

Testing throughout the software life cycle

Software Testing: IN3240 / IN4240

Summary:

Software development **models**

Sequential / Iterative-Incremental / Testing within a life cycle

Test **levels**

Component (Unit) / Integration / System / Acceptance

Test **types**

Functional / Non-functional / Software structure / Related to changes

Maintenance testing



Part I: Close-ended questions

Question 1

Which are **good practices** for **testing** within the **development life cycle**?

- a. Early test analysis and design
- b. Different test levels are defined with specific objectives
- c. Testers will start to get involved as soon as coding is done
- d. A and B above



Question 1: Clue

Which are **good practices** for **testing** within the **development life cycle**?

Characteristics of **good** testing

Early testing

Every **development** activity has a **corresponding testing** activity

Each test **levels** has test **objectives specific** to that **level**

Test **analysis + design** should begin **during** the **corresponding** development activity

Testers should be **involved** in **reviewing** documents as soon as drafts are available



Question 2

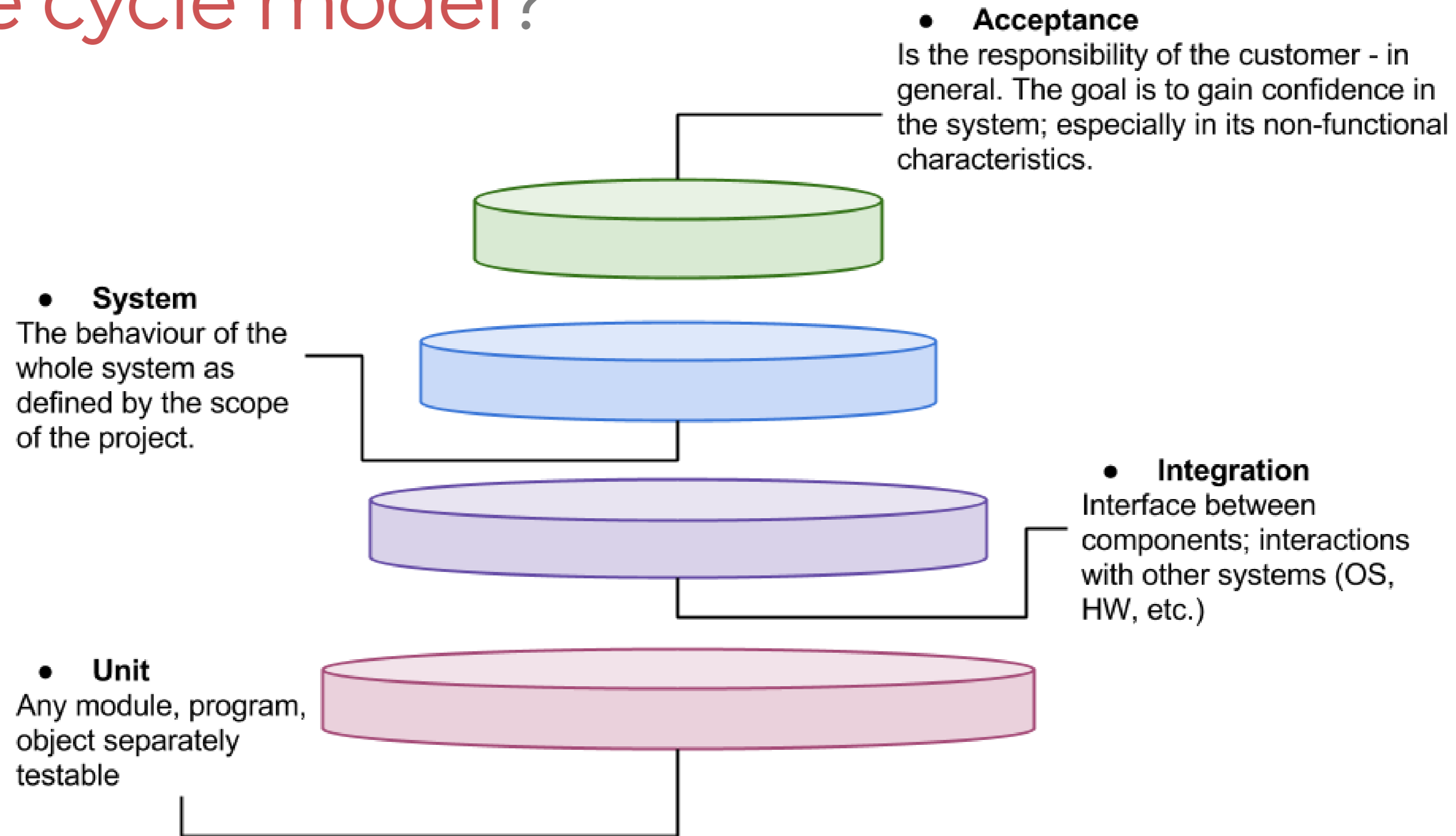
Which option best describes **objectives** for **test levels** with a **life cycle model**?

