GTB

German Testing Board

Software.Testing. Excellence.

PROFESSIONAL VIEW ON TESTING

THE REFERENCE SCHEME FOR PEOPLE AND ORGANIZATIONS INVOLVED IN THE TOPICS OF QUALITY AND TESTING OF SOFTWARE-BASED COMPONENTS AND SYSTEMS.

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CONTENT OVERVIEW

PROFESSIONAL VIEW ON TESTING

The German Testing Board's (GTB) professional profile for testing provides guidance for individuals and organizations, and prepares them for the current and future challenges of ensuring software quality.

The digital transformation of society is omnipresent and touches all areas of life, from personalized mobile devices to smart homes, Internet of Things (IoT), AI, and processes in business and administration. Digital communication, interaction and data processing form the basis of all these software-based systems. In addition, the influence of software quality often reaches into areas that are safety-critical. However, predicting quality as the adequacy and overall performance of system properties is becoming increasingly difficult. Design quality management and active analytical quality assurance must be used from the very beginning. Early requirements review and testing, which involve methodical testing prior to use, remain the most appropriate approaches to risk and quality assessment and must be carried out efficiently and effectively.

Professional testing therefore requires capable people who, within the framework of the chosen software development approach and (team) organizations, apply their competence in contributing to the quality of the product. This involves not only trained and specialized persons for all activities within the testing process, but also competent persons engaged in establishing the verifiability of performance and quality requirements for the system and the development process.

The professional profile for testing defines the competencies required in an organization to implement the human resource planning and professional development.

Since software and system development is not purely a production process, but rather corresponds to a reactive, evolutionary development approach (Plan-Do-Check-Act), there is no blueprint available for the 'best' organization and the 'best' approach. From sequential (e.g., waterfall model, V-model) to iterative (e.g., RUP) to agile process models (e.g., Scrum, Kanban), there are various approaches to managing the complexity of software development and deployment efficiency (e.g., schedule and cost). The professional profile for testing does not propose a specific organizational form with positions, but is structured on the basis of tasks, competencies, and responsibilities in role descriptions. A mapping in terms of persons, organizations, procedure models, projects, teams and positions can take place, but must take into consideration the context of the respective organization. Ideas for this are listed as examples at the end of this document.

THE REFERENCE SCHEME OF THE PROFESSIONAL PROFILE FOR TESTING SHOULD:

- show the way to the personal development and career planning of people in the field of testing,
- help the team, project and product organization to plan and develop the testing competency of staff,
- enable ideas, requirements and development opportunities to be communicated to the basic organizational and personnel planning of (IT) companies,
- provide orientation for the training and personal development areas, and
- demonstrate opportunities for management to plan and develop the organizational maturity necessary to meet their process and product quality goals.

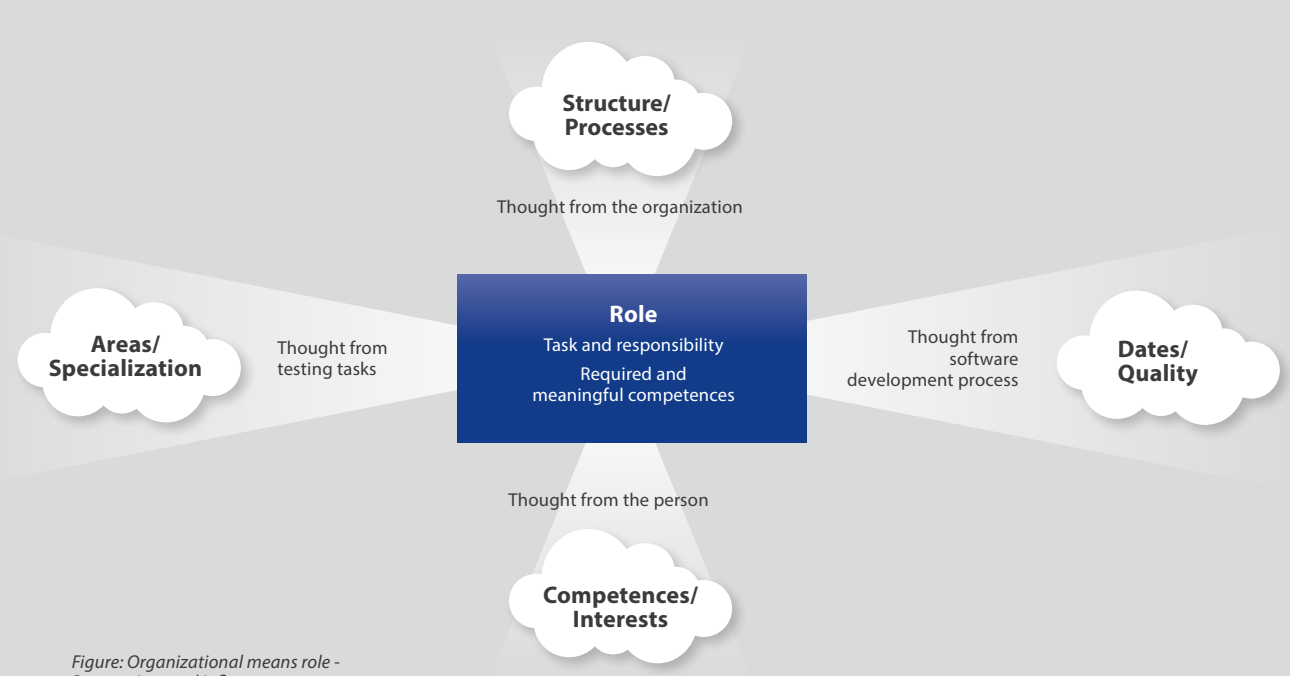

Figure: Organizational means role - Perspectives and influences

Software-based systems are becoming increasingly complex and interdependent, behavior predictions are becoming more difficult, and non-functional quality criteria are gaining in importance. As a result, the tasks in testing are also becoming more complex, the requirements for their efficient fulfillment are becoming more specialized, and the demand for professional know-how is increasing. But what knowledge is needed for what tasks and at what stage in the process?

The professional profile for testing is based on the subtasks of testing within the testing process, and describes the essential roles for this. A competency reference scheme is established which on the one hand defines the required technical knowledge, skills and experience for performing a task, titled as task competence, and on the other hand adds the personal responsibility competences needed, such as social competence and independence. Together, these form a reference scheme which enables the user to develop variations for their personal development or their specific (team/project) organization.

Figure: Test role – Competence and classification

In addition to the ISTQB® Certified Tester scheme, the following documents are the main sources of ideas for structuring the professional profile description (as of 10-05-2021):

- SFIA Skills Framework for the Information Age: Version 8 (https://sfia-online.org/de/sfia-8/sfia-8)
- AK DQR - Deutscher Qualifikationsrahmen für lebenslanges Lernen (Germany: qualifications framework for lifelong learning) (https://www.dqr.de/dqr/shareddocs/downloads/media/content/der_deutsche_qualifikationsrahmen_fue_lebenslanges_lernen.pdf)
- BMBF: Zur Entwicklung nationaler Bildungsstandards (Germany: On the development of national educational standards) (http://edudoc.ch/record/33468/files/develop_standards_nat_form_d.pdf)
- Lisa Crispin, Janet Gregory: Agile Testing (2008, Addison-Wesley Signature Series).

In order to perform tasks adequately, a person needs the appropriate competencies. We follow here the definition of the term from the document On the development of national educational standards, which describes competencies as the abilities and skills available or learned by individuals to solve problems, as well as the motivation, the will and the social readiness and ability to use the problem solutions [...] successfully and responsibly.

This understanding is also reflected in the four-pillar structure of the DQR, which is based on two competence categories: professional (task) competence with the pillars knowledge and skills and personality (responsibility) competence with the pillars social competence and independence. Similar models describe the whole with action competence and the four subareas of professional competence (knowledge), methodological competence (skills), social competence and personal competence (independence). The GTB's professional profile primarily uses the DQR terminology.

The reference scheme for the professional profile constructs a model of roles on the basis of testing subtasks with assigned specialization requirements. It defines associated task and responsibility competencies for each of them.

The model developed for this purpose, including the assignment of required competencies, serves as a reference and a source of ideas for pointing out sensible career paths and for integrating and establishing professional testing in the organization. Furthermore, the model conveys which training and further education modules from the ISTQB® Certified-Tester program are essential or helpful for which role in order to acquire the necessary knowledge and helpful skills.

In this context, the term role represents a structuring aid and is not intended to restrict the form of the chosen organization and software development process, whether agile, iterative or sequential. Rather, it is intended to help formulate clear competency requirements for the accomplishment of individual tasks in the test. Particularly in agile projects, people take on different roles at different times, but for each role they need their own competence profiles in order to perform professionally, or to guide or support other people in the team.

The outline identifies tasks for persons working in the field of testing components or systems with a central software element. These tasks include

- the core tasks of testing (test analysis, design, implementation and execution),
- the planning tasks (including test strategy, architecture, planning, scheduling, and control), and
- the technical tasks (including test environment, data, tools and automation).

The basis is formed by the ideas and terms from the Certified Tester® training scheme of the ISTQB®, defined as by the ISTQB® Glossary, as of 11-21-2022, , (https://glossary.istqb.org/de/search):

Term 'testing'
The process consisting of all lifecycle activities, both static and dynamic, concerned with planning, preparation and evaluation of a component or system and related work products to determine that they satisfy specified requirements, to demonstrate that they are fit for purpose and to detect defects.

Term 'tester'
A person who performs testing.

Term 'test process'
The set of interrelated activities comprising of test planning, test monitoring and control, test analysis, test design, test implementation, test execution, and test completion.

Since the tasks of testing are carried out today in a very wide range of organizations, processes, projects and application areas, a definition suitable for all cases is not possible. Therefore, a reference scheme is defined below, which can then be specifically defined and refined by the user in the context of different dimensions.

The activities associated with testing are divided into the following categories:

- Project and application area (domain)
- Organization and structure
- Development or manufacturing process
- Tasks and boundary conditions

In its basic structure, each role description defines a testing task with an assigned responsibility (independence) and the associated categories of professional task competence and social competence (soft skills).

THE GTB PROFESSIONAL PROFILE FOR TESTING DESCRIPTION

Over the last 20 years, the German Testing Board e.V. (GTB) has played a major role in the development of the Certified Tester® (CT) training scheme within the framework of its umbrella organization ISTQB® (International Software Testing Qualifications Board). This worldwide standardized scheme consists of the training levels Foundation, Advanced and Expert (CORE), supplemented by modules for working in agile teams (AGILE) and further specialist modules (SPECIALIST). The courses teach both basic and in-depth software testing knowledge and offer the possibility of becoming certified in the acquired knowledge. The Certified Tester scheme is now widespread worldwide and, with over one million certification exams (as of 2021), is the most recognized education and training scheme in this field.

During the development of the CT scheme, it became apparent that the range of tasks and competencies in development projects with varying complexity is broad and diverse. For example, often other skills and competencies are required in addition to knowledge of test techniques. Much of this can be found in the in-depth and advanced training parts with focal points on aspects such as test management, test analysis, test automation or test data management.

In order to provide a better overview of this, the GTB, in collaboration with subject matter experts, has developed a reference scheme for the professional profile for testing, which is now available in an updated and revised version.

As a basis for the reference scheme, a model for representation was developed that is based on the established model of the SFIA Foundation (Skills Framework for the Information Age) and contains the following components:

- Role: Name and task description in the test
- Responsibility: Level and description
- Necessary or useful professional and social competences to perform the role and its activities.

The specialization of the roles is based on a basic division of tasks and associated task competence categories.

