



UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH
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Requirements and testing

Are they really good friends?

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Summary

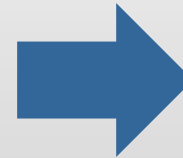
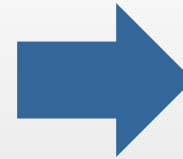
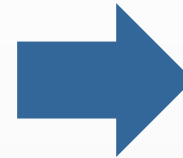
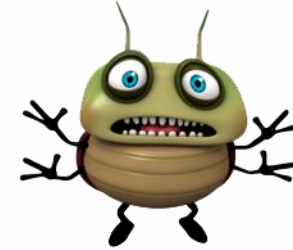
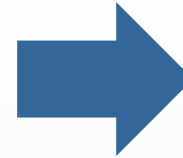
What about Testing and QA?

Performing static testing on requirements.

A black and white photograph of a modern building with a glass facade and a flat roof, reflected in a pool of water. The building has a series of horizontal lines and a grid-like structure. The reflection is clear and sharp.

What about Testing and QA?

What is Testing?



What is Testing?

and consultation with users.
The degree of clarity of
which a televised image
broadcast signal is received.

def·i·ni·tion n. 1.
The teacher gave definitions
of the new words.
of an image (picture)
on a TV screen

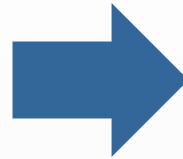
“Testing is the process to identify differences between actual and expected results.” (ISO 9126)

“Testing is demonstrating that a system is fit for purpose.” (Evans, 1996)

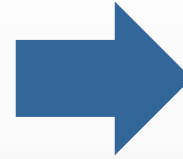
“Testing is the process of executing a program or system with the intent of finding errors.” (Myers, 1979)

“Testing is the process of establishing confidence that a program or system does what it is supposed to.” (Hetzel, 1973)

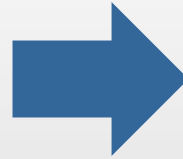
What is Testing?



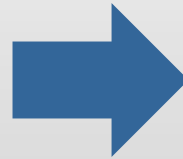
Software testing assures that the system is ready (or not!) to meet customer needs.



Testing aims to bring to light the lack in quality, which reveals itself in defects.



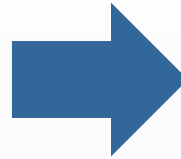
Put formally: it aims to establish the difference between the product and the previously set requirements.



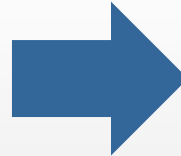
Put positively: it aims to create faith in the product.

What is NOT Testing?

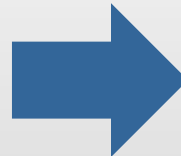
Software
testing is
not...



... a matter of releasing or accepting something. Testing supplies advice on the quality.



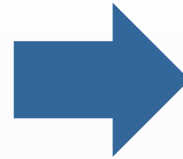
... a post-development phase. Testing activities should be carried out in parallel to development.



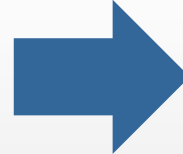
... implementation of an information system.

What is NOT Testing?

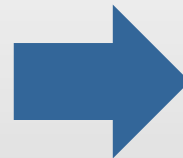
Software
testing is
not...



... intended initially to establish whether the correct functionality has been implemented.



... cheap (or it is?)



... training for operation and management.

Testing responsibilities

Responsibilities in a system development phase could be splitted into 2 main groups