- a. Objectives should be generic for any test level
- b. Objectives are the same for each test level
- c. Objectives of a test level don't need to be defined in advance
- d. Each level has objectives specific to that level



Question 2: Clue

Which option best describes **objectives** for **test levels** with a **life cycle model**?



Question 2: Clue

Which option best describes **objectives** for **test levels** with a **life cycle model**?

Unit testing

Test and verify the functioning software **items**

Integration testing

Test and verify the **interfaces** and **interactions** between components

System testing

Test the behaviour of the **whole system** as defined by the project scope

Acceptance testing

Establish **confidence** in the system | part of system | non-functional characteristics

A decorative graphic at the bottom of the slide consisting of a series of grey chevrons pointing to the right, with a small grey circle at the far right end.

Question 3

Which of the following is a **non-functional quality characteristic**?

- a. Feasibility
- b. Usability
- c. Maintenance
- d. Regression



Question 3: Clue

Which of the following is a **non-functional quality characteristic**?

Non-functional testing

Measuring **quality characteristics** of software

HOW the system **performs** a certain task / function

ISO 9126 on Software Product Quality

Efficiency | Portability | Reliability | Functionality

Usability | Maintainability



Question 4

Which of these is a **functional test**?

- a. Measuring response time on an on-line booking system
- b. Checking the effect of high volumes of traffic in a call-centre system
- c. Checking the on-line bookings screen information and the database contents against the information on the letter to the customers
- d. Checking how easy the system is to use



Question 4: Clue

Which of these is a **functional test**?

Functional testing

Testing *WHAT* a system **should do**

Considers the **external behaviour** of the software

Specification-based testing

Black-box testing


Structure-based testing

White-box testing



Question 5

Which of the following is **true** regarding the process of **fixing emergency changes**?

- a. There is no time to test the change before it goes live, only the best developers should do this work and should not involve testers as they slow down the process
 - b. Just run the retest of the defect actually fixed
 - c. Always run a full regression test of the whole system in case other parts of the system have been adversely affected
 - d. Retest the changed area and then use risk assessment to decide on a reasonable subset of the whole regression test to run in case other parts of the system have been adversely affected
- 

Question 5: Clue

Which of the following is **true** regarding the process of **fixing emergency changes**?

Confirmation testing

Retesting of **software** after defect has been detected and **fixed**

Confirm that the original **defect** has been successfully **removed**

Regression testing

Repeated testing of **already tested** program after modification

Discover any **defects introduced** or uncovered as a **result** of **change**

Test effort **extent** is based on **risk** of finding defects in previously working

software

A decorative graphic at the bottom of the slide consisting of a series of overlapping, right-pointing chevrons in shades of gray, with a small gray circle at the far right end.

Question 6

A **regression test** ...

- a. Is only run once
- b. Will always be automated
- c. Will check unchanged areas of the software to see if they have been affected
- d. Will check changed areas of the software to see if they have been affected



Question 6: Clue

A regression test ...

Regression testing

After fixing a defect; have we introduced new defects?

