Test in the development lifecycle

Gitte Ottosen
Gitte.ottosen@capgeminisogeti.dk
Twitter:godtesen

A bit about me

Gitte Ottosen
Capgemini Sogeti Danmark A/S
Gitte.ottosen@capgeminisogeti.dk
+45 52189711

Education

Corporal in the Royal Danish Airforce

Certifications

SCRUM master, ISEB foundation/practitioner, CAT trainer, Tmap Test Engineer, Tmap Test Manager, TPI Next foundation

Experience

- 21 years in the IT business
- 4 years in Capgemini Sogeti

Focus

Test management, test engineering, SCRUM, process improvement, LEAN, agile, context driven test, change management

Agile Experience

Customers: Systematic Software Engineering A/S, Mærsk Line IT, DONG, KMD, TDC

Network

Test20/Tecpoint, CAT trainer network
Fellow Sogeti Labs

How do you want your car tested?

Why Early Test

SDLC phaces	Defect Introduction	Defect Detection
Requirement Specification/Analysis	55 %	5%
Design	30 %	10%
Construction and System Test	15 %	40%
Acceptance test, Production and Maintenance	0 %	45%

- *Source:*
- *Boehm, Barry W Software Engineering Economics*
- *Engelewood Cliffs, N.J: Prentice Hall, Hughes*
- *DOD composite Software Error History*

Why Early Test

- If we develop 90% correct

Requirement	Analysis	Design	Code
90% correct	90% correct	90% correct	90% correct

Accumulated effect whn 90% correct			
90% correct	81% correct	72% correct	65% correct

Why early test

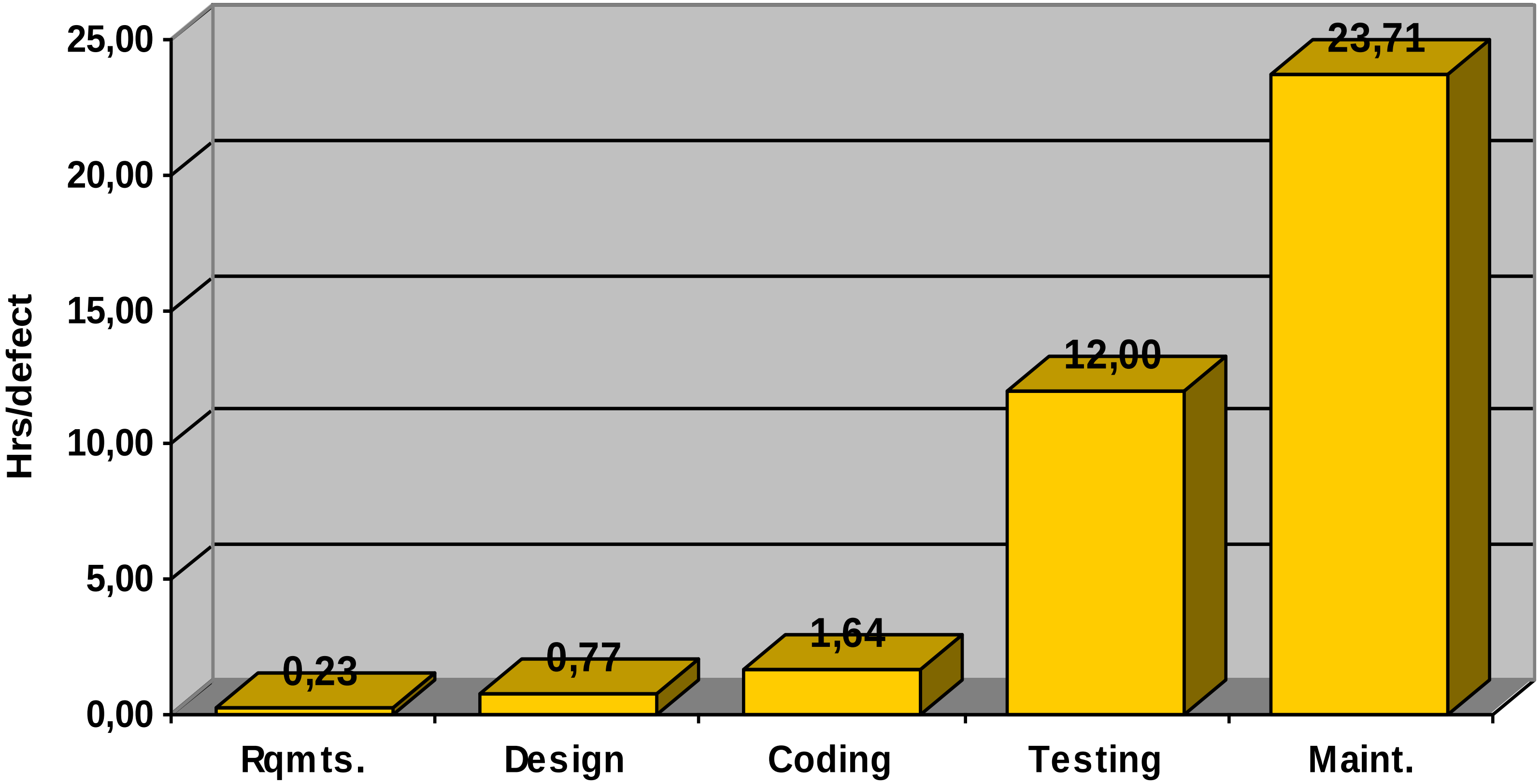
- If we develop 85% correct

Requirement	Analysis	Design	Code
85% correct	85% correct	85% correct	**85% correct**

Accumulated effect with 85% correct			
85% correct	72% correct	61% correct	**52% correct**

- *Kilde: Teradyne Software and Systems Test Inc. 1999*

The Price for Fixing a Bug

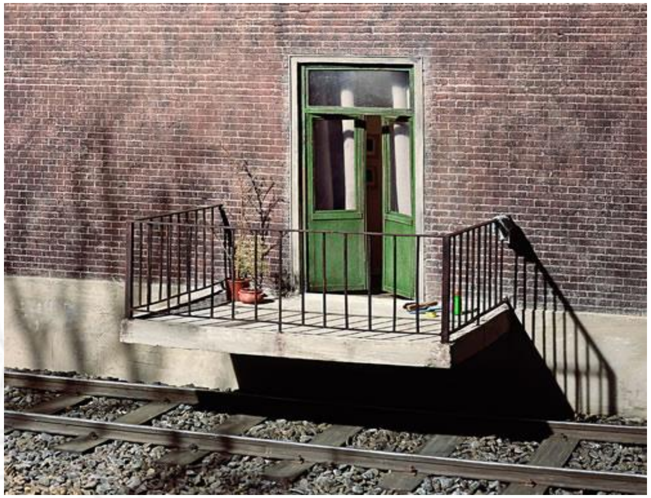


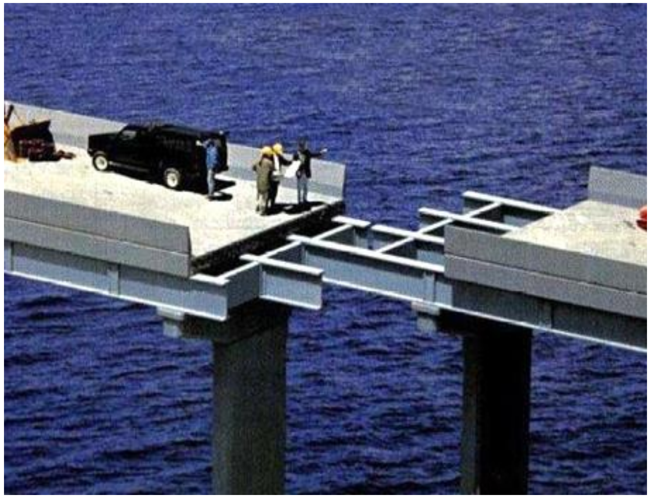
But What is Early Test?

- Review
- Unit test
- Exploratory test of user stories
- Automated regression test

But it is just a bug….

Et par eksempler på fejl





F-22 Raptor

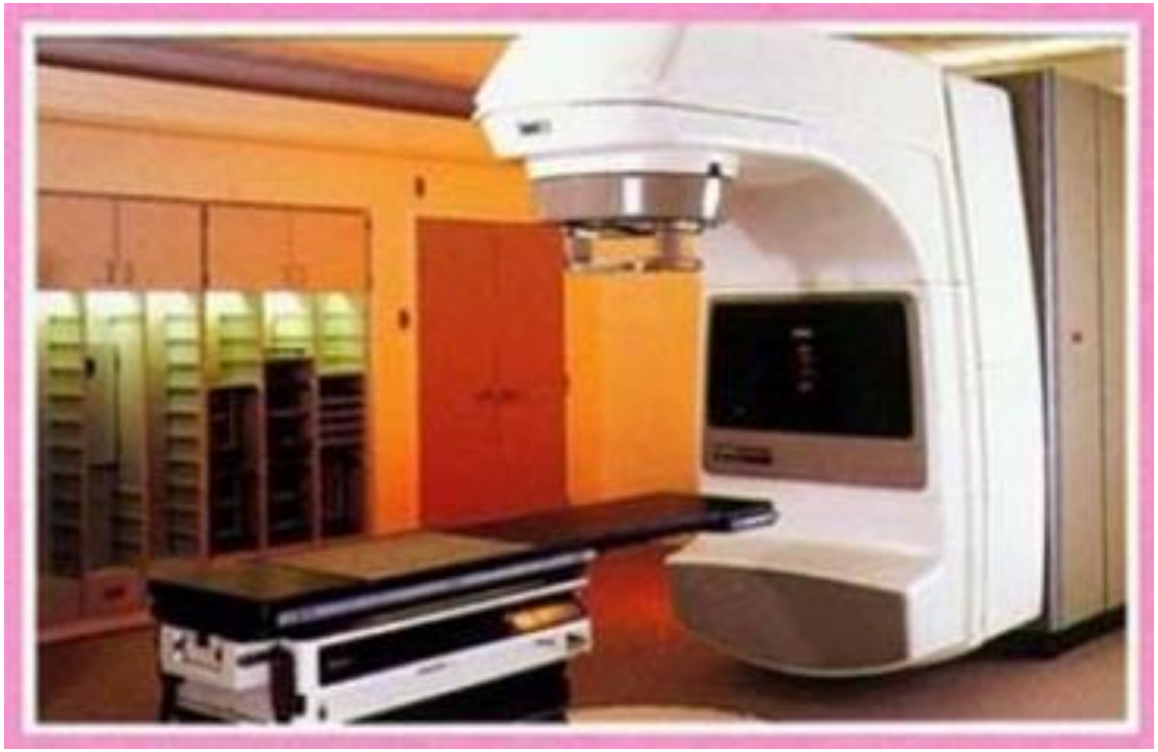
Gitte
Sea of Japan
ea
rea
大阪
Osaka
Japan
North Pacific Ocean
Honolulu
HAWAII
Hawaii

Ariane 5

$370 millions

failure due to an error in the software design caused by assertions having been turned off, which in turn caused inadequate protection from integer overflow.

