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# Test education for University and University of Applied Science, an update

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## Introduction

- Deployed at Bartosz ICT BV
- >20 years in testing
- Co-author TestGrip, TestFrame, Project de Baas, Quality Supervision, Textbook testing for universities of applied science (in press)
- Test expert online magazine Computable
- Publication areas; Testproces Improvement, BI-testing, Testautomation, test education, quality supervision
- Review committee Valid2014
- Review committee Eurostar 2014
- Founder of the “Houten groep”
- Member of several working parties Dutch Testing Society:
  - Model Based Testen
  - Test education for University and University of Applied Science

## Interpretation of the problem

There are several reasons to start working on this topic;

- Company's depends on IT
- Software glitches still increases
- The complexity of the IT is increasing. Test must increase the quality level to stay in line
- New development methods like Agile requires other skills
- Test must become more professional

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## Interpretation of the problem

The working party has defined 4 goals:

- Inventory of the current situation in the Netherlands
- Is there a need for a new study?
- Defining a curriculum for the new study
- Implementation of the new study?



## The status in 2013

The status was:

- First part of the inventory finished
- Curriculum in development stage
- Validation already started
- Pr & Marketing, Implementation must be started



## Inventory current situation test education in the Netherlands

Respondents:

| Type of university               | Total number | Number of respondents |
|----------------------------------|--------------|-----------------------|
| Universities                     | 11           | 2                     |
| Universities of applied sciences | 29           | 8                     |

Current situation:

| Subject                       | Year |   |   |   | Type of University |
|-------------------------------|------|---|---|---|--------------------|
|                               | 1    | 2 | 3 | 4 |                    |
| Introduction to testing       | X    |   |   |   | UAS                |
| Testing techniques            | X    |   |   |   | UAS / U            |
| Test organization             |      |   |   | X | UAS                |
| Test phases                   |      | X |   |   | UAS                |
| Review of requirements        |      | X |   |   | UAS                |
| Test execution                |      | X |   |   | UAS                |
| Defect management             |      | X |   |   | UAS                |
| Model based testen            |      |   |   | X | UAS / U            |
| Testing & development methods |      |   |   | X | UAS                |
| Testmethods                   |      |   |   | X | UAS                |
| Testtypes                     |      |   |   |   | UAS                |
| Development testplan          |      |   |   |   | UAS                |
| Testtools                     |      |   |   |   | U                  |

**UAS = University of Applied Science**

**U = University**

**Conclusions:**

- No. of respondents around 20%
- Mixed picture
- General & common items are educated based on the response



## Status 2014 curriculum

Curriculum based on generic description of the council of the University of Applied Science:

Structure of the curriculum is:

- Based on architecture layers of the E-competence framework
- Following the System Development Life Cycle (=SDLC)
- Spread over 3 maturity levels
- Supported by literature list



# "Test education for University and University of Applied Science"

| Generic module                   |
|----------------------------------|
| What is testing?                 |
| Why is testing important?        |
| When can there be tested?        |
| Range of testing                 |
| Risk based testing               |
| Applying Quality models          |
| Phases in the test process       |
| Validation & Verification        |
| Test organizations               |
| Properties of a good tester      |
| Roles in test                    |
| Test & development methodologies |
| Test & sourcing models           |



| Business Processes   | Analysis   | Advise   | Design   | Development   | System Management |
|--|--|--|--|---|-------------------|
| Level 3<br>Inspection final products multiple business processes<br>Applying standards such as ISO 25010 | Advise possible improvements relevant business processes | Definition test plan business processes (lateral thinking)<br>Quality supervision<br>Process simulation multiple business processes<br>Design test cases:<br>Model based<br>Definition metrics | Perform testcases multiple business processes<br>Acceptance procedure<br>Quality supervision                           | Management of knowledge<br>Selection of tooling<br>Fall back scenario                       |                   |
| Level 2<br>Review single business process: walkthrough / formal (technical) review                       | Moderation of business process simulation                | Testplan: multiple levels<br>Design test cases:<br>Complex test cases<br>Multiple business processes   | Perform complex test cases single business process<br>Execution test cases by hand of tooling<br>Collection of metrics | Configuration management<br>Change management<br>Root cause analysis<br>Security management |                   |
| Level 1<br>Perform informal review single business process.  |  | Structured based definition of simple test cases single business process   | Perform simple test cases single business process  | Testing of emergency procedures<br>Manage test ware   |                   |

| Infrastructure  | Analysis  | Advise   | Design  | Development  | System Management   |
|---|---|--|---|--|---|
| Level 3<br>Inspection final product complex network<br>Determining acceptance criteria (security, non-functional)<br>Perform risk analysis  | Recommend legal consequences chosen infrastructure                | Design test cases diverse IT landscape<br>Toolselection & -installation<br>Definition test plan, test strategy & impact analysis   | Perform test cases for complex large-scale network (possibly distributed)<br>Applying test tooling<br>Metrics<br>Development of stubs & drivers | Selection of system management tooling<br>Risk analysis infrastructure changes (lateral thinking)<br>Definition back up policy<br>Licensing policy | Manage test environment<br>Risk assessment updates in existing test environment<br>Landscape (lateral thinking)<br>Simulators |
| Level 2<br>Validate proposed infrastructure for complex network infrastructure by using acceptance criteria<br>Calculation/objectives by measuring infrastructure for using standards such as ISO 25010 (Product quality) | Possible improvements to the infrastructure based on test results | Definition of needed metrics<br>Drafting test cases for a complex infrastructure<br>Design set up test environment + configuration management<br>Selection of test tooling | Perform test cases for a simple infrastructure<br>Setup test environment  | Configuration management<br>Change management<br>Root cause analysis<br>Testing of complex multiple infra releases                                 | Setting up and developing test automation<br>Perform complex test cases<br>Collecting metrics (coverage techniques)           |
| Level 1<br>Simulation of a safety plan<br>Informal review specifications simple network   |   | Compose test cases for a simple infrastructure<br>Collecting and applying benchmark data   | Organization of test environments<br>Setup test data  | Manage test ware<br>Testing simple infra patches   | Perform simple test cases<br>Setup emulators<br>Testing of patches in maintenance<br>Manage test ware                         |