Checks unchanged areas of the software

Regression test suites are run many times during development

Evolve slowly

Regression testing is a strong candidate for automation



Question 7

Non-functional testing includes:

- a. Testing to see where the system does not function correctly
- b. Testing the quality attributes of the system including reliability and usability
- c. Gaining user approval for the system
- d. Testing a system feature using only the software require for that function



Question 7: Clue

Non-functional testing includes:

Non-functional testing

Testing **quality** characteristics → **Ability** testing

Aspects of **software not** necessarily related to **specific functions**

Examples

Reliability testing: Fault tolerance / Robustness / Recoverability /

Compliance

Usability testing: Learnability / Operability / Attractiveness

Efficiency testing: Time behaviour / Resource utilisation

Maintainability testing: Analysability / Changeability / Stability / Testability

Portability testing: Adaptability / Installability / Replaceability

Question 8

_____ testing is performed by **customers** at their **own site**



Question 8: Clue

_____ testing is performed by **customers** at their **own site**

Acceptance testing

Responsible: **Customers / Users** of the system

Alpha testing

Performed at the **site** of the **developing organisation**

Beta testing

Field testing

Performed by people at their **own locations**

User acceptance / Operational / Contract and regulation

testing



Question 9

Pair the following **test levels** with their **description**

1. Unit level	A. Tests the behavior of the whole system
2. Integration level	B. Performed by customers
3. System level	C. Tests any module or object separately testable
4. Acceptance level	D. Tests the interactions of the interfaces of the system

Question 10

Acceptance testing is not the responsibility of the development team. It is the responsibility of the customers, but the development team can assist in the process.

- a. True
- b. False



Question 10: Clue

Acceptance testing is not the responsibility of the development team. It is the responsibility of the customers, but the development team can assist in the process.

Acceptance testing

Establish confidence in the system | part of system

Examines non-functional characteristics of the system

Verify the fitness for use

Responsibility lies with the customers / users

Stakeholders may be involved in the testing process



Part II: Exercises and Open-ended questions

Exercise: Different Types of Testing

Go to www.ikea.com/no/no/

Give **examples** of possible ...

- a. Unit tests
- b. Integration tests
- c. System tests



Unit Tests

Choosing a department

IKEA

Søk...

Velg varehus
Kundeservice

IKEA FAMILY
IKEA BUSINESS

Logg inn

Nyheter | Idéblogg | **Kjøkken og hvitevarer** | Spiseplassen | Stue | **Soverom** | Barnerom | Oppbevaring | Baderom | Belysning | Alle avdelinger

IKEA INFORMERER: IKEA advarer mot svindelkampanjer

Choosing furniture

NOLBYN Stol med høy rygg
495,-/stk

VILLSTAD Stol med høy rygg
1.495,-/stk

AGEN Stol
395,-/stk

BYHOLMA Lenestol
895,-/stk

BYHOLMA / DJUPVIK Lenestol
1.125,-/stk

BYHOLMA / MARIEBERG Lenestol
1.025,-/stk

**EKENÄSET Lenestol
1.995,-/stk**

EKERÖ Lenestol
1.498,-/stk

Integration Tests


Setting a filter

Price level / Colour

The screenshot shows the IKEA website's search results for armchairs. The top navigation bar includes the IKEA logo, a search bar with the placeholder "Søk...", and links for "Velg varehus Kundeservice", "IKEA FAMILY", "IKEA BUSINESS", and "Logg inn". Below the navigation bar is a menu with categories like "Nyheter", "Idéblogg", "Kjøkken og hvitevarer", "Spiseplassen", "Stue", "Soverom", "Barnerom", "Oppbevaring", "Baderom", "Belysning", and "Alle avdelinger". The current page is "STUE: Sofa og lenestoler". The breadcrumb trail shows "Tekstilsofaer" > "Sofaer i skinn og imitert skinn" > "Sovesofaer" > "Modulsofaer" > "Sjeselonger" > "Fotskamler og puffer" > "Lenestoler" > "Ekstra trekk" > "Ekstra ben". The filter section includes a "Alt" button, several filter buttons for material and type, a "Sorter etter relevans" dropdown, a "Skinnlenestoler" button, and a "Kan kjøpes på nett" checkbox. A color palette with eight options (blue, brown, green, grey, yellow, white, red, black, and a patterned option) is highlighted with a red circle. To the right, a price range filter for "Prisnivå (NOK)" is set to "60 - 4595" and is also highlighted with a red circle.