Therac-25

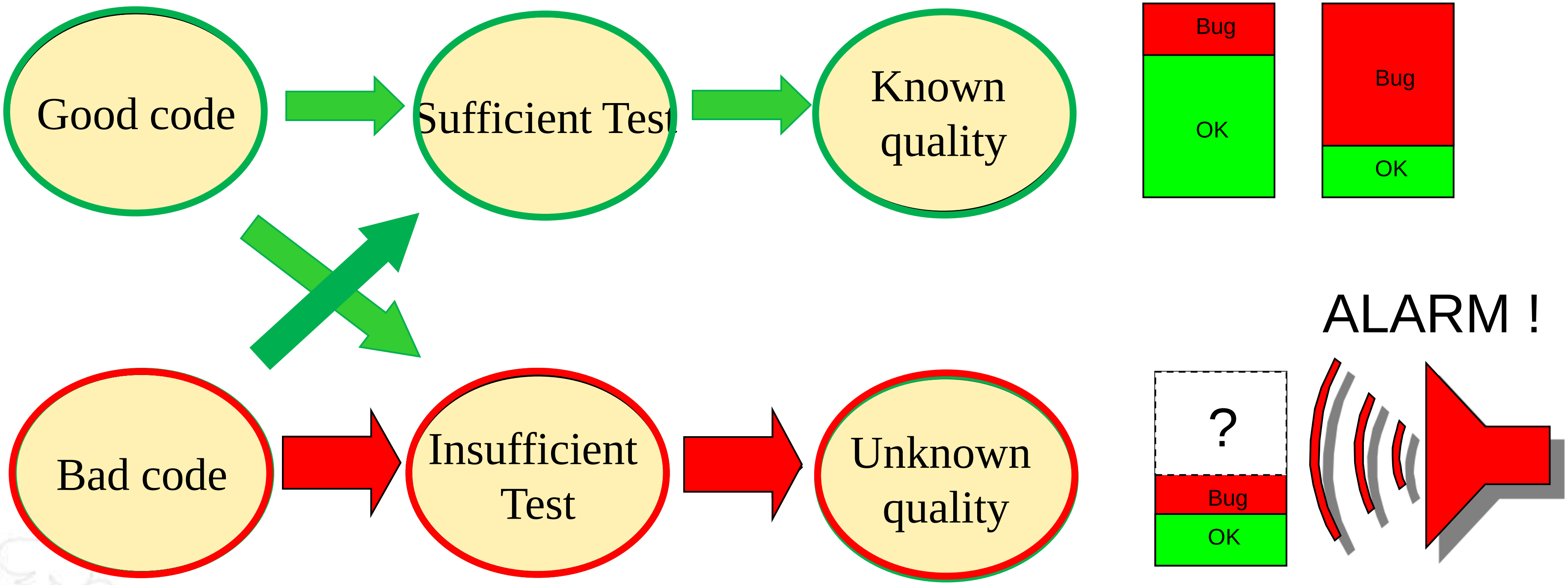


Massive overdosis – 4 døde og 2 alvorligt skadede

Root Cause Therac 25

- AECL did not have the software code independently **reviewed**.
- AECL **did not consider the design** of the software during its assessment of how the machine might produce the desired results and what failure modes existed.
- The system noticed that something was wrong and halted the X-ray beam, but **merely displayed the word "MALFUNCTION" followed by a number from 1 to 64**. The user manual did not explain or even address the error codes, so the operator pressed the P key to override the warning and proceed anyway.
- AECL personnel, as well as machine operators, initially did not believe complaints. This was likely due to overconfidence.
- AECL **had never tested the Therac-25 with the combination of software and hardware** until it was assembled at the hospital.

Sufficient Test – Known Quality



Good code

Sufficient Test

Known quality

Bad code

Insufficient Test

Unknown quality

Bug

OK

Bug

OK

ALARM !

?

Bug

OK

The agile manifest

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

Individuals and interactions	***over***	**processes and tools**
Working software	***over***	**comprehensive doc.**
Customer collaboration	***over***	**contract negotiation**
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.

Reference
Kent Beck, Mike Beedle, Arie van Bennekum, Alistair Cockburn
Ward Cunningham, Martin Fowler, James Grenning, Jim Highsmith
Andrew Hunt, Ron Jeffries, Jon Kern, Brian Marick, Robert C. Martin
Steve Mellor, Ken Schwaber, Jeff Sutherland, Dave Thomas

The agile manifest - Misunderstood

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

Individuals and interactions	***over***	~~**processes and tools**~~
Working software	***over***	~~**comprehensive doc.**~~
Customer collaboration	***over***	~~**contract negotiation**~~
Responding to change	***over***	~~**following a plan**~~

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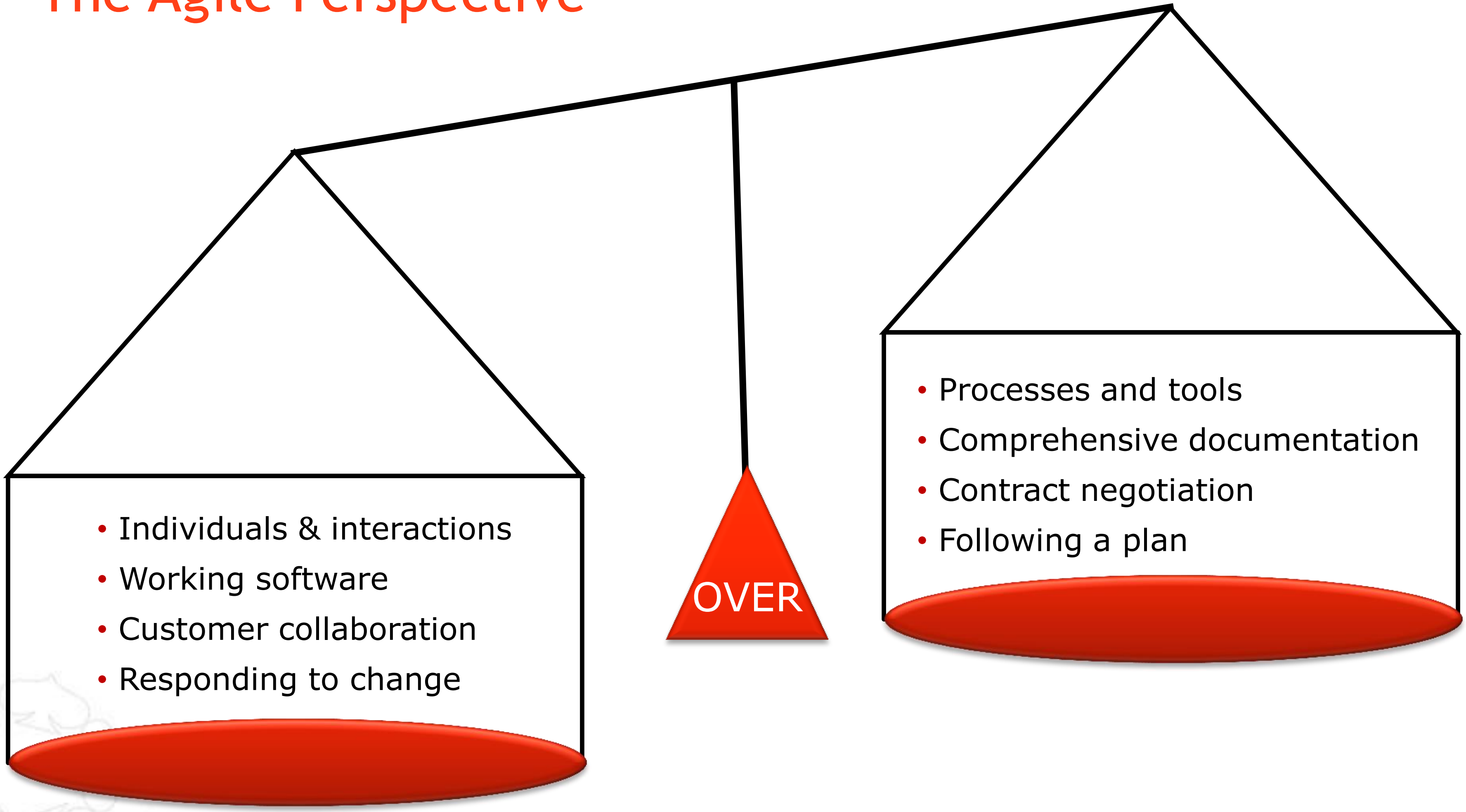
The Agile Perspective



- Individuals & interactions
- Working software
- Customer collaboration
- Responding to change

OVER

- Processes and tools
- Comprehensive documentation
- Contract negotiation
- Following a plan