Client, user, manager and system administrator



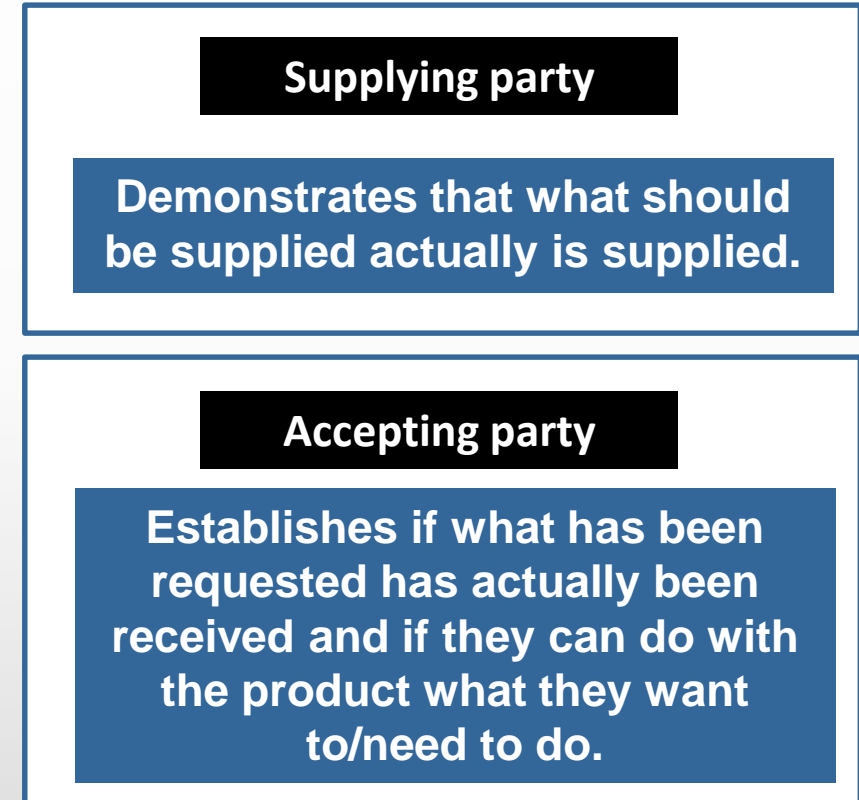
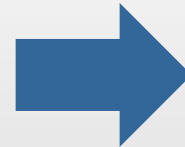
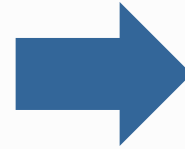
System developer and supplier



How can we explain what every group is doing?

Testing

responsibilities

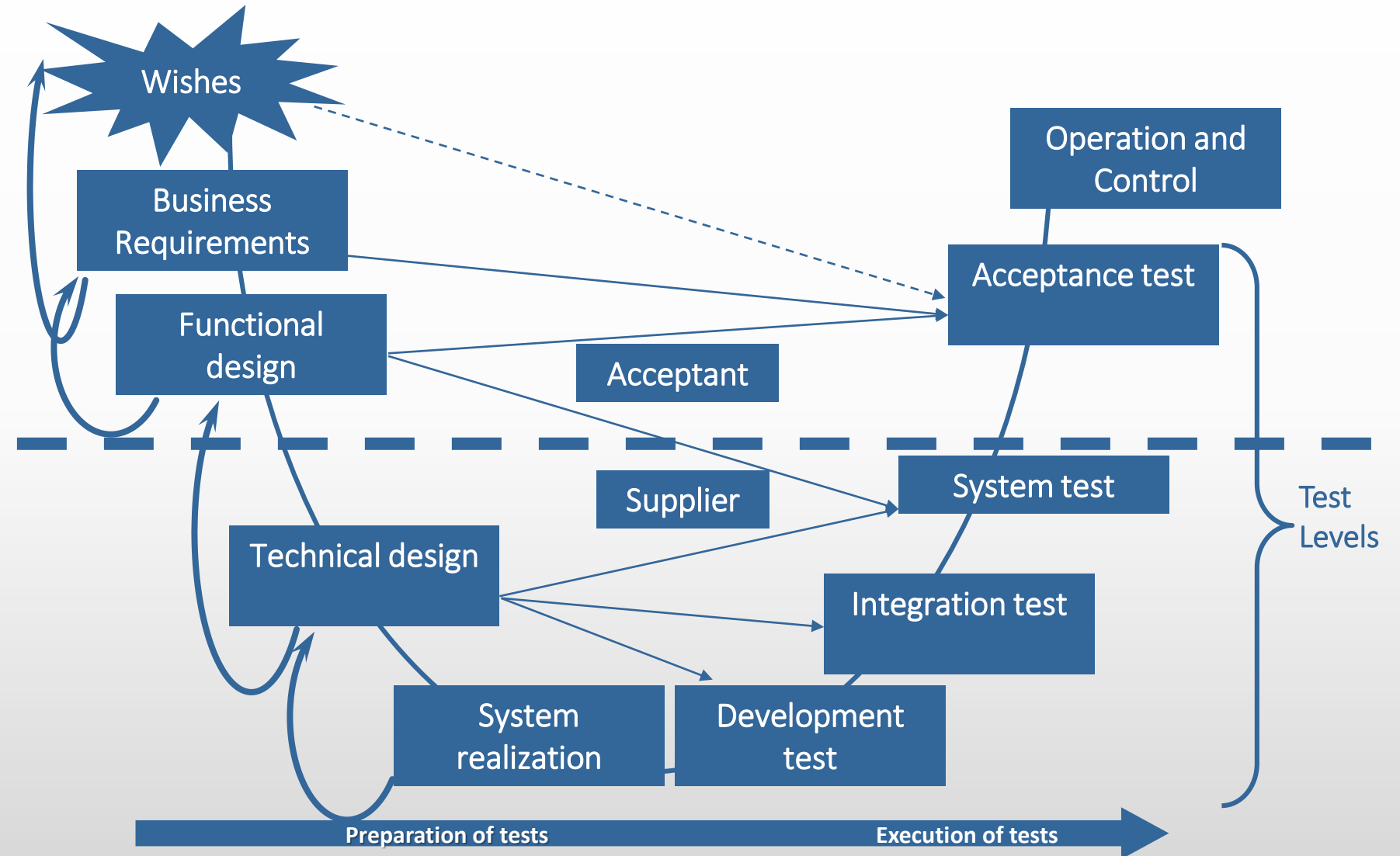


Testing responsibilities

Agile explains that...



