

IN 3240 Software Testing

Test management

Chapter 5 – Part 1

- 1. Test organization**
- 2. Test planning and estimation**

Test organization and independence

1. Test organization

- **1.1 Test organization and independence**
- 1.2 Tasks of the test leader and tester

2. Test planning and estimation

- 2.1 Test planning
- 2.2 Test planning activities
- 2.3 Entry criteria
- 2.4 Exit criteria
- 2.5 Test estimation
- 2.6 Test strategy, test approach

3. Test progress monitoring and control

- 3.1 Test progress monitoring
- 3.2 Test reporting
- 3.3 Test control

4. Configuration management

5. Risk and testing

- 5.1 Project risks
- 5.2 Product risks

6. Incident management

Testing software and **developing** (building) software are **not** the **same**

Different tasks involved

Require **different mindsets** from testers and developers

Testing is an **assessment** of **quality**

Assessments are **not always positive**

Separate the **testers** from the **developers**

Improve defect finding by using independent testers

Avoid author **bias** → **Objective** assessments

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- The **effectiveness** of finding defects by testing and reviews can **be improved** by using **independent testers**.
- Options for independence are:



1. **No independent** testers. Developers test their own code.
2. Independent testers **within the development teams**.
3. Independent test team or group **within the organization**, reporting to project management or executive management.
4. Independent testers **from the business organization or user community**.
5. **Independent test specialists** for specific test targets such as usability testers, security testers or certification testers (who certify a software product against standards and regulations).

** Independent testers outsourced or external to the organization. (Highest level of independence, but not so used in practice)*

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- For **large, complex** or **safety critical** projects, it is usually best to have **multiple levels of testing**, with some or all of the levels done by **independent testers**.
- **Development staff** can **participate** in testing, **especially** at the **lower levels**

Advantages & disadvantages

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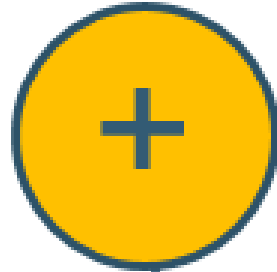
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Independent testers see other and **different defects**, and are **unbiased**.

An **independent** tester can **verify assumptions** people made during specification and implementation of the system.

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Isolation from the development team (if treated as totally independent).

Independent testers **may be the bottleneck** as the **last checkpoint**.

Developers may **lose** a sense of **responsibility** for quality.

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Note

Testing tasks may be done by people in a **specific testing role**, or may be done by someone in **another role**, such as:

- project manager
- quality manager
- developer
- business and domain expert
- infrastructure or IT operations

(this can be both good and bad)

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There is wide **variation in the roles** that people within the test team play. The two most common roles are

- **test leader**
- **tester**

Test leader = test manager / test coordinator.

The test leader **plans, monitors** and **controls** the *testing activities and tasks*.

The tester

The tester **reviews** and **contributes** to **test plan, analyses, designs, prepares, implements** and **executes** tests.

Tasks of the test leader

Coordination

of the **test strategy** and **plan** with project managers

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Coordination

of the test strategy and plan with project managers

Plan the tests

Understanding the test objectives and risks – including:

- selecting test approaches
- estimating the time, effort and cost of testing
- acquiring resources
- defining test levels, cycles
- planning incident management

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Understanding the test objectives and risks – including:

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Test specifications, preparation and execution

Initiate the specification, preparation, implementation and execution of tests

- **monitor** the test results
- **check** the exit criteria.

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Adapt planning	based on test results and progress and take any action to compensate for problems.

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Select test tools	Select tools to support testing and organize trainings for tool users.

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Automation of tests	Decide what should be automated, to what degree, and how.
Select test tools	Select tools to support testing and organize trainings for tool users.
Test environment	Decide about the implementation of the test environment.
Test summary reports	Write test summary reports based on the information gathered during testing.

Tasks of the tester

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Review and contribute to test plans

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Analyze, review and assess user requirements, specifications and models for testability.

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Test tools	Use test tools (for administration, management or monitoring) as required .

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Test automation	Automate tests (may be supported by a developer or a test automation expert).
Other metrics	Measure performance of components and systems (if applicable).

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Testing process	Design and implement on all test levels, execute and log the tests, evaluate the results, and document the deviations from expected results.
Test tools	Use test tools (for administration, management or monitoring) as required.
Test automation	Automate tests (may be supported by a developer or a test automation expert).
Other metrics	Measure performance of components and systems (if applicable).
Help the others	Review tests developed by others.

