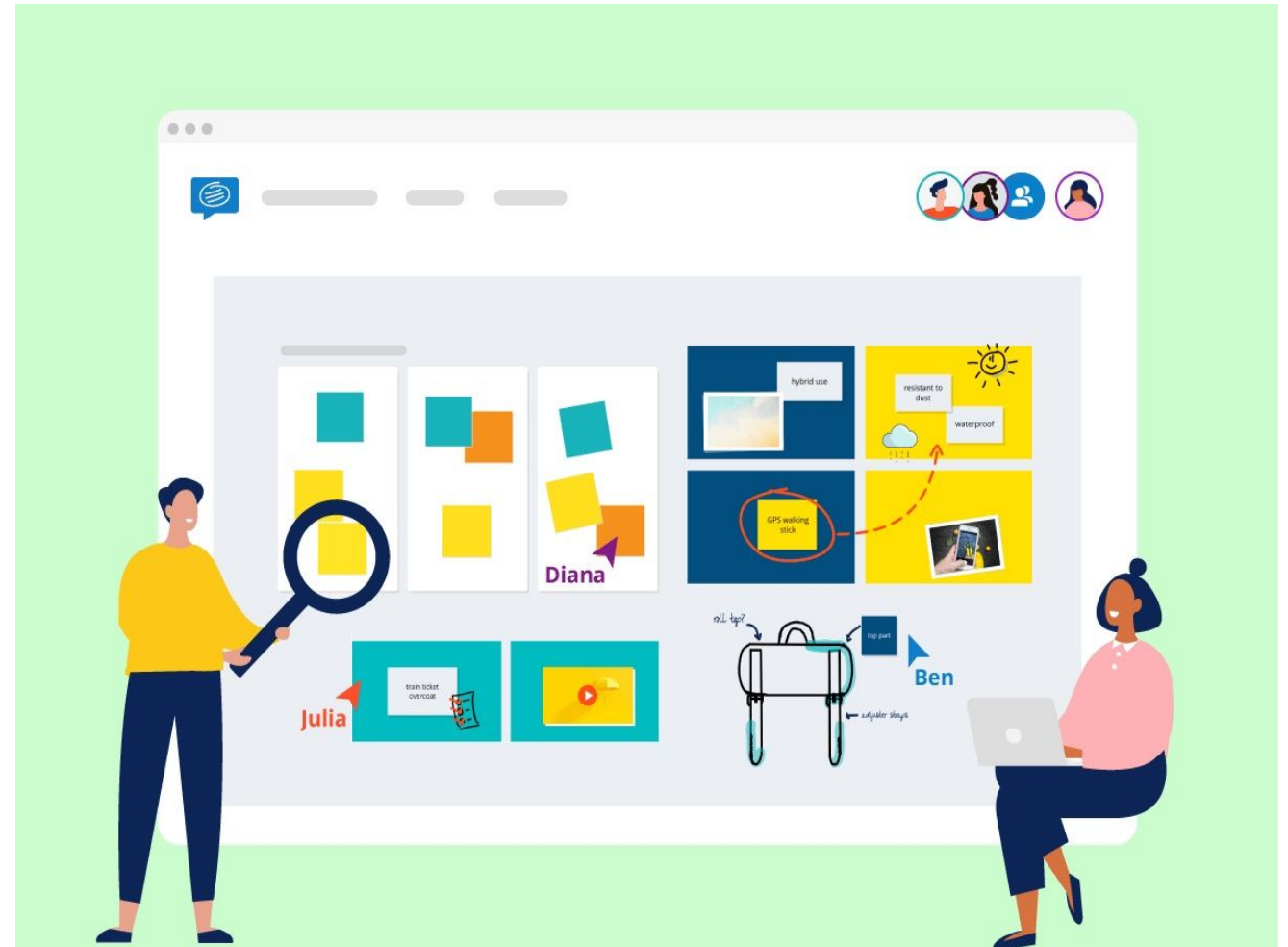
The nature of scientific analysis

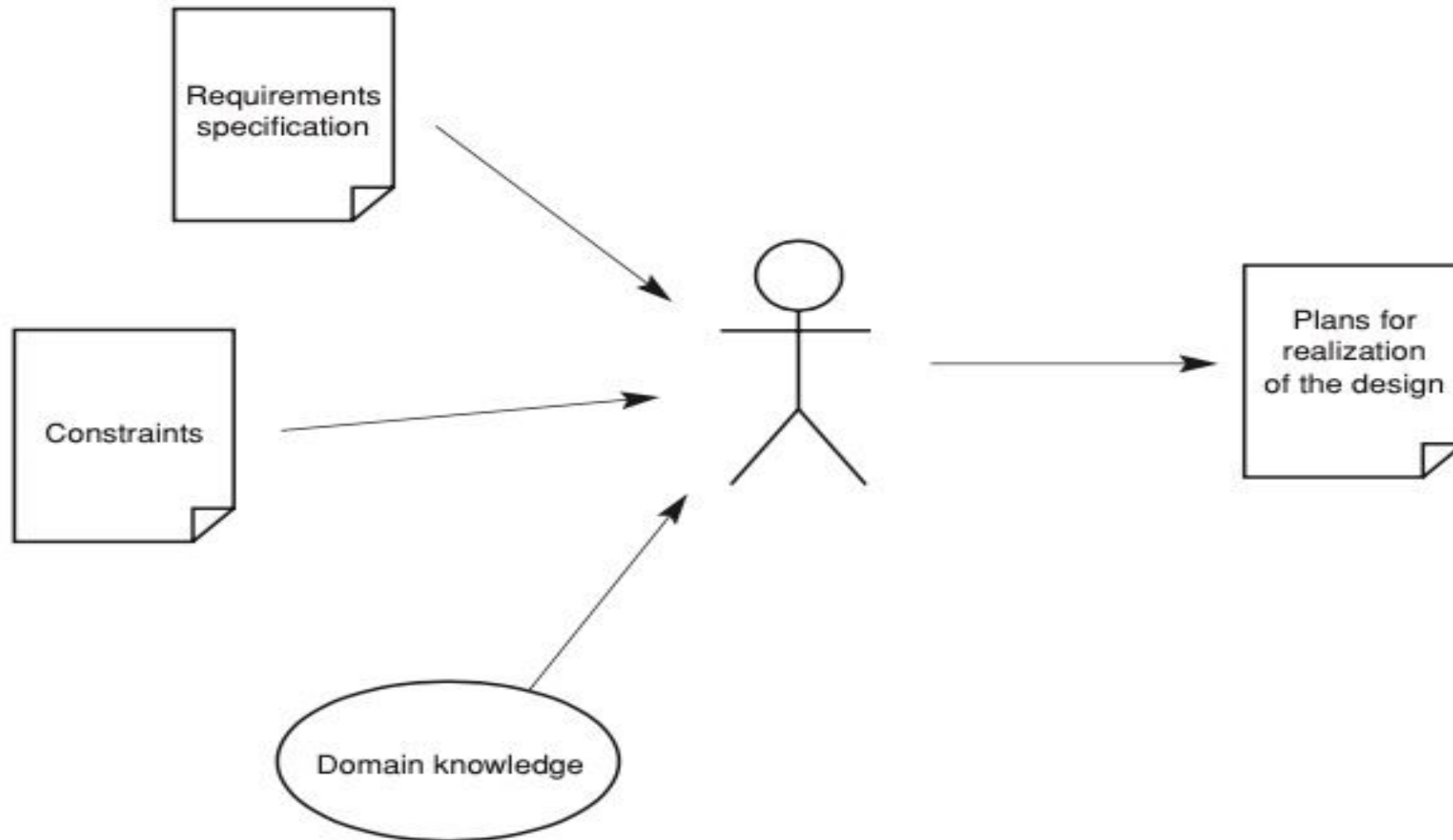# A