Testing responsibilities



Unit testing

Definition

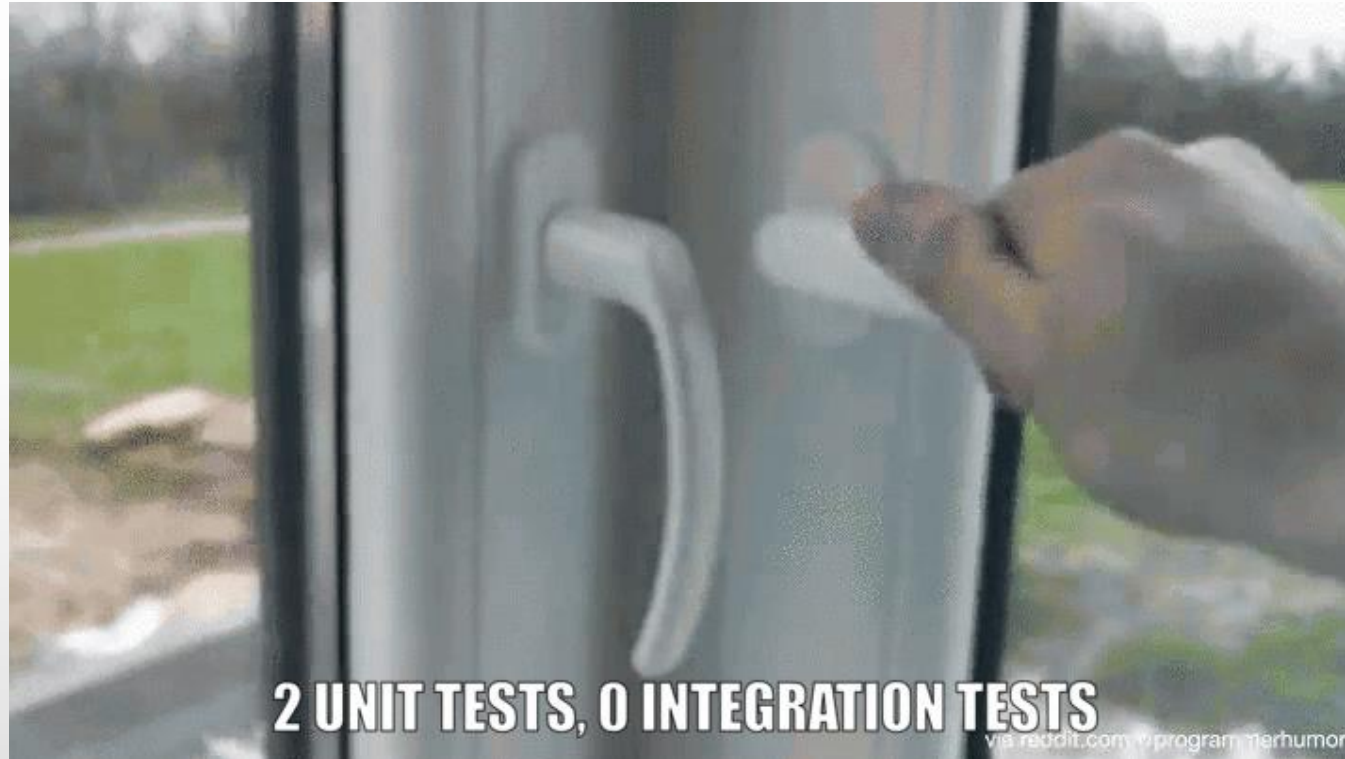
Unit Testing is the testing level of software in which every isolated and smallest unit and component of a software is tested. The purpose is to validate that each unit of the software performs as designed.

Purposes

The supplying party wants to demonstrate that the product meets the technical design and specifications.

Remove blocking issues and other types of defects that are more difficult to see in next testing stages.

Integration testing



This testing level is designed to find interface defects between the modules/functions.

the system in combination
r.

its work together.

System testing

Characteristics

It's done by an independent team.

It's the first level in which functionality can be tested as a whole.

It's the only level which has a structured process with well defined stages.

It's main source of information are requirements of the system.

