

**PSEsupportCenter**  
Test

**SIEMENS**

## B1 - Principles of software testing

### ISTQB-Certified Tester Foundation level

**PSEsupportCenter**  
Test

**Overview**


**SIEMENS**

Overview	
Problem	
Software testing	
Test process	
Test levels	
Summary	

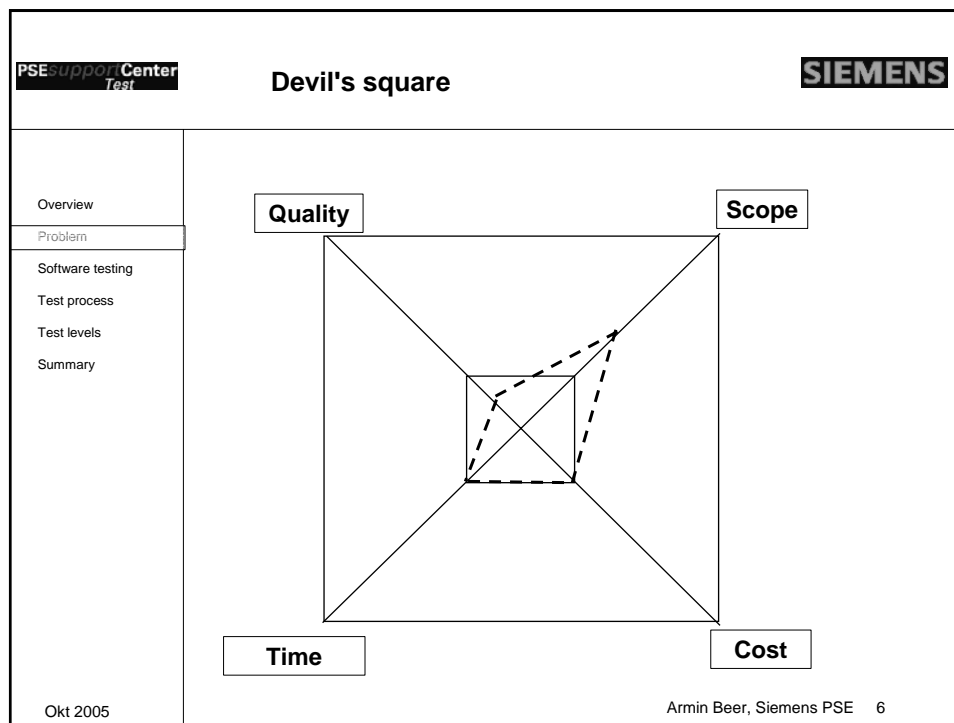
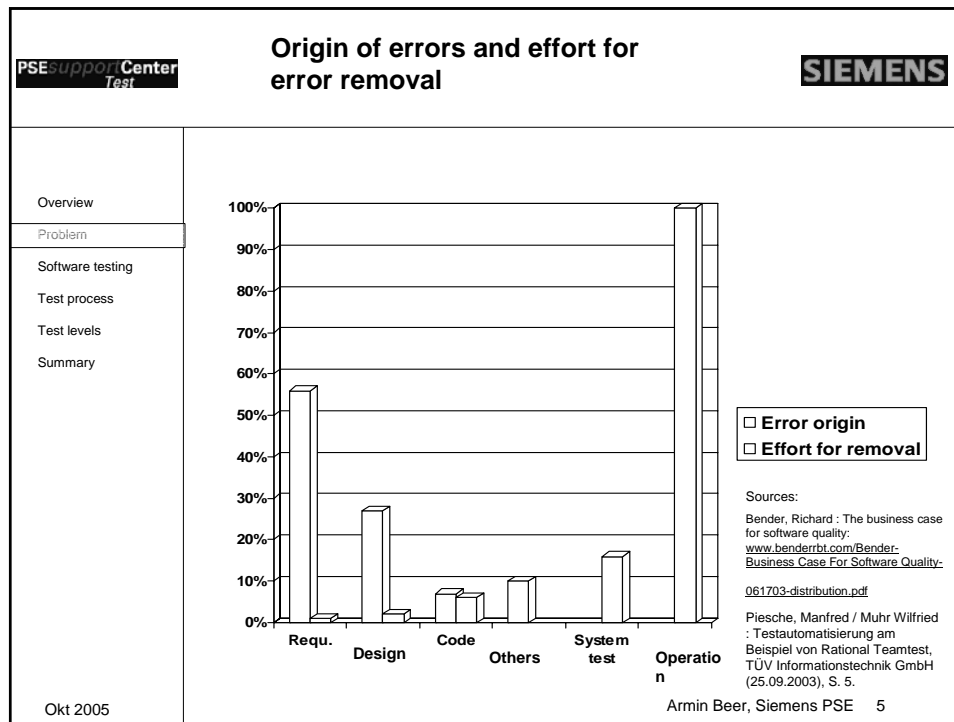
- Problem
- Software testing
- Test process
- Test levels
- Summary