model of the design process
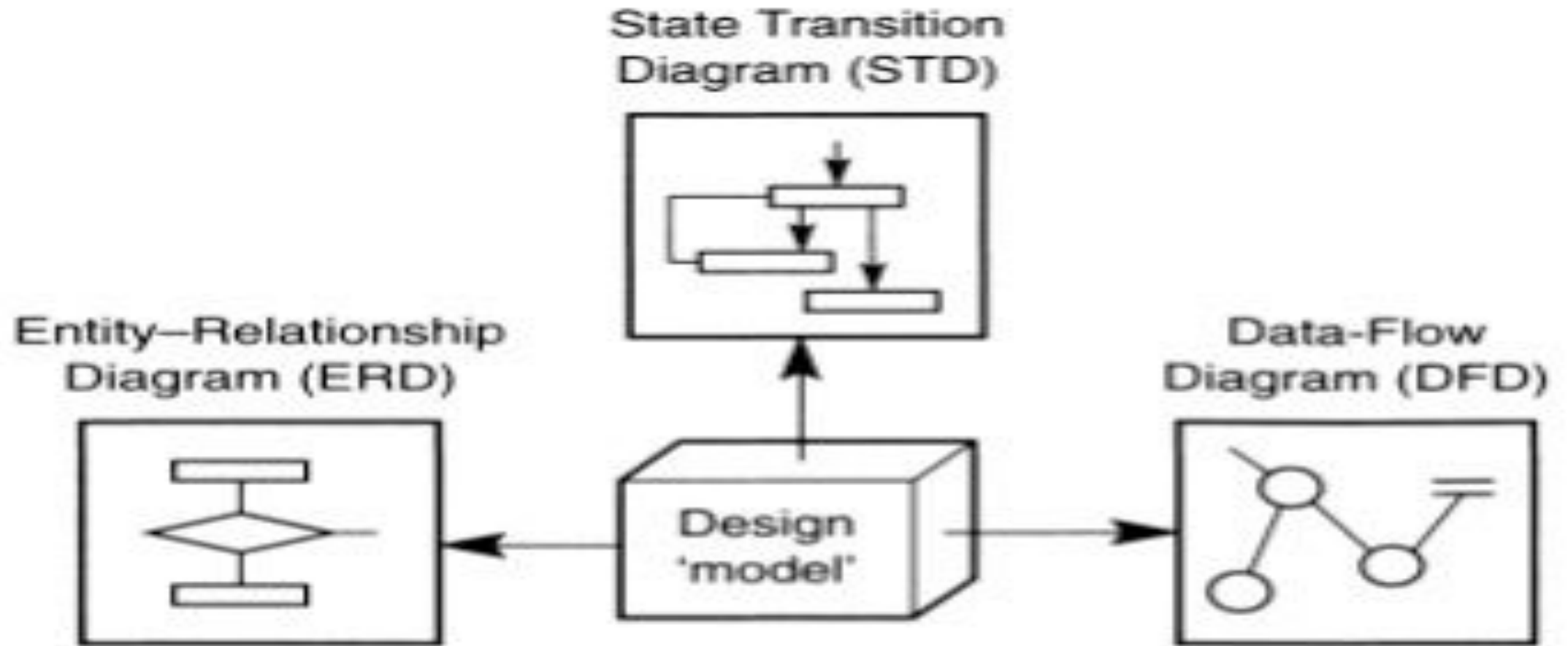
The role of the design activity