Tasks

Testing	Test analysis, design, implementation/automation, execution
Test Management	Test strategy, architecture, planning, scheduling, controlling
Testunterstützung	Test environment, data management, tools/frameworks

Categories

Process	Product and software development
Domain	Application and subject domain
IT structure	Test object
Technology	Test and environmental technology

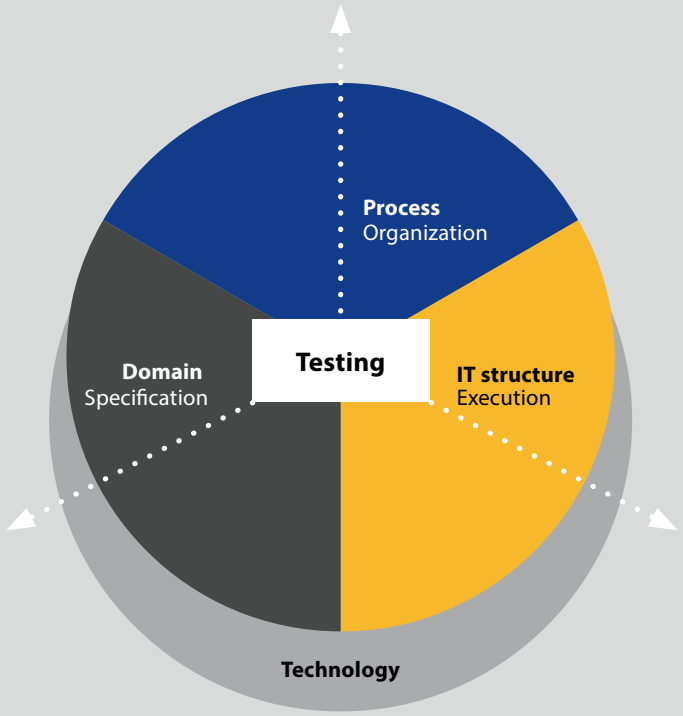

Figure: Competence categories and core tasks activities

TESTING - THE PERSONAL AND PROFESSIONAL QUALIFICATION

Basically, in order to be suitable for the efficient and professional execution of a task or the assumption of a role, one needs knowledge, skills and experience, but also social and personal competencies.

- Personal competence (independence) is often expressed in terms of willingness to take responsibility, leadership skills, assertiveness, decisiveness, critical faculties and resilience. In the professional profile description, this competence is strongly related to the level of responsibility with which a person takes on a task.
- Knowledge (professional competence) comprises the technical fundamentals for a subject and task area and is acquired through education and training.
- Skills (methodological competence) include the abilities to obtain and utilize knowledge and other information, e.g., to successfully solve tasks by making decisions and prioritizing. Skills can be acquired through learning basic methods, as well as deepened through training.
- Experience relates to references from applied knowledge and skills as well as the successes or failures achieved with them, which can be used when deciding on approaches to solving a task.
- Social competence comprises the categories that enable a person to act in a community / team. Categories that are particularly mentioned in IT development include communication skills, team spirit, empathy, resilience, the ability to compromise, and customer or quality awareness.

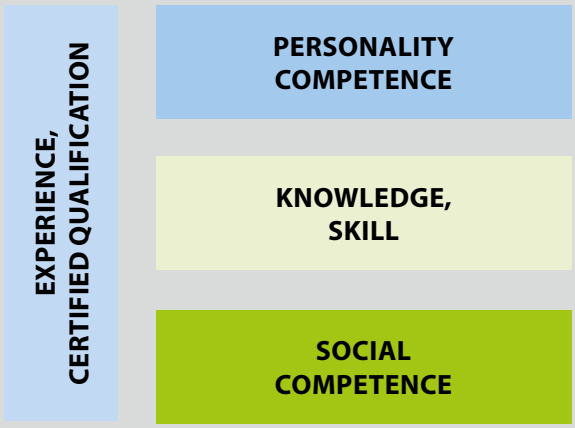

Figure: Basic competence structure

The professional profile for testing description focuses on the tasks in testing and therefore focusses mostly on aspects of knowledge and skills. On a secondary level, it also considers responsibility (personal competence), experience and social competence in order to describe the roles. Everything that concerns specific organizations, team management and basic procedure models is only treated abstractly in order to achieve basic coverage.

For the GTB model, the knowledge and skills domain is broken down into four subdomains: test competence, IT/technology competence, process competence, and application or domain competence.

- Test competence includes all knowledge about testing, e.g., test techniques, test levels and test processes: How do I solve the task effectively and efficiently?
- Technology competence includes knowledge of the structure and technology of the test object on the one hand and knowledge of the test means, e.g., interfaces and test tools, on the other hand: What and how is to be tested?
- Process competence describes how deep the knowledge of the organization and the process model must be in order to complete tasks on time, e.g., What plans and constraints apply and who are my partners?
- Domain competence indicates how good the knowledge from the area of the application and its requirement should be, e.g., which requirements on the test object are to be tested with which priority?

For the area of test competence, the individual building blocks of the Certified Tester scheme are used in part to show which qualifications are useful under which framework conditions. For the other knowledge areas, more general statements are used, since a specific professional and technical context is necessary for providing details.

COMPETENCE CATEGORIES TESTING

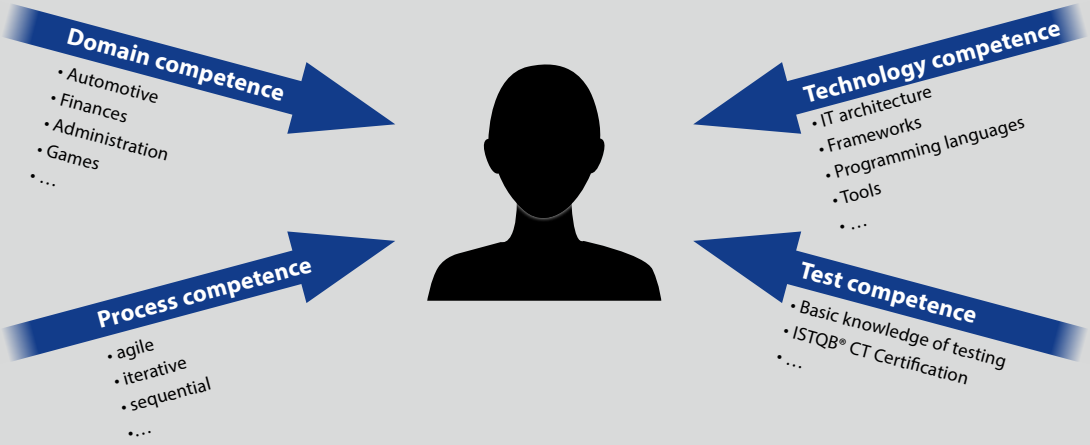

Figure: Knowledge and method competence categories testing

ROLES VS. PEOPLE

Roles describe the range of competencies needed to perform tasks efficiently - people have competencies or can acquire them. Understanding roles helps in staffing and organizing teams.

Every person trained or at least experienced in the IT environment brings a certain range of competencies with them which can be used for various tasks in the process of software development. In most cases, the person also has focal points, preferences and characteristics that make them particularly suitable for certain tasks. Often, the person is then able to handle additional tasks with only minor support (e.g., training or coaching) and motivation. For example, business analysts are often also active in the area of test specification and acceptance testing, or coders can be tasked with unit and integration testing or in test automation. The same applies to test analysts in business analysis or test data managers in database design or database programming.

TASKS IN TESTING

The basis of the task description are the activities in the test process briefly outlined below (for detailed definitions, see Certified Tester syllabi):

- **Test planning**

Elaboration of the conceptual and content planning of the test objectives and deriving the tasks to be performed. Conversion of the planning into a (basic) time and resource schedule within the possible budget.

- **Test analysis (what to test)**

Analysis of the requirements and realization information to check testability (defect avoidance), to identify the testable features and, for example, to define the test conditions and coverage criteria. This can be done using the planned test techniques and a risk analysis and should take into account the functional and non-functional requirements at hand.

- **Test design (how to test)**

Specification of test cases based on the test conditions and the technical boundary conditions of the test object in order to implement the planned test objectives in prioritized abstract test cases and test sets. Test techniques are used here and a risk analysis is taken into account.

- **Test implementation (is the test case ready for execution)**

Preparation of the test case specification and the defined test object in such a way that the test cases can be executed, e.g., by concrete test data selection, by required system configuration, by test automation, etc.

- **Test execution**

Manual or partially or fully automated execution of the prepared test steps of a test case including the comparison with the test expectations and the documentation of the test protocols, e.g., data entry and service call with associated screenshot of the result mask as well as a database query.

- **Test monitoring (evaluation & reporting)**

Identify and assess test progress against planning and achievement of end criteria (e.g., coverages). Sum-

marizing all test assessments at a given point in time to enable the presentation of the current test status in relation to planning as a basis for decision-making

› Test control

Management of the implementation of the test plan by means of concrete tasks, deadlines and resources, as well as related adjustments in the course of execution as a result of influences and results..

› Test completion

Test completion activities take place at milestones, e.g., when a test stage is completed or a software version is released. This includes securing the test results and evaluating the test procedure (lessons learned).

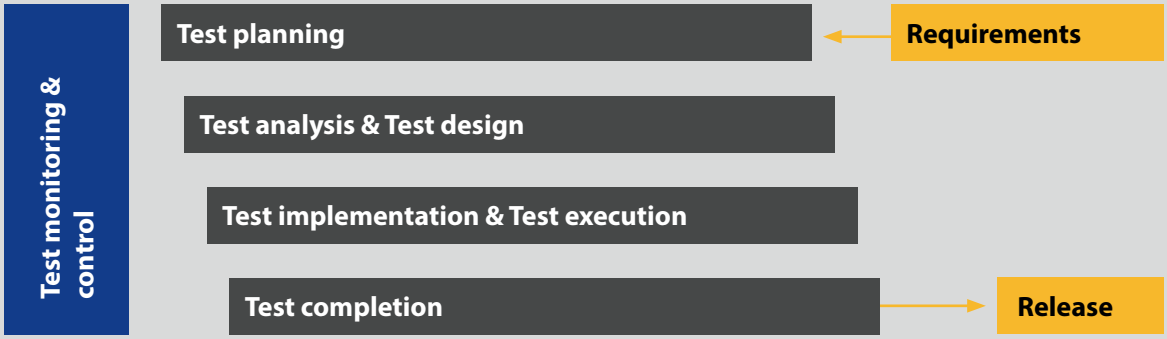

Figure: Representation of the test process

TEST SUPPORT TASKS

In addition to the actual tasks of testing, other tasks have proven to be useful, especially in the context of test execution. These require additional, specific competencies in testing and technology and can positively improve the efficiency of testing:

› Test environment coordination

The timely technical provision of a test environment, including an executable test object as well as the necessary access points (test interfaces) and the test data, can greatly reduce the burden on testing. In addition to test knowledge, the task requires many competencies from the areas of system configuration and operation, e.g., version control, deployment, environment configuration.

› Test automation (tools and frameworks)

Developing automatically executable scripts can drastically reduce test execution time, simplify test repeatability (e.g., regression testing), and lead to more cost-effective testing. Making automation test scripts sustainable and maintainable requires both basic test knowledge and further competencies relating to the architecture, design and programming of automation frameworks, (e.g., for keyword-driven test generation), as well as to the test tools used.

- **Test data management**

The availability of correct test data is crucial for testing many applications. This concerns the test input data and, usually to a greater extent, the data stored in the test object itself, e.g., in databases. Especially complex data constellations such as those found in parallel test environments or those based on anonymized production data, specific competencies are required to guarantee the quality and efficiency of the test. In addition, for the testing of AI applications, the acquisition of correct, appropriate and comprehensive test and validation data forms a major challenge which require appropriate skills.

- **Test architecture**

Test strategy and test conception must be implemented in the architecture of both the test object and the entire test environment in order to efficiently fulfill the requirements for the whole test execution in test stages and test cases. The test architecture supports the entire range of test execution tasks. This requires a broad competence in the areas of testing, test strategy and systems, as well as test technology.

ROLES - BASICS AND SPECIALIZATION

The tasks of testing depend on the test object and its requirements. Depending on the scope of the requirements and the complexity and testability of the solution, the test tasks may also be more complex and must be structured in a meaningful way. Starting from the basic tasks of testing, the model shows how a necessary deepening or specialization arises from an increasing complexity. A detailed description of the roles is given in the appendix.