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PSE-supportCenter Test		Problem		SIEMENS	
<div>Overview</div> <div>Problem</div> <div>Software testing</div> <div>Test process</div> <div>Test levels</div> <div>Summary</div>		<p><b>How can situations such as what happened during the presentation of Windows 98 by Bill Gates be prevented?</b></p> 			
		<p><b>Or the crash of Ariane 5 during her maiden voyage on account of a software error?</b></p> <ul style="list-style-type: none"><li>o 4 June 1996 ESA Ariane 5 crashed</li><li>o 500 million US\$ Ariane 5 and satellites</li><li>o 7,000 million US\$ development cost</li></ul>			
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PSE-supportCenter Test		Number of errors		SIEMENS	
<div>Overview</div> <div>Problem</div> <div>Software testing</div> <div>Test process</div> <div>Test levels</div> <div>Summary</div>		<ul style="list-style-type: none"><li>➤ INTEL: A maximum of 80-90 errors in the Pentium</li><li>➤ Standard software: 25 errors per 1000 Lines of Code (LOC).</li><li>➤ Good-quality software: 2 errors per 1000 LOC.</li><li>➤ Space Shuttle software: &lt; 1 error per 10000 LOC.</li><li>➤ Example mobile phone: 200 000 LOC: up to 600 errors.</li></ul>			
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<b>PSE Support Center</b> Test	<b>Problem</b>	<b>SIEMENS</b>
Overview Problem Software testing Test process Test levels Summary	<p><b>Task: Testing of an application in the field of social insurance</b></p> <div> </div> <div> <p>What will be tested?      ➡ Quality requirements</p> <p>How intensive will the tests be?      ➡ Criticality</p> <p>How much time/budget is available?      ➡ Urgency, overall budget, resources</p> </div> <div>         Okt 2005       </div> <div style="text-align: right;">         Armin Beer, Siemens PSE 7       </div>	