System Tests

Choose an **item**



BYHOLMA / MARIEBERG Lenestol
1.025,-/stk

EKENÄSET Lenestol
1.995,-/stk
Bredde: 62 cm, Dybde: 73 cm, Sete bredde: 48 cm


EKERÖ Lenestol
1.498,-/stk

Kjøp på nett

Huskeliste

Place into **shopping** cart 



Søk... 

Velg varehus | Kundeservice | **IKEA FAMILY** | **IKEA BUSINESS** | Logg inn | 

Nyheter | Idéblogg | Kjøkken og hvitevarer | Spiseplassen | Stue | Soverom | Barnerom | Oppbevaring | Badetrom | Belysning | Alle avdelinger

FORTSETT Å HANDLE

Min handlevogn

1 x		EKENÄSET Lenestol 1.995,- Isunda grå Bredde: 62 cm, Dybde: 73 cm, Sete bredde: 48 cm Artikkelnummer: 802.758.11	Sum	1.995,-
			 Flytt til huskeliste	 Slett

Open-Ended Questions

Why do you think we need to **test** at **integration** level **top-down** or **bottom-up** rather than **big-bang**?

Why is **acceptance** testing **important**?

Why do you think it is **important** to **test on-site**?



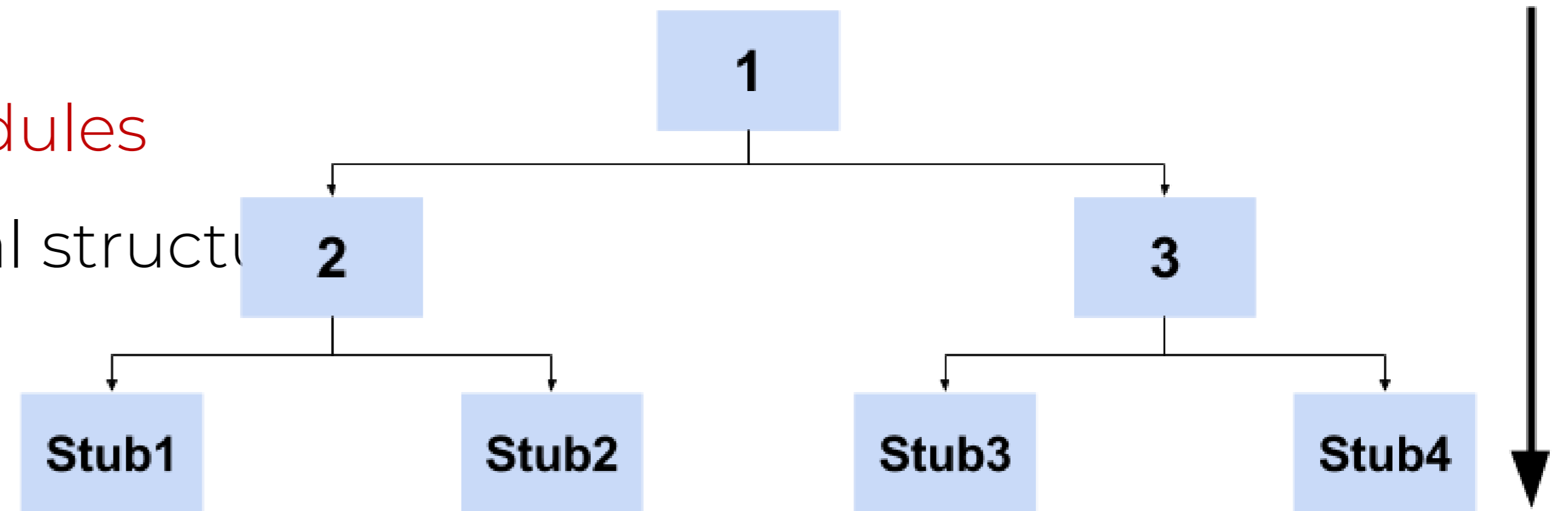