Starting from the core process 'Testing', which includes the basic tasks, the model defines the so-called basic roles::

- **Test Analysis (TA)** has the core tasks of test analysis and test design. This requires a knowledge and skill focus in the areas of testing, e.g., test techniques, requirements engineering and domain.
- **Test-Engineering (TE)** has the core tasks of test implementation and test execution. This requires knowledge and skill focus in testing, IT structure and technology.
- **Test Management (TM)** has the core tasks of test planning and scheduling, test monitoring and test control. This requires knowledge and skills which focus in the areas of testing and process,

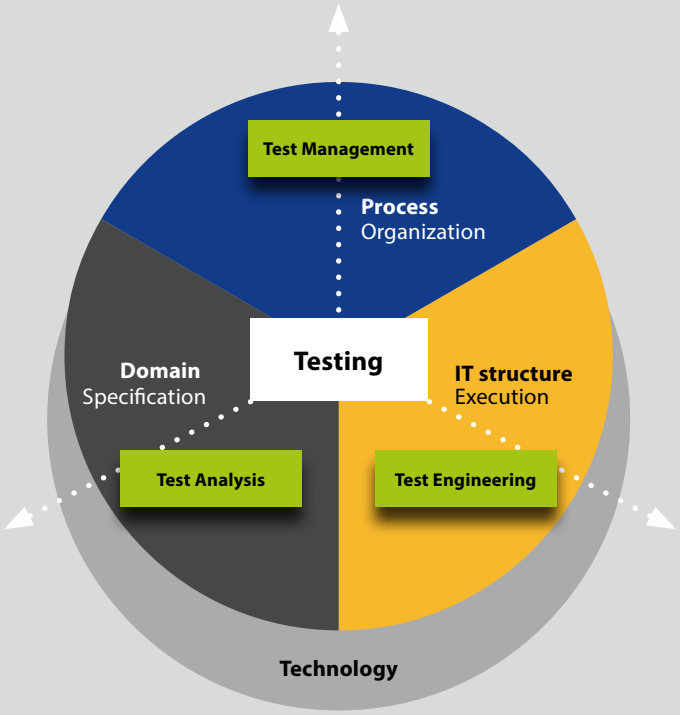

Figure: Basic roles testing

A specialization does not mean that a role does not require basic competencies in the other knowledge categories, but indicates areas of emphasis.

Visualization example (column height corresponds to the required knowledge/skill):

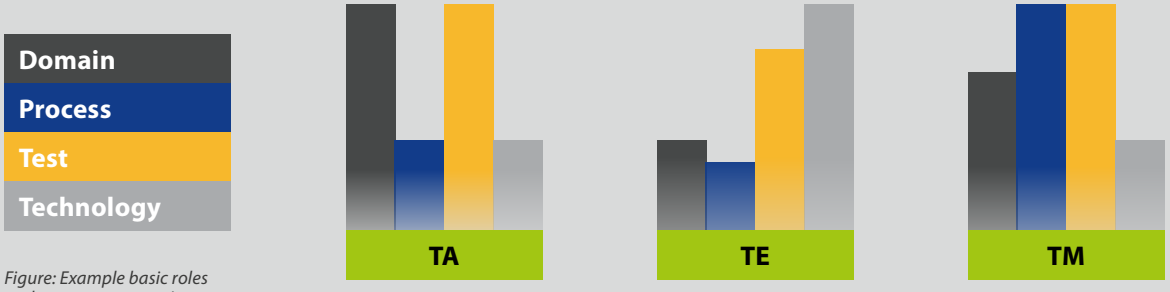

Figure: Example basic roles and competence requirements

The model expands into special roles, which are derived on the basis of increased complexities of the test objects, requirements and test tasks and are usually also reflected in the organization of testing in software / system development. In order to solve the tasks professionally, very specific combinations of competencies are often required.

In the context of the test approach, this applies to areas with very specific needs, especially from the range of non-functional requirements, domain-specific regulations (e.g., automotive, medical technology, avionics) or special technologies (e.g., AI, mobile). Here, test tasks are often only used for temporary phases in a project / release / sprint, but require in-depth knowledge and experience of test techniques and tools. Examples are the load and performance test, the security test or the usability test (role special tests).

Overarching the test process for a test object, it often makes sense to develop an overarching test strategy for an organization that harmonizes concepts and approaches and makes them more efficient overall (role test strategy).

Also, in the area of test execution there is often the requirement for overarching support, which relieves the actual test of technological constraints and thus raises efficiencies. These areas include test environment management (role test environment coordination), central test data management (role test data management) or the use of specific concepts / tools / technologies for test automation (role test automation).

In the area of test execution, it makes sense to develop and establish overarching concepts and architectures. This can have cost-saving effects, especially for the development and use of extensive infrastructures and tools (role test architecture).

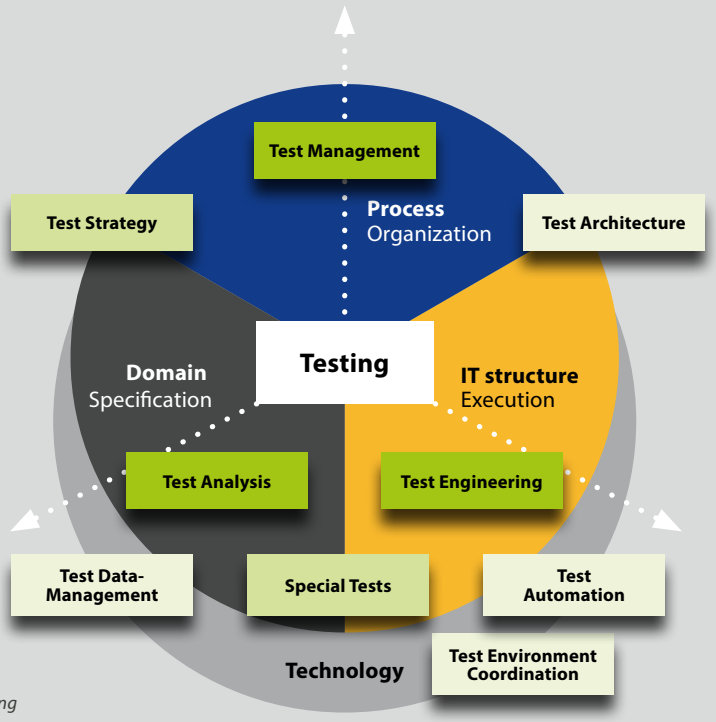

Figure: Special roles Testing and Test support

ROLE AND RESPONSIBILITY

Based on qualifications, knowledge, skills, experience and social competence, a person can also assume a role at different levels of responsibility.

To complete the model, roles are divided into the following levels of responsibility:

› Do
- works according to instructions: follow, assist

› Responsible
- works independently: apply, enable, ensure, advise
- is capable of judgment and willing to make decisions regarding viable solutions in the area of responsibilityt

› Design
- Conceives or directs work: initiates, influences, inspires, mobilizes, sets strategy.
- is capable of judgment and willing to make decisions regarding viable solutions in the overall context
- observes, analyzes, and evaluates trends and can identify opportunities as well as risks
- can develop and manage sound, forward-looking plans and strategies

On the one hand, these levels show that personal career development is feasible and presentable through more knowledge and skills, accumulated experience and a willingness to take on responsibility. On the other hand, they support the organization in planning and defining roles and resources and the qualifications required for them. In addition, they can be used to establish development paths for employees.

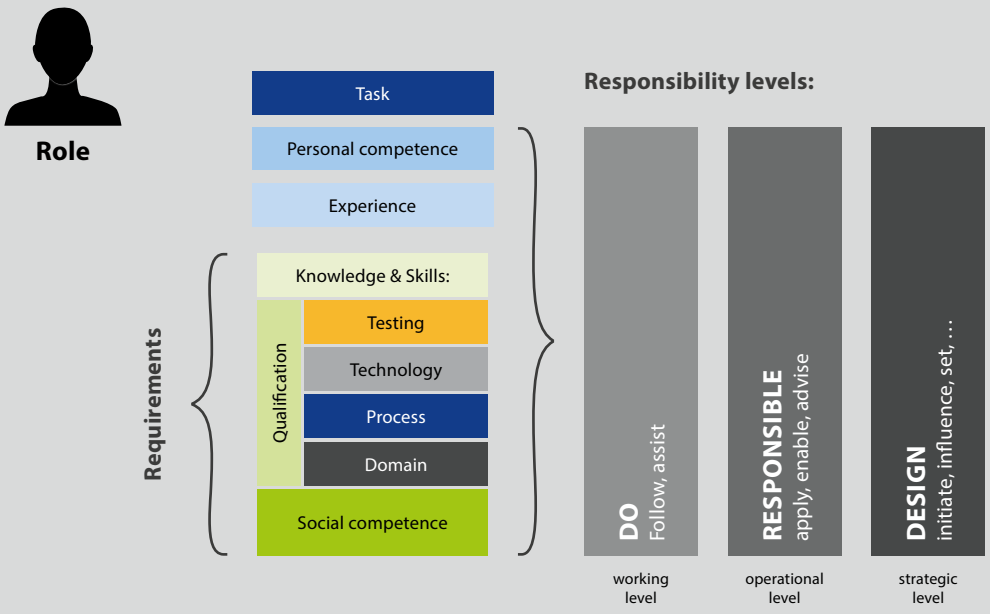

Figure: Role and responsibility

SUMMARY

The professional profile for testing aims to support individuals and organizations in positioning themselves professionally in the field of testing. To this end, the reference scheme provides a clear structure for mapping at team, project, specialist and organizational levels.

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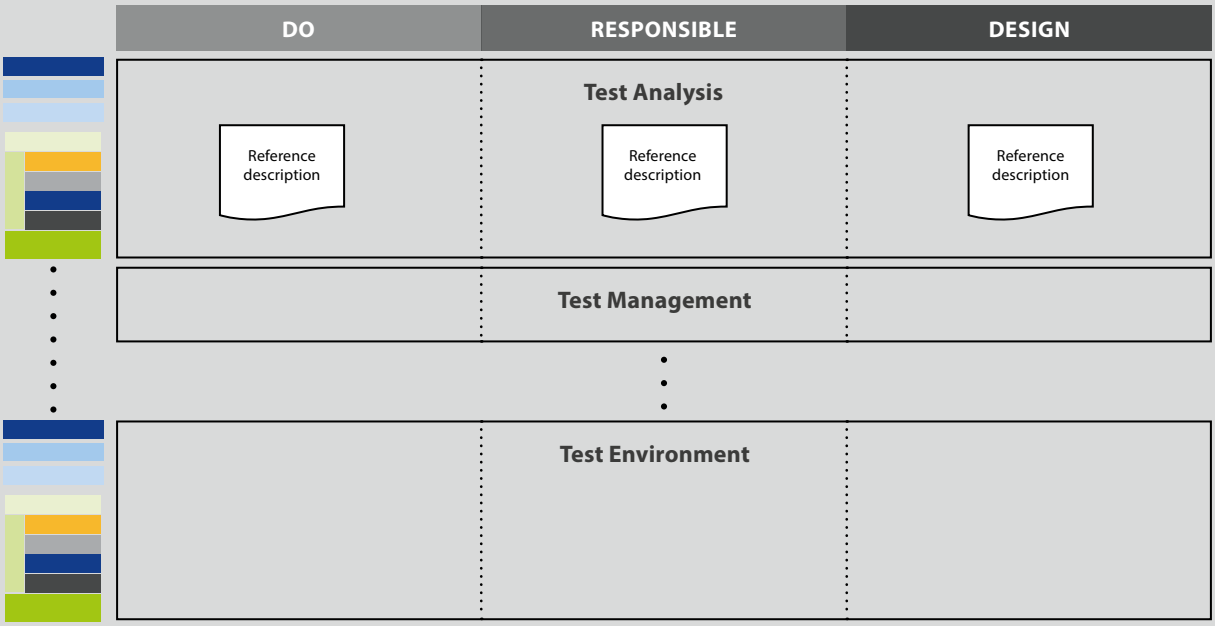


CURRENT ROLES

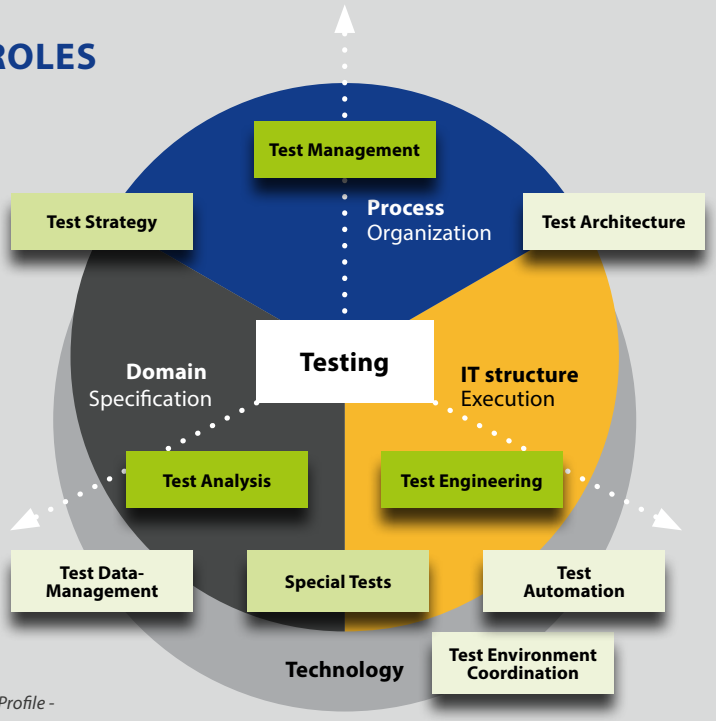


Figure: GTB Professional Profile - Structure and roles

Roles are abstracted definitions of tasks and knowledge.