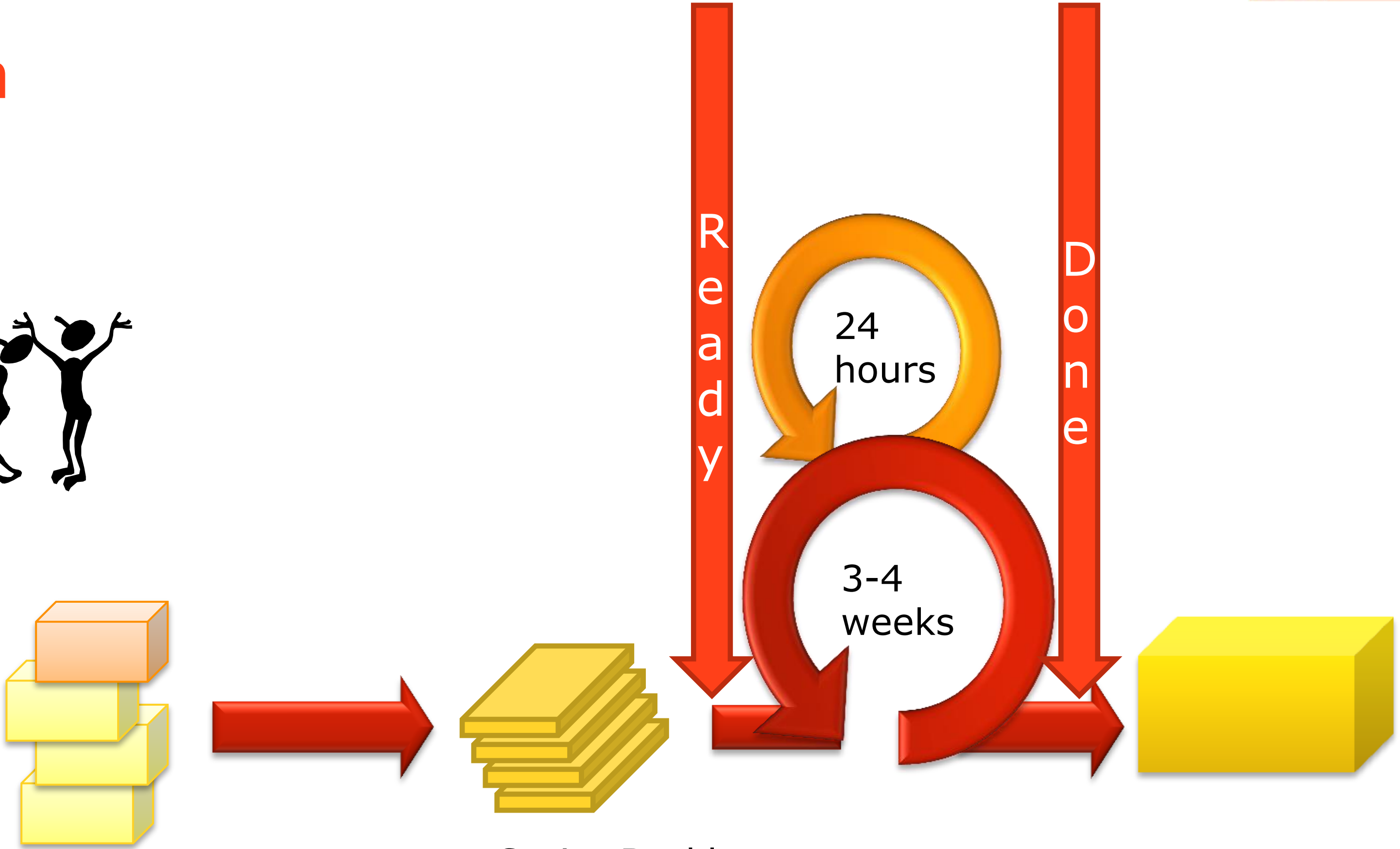
The 12 Agile Principles

1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
2. Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
3. Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
4. Business people and developers must work together daily throughout the project.
5. Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
7. Working software is the primary measure of progress. Agile processes promote sustainable development.
8. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
9. Continuous attention to technical excellence and good design enhances agility.
10. Simplicity--the art of maximizing the amount of work not done--is essential.
11. The best architectures, requirements, and designs emerge from self-organizing teams.
12. At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

Capgemini

SOGETI

Scrum



Product Backlog
Prioritized by customer

Sprint Backlog
Broken down by
SCRUM team.

Testet product ready
for release

What Changes with Agile

Feedback

- Faster delivery of business benefits
- Reduced risk through early delivery

Quality

- Higher quality of deliverables through continuous testing

Adaption

- Continuous learning and improvement
- Iterative planning and communication

Empowerment

- Improved teamwork and morale through empowerment and self organisation

Visibility

- Business have control over priorities through continuous collaboration
- More accurate reporting through delivery of working product

Traditional versus Agile Projects

	Plan driven	Agile
Change	Manage & control it	Change is inevitable – embrace and expect it
Planning/test design	Comprehensive upfront plans/test design	Plan/design as you go
Documentation	Can be heavy	Minimised - Only as much as necessary
Handoffs	Formal entry/exit criteria	Team Collaboration
Test Automation	System level built by tool specialists, created after code is 'done'	All levels, built by anyone, an integral part of the project

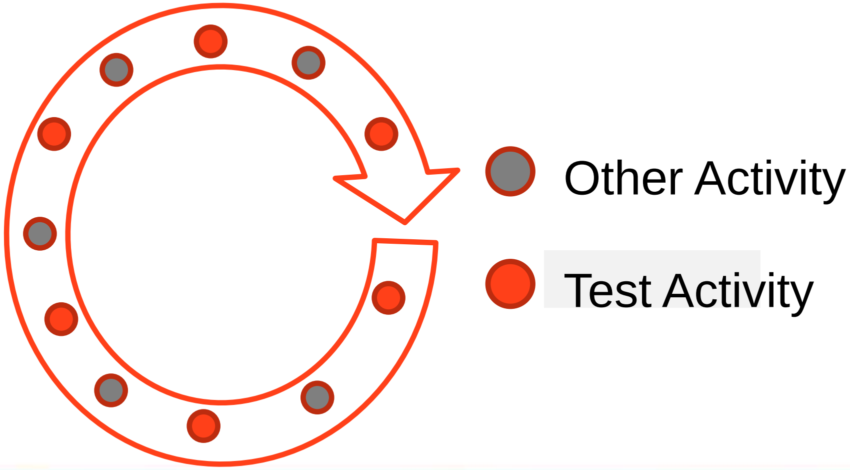
Source: Elizabeth Hendrickson

Challenges

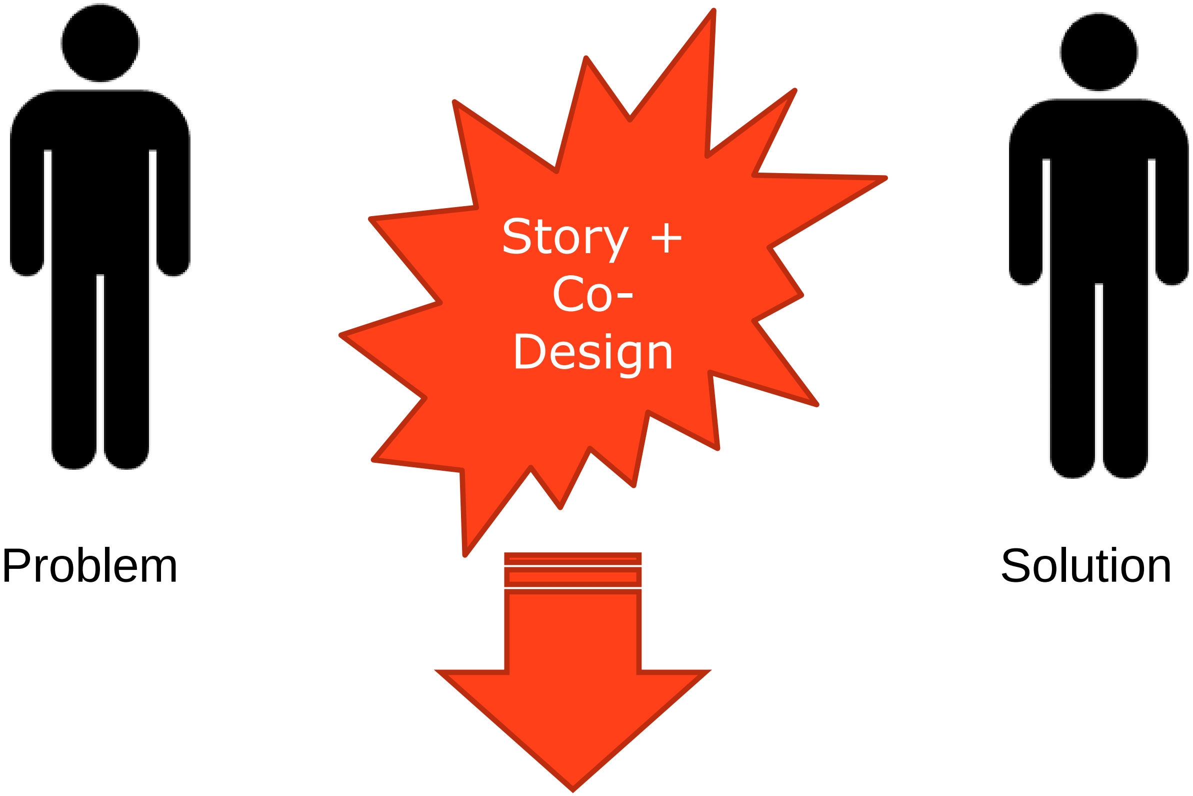
- Test becoming bottleneck
- Common ownership of quality
- Non functional issues
- Insufficient technical knowledge
- System integration test
- Too little focus on ”done”
- An effective test automation strategy
- Role of test and test manager
- Empowerment

Test in Agile Projects

- Test is done continuously through the iteration, it is NOT a finishing activity
- All team members take part in the test activities – quality is a shared responsibility.