Skills

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People involved in testing need

- **Application or business domain:** A tester must **understand** the intended **behavior** and the **problem the system will solve** in order to spot improper.
- **Technology:** A tester must **be aware of issues, limitations** and **capabilities** of the chosen **implementation technology**, in order to locate problems and the 'likely to fail' functions and features.
- **Testing:** A tester must **know the testing topics** discussed in this book - in order to carry out the test tasks assigned.

Skills

People involved in testing

need basic **professional** and **social qualifications** such as

- **literacy**
- the ability to **prepare** and **deliver written** and **verbal reports**
- the ability to **communicate** effectively
- contribute to a **positive relationship** between **developer** and **tester**

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- 1.2 Tasks of the test leader and tester

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**Who will do
what,
when
and how**

The purpose of a test plan

A test plan is the **project plan** for the **testing work to be done**.

- Writing a test plan forces us to **confront the challenges** that await us and **focus** our thinking on **important topics**.
- The test planning process and **the plan** itself serve as **vehicles for communicating** with other members of the project team, testers, peers, managers and other stakeholders.
- The test plan also helps us **manage change**. As we gather **more information**, we **revise** our plans.

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Planning may be **documented** in:

- a **project** or **master test plan**
- and in **separate test plans for test levels**, such as integration testing, system testing and acceptance testing.

Test planning is a **continuous activity** and is performed in **all life cycle** processes and activities.

Feedback from test activities is used to **recognize changing risks** so that planning can be **adjusted**.

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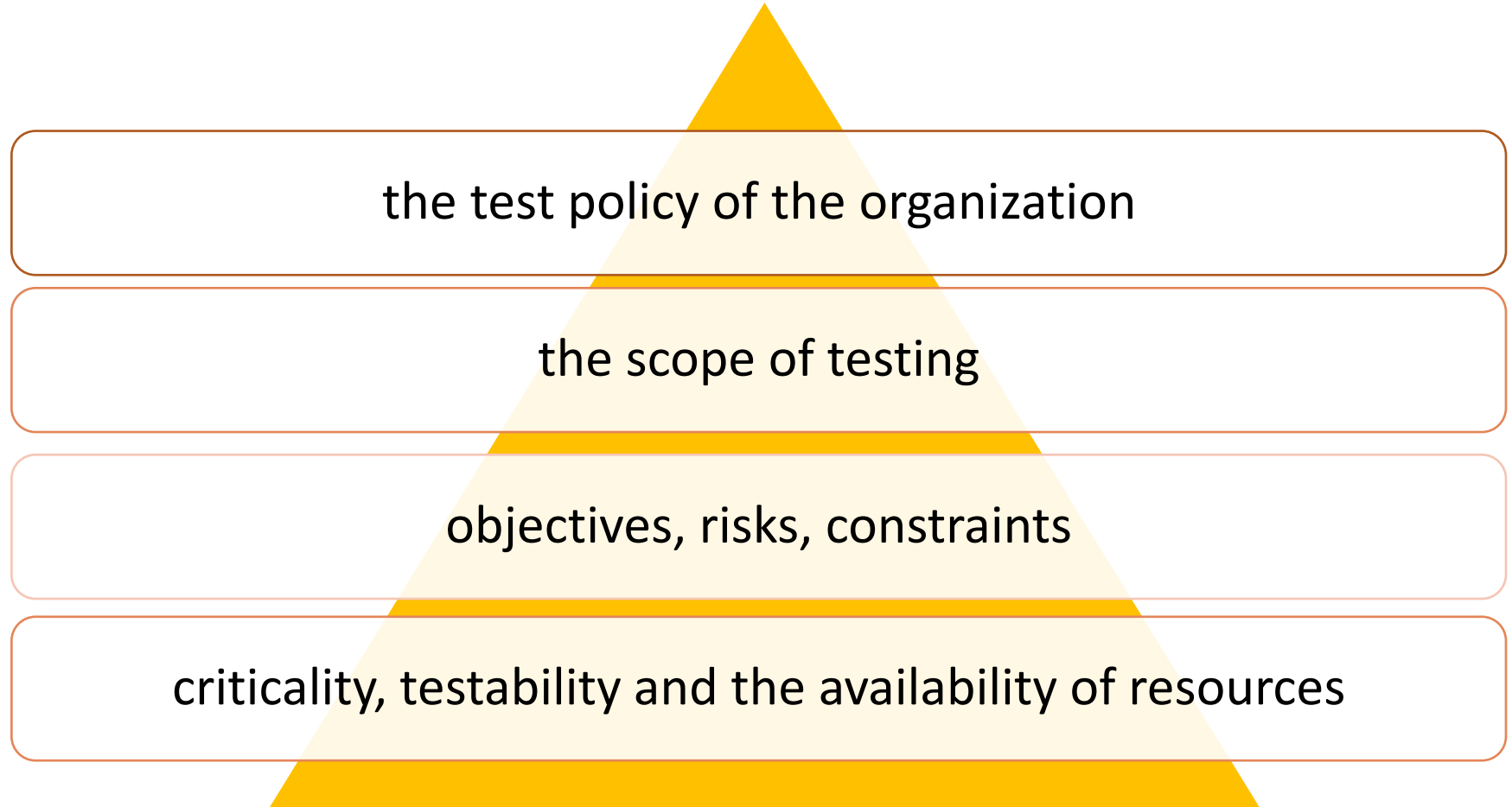
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** Outlines of test planning documents are covered by the 'Standard for Software Test Documentation' (IEEE 829).*