In reality, a person can take on several roles or have knowledge that goes beyond the role description. Particularly in agile projects, on the one hand, the assumption of people changing their roles is required, and on the other hand, depending on the level of complexity, specialized knowledge is also necessary.

While in simple conditions one trained person can perform all the tasks of testing, in more complex testing conditions and larger organizations it makes sense to specially qualify one or more people in the team for specific topics, or to include people in the team who have complementary and in-depth knowledge.

For the area of testing knowledge and skills, the Certified Tester scheme forms a suitable reference for basic and advanced training.

CLASSIFICATION OF THE CT SCHEME (AS OF 2022):

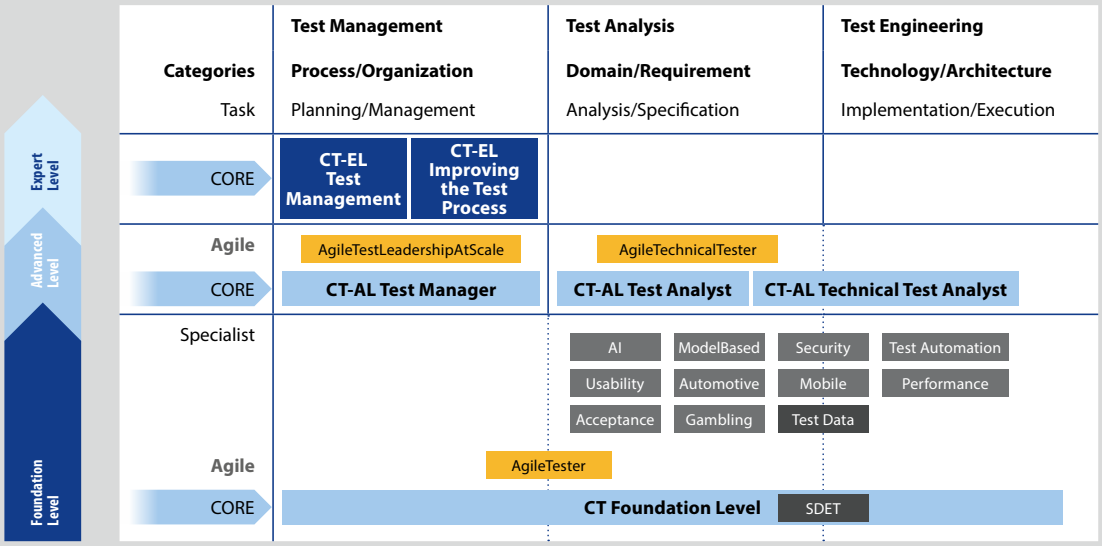


Figure: Task / Skill areas and CT training modules

APPLICATION OF THE PROFESSIONAL PROFILE / THE REFERENCE SCHEME OF THE GTB

The reference scheme of the professional profile for testing wants to:

- visualize and clarify the diverse tasks involved in testing;
- support personal development and career planning;
- help the team, project and product organization;
- communicate basic organizational and personnel planning ideas;
- provide guidance for the training and development areas;

For this purpose, it offers a clear structure by means of the roles, which define meaningful task areas in testing and are reusable in the organization of software development and system release

APPLICATION IN PERSONAL CAREER PLANNING

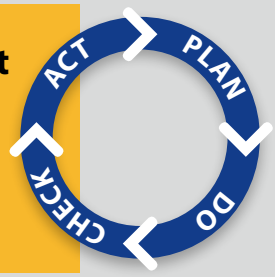
On the one hand, the reference model provides a number of suggestions as to which tasks and associated roles are possible for the subject of testing; on the other hand, it also provides a specific model as to which competencies are useful for personal development.

This can help you to determine which competencies you want to develop more and whether testing will become a core competency or whether you are more likely to broaden your knowledge. Examples for deepening, specialization or expansion are:

HOW TO USE THE PROFESSIONAL PROFILE FOR TEST *IN CONTINUOUS EDUCATION AND CAREER PLANNING?*

Plan – Do – Check – Act your own way:

- **your wishes**
- **your strengths**



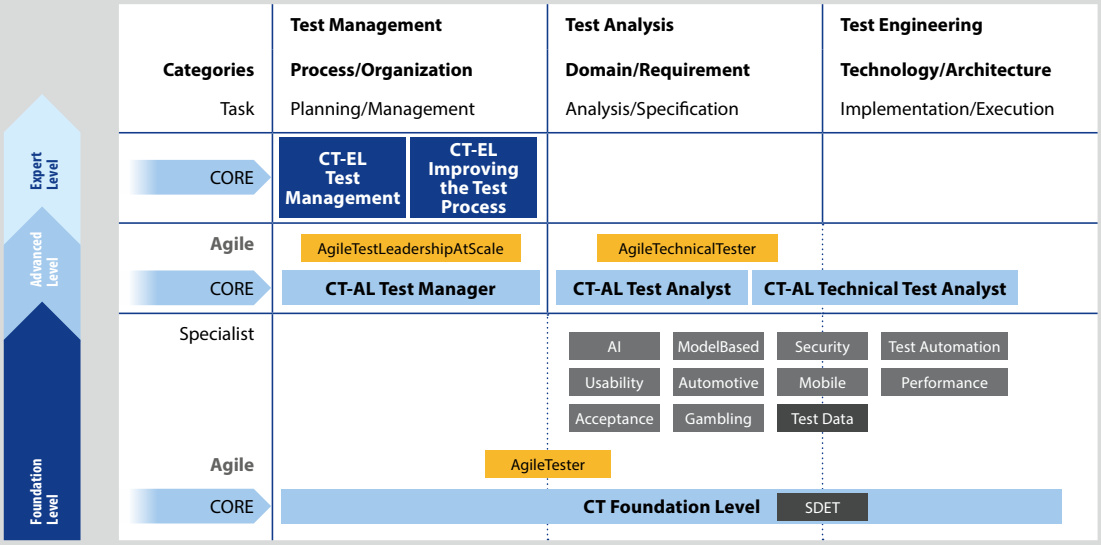
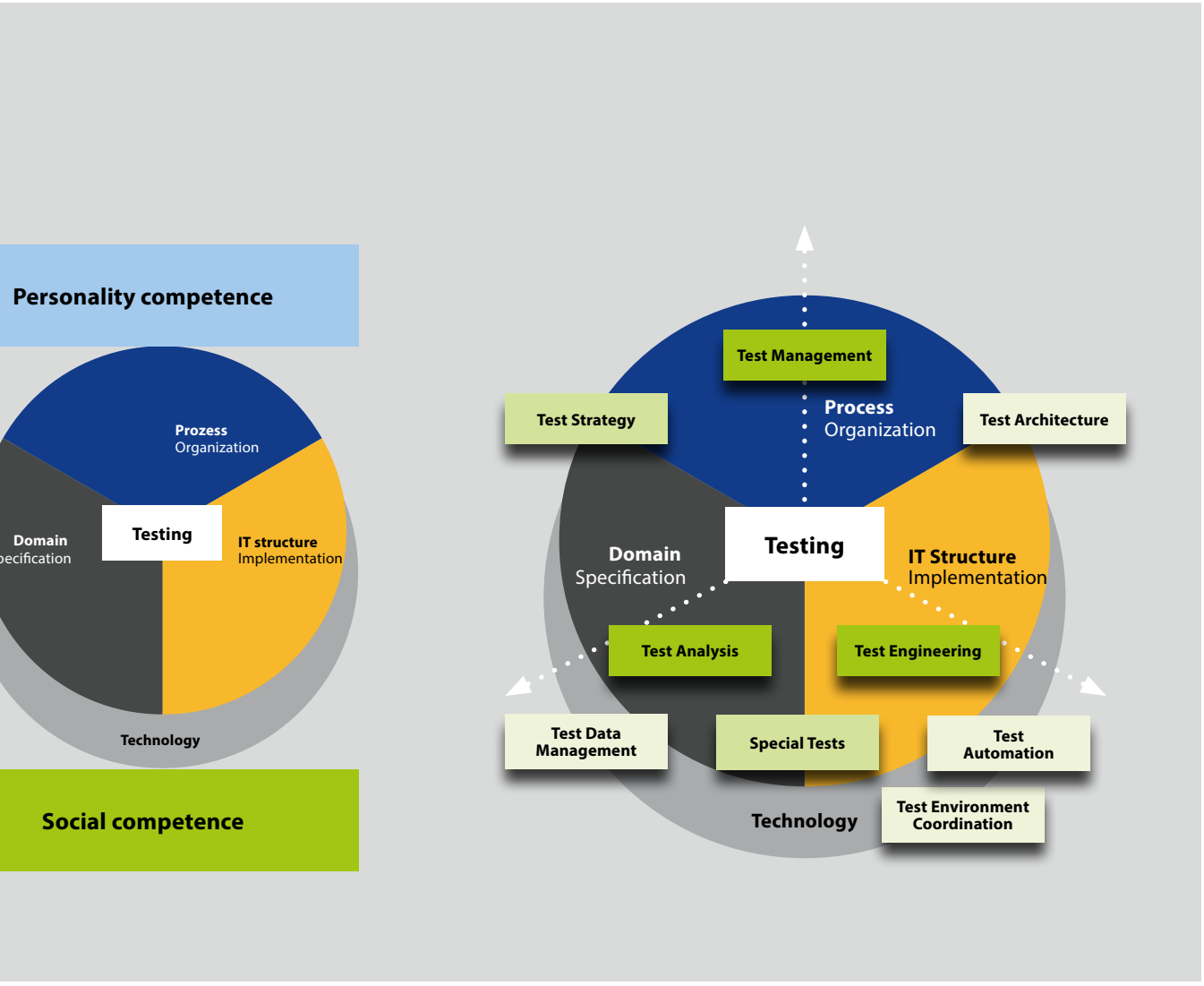


Figure: The professional profile as a personal support

- Deepening test engineering, e.g., in connection with test implementation, test automation and test data management
- Specialization in security testing, e.g., by deepening the subject of requirements and test techniques / technology
- Expansion for coders, e.g., by getting to know test techniques, test implementation and test automation
- Expansion for business analysts, e.g., by getting to know review and test techniques, also for specific domains or non-functional requirements

Together with the Certified Tester training scheme, this scheme forms a framework that everyone can use for themselves. This also applies in the long term, as one can (on the basis of the Deming Cycle) repeatedly check and align one's personal development.



TESTING: PROCEDURE AND ORGANIZATION

In order to be able to use the professional profile description for a team or more complex organization, it is necessary to be clear about the distribution of tasks and their respective objectives in the software development lifecycle used. All approaches, whether agile, iterative or classic sequential, have quality objectives from which test tasks follow, each with their complexity, effort and priority. The implementation of these tasks varies depending on the development approach. Based on the complexity of the delivery object and the quality, budget and delivery time requirements, the test tasks localize themselves in the organization, or should be localized for efficiency reasons.