Define Acceptance Criteria

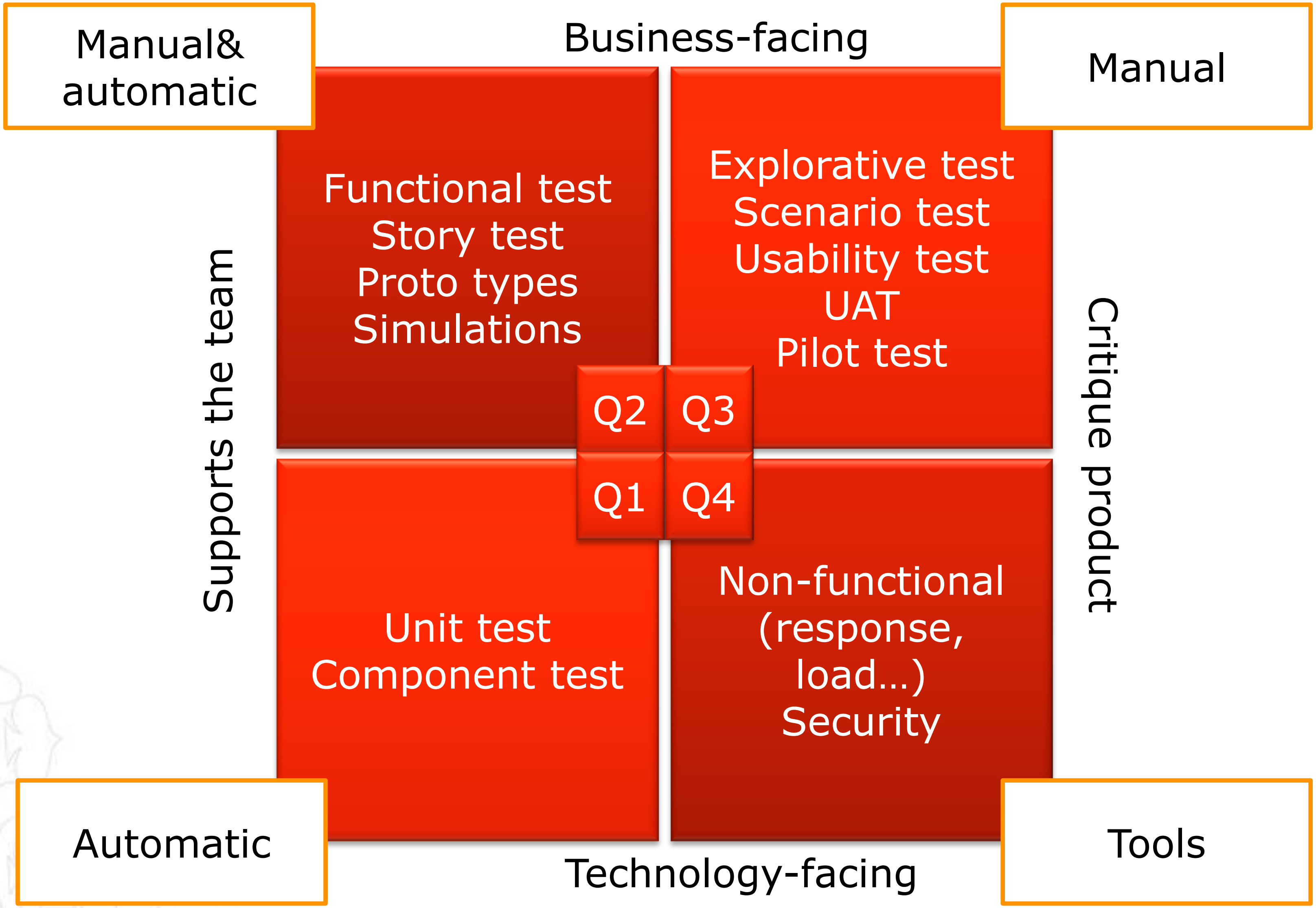


Acceptance Criteria
- I can find all users
- I can sort the result according to price
- …

Details
- Cookies will be used to store…
- E-mail must be validated….
- …

SMART Requirement

- Specific
- Measurable
- Acceptable
- Relevant
- Timespecific



Business-facing

Manual& automatic

Manual

Supports the team

Critique product

Functional test
Story test
Proto types
Simulations

Explorative test
Scenario test
Usability test
UAT
Pilot test

Q2 Q3

Q1 Q4

Unit test
Component test

Non-functional (response, load…)
Security

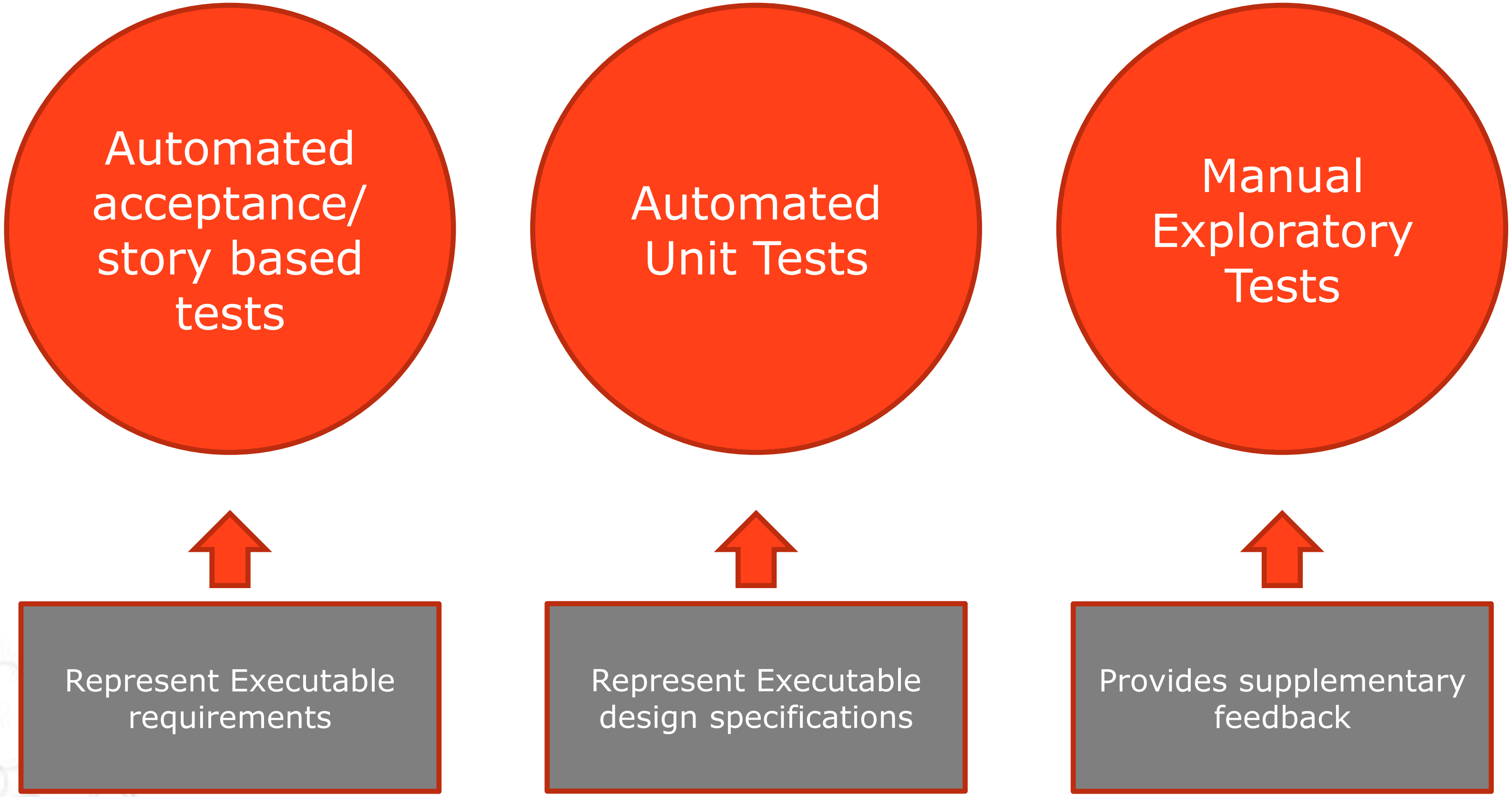
Automatic

Tools

Technology-facing

Source: Brian Marick

Testing Within a Sprint



Automated acceptance/ story based tests

Automated Unit Tests

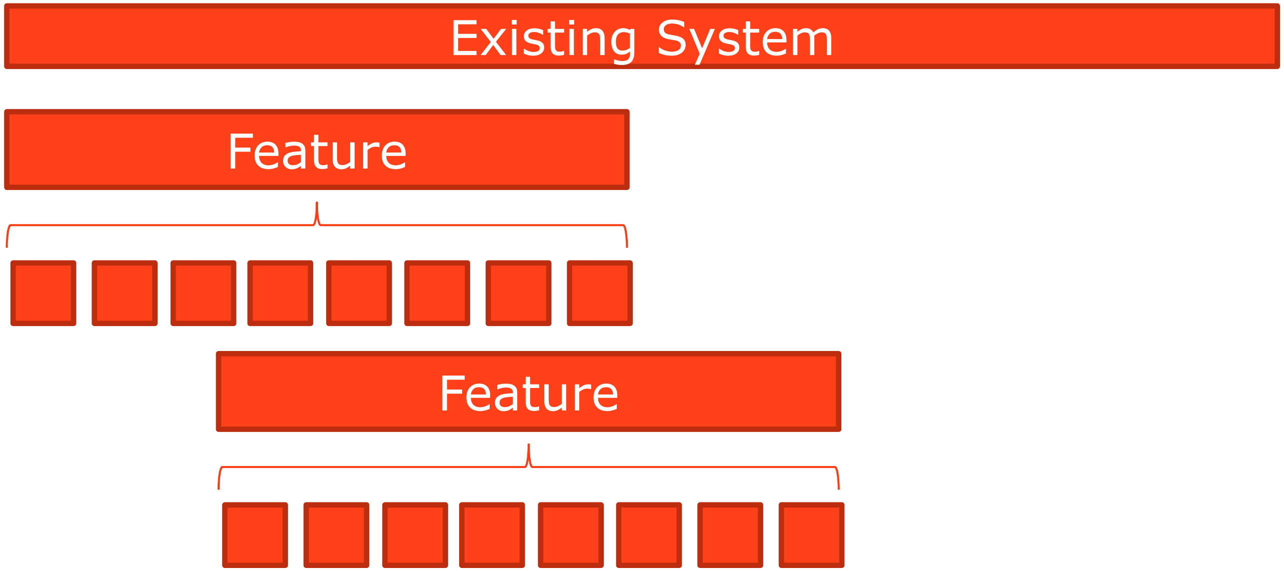
Manual Exploratory Tests

Represent Executable requirements

Represent Executable design specifications

Provides supplementary feedback

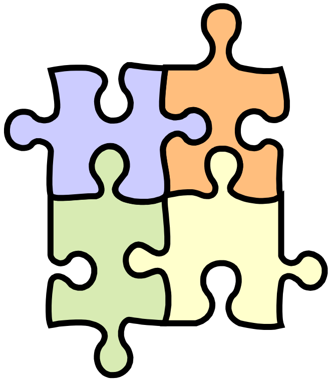
Is It Enough? – Remember the Big Picture