Benefits

It simulates the behavior of a system from the customer point of view.

As it's done by an independent team, it's the 1st test that can guarantee a good objectivity of the testing being done.

User Acceptance testing

Definition

UAT is the last test level. The client determines whether the system is ready for release, by analyzing if the product meets their requirements.

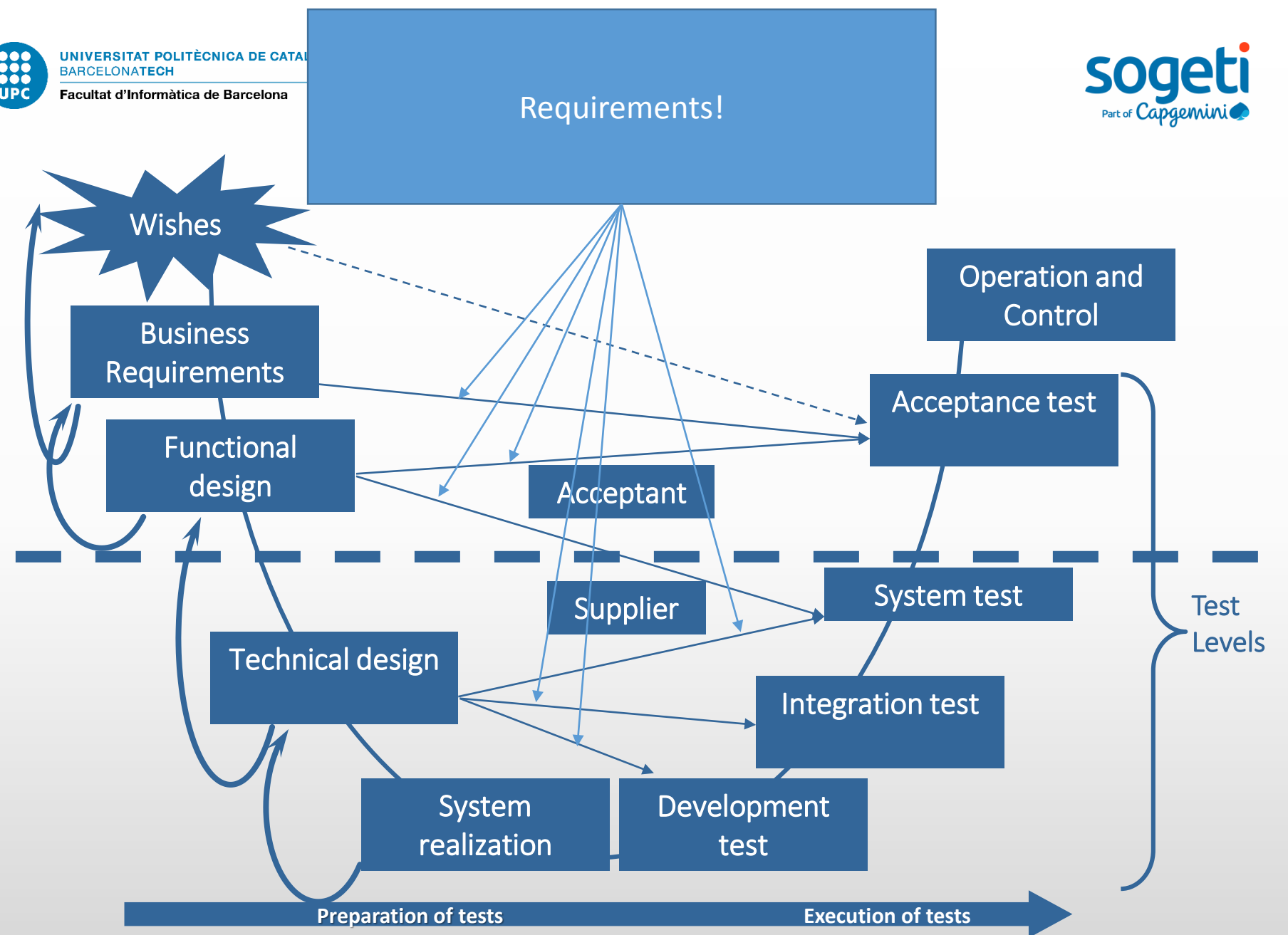
Purposes

Determine if the product is ready to be released.

See if changes in requirements have been correctly processed.

Matching product vision between supplying and accepting parts.

Testing responsibilities



The background of the slide features a stylized illustration of three people in silhouette, sitting at a table and engaged in a discussion. The background is light blue with faint, geometric patterns resembling architectural lines or data structures. A dark blue rectangular box is overlaid on the right side of the image, containing the title text.