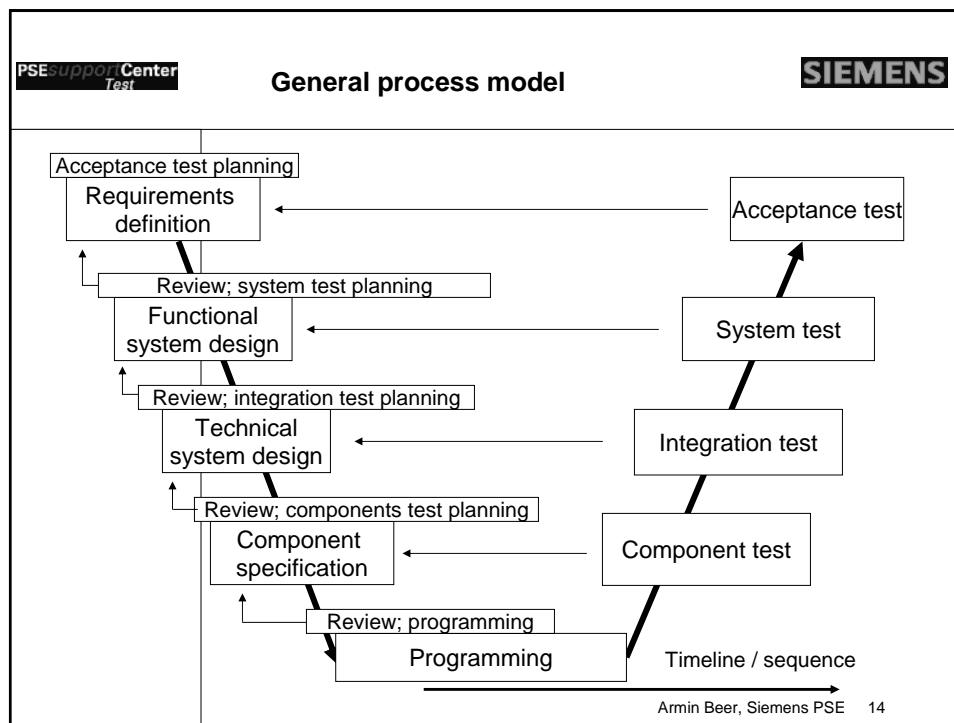
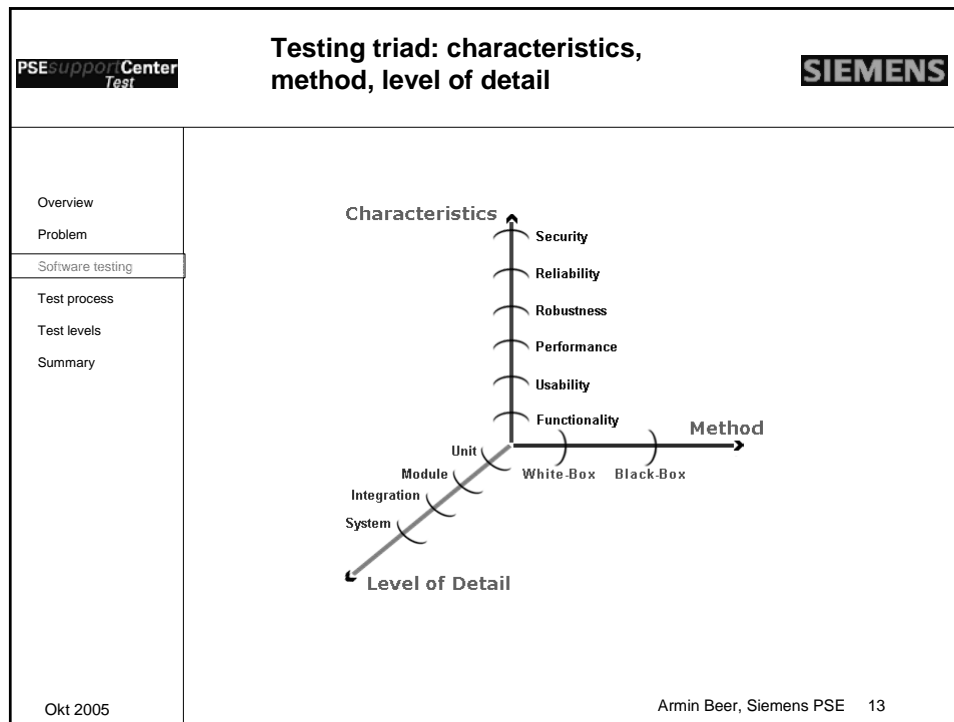
<b>PSE Support Center</b> Test	<b>Testing / Debugging</b>	<b>SIEMENS</b>
Overview Problem Software testing Test process Test levels Summary	<ul style="list-style-type: none"> <li>• Debugging aims to locate errors and to remedy defects.</li> <li>• Testing aims to systematically uncover failures (which are an indication of defects).</li> </ul> <div style="border: 1px solid black; padding: 10px; margin-top: 20px;">  <p><b>Software testing: The execution of a test object for the purpose of checking it!</b></p> </div> <div>         Okt 2005       </div> <div style="text-align: right;">         Armin Beer, Siemens PSE 8       </div>	