Existing System

Feature

Feature



Think about the testing quarants

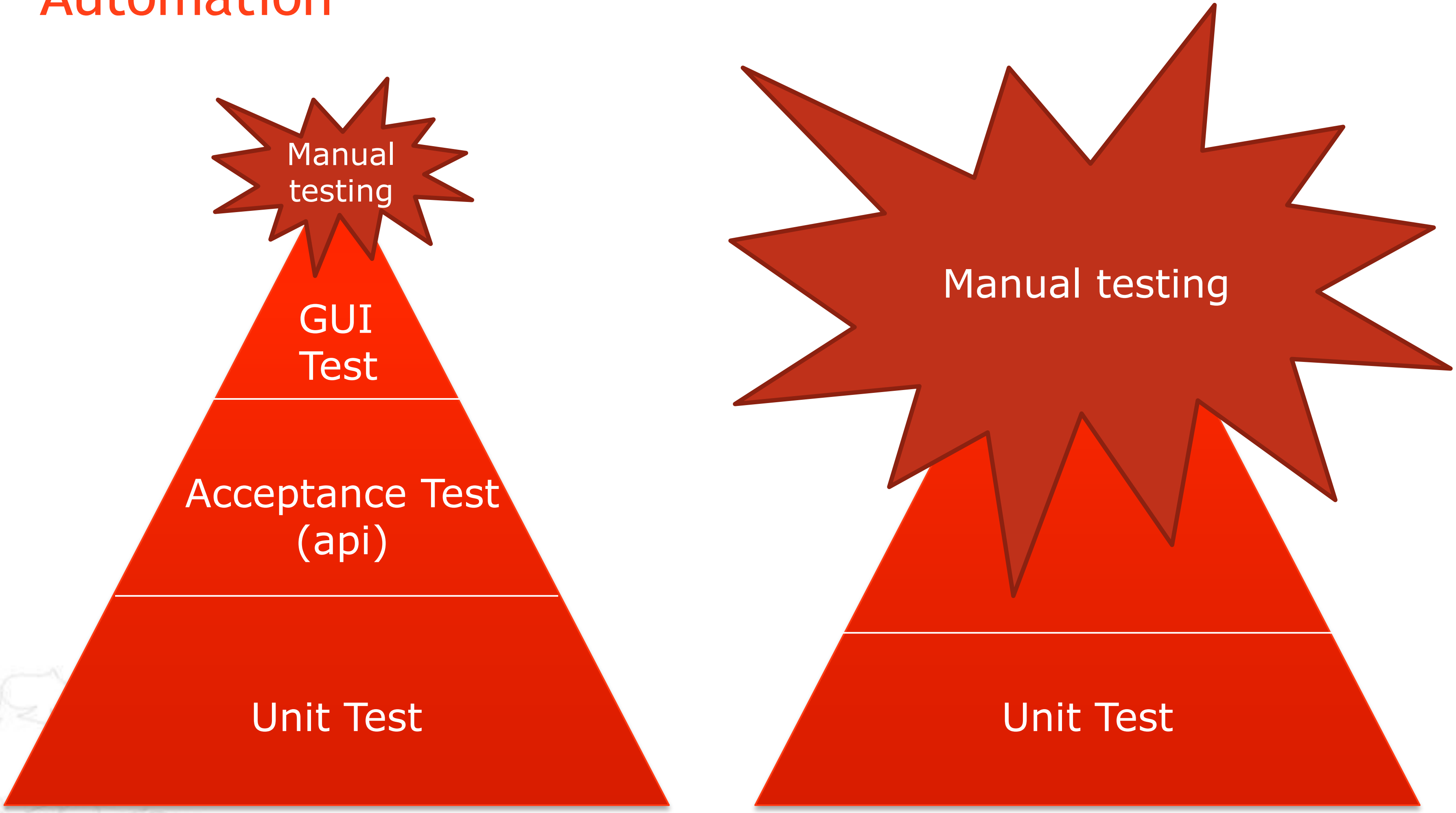
Unit test
Component test

Functional test
Story test
Proto types
Simulations

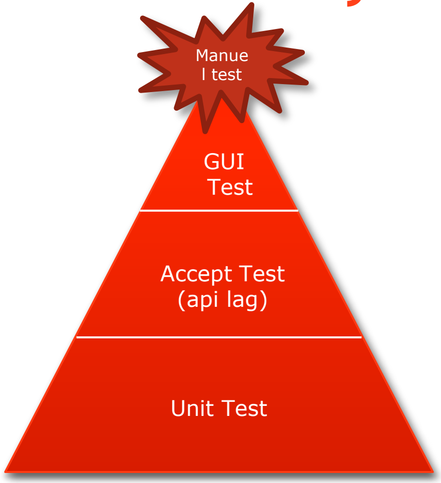
Explorative test
Scenario test
Usability test
UAT
Pilot test

Non-functional (response, load…)
Security

Automation


Manual testing
GUI Test
Acceptance Test (api)
Unit Test
Manual testing
Unit Test

The Test Pyramid - Context is Everything…



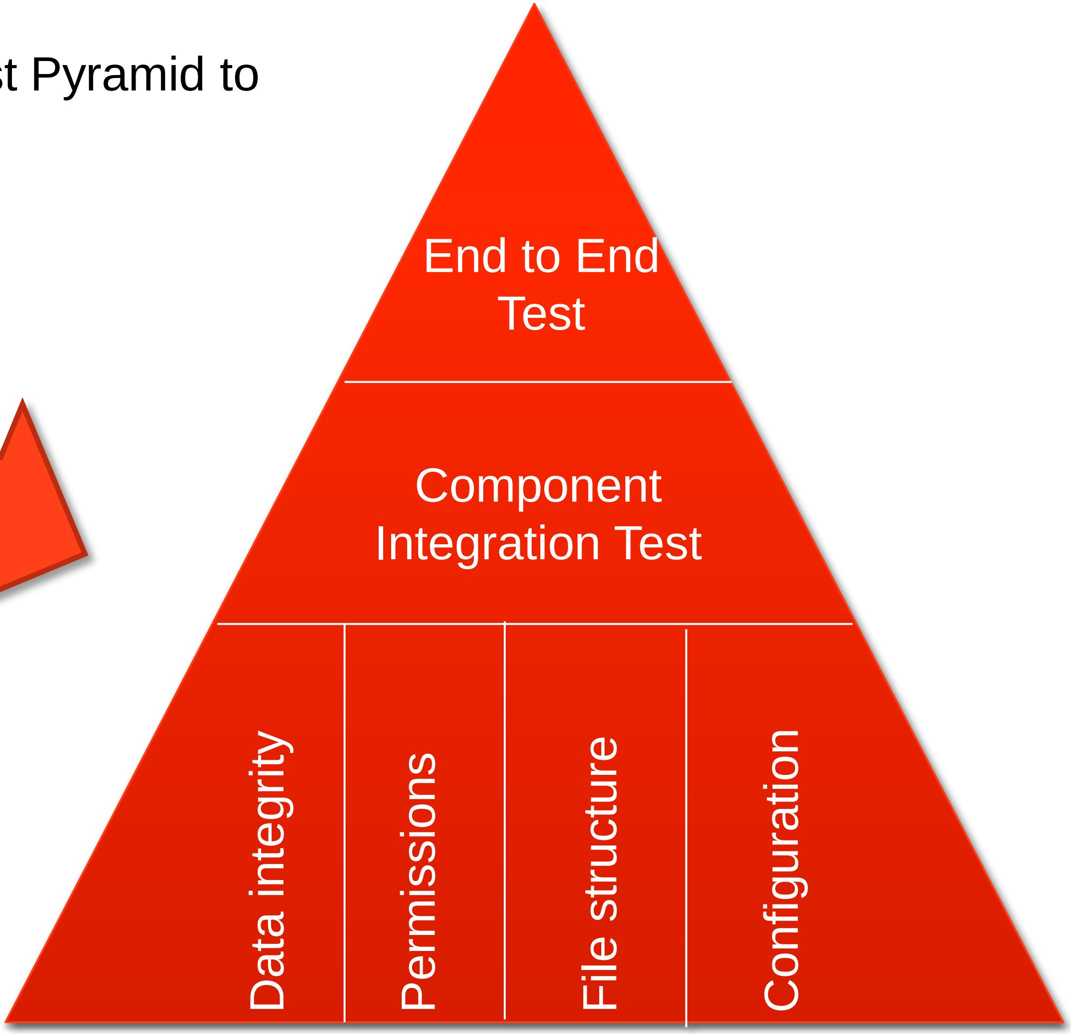
Manue l test

GUI Test

Accept Test (api lag)