Requirements for testing levels

Practice discussion

Scenario

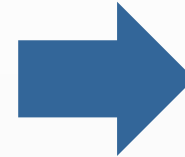
In groups of 4 people

Give examples of test basis (requirements) that could be useful for every of the four test levels (10 minutes).

Ways of doing Testing

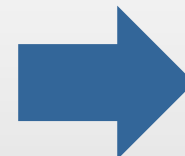
3 ways of doing testing...

Dynamic explicit testing



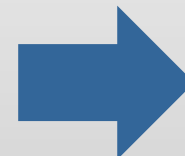
In the execution of dedicated Test Cases by running software, the actual and expected result is compared to determine if the system behaves as it should.

Dynamic implicit testing



While the course of Dynamic explicit testing, we discover information about the system for which no explicit Test Cases have been designed.

Static testing



Testing of end products without software being run (e.g test of requirements).

The background of the slide features a stylized illustration. It shows the black silhouettes of three people sitting around a dark table, engaged in a meeting. The person on the left is seen from the back, while the other two are in profile. The table has several white papers on it. The background is a light blue color with faint, white geometric patterns resembling architectural lines or a grid.

Ways of doing testing

Let's go!

Scenario

Imagine that you're moved to a new testing project in which you will test the online shop of a famous retail company with only 4 products offered. The first assignment that you receive is to test the functionality of the purchase process.

Provided info

You only receive 2 pieces of information:

- All combinations of purchasing products should be tested, for all countries in which the company is available.
- The response time of every single page of the purchase process should be quick.

Testing session

While doing the test execution cycle you realized about the following:

- One of the products combinations is not working: a technical error appears after payment process.
- While doing all purchases you have realized that the average response time of every transition is more than 5 seconds.

Provided info

Groups of 4 people

Write down in a paper the conclusions of your testing process (10 minutes). Bear in mind your assignment, provided information and results of your testing session.

Conclusions

Minimum conclusions of the exercise:

- Requirements: What does it mean “quick response” -> Not estimable, not testable.
- Testing session: 2 main conclusions:
 - In a functional way the purchasing process can not be verified, as there is one combination of products that can not be bought.
 - From a personal tester point of view we guess that the average response time is worse. However we cannot be sure that is not acceptable for the stakeholders, as it's not specified in the requirements which is the minimum accepted response time between transitions.

What is Quality Assurance?

What is QA?



“Quality Assurance covers all the planned and systematic activities necessary to provide adequate confidence that a product or service meets the requirements for quality.”

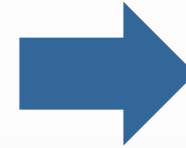


Which are these activities?

What is Quality Assurance?

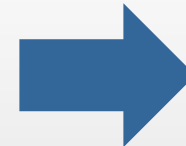
3 QA types of activities...

**Preventive
measures**



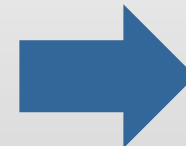
Actions focused at preventing a lack of quality (documentation, revision of requirements, standards...)

**Detective
measures**



Actions focused on uncovering a lack of quality by evaluation or testing (Quality control: execution of Test Cases).

**Corrective
measures**



Actions focused on correcting the lack of quality (reworking of defects).

Ten green 3D question marks are scattered around the central text box, with three in the top row, two in the middle row, and five in the bottom row.

Is there any activity related to
requirements that could be
considered as QA?

A young man in a white t-shirt and brown pants is leaning against the side of a dark blue car, pointing his right index finger towards the camera with a smile. A young woman with long brown hair is sitting in the driver's seat, looking towards the camera. The car is parked on a paved road with a grassy field and hills in the background. A semi-transparent grey rounded rectangle is overlaid on the right side of the image, containing the text.

QA on
requirements
helps to create
better
applications

What is Quality Assurance?

3 QA types of activities...

**Preventive
measures**



Actions focused at preventing a lack of quality (documentation, revision of requirements, standards...)

**Detective
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Actions focused on uncovering a lack of quality by evaluation or testing (Quality control: execution of Test Cases).

**Corrective
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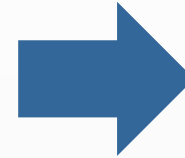


Actions focused on correcting the lack of quality (reworking of defects).

Ways of doing Testing

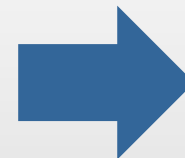
3 ways of doing testing...

Dynamic explicit testing



In the execution of dedicated Test Cases by running software, the actual and expected result is compared to determine if the system behaves as it should.

Dynamic implicit testing



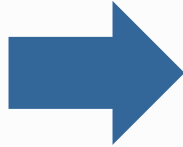
While the course of Dynamic explicit testing, we discover information about the system for which no explicit Test Cases have been designed.