Test planning activities

Scope and risk

Determining the **scope** and **risks** of testing

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Test planning activities

Scope and risk

Determining the scope and risks of testing

Objectives

Identifying the **objectives** of testing.

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Test planning activities

Scope and risk	Determining the scope and risks of testing
Objectives	Identifying the objectives of testing.
Overall approach	Defining the overall approach of testing, including: <ul style="list-style-type: none">the definition of the test levelsentry and exit criteria.

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Schedule	Scheduling test analysis and design activities. Scheduling test implementation, execution and evaluation

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Schedule	Scheduling test analysis and design activities. Scheduling test implementation, execution and evaluation
Resources	Assigning resources for the different activities defined.

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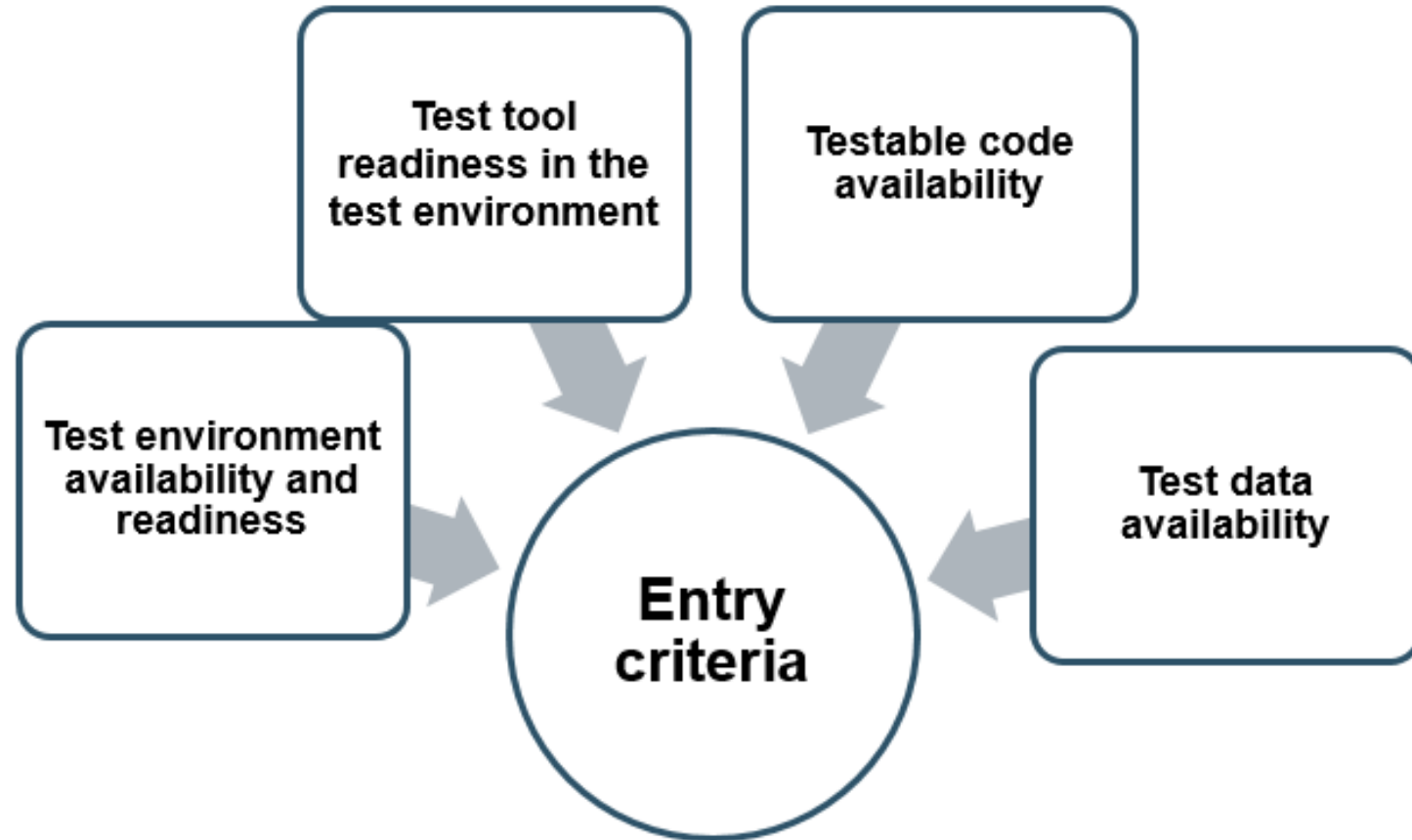
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Schedule	Scheduling test analysis and design activities. Scheduling test implementation, execution and evaluation
Resources	Assigning resources for the different activities defined.
Metrics	Selecting metrics for monitoring and controlling test preparation and execution, defect resolution and risk issues.