Unit Test

Adapt the Test Pyramid to your needs



End to End Test

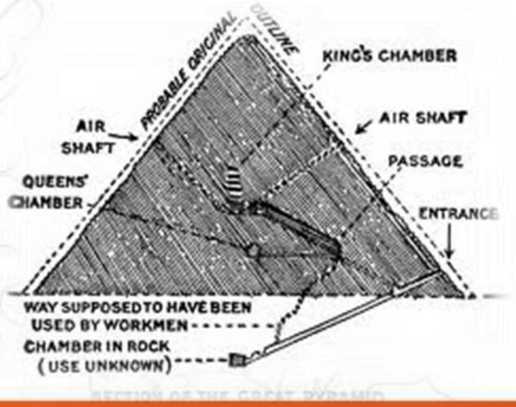
Component Integration Test

Data integrity

Permissions

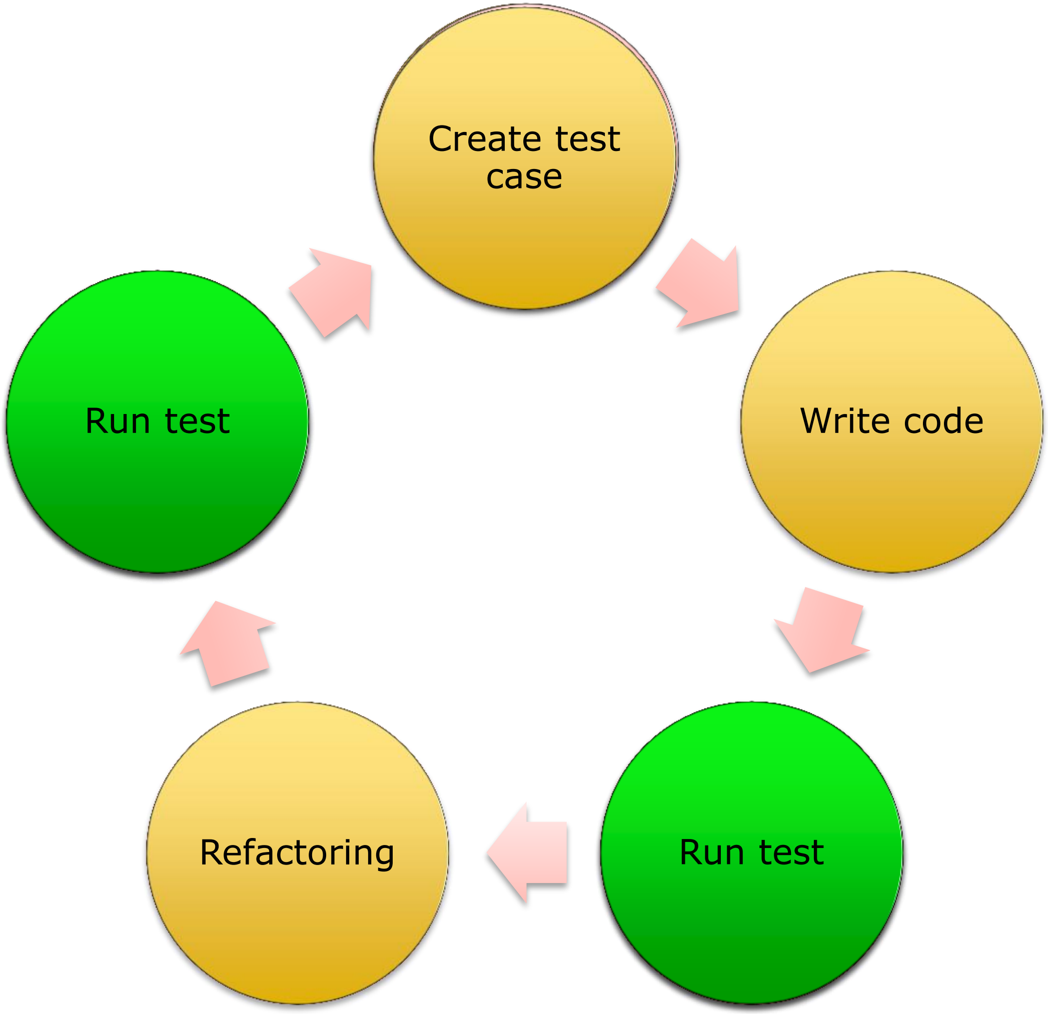
File structure

Configuration


PROBABLE ORIGINAL OUTLINE
KING'S CHAMBER
AIR SHAFT
AIR SHAFT
QUEENS' CHAMBER
PASSAGE
ENTRANCE
WAY SUPPOSED TO HAVE BEEN USED BY WORKMEN
CHAMBER IN ROCK (USE UNKNOWN)
SECTION OF THE GREAT PYRAMID

Source: Lisa Crispin

Test-driven development - How it works

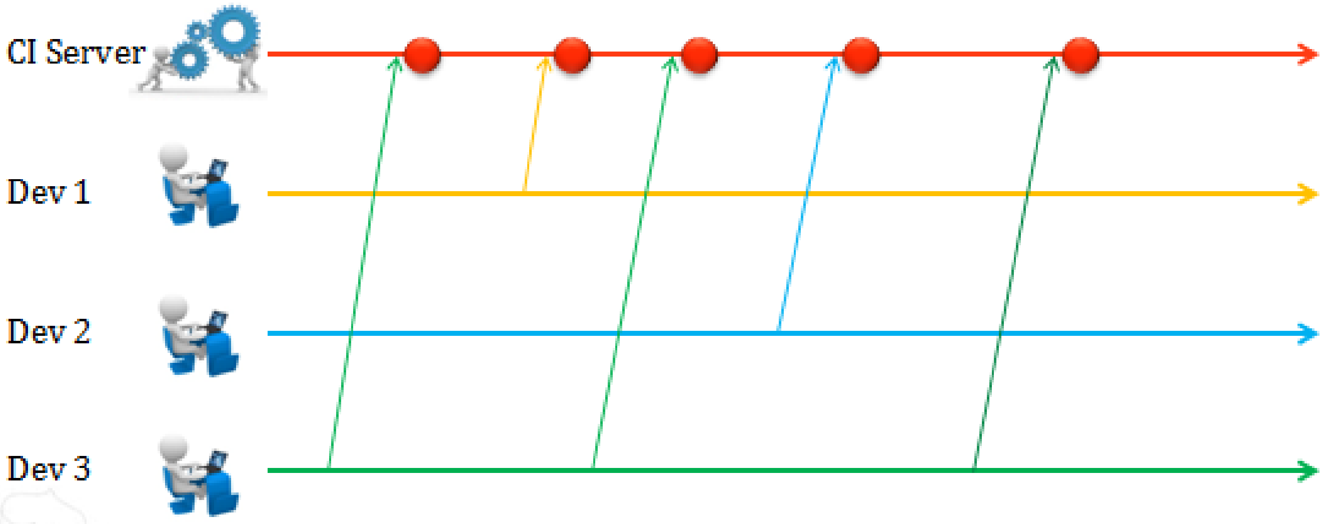


The Role of a Tester - Integration

Integration strategy

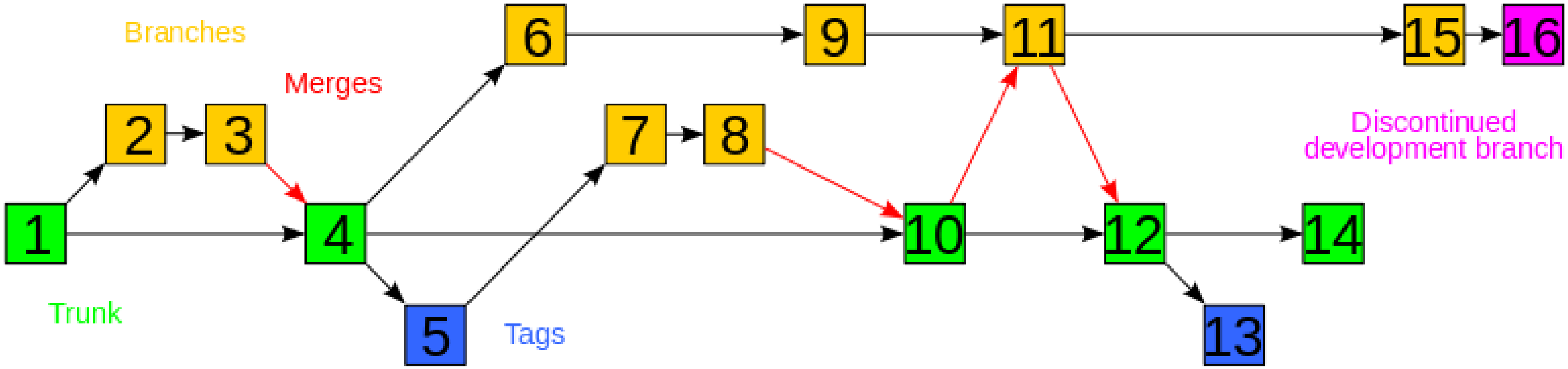
Consider both: design and test

Dependencies



● = Build, test, notify about defects

Configuration Management Tools



Source code

Automated tests
Manual tests

Other work products

Behavior-driven development

Describes the expected behavior of the software

Define acceptance criteria based on the given/when/then format:

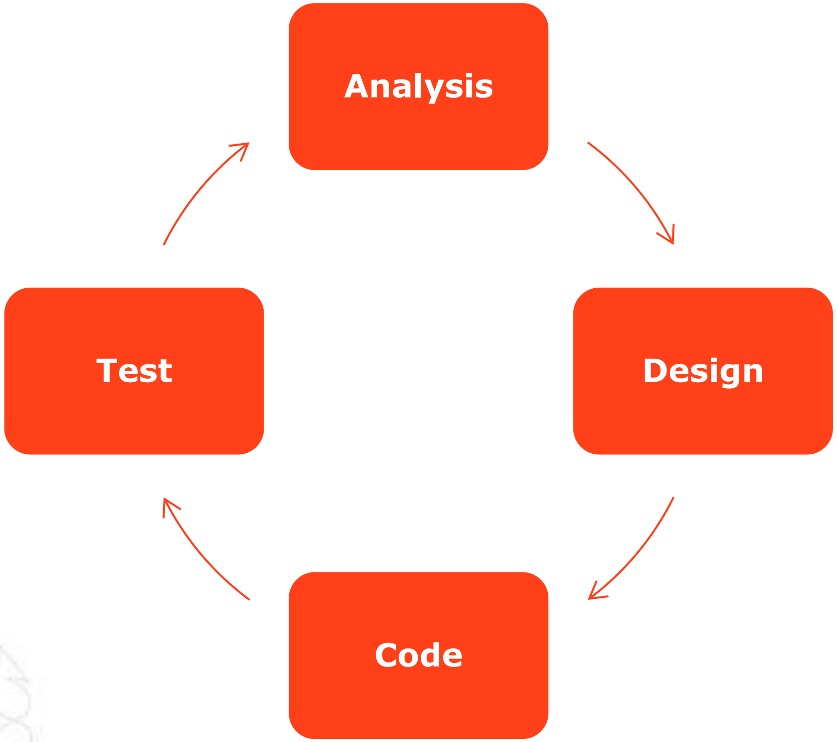
- Given some initial context,
- When an event occurs,
- Then ensure some outcomes.