Static testing



Testing of end products without software being run (e.g test of requirements).

BENEFITS



More quality

Improve quality on requirements helps to create a less buggy application.

Better quality on requirements helps to satisfy customers.

Less cost

Shorter development periods.

Less reworking on defects.

“Early testing, easier life”

The Baziuk Study (1995) estimates the relative cost to repair a defect found in Operations to be between 470 – 880 times the amount found in the Requirements phase of the lifecycle

Life Cycle Stage	Baziuk (1995) Study Costs to Repair when Found	Boehm (1976) Study Costs to Repair when Found ^a
Requirements	1X ^b	0.2Y
Design		0.5Y
Coding		1.2Y
Unit Testing		
Integration Testing		
System Testing	90X	5Y
Installation Testing	90X-440X	15Y
Acceptance Testing	440X	
Operation and Maintenance	470X-880X ^c	

^aAssuming cost of repair during requirements is approximately equivalent to cost of repair during analysis in the Boehm (1976) study.

^bAssuming cost to repair during requirements is approximately equivalent to cost of an HW line card return in Baziuk (1995) study.

^cPossibly as high as 2,900X if an engineering change order is required.

Summary

What about Testing and QA?

Performing static testing on requirements.

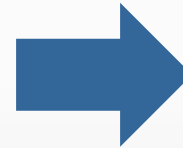
A grayscale photograph of a modern building with a glass facade and a flat roof, reflected in a body of water. The building has a series of vertical bars or columns on its facade.

Performing static testing on requirements

Requirements Testing

Testing of requirements should be seen from two points of view...

Business side



Does requirements fullfill business needs?

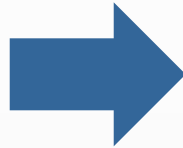
Technical side



Are requirements written in appropriate way?

Requirements Testing

Business side



How can we check that a
requirement fulfill business needs?

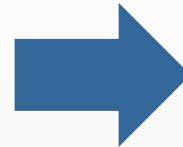


There is no an easier way to check
that, but QA provides some shared
methods to check correctness.

Static testing Types

Static testing types

Static testing types



Static analysis



Reviews

Informal review

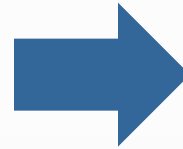
Walkthrough

Technical review

Inspection

Static analysis

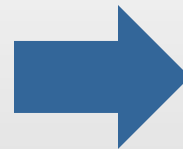
```
for i in people.data.users:
    response = client.api.statuses.user_timeline.get(screen_name=i.scre
    print 'Got', len(response.data), 'tweets from', i.screen_name
    if len(response.data) != 0:
        ldate = response.data[0]['created_at']
        ldate2 = datetime.strptime(ldate, '%a %b %d %H:%M:%S +0000 %Y'
        today = datetime.now()
        howlong = (today-ldate2).days
        if howlong < daywindow:
            print i.screen_name, 'has tweeted in the past', daywindow,
            totaltweets += len(response.data)
            for j in response.data:
                if j.entities.urls:
                    for k in j.entities.urls:
                        newurl = k['expanded_url']
                        urlset.add((newurl, j.user.screen_name))
        else:
            print i.screen_name, 'has not tweeted in the past', daywind
```



Static analysis is focused on checking that the code of the application adheres to the industry standards.



The application is not running while doing static analysis.

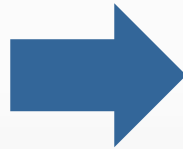


Normally, this type of static testing is done by using static analysis test tools.