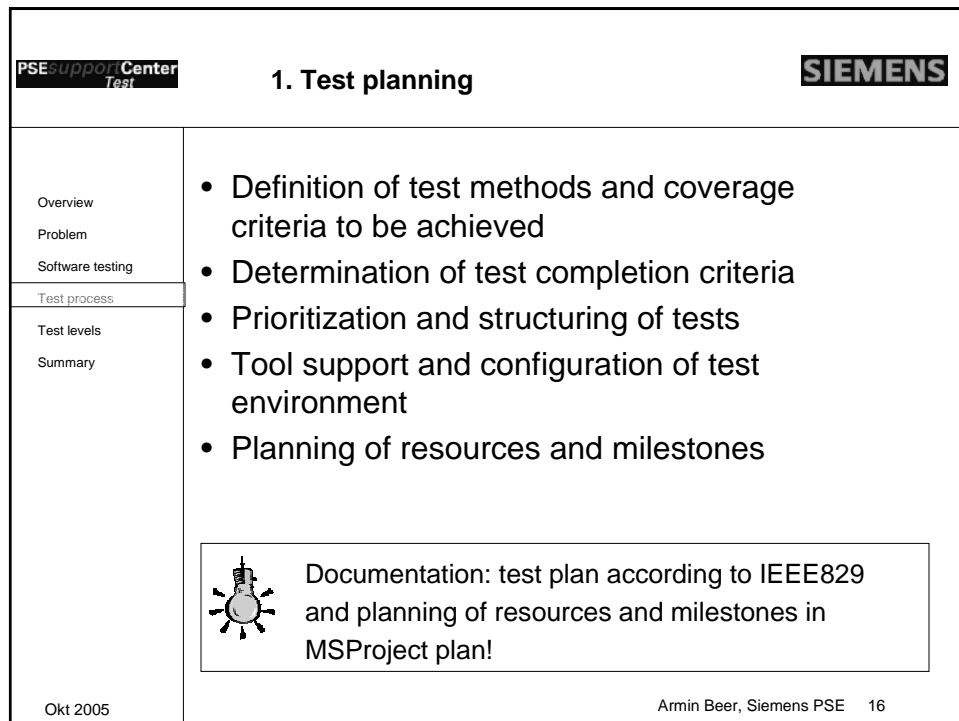
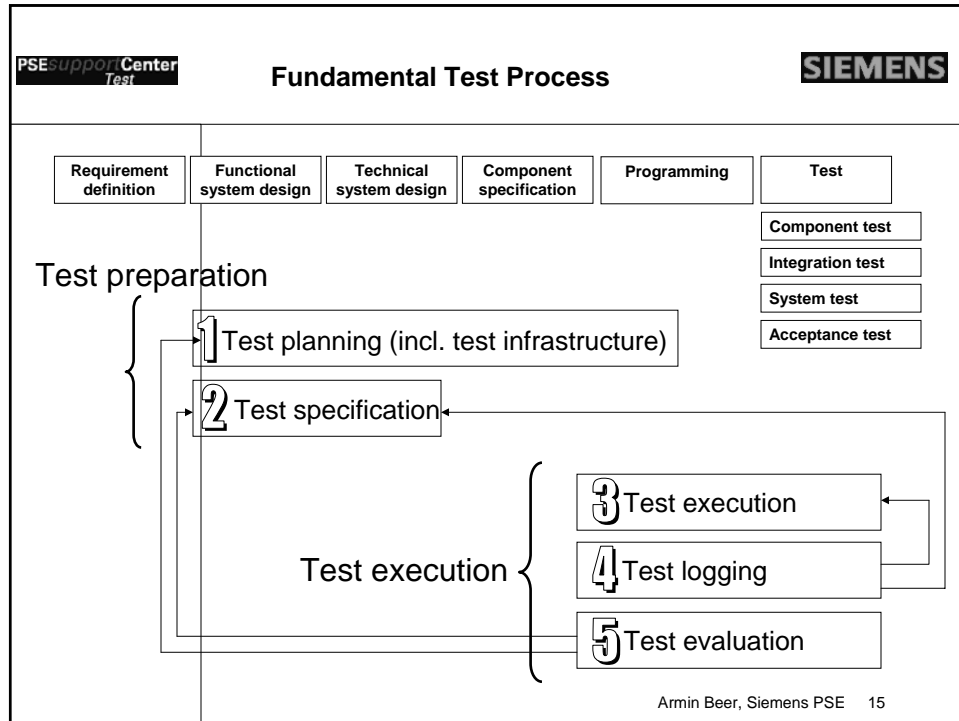
<b>PSE-supportCenter</b> <b>Test</b> <b>Goals of testing</b> <b>SIEMENS</b>	
Overview	<p>Two points of view:</p> <ul style="list-style-type: none"><li>➤ Systematic verification of design and implementation with regard to whether or not specified requirements are met</li><li>➤ The purpose of testing is to find errors</li></ul> <div> The key motivation for testing is that it makes it possible to safeguard and prove quality vis-à-vis the customer</div>
Problem	
Software testing	
Test process	
Test levels	
Summary	
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<b>PSE-supportCenter</b> <b>Test</b> <b>What will be tested?</b> <b>SIEMENS</b>	
Overview	<p>Testing of functional and non-functional quality characteristics</p> <ul style="list-style-type: none"><li>➤ Functionality: Behavior of the GUI, input field syntax, installation, etc.</li><li>➤ Non-functional quality characteristics: response time behavior, portability to other platforms, etc.</li></ul> <div> In many applications, meeting non-functional quality aspects is often of equal importance as providing the required functions!</div>
Problem	
Software testing	
Test process	
Test levels	
Summary	
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<div>PSEsupportCenter Test</div> <div>Quality assurance</div> <div>SIEMENS</div>	
<div>Overview</div> <div>Problem</div> <div>Software testing</div> <div>Test process</div> <div>Test levels</div> <div>Summary</div>	<p><b>Measures to take:</b></p> <ul style="list-style-type: none"><li>• Constructive quality assurance (error prevention strategy)</li><li>• Analytic quality assurance (error detection strategy)</li></ul> <div> Testing is the most important analytical quality assurance measure!</div> <div>Okt 2005</div> <div>Armin Beer, Siemens PSE 11</div>