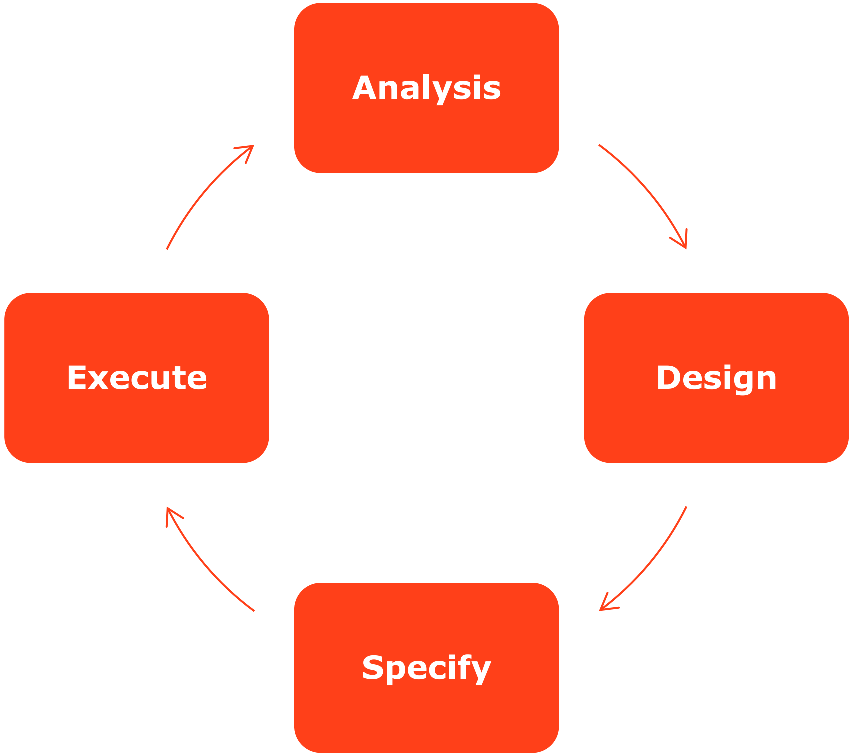
Behavior-driven development frameworks

- Create accurate Unit test
- Focused on business needs

What is Structured Testing

A Cycle for Development… And Testing





AND THAT GOES FOR ALL TEST LEVELS

Unit integration test

Unit test

System integration test

System test

Acceptance test

Non functional test types

Review

A Pairwise Example

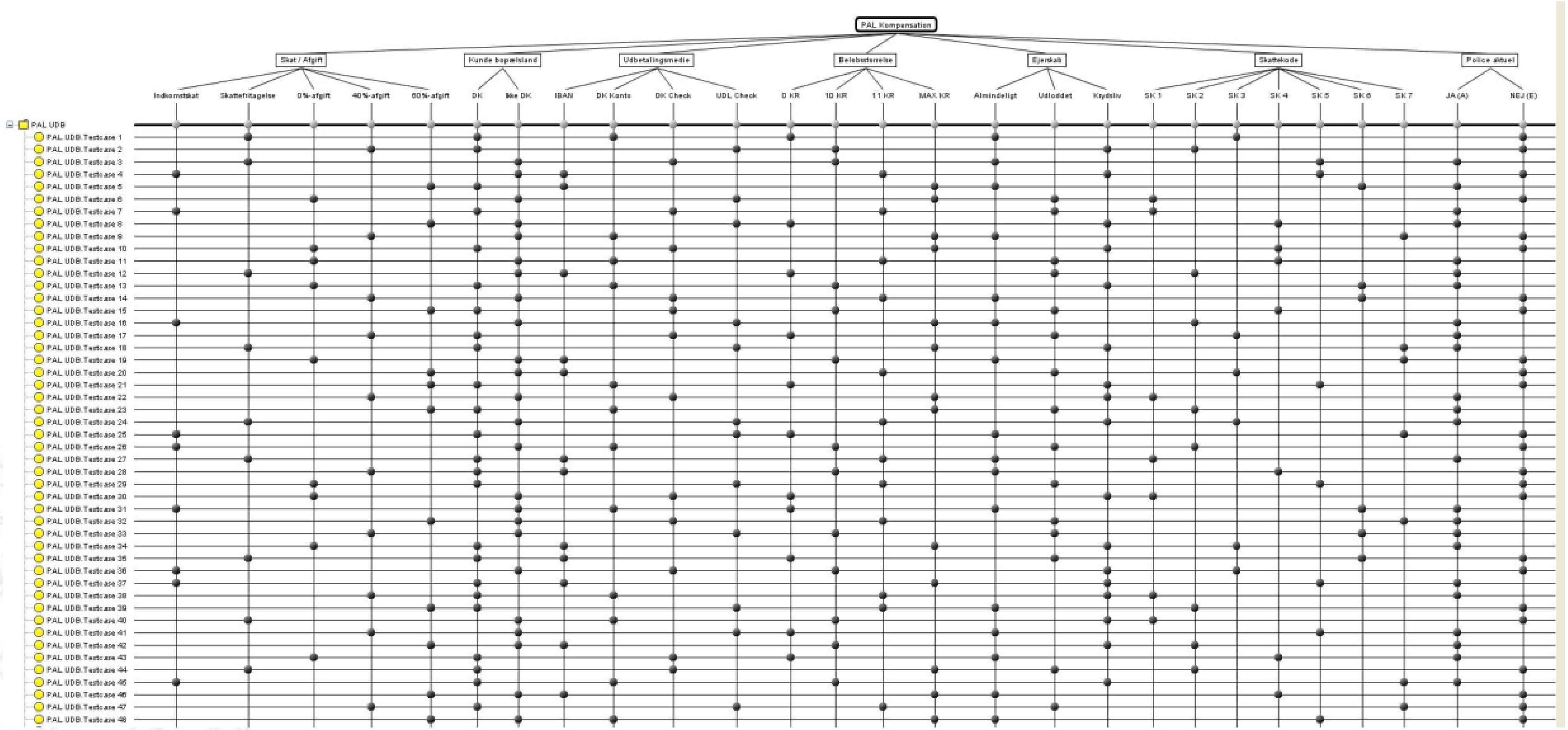
- Tax / Tax
  - Income Tax, Tax exemption, 0% tax, 40% tax, 60% tax
- Customer's country of residence
  - Denmark, Not Denmark
- Payment media
  - IBAN, DK account, DK-Check, UDL-Che
- Amount
  - 0 kr., 10 kr., 11 kr., Max kr.
- Ownership
  - Commonly, Distributed, Krydsliv
- Tax code
  - SK1, SK2, SK3, SK4, SK5, SK6, SK7
- Actual policy
  - Yes (A), No (E)

Number of combination

5 * 2 * 4 * 4 * 3 * 7 * 2 = 6.720

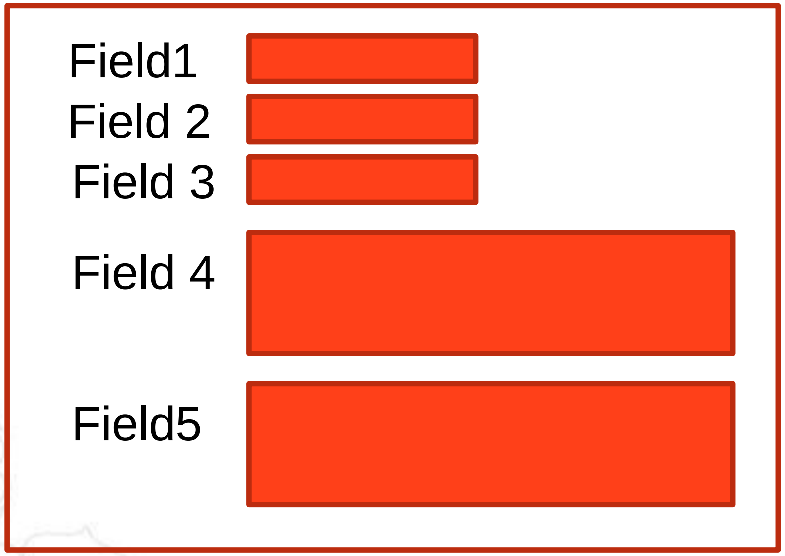
With pair wise
38 test cases (0,6%)

With triple-wise
178 test cases (2,6%)