Static analysis

Static analysis

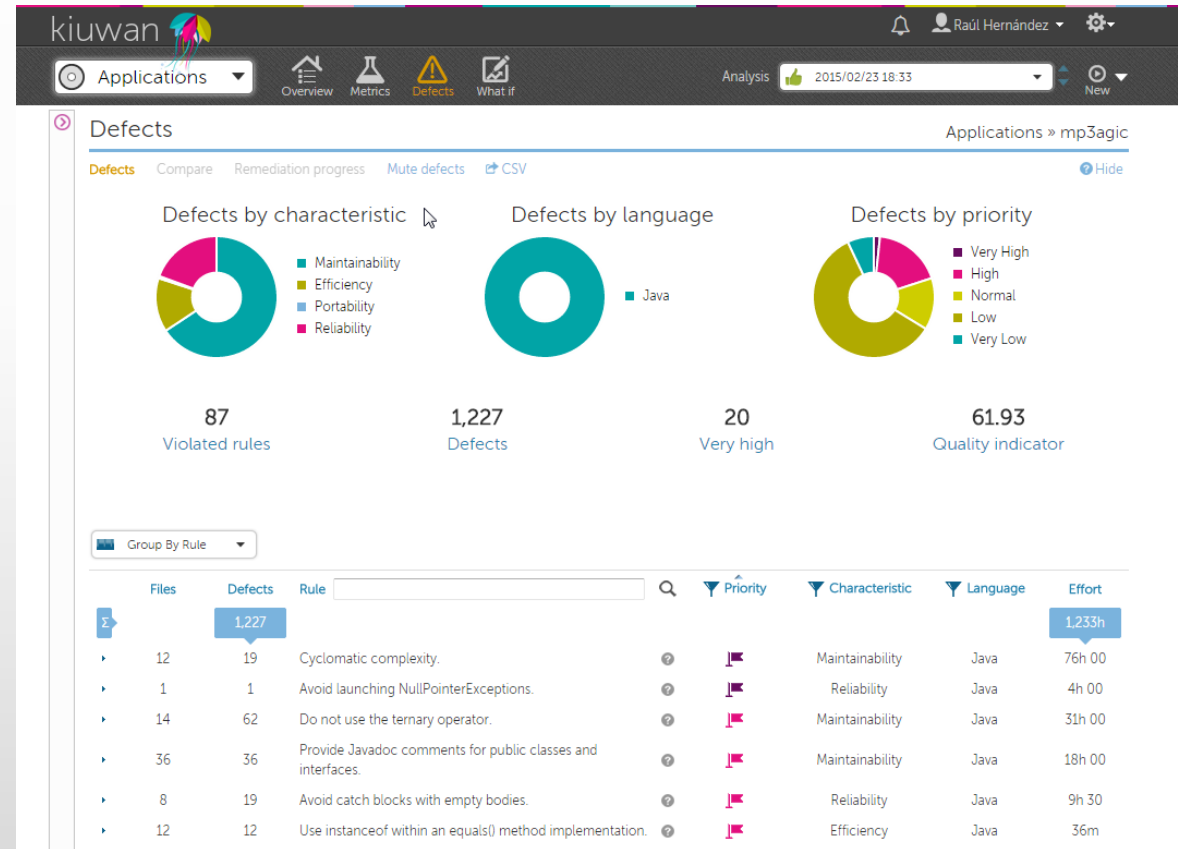
They're able to provide metrics classifying incidences found in our code.



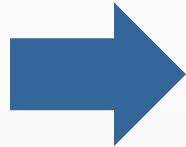
Static analysis tools (e.g Kiuwan or SonarQube) shows inconsistencies in our code according to standards.



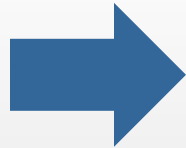
Static analysis



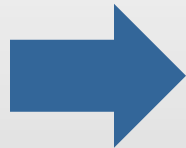
Static analysis



They're able to find bugs, and not only potential failures.



It helps to detect areas in the code that needs for simplification/refactoring.



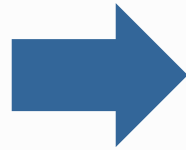
It detects flaws or programming code errors.

Static analysis

Reviews



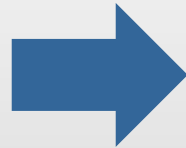
def·i·ni·tion n. 1.
The teacher gave de
of the new words.
of an image (pict
... TV screen



It is a shared exercise to reach common agreements on important documents (e.g requirements).



It also could help to find out irregularities and flaws into these documents.

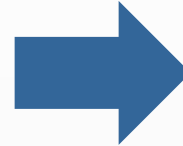


Reviews can be applied for any document produced during development process (e.g. Requirements, test cases, designs...)

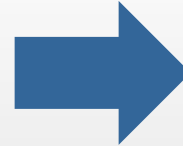
Static testing Types

Static testing types

Static testing types



Static analysis



Reviews

Informal review

Walkthrough

Technical review

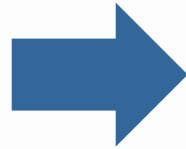
Inspection

Reviews

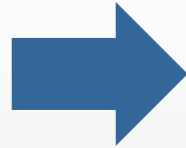
Informal review

and reproduction of the original.
The degree of clarity at which a televised image
broadcast signal is received.

def·i·ni·tion n. 1.
The teacher gave definitions
of the new words.
of an image (picture)



Specially used when requirements are being built.



Normally, they are run under a peer review focus:
author and reviewer.



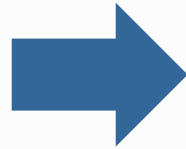
They do not follow any process or procedure: their
purpose is to check about quality on requirements
before a more formal review.

Reviews

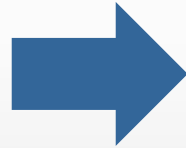
Walkthrough

and reproduction step...
The degree of clarity at which a televised image broadcast signal is received...

def·i·ni·tion n. 1.
The teacher gave definitions of the new words.
of an image (picture) on a TV screen



The author of the requirements explain their content to a prepared set of stakeholders.