<div>PSEsupportCenter Test</div> <div>Analytical quality assurance</div> <div>SIEMENS</div>	
<div>Overview</div> <div>Problem</div> <div>Software testing</div> <div>Test process</div> <div>Test levels</div> <div>Summary</div>	<div><div>Static Testing</div><div>Dynamic Testing</div><div>Reviews</div><div>Static Analysis</div><div>Black Box Test (based on requirements)</div><div>White Box Test (structural)</div></div> <div> Analytical quality assurance serves to detect errors!</div> <div>Okt 2005</div> <div>Armin Beer, Siemens PSE 12</div>










## 2. Test specification



Overview

Problem

Software testing

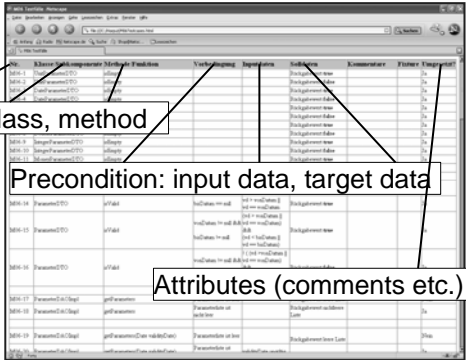
Test process


Test levels

Summary

Test cases for the component test in HTML


- Logical test cases
- Concrete test cases






Application of test case design methods, such as equivalence classes, cause-effect analysis, state-based...!