Classification tree and triple-wise

Equivalence Partitioning and Classification Tree



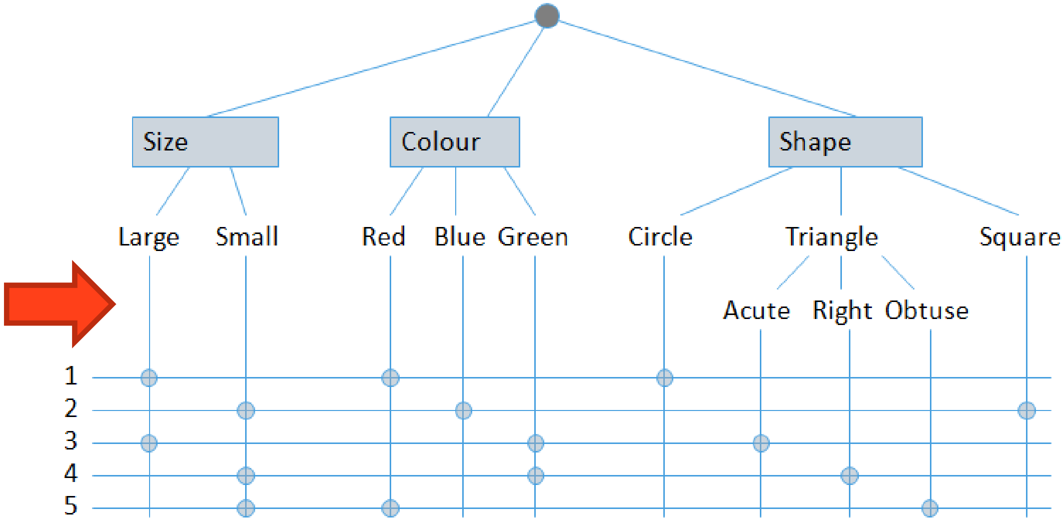
Field1

Field 2

Field 3

Field 4

Field5



Size

Colour

Shape

Large Small

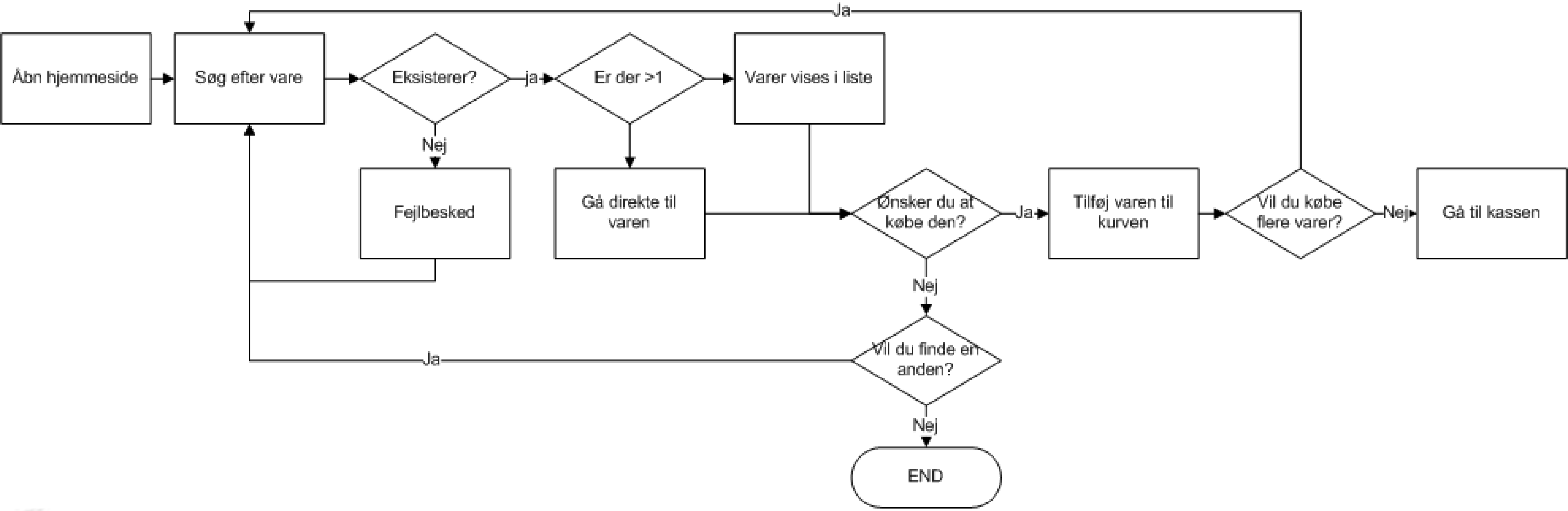
Red Blue Green

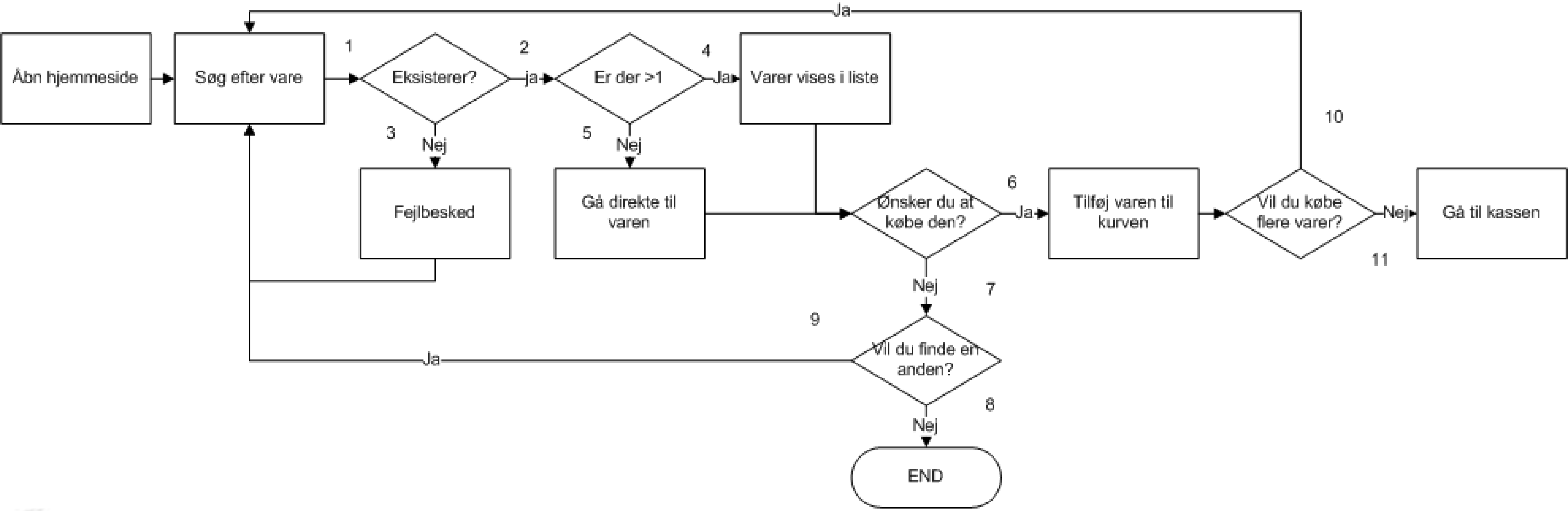
Circle Triangle Square

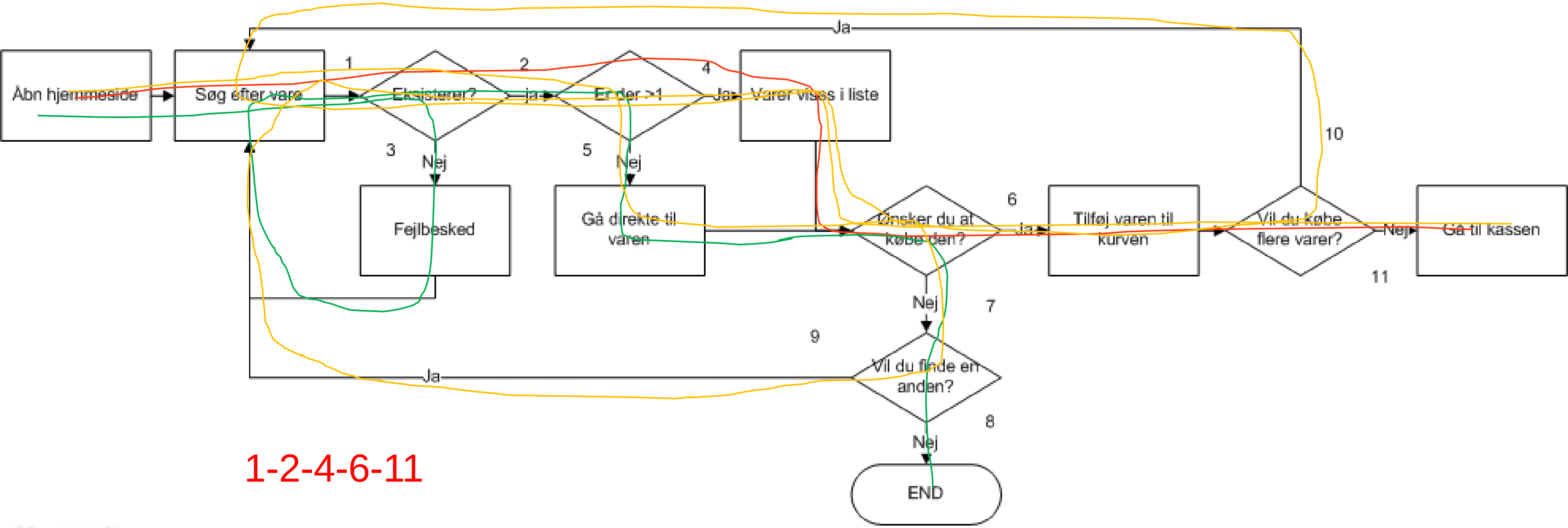
Acute Right Obtuse

	Large	Small	Red	Blue	Green	Circle	Acute	Right	Obtuse	Square
1	●		●			●				
2		●		●						●
3	●				●		●			
4		●			●			●		
5		●	●						●	

Workflows with the Users Glasses




Åbn hjemmeside
Søg efter vare
1
Eksisterer?
2
ja
Er der >1
4
Ja
Varer vises i liste
3
Nej
Fejlbesked
5
Nej
Gå direkte til varen
Ønsker du at købe den?
6
Ja
Tilføj varen til kurven
Vil du købe flere varer?
10
Ja
Nej
11
Gå til kassen
Nej
7
9
Vil du finde en anden?
Ja
8
Nej
END



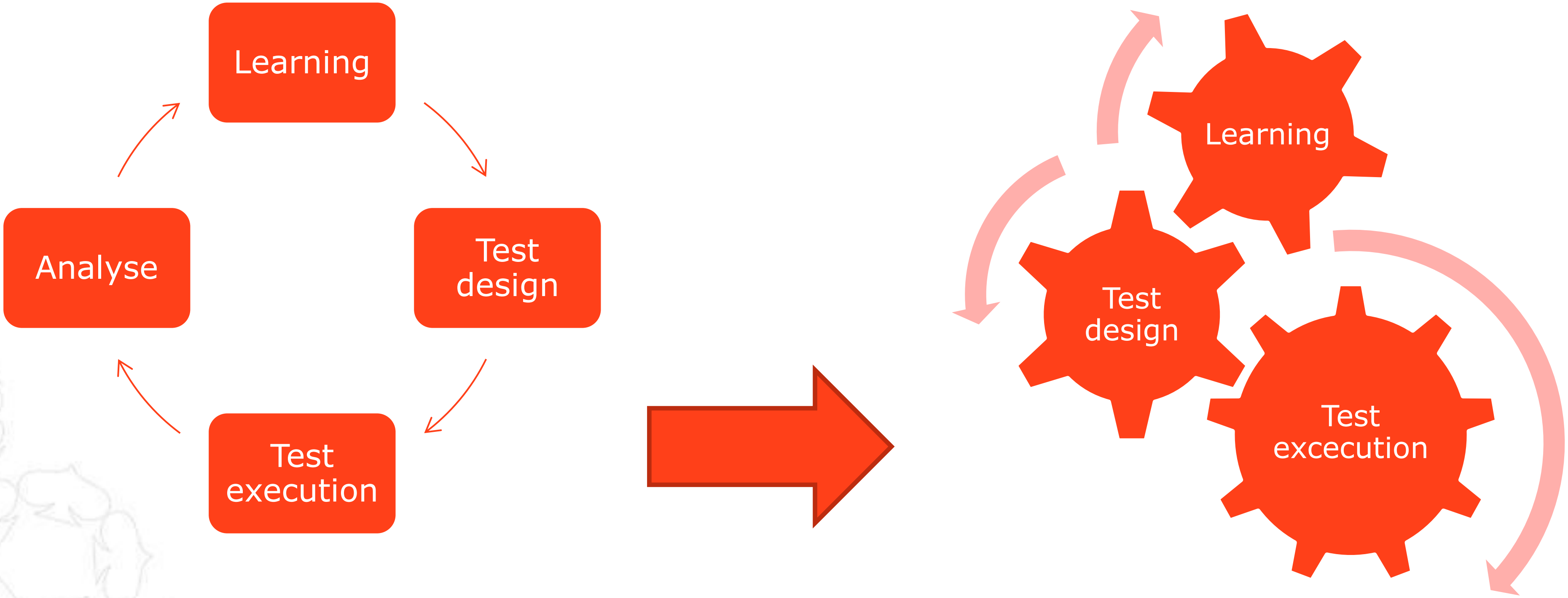
1-2-4-6-11

1-3-1-2-5-7-8

1-2-4-7-9-1-2-5-6-10-1-24-6-11

Exploratory Testing and Agile Testing - ET

Exploratory testing is simultaneous learning, test design, and test execution.



Cycle

Continous

Capgemini

SOGETI

Exploratory Testing and Agile Testing -Test charter

Heuristics

Pair wise

Equivalence partitionering

Boundary value analysis

Syntax test

Semantic test

State-transition test

Data combination test

Mnemonics

Procescyklustest

Decision Tables

Usecase test

All in All – Who Tests?

- Everybody!!
  - Business. With the focus that what is developed can be used ”in the real world”.
  - The tester. With the focus that specification and requirements are implemented – with focus on bughunting.
  - The Developer. With the focus that he/she has build the software right

EVERYBODY REVIEWS – that is also testing... Just static