The author normally lead this meeting once he/she has finished writing requirements.



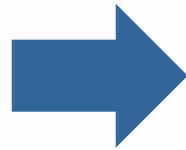
Attendants to this meeting are normally stakeholders representing business interests.

Reviews

Technical review

and reproduction step...
The degree of clarity at which a televised image broadcast signal is received...

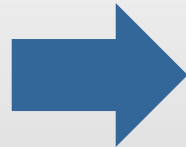
def·i·ni·tion n. 1.
The teacher gave definitions of the new words.
The clarity of an image (picture) on a TV screen.



The purpose is to check if technical language/requirements are understandable enough.



The author needs to convince two levels of stakeholders: business representatives and technical resources (e.g developers).



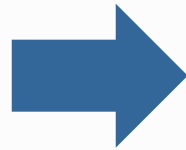
It's not the most formal review technique: business people sometimes is not able to provide with concrete data on technical aspects.

Reviews

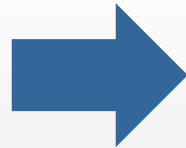
Inspection

and reproduction step...
The degree of clarity at
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Inspection is a review type useful when requirements need to be validated against external documents (e.g APIs).



This review type is the most formal one as it requires a previous preparation, and we know in advance against which documents we are going to face our requirements.



It can also be used to check that our requirements fulfill legal or standard documents.

Is this enough to check the validity of our requirements?





How we can check technical correctness of a requirement?

used on finding a
holders.

have not been

account all aspects
that makes a requirement correct from a syntactic
point of view.

Requirements static validation

Technical side

*The following factors should be considered
when reviewing a User Story...*



Completeness

Consistency

Unambiguity

Realisable

Testable

Traceable

Specific

Measurable

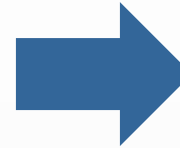
Acceptable

Achievable

Independent

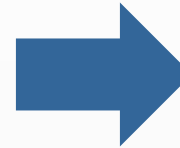
Requirements static validation

Completeness



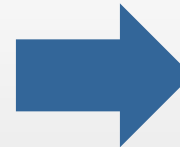
Does it have all the information it is supposed to? Does it have traceability from previous documentation or discussions?

Consistency



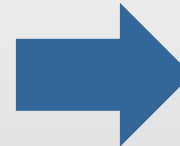
The way the specification is formatted, the language used and the way the requirements are presented should be consistent throughout the document.

Unambiguity



Is it free of statements such as 'timely manner'?

Realisable



Does the requirement make sense and it is possible?

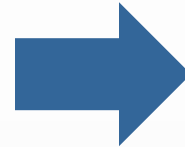
Testable



If the requirement is not testable, it cannot be built.

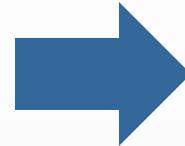
Requirements static validation

Traceable



Who wants this requirement, why is it needed, and what business strategy does it support?

Specific



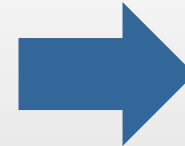
Has all of the information been included to not contain general statements?

Measurable



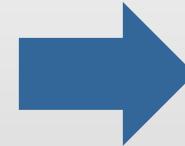
How you measure that the requirements have been delivered?

Acceptable



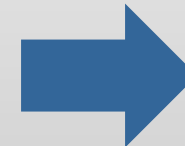
Is the use of calculations, language, logic and formulas correct?

Achievable



Is the requirement achievable in a reasonable time?

Independent



Try to keep requirements as independent as possible.

The background of the slide features a light blue background with a pattern of white geometric shapes, resembling a stylized cityscape or architectural drawing. In the foreground, there are black silhouettes of three people sitting around a table, engaged in a discussion. The person on the left is seen from the back, while the other two are in profile. Papers are scattered on the table in front of them.

Assess quality of User Stories

Practice exercise

User Stories

In your Agile team, review the following User Stories (15 minutes):

- US 1: The Software will be written in JAVA.
- US 2: The program will connect to the DB via a connection pool.
- US 3: As a staff member, I want to be able to add details of the training courses I have attended quickly, so that I can track my training history.
- US 4: As a staff member, I want to be able to print a report, so that I can attach the report to my performance appraisal.
- US 5: As a customer, I want to be able to easily apply for a loan, so that I can purchase a house.
- US 6: As a bank client, I want to be able to see my details, before I make a transaction request.
- US 7: The system needs to be able to produce reports, that look like the current ones.



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Thank you.

Questions?

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