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## 3. Test execution



Overview

Problem


Software testing

Test process

Test levels


Summary

- Compilation of a test suite by selecting suitable test cases
- Execution of manual and automated test cases




Input test results in the test management tool so you can instantly see the test progress.

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## 4. Test logging



Overview

Problem

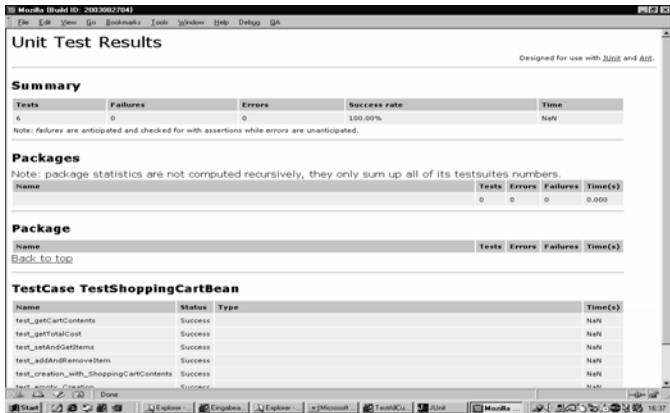
Software testing

Test process


Test levels

Summary


➤ The logging of a test run, showing which parts were tested when, by whom, how intensively and with what result.



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## 5. Test evaluation (1)



Overview

Problem

Software testing

Test process

Test levels


Summary

**Test oracle: Source of information for calculating the respective target results of a test case**

- requirements specification, user manual, etc.
- an existing system for a „benchmark“
- expert knowledge
- but not the code


**Is this a a failure or not?**

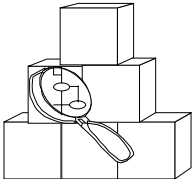
**Comparison between actual result/actual behavior and expected result/expected behavior**




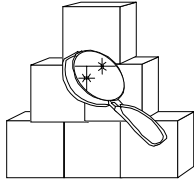

Not only bugs in the code, but also in requirements are detected!

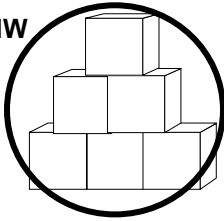
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<b>PSE-supportCenter</b> <small>Test</small>		<b>5. Test evaluation (2)</b>	<b>SIEMENS</b>
Overview		<ul style="list-style-type: none"><li>➤ Analysis of unsuccessful test cases</li><li>➤ Collection of evidence for error localization</li><li>➤ Collection of detected errors in the problem management system <i>(Important: link between test run, test case and error number)</i></li></ul>	
Problem			
Software testing			
Test process			
Test levels			
Summary			
Okt 2005		<div> The effort for test evaluation may become very high!</div>	Armin Beer, Siemens PSE 21

<b>PSE-supportCenter</b> <small>Test</small>		<b>Definition of component testing</b>	<b>SIEMENS</b>
Overview		<b>Test of the individual implemented components</b>  <b>Test goals</b> <ul style="list-style-type: none"><li>• Test for functionality (according to specification)</li><li>• Test for robustness (negative cases)</li><li>• Test for efficiency</li><li>• Test for maintainability</li></ul> <b>Test strategies</b> <ul style="list-style-type: none"><li>• White box tests</li><li>• Black box (functional) tests</li></ul>	
Problem			
Software testing			
Test process			
Test levels			
Summary			
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<div>PSEsupportCenter Test</div> <div>Characteristics of component testing</div> <div>SIEMENS</div>	
<div>Overview</div> <div>Problem</div> <div>Software testing</div> <div>Test process</div> <div>Test levels</div> <div>Summary</div>	<ul style="list-style-type: none"><li>• Tests executed by the developers</li><li>• Component test drivers with placeholders (stubs and mock objects) for still missing components</li><li>• "Test-driven development"</li><li>• Automated testing with JUnit</li></ul> <div> Automated component testing to achieve good quality!</div> <div>Okt 2005<span>Armin Beer, Siemens PSE 23</span></div>