The basis for this is the division into the core tasks of testing, which focus on the test object (product) and the requirements placed on it (functional and non-functional quality characteristics), and the tasks that are oriented towards the processes and means of task implementation and their efficiency.

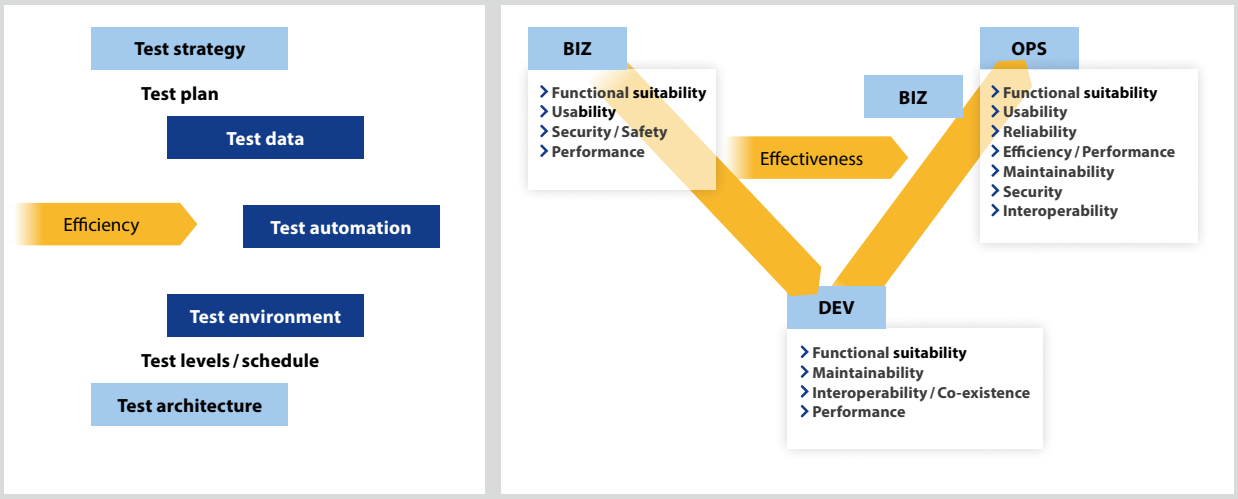


Figure: Testing - Requirements for product and process

BIZ – Requirements side
DEV – Development side
OPS – Operational side

Depending on the actual organization, the chosen software development lifecycle model and the end product, a specific set-up and assignment of test tasks must be made. There is no simple blueprint for this; it can range from a more task-oriented organization with different test teams, e.g., for integration/acceptance testing, usability testing, performance testing and test environment, to a decentralized organization in which, for example, each development team is completely responsible for its quality.

Both extremes have their own challenges and are often not optimal in their efficiency. They are either too far away from the specific, product-specific test task (test teams) or they are not sufficiently equipped with the necessary broad testing expertise (development teams).

One solution that many agile organizations are now adopting is that testing tasks are structured into two levels based on system integration: local testing in the respective feature team and integrative and operational testing at the release level. All of this is supported by overarching Centers of Competence (CoC), which provide for an exchange of information and expertise or coaching to increase efficiency, as well as by overarching test strategies and test architectures, which set guidelines for structures, goals, and resources.

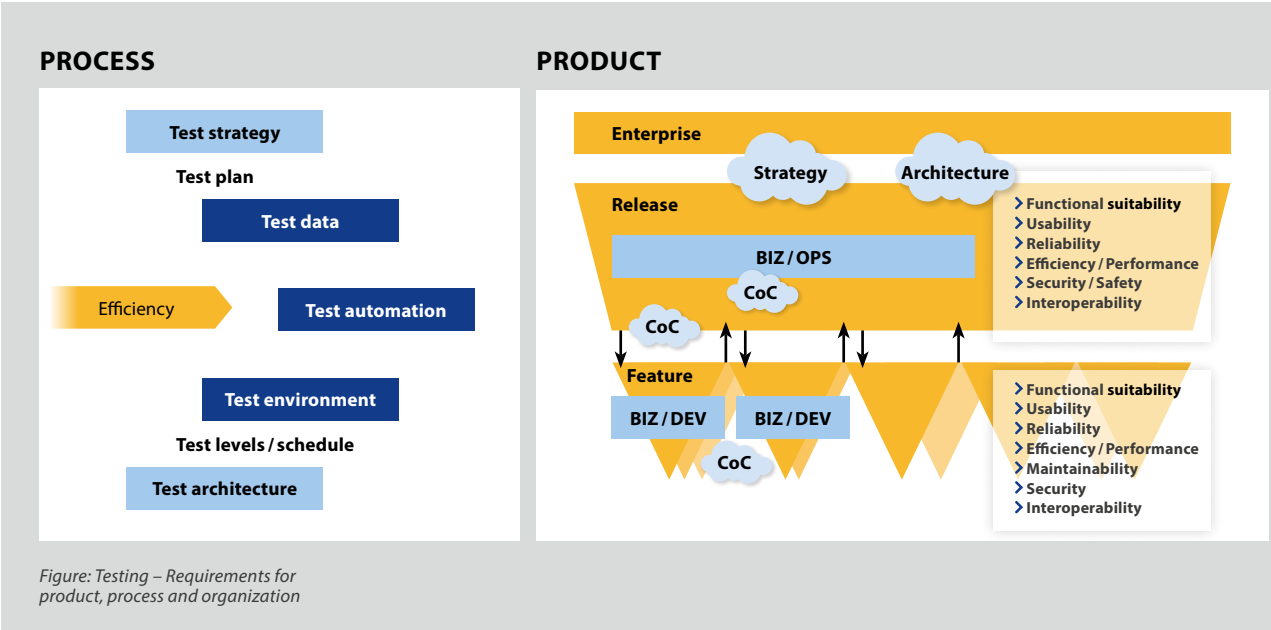


Figure: Testing – Requirements for product, process and organization

The basic principles are

- Organizations must align themselves with their goals, the architecture of their products and their approach. Responsibilities and the distribution of tasks are derived from this.
- Organizations need to learn in order to adapt to changing conditions.
- Efficiency follows from the competence of the acting persons.

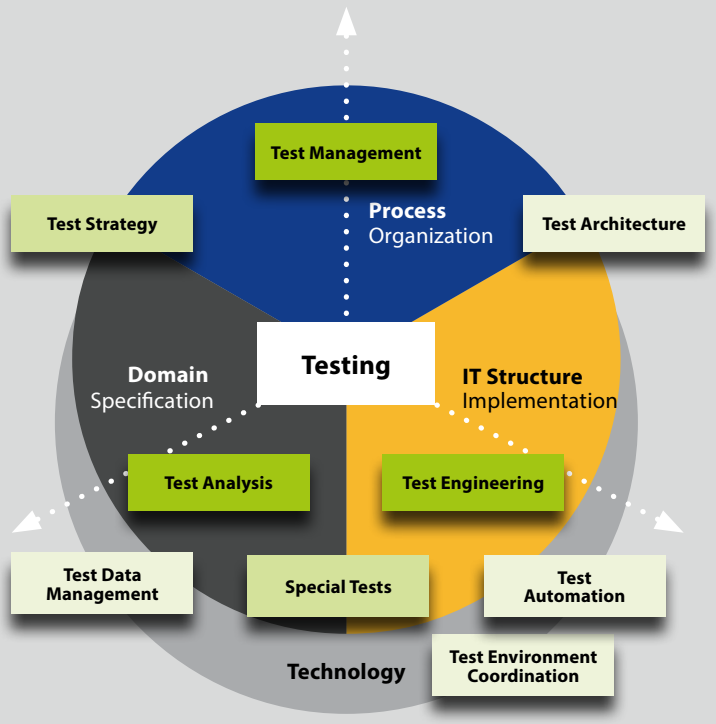
TEAM AND PROJECT DEPLOYMENT

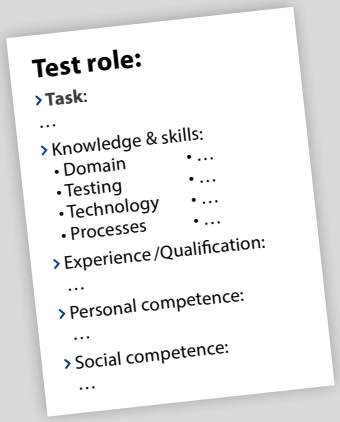
Depending on the scale of a sprint / project, the technical and economic requirements and the complexity of the feature / system to be developed, test tasks must be assigned. The basis for this are the quality and capabilities required for the object to be delivered.

Based on the requirements and the underlying development procedure, an initial estimate of the test tasks can be made and thus a first draft of the required test roles and competencies. Here, the job description can already provide support as an idea generator or checklist. In a further step, the planning of the tasks can be supplemented by dates, effort, boundary conditions, etc., in order to obtain capacity and time requirements in addition to the roles.

HOW TO USE THE PROFESSIONAL PROFILE FOR TEST *IN TEAM / PROJECT STAFFING*

Identify your target, build your team and promote your team specifically





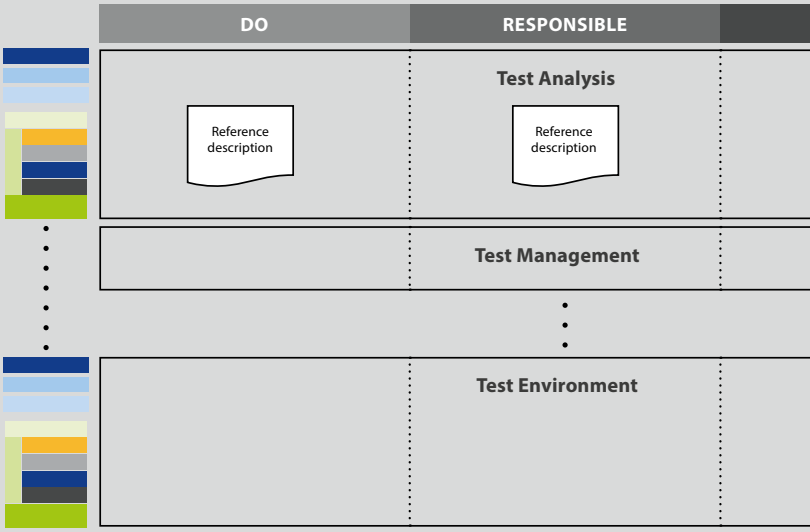
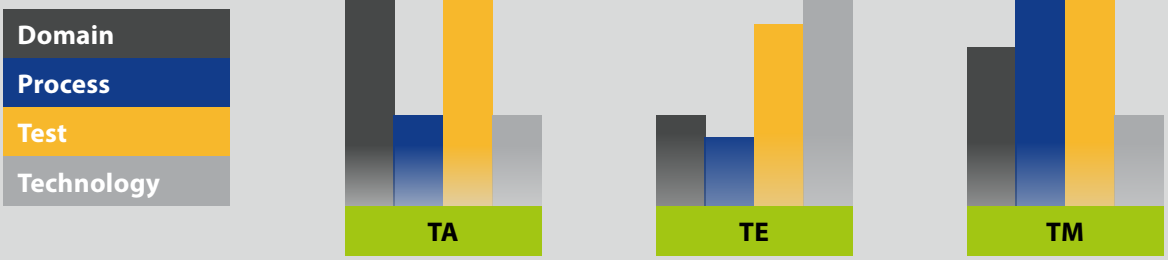
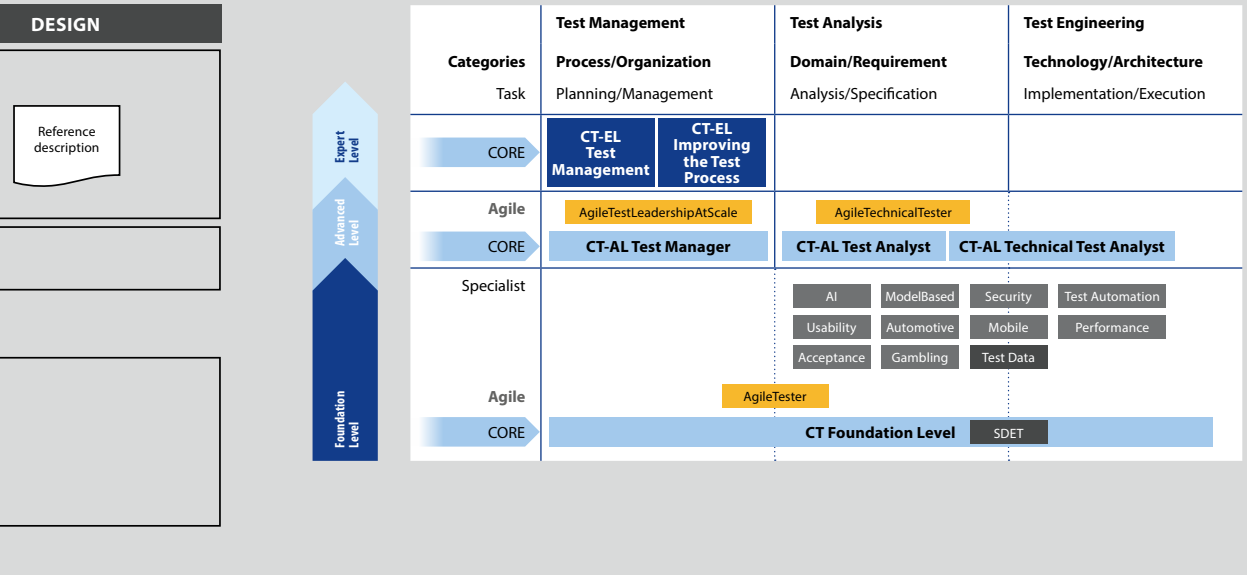