Top-down Testing

Top-down testing

Testing from **top** to **bottom**

From **main** module to **sub-modules**

Follows **control flow** or architectural structure



If **lower-level** modules have **not** yet been **developed**

Simulate the lower-level **modules** using **STUBS**

Temporary programs substitute components / systems

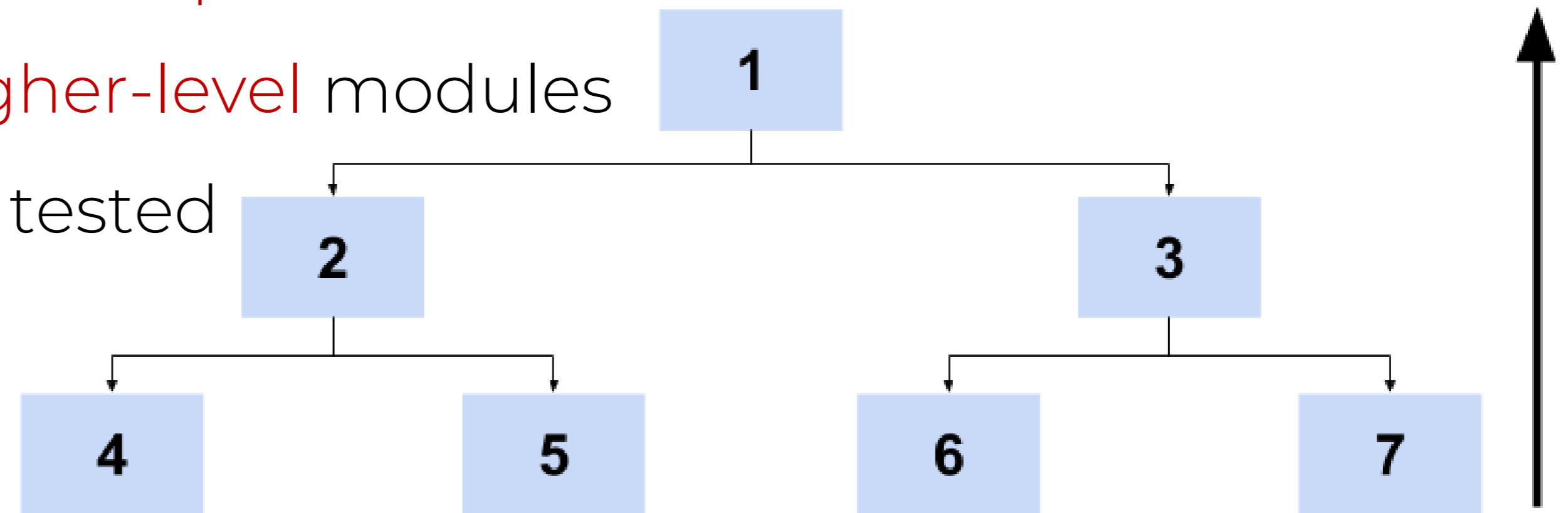
Bottom-up Testing

Bottom-up testing

Testing from **bottom** of the control flow **upwards**

From **lower-level** modules to **higher-level** modules

Each lower hierarchy component is tested



If **higher-level** modules have **not yet** been **developed**

Simulate the higher-level modules using **DRIVERS**

Temporary programs to **substitute** main components or higher-level

systems



Importance of Acceptance Testing

Acceptance testing

Does the software product meet the customer's needs?

Does the software product comply with the specified requirements / documentation?