<div>PSEsupportCenter Test</div> <div>Integration testing</div> <div>SIEMENS</div>	
<div>Overview</div> <div>Problem</div> <div>Software testing</div> <div>Test process</div> <div>Test levels</div> <div>Summary</div>	<div><b>Step-by-step integration and testing of the product</b></div> <div></div> <div><b>Test goal:</b> Detection of interface problems, e.g., between GUI and database</div> <div><b>Test strategies:</b> Black-box test<ul style="list-style-type: none"><li>• Top-down integration and test</li><li>• Bottom-up integration and test</li></ul></div> <div> Test against the technical system design!</div> <div>Okt 2005<span>Armin Beer, Siemens PSE 24</span></div>

<b>PSE-supportCenter</b> <small>Test</small>		<b>System testing</b>		<b>SIEMENS</b>
<div>Overview</div> <div>Problem</div> <div>Software testing</div> <div>Test process</div> <div>Test levels</div> <div>Summary</div>	<b>Verification of the entire system (HW + SW) against the requirements derived from the functional system design (software requirements specification)</b>			
				
	<b>Test goals:</b> <ul style="list-style-type: none"><li>• Test of functional requirements (against software requirements specification)</li><li>• Test of non-functional quality features (e.g. performance)</li></ul>			
	<b>Test strategies:</b> <ul style="list-style-type: none"><li>• Black box (functional) tests</li><li>• Test in original environment</li></ul>			
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<b>PSE-supportCenter</b> <small>Test</small>		<b>Acceptance testing</b>		<b>SIEMENS</b>
<div>Overview</div> <div>Problem</div> <div>Software testing</div> <div>Test process</div> <div>Test levels</div> <div>Summary</div>	<ul style="list-style-type: none"><li>• Test against the <b>requirements definition</b></li><li>• Test for <b>contractual acceptance</b></li><li>• Test for <b>user acceptance</b></li><li>• Implicit expectations of the customer/client in compliance with the <b>general state of the art</b></li></ul>			
	<div> The viewpoints of the customer and of the users are what we focus on!</div>			
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<b>PSE Support Center</b> <small>Test</small>		<b>Acceptance testing: Test for user acceptance</b>	<b>SIEMENS</b>
Overview		<ul style="list-style-type: none"><li>• Client (customer) conducts the tests</li><li>• Acceptance criteria derived from the product definition</li><li>• Use of test cases from system testing (business processes)</li><li>• Test conducted in an environment close to production</li></ul>	
Problem			
Software testing			
Test process			
Test levels			
Summary			
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<b>PSE Support Center</b> <small>Test</small>		<b>Maintenance testing</b>	<b>SIEMENS</b>
Overview		<ul style="list-style-type: none"><li>• Software maintenance</li><li>• Further product development</li><li>• Regression testing<ul style="list-style-type: none"><li>– Test to avoid loss of quality after a modification of code (patches, functional enhancements,... )</li></ul></li></ul>	
Problem			
Software testing			
Test process			
Test levels			
Summary			
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Retesting and regression testing  
to avoid a loss of quality

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<div>Overview</div> <div>Problem</div> <div>Software testing</div> <div>Test process</div> <div>Test levels</div> <div>Summary</div>	<ul style="list-style-type: none"><li>• Testing is a complex task</li><li>• The test process is embedded in the development process</li><li>• The fundamental test process consists of five phases</li><li>• Prioritization of tests if the schedule is tight</li><li>• Testing is a creative, interesting activity</li><li>• The sooner errors are detected, the lower the costs</li><li>• ISTQB: Glossary of terms used in software testing; <a href="http://www.istqb.org/">http://www.istqb.org/</a></li></ul>
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