Figure: The professional profile as a team or project support

The decisive step is to assign tasks and roles to real people who are up to the tasks. Here, too, the job profile can provide support in the form of structures, ideas and checklists to assess the suitability of the planned or available persons for the tasks and thus identify any open areas (target/actual determination). Any gaps identified can be closed through targeted training, coaching or outsourcing.





USE IN ORGANIZATIONAL/STAFF PLANNING AS WELL AS CONTINUING EDUCATION:

Depending on the size or complexity of the software applications and the targeted software development lifecycle, an IT organization creates its structure for development and operation.

Depending on the risks and requirements, also in terms of delivery and response time, the organization needs not only the right development / working environment, but above all the right personnel. This applies regardless of whether it is internal or external personnel.

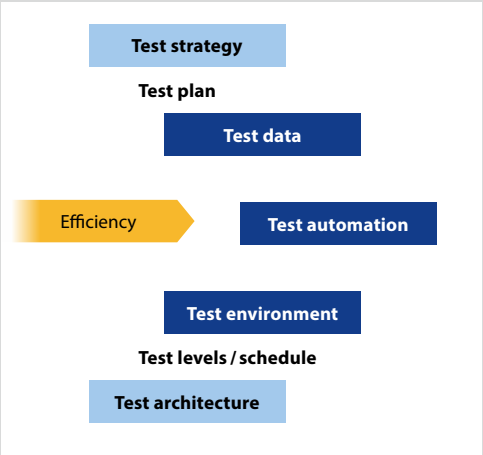
HOW TO USE THE PROFESSIONAL PROFILE FOR TEST *IN ORGANIZATIONAL / PERSONNEL PLANNING*

Identify your target, build your team and promote your team specifically

Test role:

- Task:
  - …
- Knowledge & skills:
  - Domain
  - Testing
  - Technology
  - Processes
  - …
  - …
  - …
  - …
- Experience /Qualification:
  - …
- Personal competence:
  - …
- Social competence:
  - …

PROCESS



PRODUCT

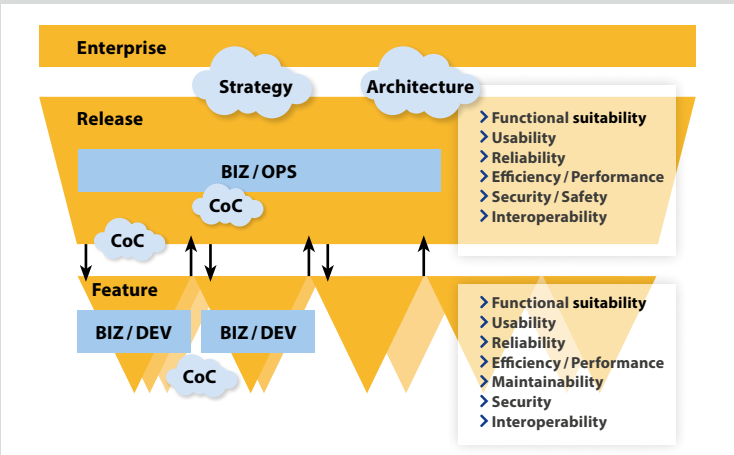


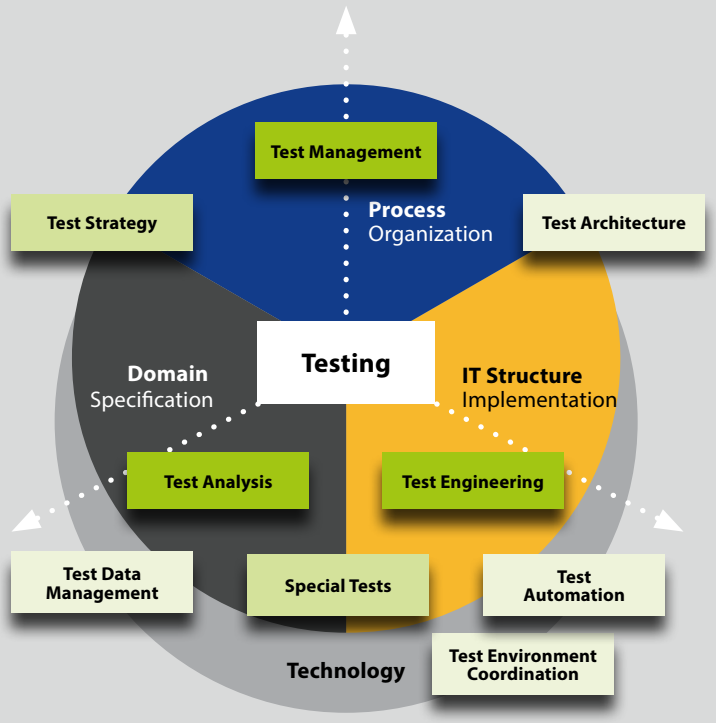
Figure: The professional profile as an organizational support

The GTB job profile for testing can

- be a basic idea generator as to what tasks need to be filled;
- serve as a scheme and checklist for a specific role or personnel description;
- be a reference for continuing education for identified gaps, whether for training or coaching.

The job description in particular can also serve as a reference for training providers (or HR departments) as a suitable continuing education offering.

Strategy Process	Test strategy
Efficient Environment	Test architecture Test environment Test automation
Test Team	Test Management Test Analysis Test Engineering Test Specialist



CONCLUSION

The professional profile for testing wants to create an understanding that quality assurance is a topic for every step and for everyone in the team, that testing or inspection competence is a help for everyone and that quality assurance can be integrated efficiently and flexibly.

This includes the development of people, their professional and social competencies, and the delegation of responsibility. In the future, it will be less about having the tester or the coder or the requirements engineer, but about people who competently and responsibly take on tasks in the short or medium term. This also applies to quality assurance tasks:

- through reviews of ideas/epics and requirements/user stories;
- through architecture reviews and the integration of test access into the system design;
- by (automated) testing of the system from unit to application level;
- through monitoring, automated checks and safety switches during application operation;
- through efficient test support, e.g., test environments, test data, test tools; and
- by an overall quality management with strategy and planning, but also feedback, improvement and communication.

Competence and team management is and remains a core task, which includes identifying knowledge and skill gaps and (pro-)actively closing them.

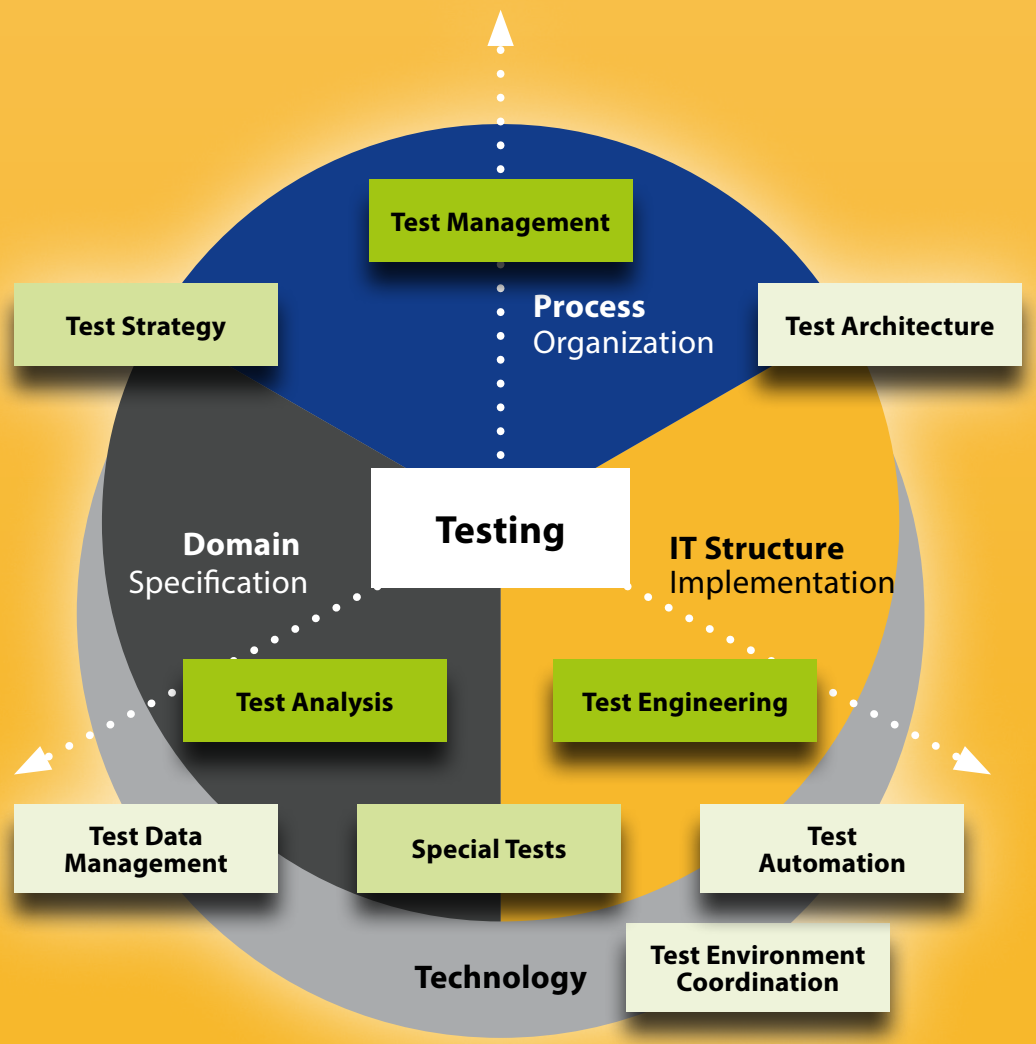
The GTB would like to thank the working group Berufsbild and its members for the preparation and review of this document. Sabine Baxmeier, Thomas Karl, Dietrich Leimsner, Nico Liedl, Elke Mai, Dr. Armin Metzger, Jörn Münzel (leadership), Steffen Schild, Torsten Wille and Peter Zimmerer were involved.