Last chance of the customer to discard an insufficient / inadequate product

Adequate testing protects customer from losses caused by poor software products

Compares results to expectations

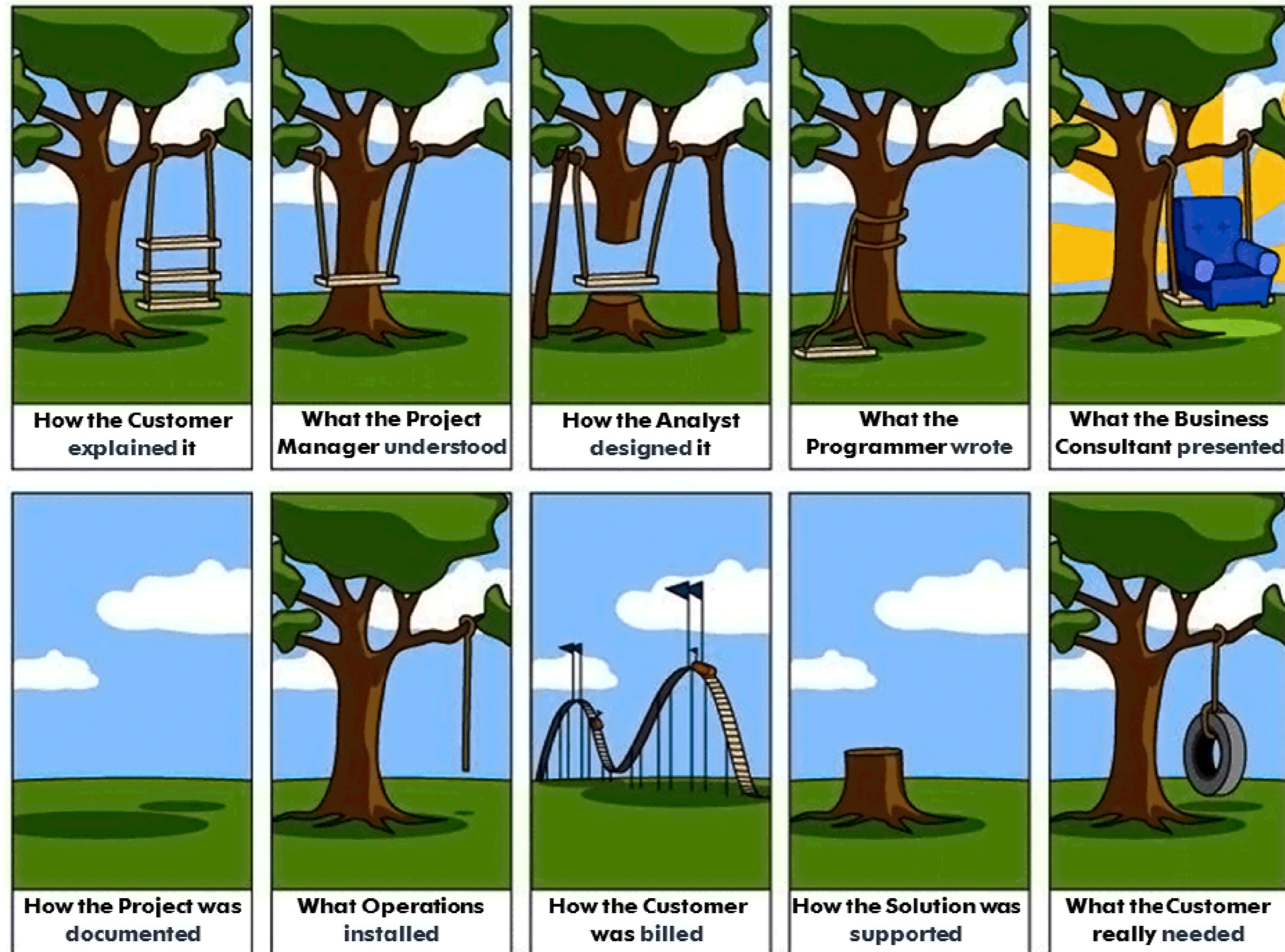
Validation

Did we build the *right thing*?

Verification



Importance of Acceptance Testing



<https://i.stack.imgur.com/2YGV6.png>

Importance of on-Site Testing

On-site testing

Get *application* into the *hands* of the *customers*

The people who will *actually* be *using* the software *product*

Provides a “*real*”, overall experience of the software

Realistic environment to mimic *actual use* after deployment

Potentially more *honest* user feedback

Other benefits

Improve software quality

Bug detection

Cost reduction



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