Entry criteria

Entry criteria defines **when to start testing**.



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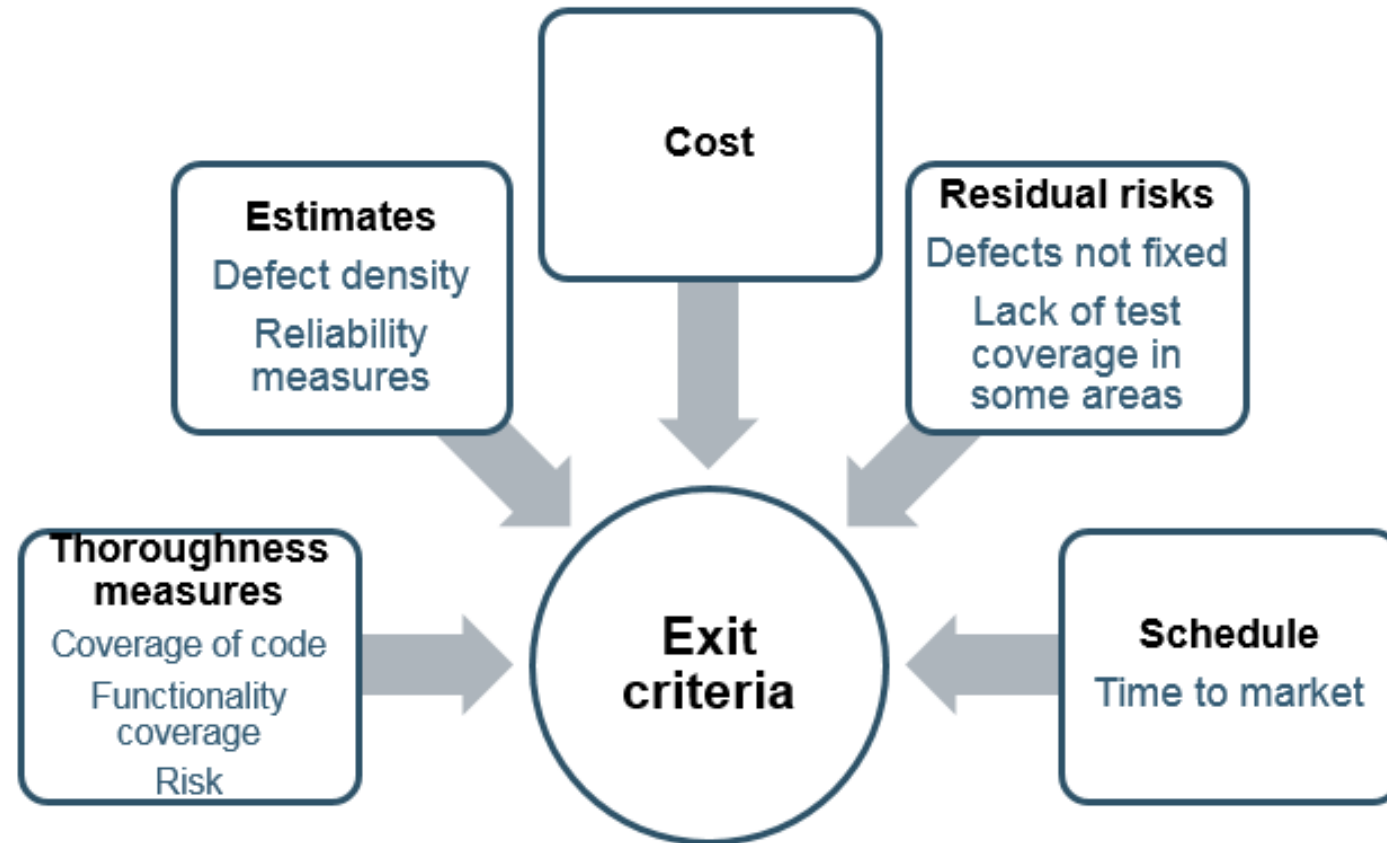
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Exit criteria

Exit criteria is to define **when to stop testing**, such as at the end of a test level, end of project or when a set of tests has a specific goal.