The testing profession will and must continue to evolve, so we welcome comments and ideas, criticism and praise, questions and discussions. You can reach us via:

- Email: info@gtb.de
- Internet: http://www.gtb.de
- Twitter: https://twitter.com/GTB_ISTQB
- LinkedIn: https://de.linkedin.com/company/german-testing-board

PROFESSIONAL VIEW ON TESTING

- Roles -



Testing and Test Management
Test Support

TESTING

AREA	DO Working level	RESPONSIBLE + Operational level
Task / Responsibility / Competence ***(detailed information about the task see GTB: CT_FL syllabus)***	*Carries out the basic activities of testing (test analysis, design, implementation, execution and test evaluation) for a limited test field (test level, domain) independently according to instructions.*	*Carries out the basic activities of testing (test analysis, design, implementation, execution and test evaluation) for a broader test field (test level, domain) independently and on his/her own responsibility. Can carry out test planning and control for small teams (up to 3 people, 4-6 weeks test project duration).*
Test competence	basic test competence (CT_FL: test process, test techniques, documentation, ...); optional: CT - Agile Tester	in-depth test competence (CT_AL - TA or TTA : test techniques, reporting, test / defect management, ...) and testing experience (> 3 years); optional: CT - Agile Tester and CT_AL - Agile Technical Tester
Technology competence	basic IT competence on programming/scripting languages, on system architectures	IT competence on programming/scripting languages, on system architectures and on test/test management tools
Process competence	basic competence in software development processes (e.g., agile, iterative, sequential)	basic competence in software development processes (e.g., agile, iterative, sequential) and project organization
Domain competence	basic domain competence in the environment of the test object, e.g., basic application, basic quality criteria	in-depth domain competence in the environment of the test object, e.g., area of application, risks of application, required quality criteria
Social competence (soft skills)	analytical thinking, systematic, conscientious approach, responsible, able to communicate, able to work in a team;	analytical thinking, good comprehension skills, creative-destructive skills (what if), systematic, conscientious approach, responsible, able to communicate, able to deal with conflict/ discussion, able to work in a team, able to lead/motivate;

	DESIGN + Strategic level	BEREICH
	Position not occupied at this level of responsibility, as specialization makes sense here.	***Task / Responsibility / Competence*** ***(detailed information about the task see GTB: CT_FL syllabus)***
		Test competence
		Technology competence
		Process competence
		Domain competence
		Social competence (soft skills)

TEST ANALYSIS

AREA	DO Working level	RESPONSIBLE + Operational level
Task / Responsibility / Competence ***(detailed information about the task see GTB: CT_AL module overview and syllabi)***	*Performs activities according to instructions with a focus on the area of 'subject test specification' (test analysis, test design).* *(e.g., subject/application tester, user acceptance tester)*	*Performs independently activities with a focus on the area of 'subject test specification' (test analysis, test design) for a broader test field.* *Can review other test specifications and can lead small teams.* *(e.g., subject/application tester or test responsible, user acceptance tester)*
Test competence	basic test competence (CT_FL: test process, documentation, ...), in-depth competence in test techniques; optional: CT - Agile Tester	in-depth test competence (CT_AL - TA or TTA : focus on test techniques) and test (specification) experience (> 3 years); optional: CT - Agile Tester and CT_AL - Agile Technical Tester
Technology competence	basic IT competence on system architectures, basic skills on requirements engineering	basic IT competence on system architectures, in-depth skills on requirements engineering
Process competence	basic competence in software development processes (e.g., agile, iterative, sequential)	basic competence in software development processes (e.g., agile, iterative, sequential), e.g., experience in at least one process model
Domain competence	in-depth domain competence, at least in partial areas, in the environment of the test object, e.g., subject application requirements, domain-specific quality criteria	in-depth, if necessary also specialized domain competence in the environment of the test object, e.g., subject application requirements, domain-specific quality criteria; experience in domain (>3 years)
Social competence (soft skills)	analytical thinking, systematic, conscientious approach, responsible, able to communicate, able to work in a team;	analytical thinking, good comprehension skills, creative-destructive skills (what if), systematic, conscientious approach, responsible, able to communicate, able to deal with conflict/ discussion, able to work in a team, able to lead/motivate;

	DESIGN + Strategic level	AREA
	Performs responsible activities with a focus on the area of 'subject test specification' (test analysis, test design) for an entire test field. *Can review other test specifications and can lead medium to large subject/application test teams.* *(e.g., subject/application test responsible, user acceptance test responsible)*	***Task / Responsibility / Competence*** ***(detailed information about the task see GTB: CT_AL module overview and syllabi)***
	in-depth test competence (CT_AL - TA or TTA : focus on test techniques; reasonable: Full-Advanced CT) and test (specification) experience (> 6 years); optional: CT - Agile Tester and CT_AL - Agile Technical Tester	**Test competence**
	in-depth IT competence on system architectures, in-depth skills on requirements engineering	**Technology competence**
	in-depth competence in software development processes (e.g., agile, iterative, sequential), e.g., experience in more than one process model	**Process competence**
	in-depth, if necessary also specialized domain competence in the environment of the test object, e.g., subject application requirements, domain-specific quality criteria, economic risk analysis; experience in domain (>6 years)	**Domain competence**
	analytical thinking, good comprehension skills, creative-destructive skills (what if), systematic, conscientious approach, organizational skills, responsible, able to communicate, able to deal with conflict/ discussion, able to work in a team, able to lead/motivate;	**Social competence (soft skills)**

TEST ENGINEERING

AREA	DO Working level	RESPONSIBLE + Operational level
Task / Responsibility / Competence ***(detailed information about the task see GTB: CT_AL module overview and syllabi)***	*Performs, with a focus on the area of 'technical test realization' (test implementation, test execution) and according to instructions, the mapping of the subject test specifications into a test execution and result determination.* *(e.g., integration tester, system tester, developer)* *Uses basic skills of IT structures and development methods/techniques for this purpose.*	*Performs with a focus on the area of 'technical test realization' (test implementation, test execution) on his/her own responsibility the mapping of the subject test specifications into a test execution and result determination. Can lead small teams. (e.g., integration test responsible, system tester)* *Can create basic concepts for test implementation based on knowledge of IT structures and development methods/techniques.* *If necessary, can design and implement test automation or control its implementation.*
Test competence	basic test competence (CT_FL: test process, test techniques, documentation, ...); optional: CT - Agile Tester	in-depth test competence (CT_AL - TTA / TA : focus on test implementation and test tools) and test (implementation) experience (> 3 years); optional: CT - Agile Tester and CT_AL - Agile Technical Tester
Technology competence	in-depth IT competence about system architectures, IT components, data models and programming interfaces, e.g., scripting/programming languages, SQL, …	in-depth IT competence on development environments; in-depth IT competence about system architectures, IT components, data models and programming interfaces, e.g., scripting/programming languages, SQL, ... IT technical skills about the test object and the development approach;
Process competence	basic competence in software development processes (e.g., agile, iterative, sequential)	in-depth competence in software development processes (e.g., agile, iterative, sequential), e.g., experience in more than one process model
Domain competence	basic domain competence in the environment of the test object, e.g., basic application, basic quality criteria, interfaces	domain competence in the environment of the test object, e.g., application, quality criteria, interfaces
Social competence (soft skills)	analytical thinking, structural, conscientious approach, responsible, able to communicate, able to work in a team;	analytical thinking, IT-savvy, conceptual and constructive thinking, structural, conscientious approach, responsible, able to communicate, able to deal with conflicts/ discussions, able to work in a team, able to lead/motivate;

	DESIGN + Strategic level	AREA
	Performs and is responsible, with a focus on the area of 'technical test realization' (test implementation, test execution), the mapping of the subject test specifications into a test execution and result determination. Can lead medium-sized teams. (e.g., integration test responsible, system test responsible) *Can create more complex concepts for test implementation based on knowledge of IT structures and development methods/techniques.* *Can design and implement test automation or control its implementation.*	***Task / Responsibility / Competence*** ***(detailed information about the task see GTB: CT_AL module overview and syllabi)***
	in-depth test competence (CT_AL - TTA / TA : focus on test implementation and test tools; reasonable: Full-Advanced CT) and test (implementation) experience (> 6 years); optional: CT - Agile Tester and CT_AL - Agile Technical Tester	**Test competence**
	in-depth IT competence (training) on development models (processes) and development environments; in-depth IT competence (training) about system architectures, IT components, data models and programming interfaces, e.g., scripting/ programming languages, SQL, ... IT technical skills about the test object and the development approach;	**Technology competence**
	in-depth competence (training) in software development processes (e.g., agile, iterative, sequential), e.g., experience/training in several procedure models	**Process competence**
	domain competence in the environment of the test object, e.g., application, quality criteria, risks and interfaces	**Domain competence**
	analytical thinking, IT-savvy, conceptual and constructive thinking, structural, conscientious approach, organizational skills, responsible, able to communicate, able to deal with conflicts/ discussions, able to work in a team, able to lead/motivate;	**Social competence (soft skills)**

TEST MANAGEMENT

AREA	DO Working level	RESPONSIBLE + Operational level
Task / Responsibility / Competence ***(detailed information about the task see GTB: CT_AL module overview and CT_AL resp. CT_EL syllabi)***	*Position not occupied at this level of responsibility as it requires independent action and is not meaningful based on guidance and instruction.*	*Is responsible for the tasks 'test planning', 'test monitoring' and 'test control' as well as the 'test completion', carries out the activities independently or in a steering role as part of a team. Leads medium-sized teams (up to 6 people) and leads the team for one or more test levels.* *Is the representative of the test in the project office or corresponding organization.* *Should have in-depth experience in at least one of the positions of testing, test analysis or test engineering.*
Test competence		in-depth test competence (CT_AL - TM, reasonable also CT_AL - TA), basic skills about test management tools, team leadership experience (>2 years) and test experience (> 3 years); optional: CT - Agile Tester and CT_AL - Agile Test Leadership at Scale (ATLaS)
Technology competence		basic IT competence on development environments; basic IT competence about system architectures and data models; IT technical skills about the test object and the specific development approach;
Process competence		in-depth competence in software development processes (e.g., agile, iterative, sequential), e.g., experience in more than one process model; basic competence on project organizations
Domain competence		domain competence in the environment of the test object, e.g., subject application requirements, domain-specific quality criteria; domain experience (>3 years)
Social competence (soft skills)		analytical thinking, good comprehension skills, organizational skills, moderation skills, systematic, conscientious approach, responsible, able to communicate, able to deal with conflict/ discussion, presentation and assertiveness skills, able to work in a team, able to lead/motivate;

	DESIGN + Strategic level	AREA
	Is responsible for the tasks 'test planning', 'test monitoring' and 'test control' as well as the 'test completion', carries out the activities independently or in a steering role as part of a team. Leads large teams (up to 15 people) and leads the team for one or more test levels. *Is the representative of the test in the project office, is responsible for the test budget and represents quality management to the client. (Responsibilities may vary depending on organizational and process model).* *Should have in-depth experience in more than one of the Testing, Test Analysis or Test Engineering positions.*	***Task / Responsibility / Competence*** ***(detailed information about the task see GTB: CT_AL module overview and CT_AL resp. CT_EL syllabi)***
	in-depth test competence (CT_AL - TM, reasonable also CT_AL - TA, recommendable CT_EL - TM), in-depth skills about test management tools, team leadership experience (>4 years) and test experience (> 6 years); optional: CT - Agile Tester and CT_AL - Agile Test Leadership at Scale (ATLaS)	**Test competence**
	in-depth IT competence on development environments; basic IT competence about system architectures and data models; IT technical skills about the test object and the specific development approach;	**Technology competence**
	in-depth competence (training) in software development processes (e.g., agile, iterative, sequential), e.g., experience/training in several procedure models; in-depth competence on project organizations	**Process competence**
	in-depth domain competence in the environment of the test object, e.g., subject application requirements, domain-specific quality criteria; domain experience (>5 years)	**Domain competence**
	analytical thinking, good comprehension skills, organizational skills, moderation skills, systematic, conscientious approach, responsible, able to communicate, able to deal with conflict/ discussion, presentation and assertiveness skills, able to work in a team, able to lead/motivate;	**Social competence (soft skills)**

SPECIAL TESTS
(non-functional / domain / technology)