The principal task for the designer is to specify the best solution to a problem and produce a description of how this is to be organized.

The designer's channels of communication

Examples of design viewpoints

Design as a problem-solving process

- The purpose of design is simply to produce a solution to a problem.

- Abstraction therefore plays a key role.

Problem solving is the act of defining a problem; determining the cause of the problem; identifying, prioritizing, and selecting alternatives for a solution; and implementing a solution.

Why is abstraction important in software design?

Abstraction is used to hide background details or any unnecessary implementation about the data so that users only see the required information.

Abstraction "displays" only the relevant attributes of objects and "hides" the unnecessary details.

Design as a 'wicked' problem

It can be characterized as a problem whose form is such that a solution for one of its aspects simply changes the problem.
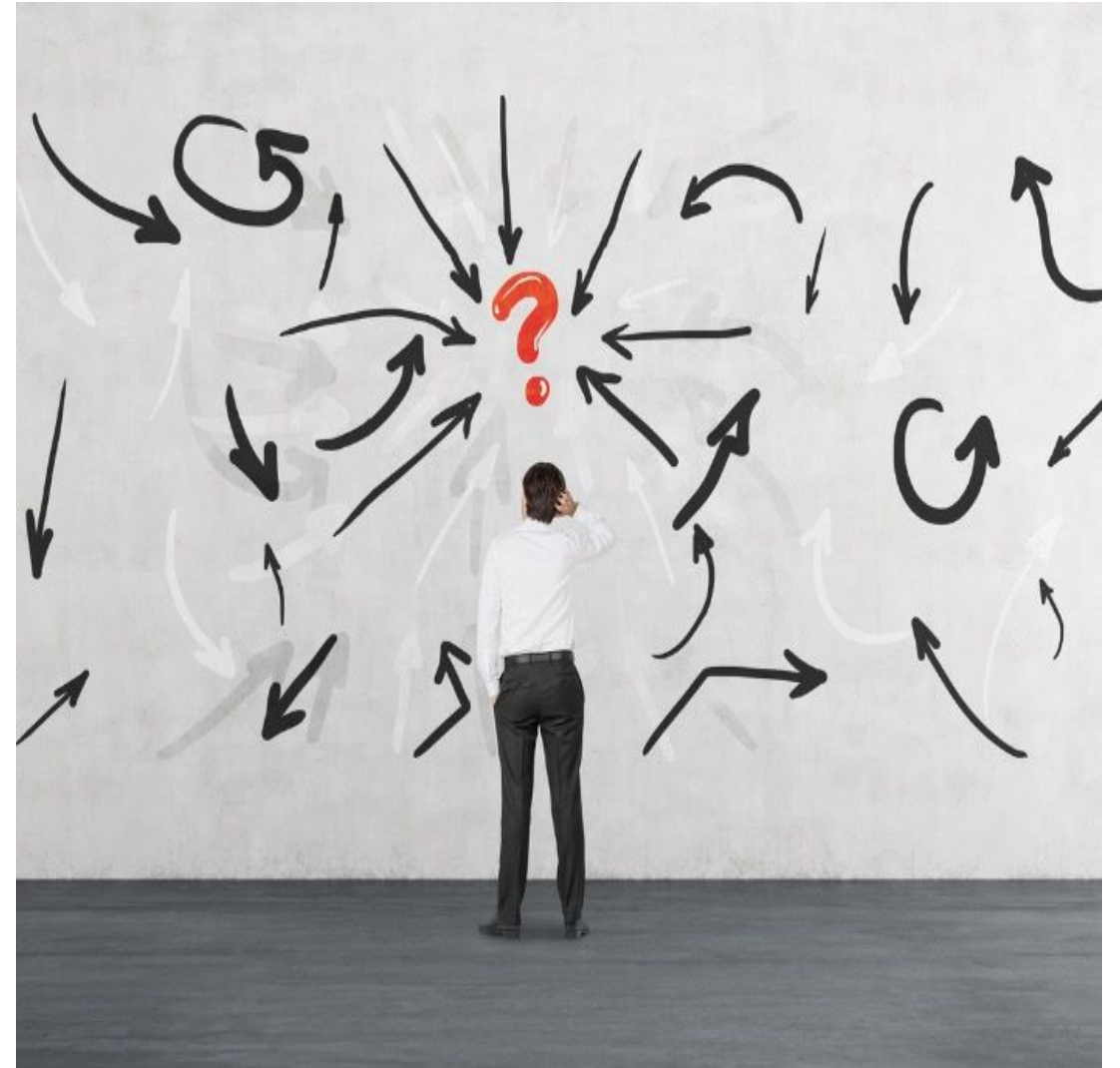
What is software?

Software is a set of

instructions, data or

programs used to
operate computers and
execute specific tasks.

What is Software Design

The process to transform the user requirements into some suitable form, which helps the programmer in software coding and implementation.

The process of envisioning and defining software solutions to one or more sets of problems.

# How to create software-based systems

The following items are designed and documented during the design phase:

- Different modules required.
- Control relationships among modules.
- Interface among different modules.
- Data structure among the different modules.
- Algorithms required to implement among the individual modules
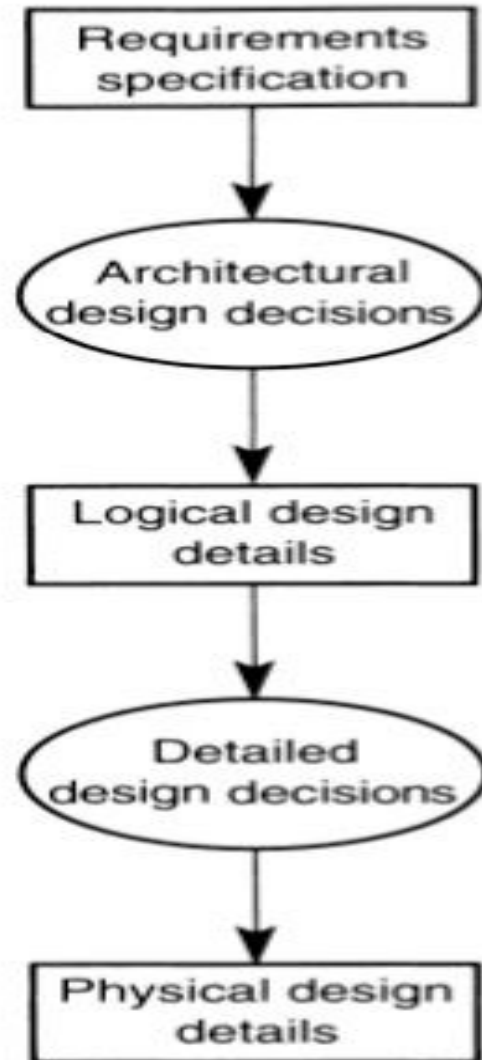
Objectives of Software Design:

1. Correctness

2. Efficiency

3. Understandability

4. Completeness

5. Maintainability

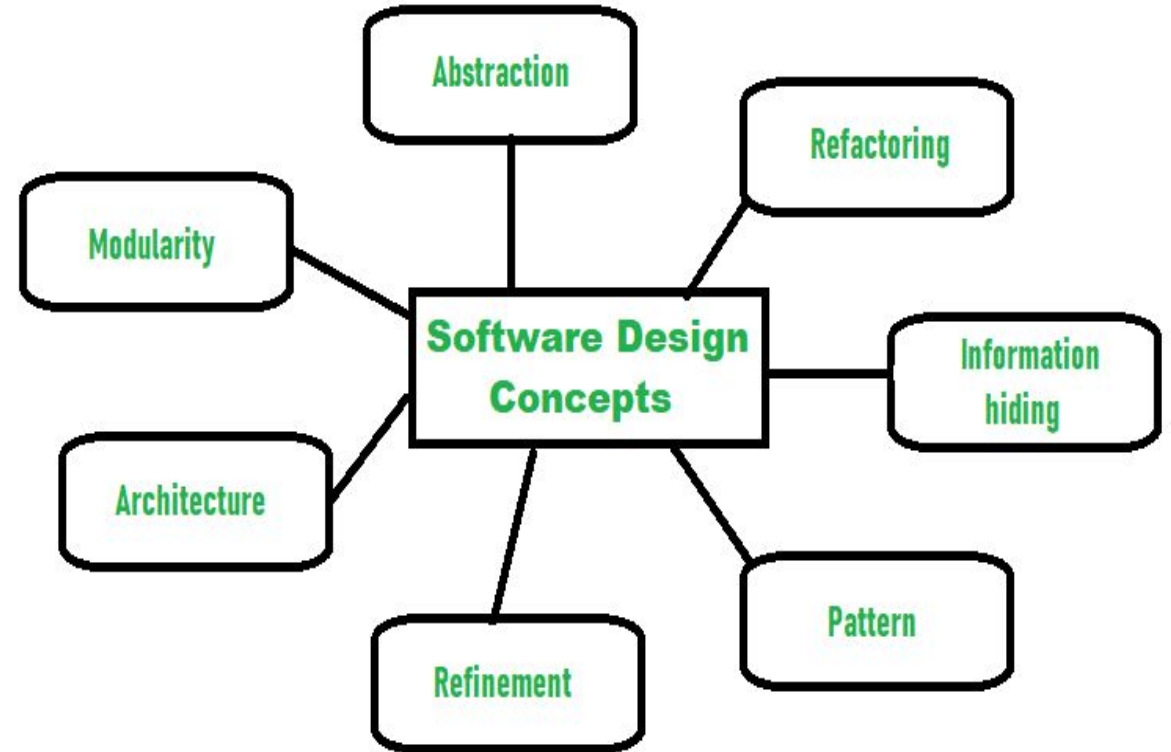# General model of the software design process
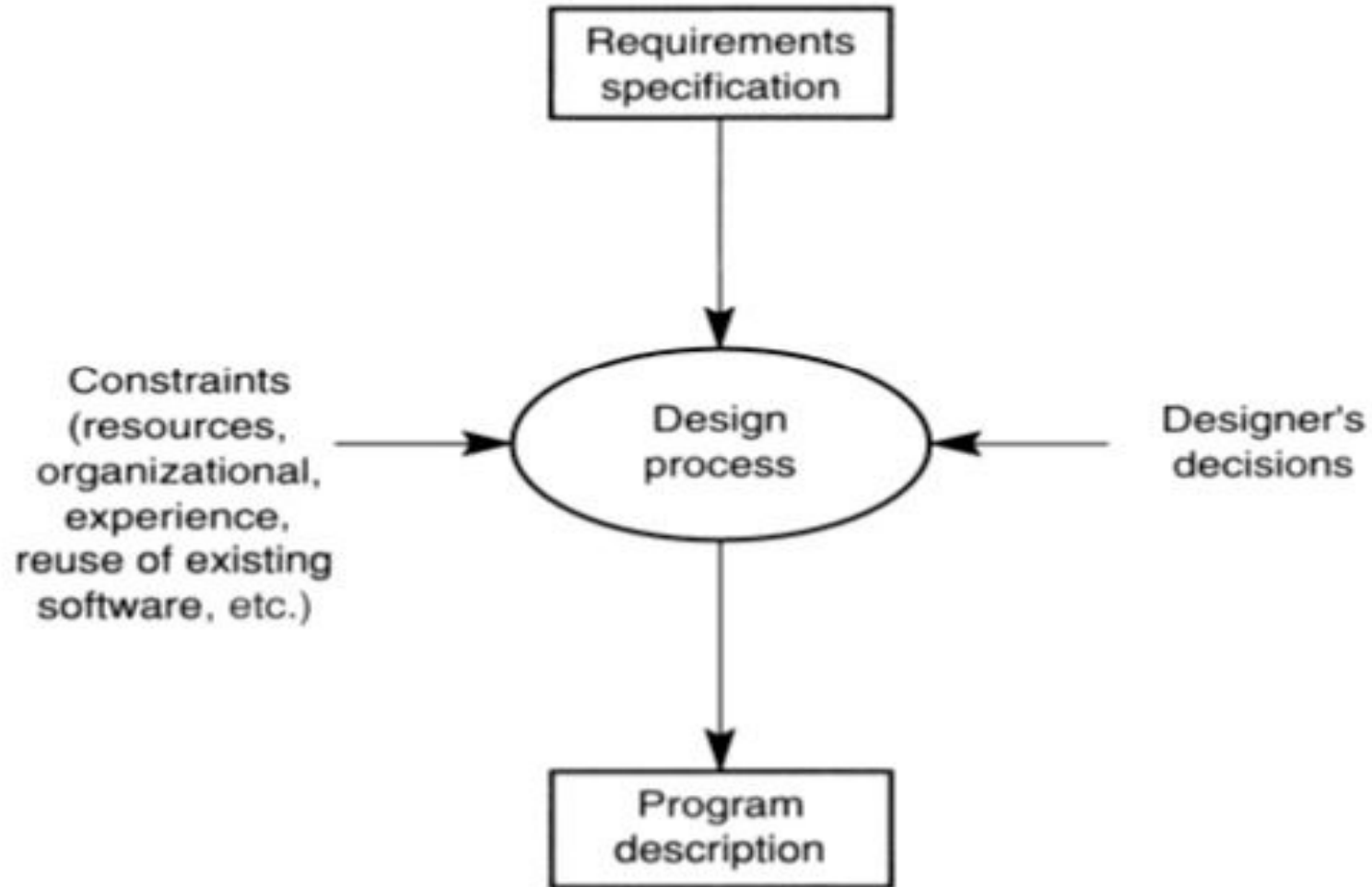
Major phases of the software design process

Software Design Concepts

Concepts are defined as a principal idea or invention that comes into our mind or in thought to understand something.

The software design concept simply means the idea or principle behind the design.

Software Development Problems:

Problem 1: Unclear and Ever-Changing Software Requirements

Problem 2: Inadequate Communication

Problem 3: Confidentiality Of Information

Problem 4: Too Many Bugs And A Flawed Final Product

Problem 5: Hidden Costs

End of Chapter 1