| User Interaction   | Analysis                     | Advise   | Design   | Development   | System Management  |
|--|------------------------------|--|--|---|--|
| Level 3<br>Inspection final product in conjunction with other products on the basis of acceptance criteria (using W3C infrastructure and matter knowledge)<br>The psychology of learning |                              | Presentation of the result analysis + advice how further | Test plan: Complex system multiple aspects based on the context and/or the chain. Risk based (lateral thinking)<br>Select the required tooling   | Perform test cases using usability lab.<br>Defect management<br>Metrics<br>Result analysis  | Selection of system management tooling   |
| Level 2<br>Walkthrough/formal (technical) review based on usability standard of end product using acceptance criteria  | Presentation chosen approach |  | Test plan: simple system<br>Specify complex test cases in conjunction with other products<br>Apply standard techniques<br>Context related<br>Definition required metrics<br>Drafting usability checklist | Perform complex test cases in conjunction with other products<br>(heuristic evaluation)<br>Collecting metrics<br>Perform test cases using tooling | Root cause analysis<br>Change management<br>Configuration & version management |
| Level 1<br>Informal review on intermediates  | Communication to end user    |  | Specify test cases: apply standard techniques<br>Peer review test cases<br>Paper prototyping   | Perform simple test cases   | Manage test ware   |

| Software   | Analysis  | Advise               | Design  | Development   | System Management  |
|--|---|----------------------|---|---|--|
| Level 3<br>Inspection requirements / acceptance criteria complex system<br>Definition master testplan risk based(lateral thinking)<br>Integral teststrategy<br>Perform product risk analysis |   | Advise test approach | Inspection test basis<br>Design complex test cases multiple chains<br>Multiple test types<br>Definition of metrics<br>Quality supervision<br>Selecting required testtooling | Perform test cases:<br>chain focused<br>Multiple test types<br>Acceptance procedure<br>Metrics<br>Quality supervision<br>Definition tool strategy | Maintenance testing complex systems<br>Definition of metrics                               |
| Level 2<br>Walkthrough / formal (technical) review<br>Definition detailed testplan: test level<br>test type<br>required test environment and test data                                       | Presentation of test results to stakeholders involved |                      | Design complex testcases:<br>required test levels<br>applying complex test techniques<br>by hand of test specification tools<br>Applying of testtooling & testautomation    | Perform complex test cases:<br>Applying tooling:<br>excel/Altus/drivers /r&p<br>ALM<br>Modelling tools  | Change management<br>Configuration Management<br>Release management<br>Root cause analysis |
| Level 1<br>Design simple test cases. Informal review requirements (based on standards as ISO 25010 & 25012)  |   |                      | Design simple test cases:<br>applying standard techniques relevant to selected test levels  | Evaluate data quality<br>Perform test cases   | Maintenance testing simple system<br>Manage testware                                       |

| Hardware Interfacing  | Analysis                             | Advise                              | Design   | Development   | System Management   |
|---|--------------------------------------|-------------------------------------|--|---|---|
| Level 3<br>Inspection final product in conjunction with the environment + relevant standards<br>Drafting test plan multiple interfacing<br>Collecting benchmark data and/or market research |                                      | Chosen test approach & test results | Design test cases:<br>model based<br>State transition<br>Simulators<br>Definition metrics<br>Establish end-to-end test plan<br>Process simulation embedded system multiple interfacing | Simulation of processors/chips<br>Perform acceptance procedure  | Manage test environment<br>Risk assessment updates in existing test environment<br>Landscape (lateral thinking)<br>Simulators |
| Level 2<br>Preparing test plan simple interfacing<br>Walkthrough / formal (technical) review  | Presentation results performed tests |                                     | Designing test harness<br>Test plan:<br>various levels<br>Design tests: complex test cases<br>simple interfacing<br>Selection of tooling   | Setting up and developing test automation<br>Perform complex test cases<br>Collecting metrics (coverage techniques) | Root cause analysis   |
| Level 1<br>Drafting global test specifications<br>Being able for an embedded system to perform an informal review   |                                      |                                     | Define simple structured test cases single embedded system   | Perform simple test cases<br>Setup emulators  | Testing of patches in maintenance<br>Manage test ware   |

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## The curriculum

Question to the audience:

What is missing?



# Status 2014 Implementation

Discussion about the education:

- Complete new education regarding testing
- Minor
- Specialisation
- Combine it with current curriculum
- Education is not necessary

Marketing is just started:

- Presentations
- Via personal network
- Articles

| Type | #US | #started | Type | #UAS | #started |
|------|-----|----------|------|------|----------|
| U    | 11  | 0        | UAS  | 29   | 4        |

Two stage approach:

1. Implementation Universities of Applied Science
2. Implementation Universities

## Status 2014 Implementation

Deliverables till now are:

- Curriculum
- Textbook for UAS(press 2015)
- Marketing material:
  - Flyer
  - Banner
- Few implementations running
- Presentations
- Publications



## Conclusion

- Continuation of the inventory of current situation by hand of available education plans
- Maintenance of the curriculum scheduled early 2015
- Securing of the curriculum
- Implementation will proceed(main focus):
  - Presentations
  - Articles
  - Personal visits to U/UAS
  - Guest lectures
- First textbook will be published 2015

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Questions?



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