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Test estimation

The testing work is usually a **subproject** within the larger project.

Fundamental **techniques** of **estimation** can be adapted for testing

We can **break down** a testing project into **phases**

- planning and control
- analysis and design
- implementation and execution
- evaluating exit criteria and reporting
- test closure

Within each **phase** we identify **activities** and within each **activity** we identify **tasks** and perhaps **subtasks**.

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To identify the activities and tasks, we work both

- forward
- backward

To ensure accuracy of the estimate, make sure that you subdivide the work into tasks that are short in duration, say one to three days.

If they are much longer - say two weeks – there will be a risk that long and complex sub-tasks are 'hidden' within the larger task.

Test estimation techniques

Two approaches for the estimation of test effort are covered in this syllabus

The **metrics-based**
approach



Estimating the testing effort based on **metrics** of **former** or **similar projects** or based on **typical values**.

The **expert-based**
approach



Estimating the tasks by **the owner** of these tasks or by **experts**.

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Test estimation

A good solution is to **combine the two strategies**:

- **First** create the **work-breakdown structure** and a detailed **bottom-up estimate**.
- **Second**; we then apply **models** and **rules of thumb** to **check** and **adjust** the estimate **bottom-up** and **top-down** using **past history**.

This approach tends to create an estimate that is both more accurate and more defensible than either technique by itself.

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Test estimation – an example

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Performance tests need to be run in a **special test environment** that look like **the production or field environment**, due to the **response time** and **resource utilization**.

Performance testing involves

- **special tools** to generate **load** and check **response**
- environment **acquisition** and **configuration**
- time to **identify** and hire a performance test **professional**, if required
- **training activities**, if required

A **detailed test plan** for performance testing should be written in the **test planning phase**, where **time** is required to **draft**, **review** and **finalize** a performance test plan.

Factors affecting the test effort

The testing effort may depend on a number of factors, including:

Product factors	<ul style="list-style-type: none">• the quality of the specification (the test basis)• the size of the product• the complexity of the problem domain• the importance of non-functional quality e.g. usability, performance, security etc.
Process factors	<ul style="list-style-type: none">• the development model• availability of test tools (e.g. test executing tools)• skills of the people involved• time pressure
The outcome of testing	<ul style="list-style-type: none">• the number of defects• the amount of rework required

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The **test approach** is the **implementation of the test strategy** for a specific project.

Since **the test approach is specific to a project**, the approach should be **documented in the test plan**

One way to **classify** test approaches or strategies is based on **the point in time** at which the bulk of the test design work is begun:

Preventative approaches

Tests are designed **as early as possible**

Reactive approaches

Test design comes **after** the software or system has been produced

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Analytical approaches

e.g. risk-based testing - testing is directed to areas of greatest risk, requirement-based testing

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Analytical approaches	e.g. risk-based testing - testing is directed to areas of greatest risk, requirement-based testing
Model-based approaches	e.g. testing using statistical information about failure rates (such as reliability growth models)

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Analytical approaches	e.g. risk-based testing - testing is directed to areas of greatest risk, requirement-based testing
Model-based approaches	testing using statistical information about failure rates (such as reliability growth models)
Methodical approaches	e.g. failure-based (including error guessing and fault-attacks), experienced-based, check-list based, and quality characteristic based.

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Process- or standard-compliant approaches	e.g. specified by industry-specific standards or the various agile methodologies.

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Process- or standard-compliant approaches	e.g. specified by industry-specific standards or the various agile methodologies.
Dynamic and heuristic approaches	e.g. exploratory testing, execution & evaluation are concurrent tasks.
Consultative approaches	e.g. test coverage is evaluated by domain experts outside the test team.
Regression-averse approaches	e.g. include reuse of existing test material, extensive automation of functional regression tests.

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The choice of test approaches and strategies is one powerful factor in the success of the effort and the accuracy of the test plans and estimates.

When we choose test strategies there are many factors to consider:

- Risks
- Skills
- Objectives
- Regulations
- Product
- Business