AREA	DO Working level	RESPONSIBLE + Operational level
Task / Responsibility / Competence ***(detailed information about the task see GTB: CT_FL and CT_Specialist syllabi)***	*Position not occupied at this level of responsibility as it requires independent action and is not meaningful based on guidance and instruction.t*	*Is responsible for the preparation and execution of specific test types, performs the associated activities independently or in a controlling capacity in a small team (<3 people).* *Examples of specific test types: in the non-functional test area - performance/load testing, security testing, usability testing; in the domain-specific test area - normative / legal requirements (railroad, aircraft, automotive, medical technology, ...); in the technological test area - obligations / risks (AI, mobility, ...).* *Based on the test analysis (need and goal of the specific test type), the activities include test design, test implementation, test execution and test evaluation.* *If possible, results of the general test design / implementation / automation are used.*
Test competence		in-depth test competence (CT_AL - TA / TTA : focus on test design [non-functional tests, risk analysis], test implementation and test tools) and test experience (> 3 years); recommended: further training in the special test area (see CT)
Technology competence		In-depth IT competence about structure of the test object, e.g., system architecture, IT technology, IT components and IT interfaces; IT competence about data models and programming interface, e.g., scripting/programming languages, SQL, ... IT competence on development and test environments; IT technical skills about the deployment environment or the application environment; IT technical competence about relevant test execution tools, e.g., load generators
Process competence		basic competence in software development processes (e.g., agile, iterative, sequential)
Domain competence		domain competence in the environment of the test object, e.g., application and user environment with in-depth focus on the relevant quality criteria (requirement for special test) including the application interfaces; knowledge of the relevant legal or normative requirements.
Social competence (soft skills)		analytical thinking, IT-savvy, creative-destructive skills (what if, even for complex scenarios), conceptual and constructive thinking, structural, conscientious approach, responsible, able to communicate, able to deal with conflicts/ discussions, able to work in a team, able to lead/motivate

	DESIGN + Strategic level	AREA
	Is responsible for the preparation and execution of specific test types, performs the associated activities primarily in a controlling capacity in a team (>3 people). *Examples of specific test types: in the non-functional test area - performance/load testing, security testing, usability testing; in the domain-specific test area - normative / legal requirements (railroad, aircraft, automotive, medical technology, ...); in the technological test area - obligations / risks (AI, mobility, ...).* *Based on the test analysis (need and goal of the specific test type), the activities include test design, test implementation, test execution and test evaluation.* *If possible, results of the general test design / implementation / automation are used.*	***Task / Responsibility / Competence*** ***(detailed information about the task see GTB: CT_FL and CT_Specialist syllabi)***
	in-depth test competence (CT_AL - TA / TTA : focus on test design [non-functional tests, risk analysis], test implementation and test tools; reasonable: Full-Advanced CT) and test experience (> 6 years); further training in the special test area (see CT)	**Test competence**
	In-depth IT competence about structure of the test object, e.g., system architecture, IT technology, IT components and IT interfaces; IT competence about data models and programming interface, e.g., scripting/programming languages, SQL, ... IT competence on development and test environments; IT technical skills about the deployment environment or the application environment; IT technical competence about relevant test execution tools, e.g., load generators	**Technology competence**
	in-depth competence in software development processes (e.g., agile, iterative, sequential)	**Process competence**
	domain competence in the environment of the test object, e.g., application and user environment with in-depth focus on the relevant quality criteria (requirement for special test) including the application interfaces; Knowledge of systematic and economic risks; In-depth knowledge of the relevant legal or normative requirements.	**Domain competence**
	analytical thinking, IT-savvy, creative-destructive skills (what if, even for complex scenarios), conceptual and constructive thinking, structural, conscientious approach, organizational skills, presentation skills, responsible, able to communicate, able to deal with conflicts/ discussions, able to work in a team, able to lead/motivate	**Social competence (soft skills)**

TEST STRATEGY

AREA	DO Working level	RESPONSIBLE + Operational level
Task / Responsibility / Competence ***(detailed information about the task see GTB: CT_AL module overview and CT_AL resp. CT_EL syllabi)***	*Position not occupied at this level of responsibility as it requires independent action and is not meaningful based on guidance and instruction.*	*Is responsible for defining the test strategy and the guidelines for test plans for a complex or comprehensive test area, performs the associated activities independently or in a team (< 3 people). Defines the basic quality objectives of the applications and systems and derives basic recommendations for the test approach from this, e.g., test levels and test techniques.* *Leads appropriate expert groups, e.g., the test managers, for regular evaluation and adjustment of the test strategy.* *Is in coordination with IT architects, test architects, and project or IT managers to consider test strategy in design decisions.*
Test competence		in-depth test competence (recommended Full Advanced CT: CT_AL - TA / TTA / TM: focus on test strategy, test organization, test process and test design, perhaps also CT_EL - TM) and test experience (> 5 years); optional: CT - Agile syllabi (CT - AT, CT_AL - ATT, CT_AL - ATLaS)
Technology competence		In-depth IT competence in system architectures, IT infrastructures, system interfaces and data models; in-depth IT competence about technologies used ('system under test'), development and test environments
Process competence		in-depth competence in software development processes (e.g., agile, iterative, sequential), e.g., experience in more than one process model; in-depth competence on project organizations
Domain competence		in-depth domain competence in the environment of the test area (experience > 3 years), e.g., applications, quality criteria, interfaces, technical and economic risks, legal and normative requirements;
Social competence (soft skills)		analytical thinking, IT-savvy, conceptual and constructive thinking, structural, conscientious approach, economic thinking (cost-benefit analyses), responsible, presentation and assertiveness skills, able to communicate, able to deal with conflicts/ discussions, able to work in a team;

	DESIGN + Strategic level	AREA
	Is responsible for defining the test strategy and the guidelines for test plans for a complex or comprehensive test area, performs the associated activities independently or in a team (> 3 people). Defines the basic quality objectives of the applications and systems or system landscapes to be tested (e.g., enterprise IT) and derives basic recommendations for the test approach from this, e.g., test levels and test techniques. *Leads appropriate expert groups, e.g., the test managers, for regular evaluation and adjustment of the test strategy.* *Is in coordination with IT architects, test architects, and project or IT managers to consider test strategy in design decisions.* *Can lead a team, has in-depth experience in test strategy and design (> 3 years) and can perform a test process assessment.*	***Task / Responsibility / Competence*** ***(detailed information about the task see GTB: CT_AL module overview and CT_AL resp. CT_EL syllabi)***
	in-depth test competence (Full Advanced CT: CT_AL - TA / TTA / TM: focus on test strategy, test organization, test process and test design, CT_EL ITP, perhaps also CT_EL - TM) and test experience (> 8 years); optional: CT - Agile syllabi (CT - AT, CT_AL - ATT, CT_AL - ATLaS)	**Test competence**
	In-depth IT competence in system architectures, IT infrastructures, system interfaces and data models; in-depth IT competence about technologies used ('system under test' to enterprise IT), development and test environments;	**Technology competence**
	in-depth competence (training) in software development processes (e.g., agile, iterative, sequential), e.g., experience/training in several procedure models; in-depth competence and experience (responsible) on project organizations	**Process competence**
	in-depth domain competence in the entire environment of the test area (experience > 6 years), e.g., applications, quality criteria, interfaces, technical and economic risks, legal and normative requirements	**Domain competence**
	analytical thinking, IT-savvy, conceptual and constructive thinking, structural, conscientious approach, economic thinking (cost-benefit analyses), organizational skills, moderation skills, responsible, presentation and assertiveness skills, able to communicate, able to deal with conflicts/ discussions, able to work in a team, able to lead/motivate	**Social competence (soft skills)**

TEST ARCHITECTURE

AREA	DO Working level	RESPONSIBLE + Operational level
Task / Responsibility / Competence	*Position not occupied at this level of responsibility as it requires independent action and is not meaningful based on guidance and instruction.*	*Is responsible for the definition of an overarching test architecture (infrastructure) and the guidelines for test environment concepts for a more complex or comprehensive test area, performs the associated activities independently or in a steering role in a small team (< 3 people).* *Supports the test environment coordination by modeling the appropriate IT test structure(s) to achieve the planned test objectives, test levels and test phases in an overall (cost-)efficient manner.* *The test architecture includes, among other things, the test flow structures including 'system under test' and test access points, the necessary 'simulators' (e.g., stubs, mocks, virtual services), the test environment configuration (e.g., permissions, containers) and test data for the respective test level, but also test management tools and test automation technologies.* *Leads appropriate technical groups, e.g., Test Environment Coordinators, to regularly evaluate and adjust the test architecture.* *Is in coordination with the test strategy people, the architects of IT and the project or IT managers to consider the test architecture in design decisions.*
Test competence		in-depth test competence (CT_AL - TTA / TA : focus on test strategy and test implementation) and test (implementation) experience (> 3 years); optional: CT - Agile syllabi (CT - AT, CT_AL - ATT)
Technology competence		in-depth IT competence (training) on system architectures, IT components, IT infrastructures, interfaces and simulation techniques; in-depth IT competence on development and test environments as well as test tools; IT technical knowledge of testing, development technologies and configuration and deployment management, e.g., CI-CD; Experience in system design / architecture (> 3 years)
Process competence		in-depth competence in software development processes (e.g., agile, iterative, sequential), e.g., experience in more than one process model; basic competence on project organizations
Domain competence		domain competence in the environment of the test object, e.g., application, quality criteria, interfaces
Social competence (soft skills)		analytical thinking, IT-savvy, conceptual and constructive thinking, structural, conscientious approach, responsible, presentation and assertiveness skills, able to communicate, able to deal with conflicts/ discussions, able to work in a team;

	DESIGN + Strategic level	AREA
	Is responsible for the definition of an overarching test architecture (infrastructure, see 'Responsible') and the guidelines for test environment concepts for a more complex or comprehensive test area, performs the associated activities independently or in a steering role in a team (> 3 people). *Leads or supports the test environment coordination by modeling the appropriate IT test structure(s) to realize the planned test objectives, test levels and test phases in an overall (cost) efficient manner.* *Leads appropriate technical groups, e.g., Test Environment Coordinators, to regularly evaluate and adjust the test architecture.* *Is in coordination with the test strategy people, the architects of IT and the project or IT managers to consider the test architecture in design decisions.*	***Task / Responsibility / Competence***
	in-depth test competence (CT_AL - TTA / TA : focus on test strategy and test implementation) and test (implementation) experience (> 6 years); optional: CT - Agile syllabi (CT - AT, CT_AL - ATT, CT_AL - ATLaS)	**Test competence**
	in-depth IT competence (training) on system architectures, IT components, IT infrastructures, interfaces and simulation techniques; in-depth IT competence on development and test environments as well as test tools; IT technical knowledge of testing, development technologies and configuration and deployment management, e.g., CI-CD; Experience in system design / architecture (> 6 years)	**Technology competence**
	in-depth competence (training) in software development processes (e.g., agile, iterative, sequential), e.g., experience/training in several procedure models; in-depth competence on project organizations	**Process competence**
	domain competence in the environment of the test object, e.g., application, quality criteria, risks and interfaces	**Domain competence**
	analytical thinking, IT-savvy, conceptual and constructive thinking, structural, conscientious approach, organizational skills, responsible, presentation and assertiveness skills, able to communicate, able to deal with conflicts/ discussions, able to work in a team, able to lead/motivate;	**Social competence (soft skills)**

TEST ENVIRONMENT COORDINATION

AREA	DO Working level	RESPONSIBLE + Operational level
Task / Responsibility / Competence	*Performs the provision of a test environment (test IT) or parts of it according to instructions.* *Test IT includes the actual test object (system under test: build & deployment, configuration), integration into the necessary run infrastructure (hardware, OS, network, DB, etc.), setup and activation of the planned test access points, installation of the necessary stubs, mocks or virtual services, test configuration (e.g., settings, permissions) and loading of test data for the respective test stage (in coordination with the test).* *May also be part of configuration and deployment management or an infrastructure team (OPS team).*	*Performs independently the provision of a test environment (test IT) in consultation with the test management or test architecture.* *See 'Do' for scope of duties.* *Has experience in configuration and deployment management (> 3 years).* *May also be part of configuration and deployment management or an infrastructure team (OPS team).*
Test competence	May also be part of configuration and deployment management or an infrastructure team (OPS team).	basic test competence (CT_FL: test process, test implementation, test tools, documentation, ...), as well as basic skills of test tools; optional: CT - Agile Tester
Technology competence	basic IT competence on programming/scripting languages, databases and on system architectures; in-depth competence (training) in build and configuration management, especially for the 'System under Test' (SUT);	in-depth IT competence on programming/scripting languages, databases and on system architectures; in-depth competence (training) in build and configuration management, especially for the 'System under Test' (SUT); basic skills of the productive environment of the SUT;
Process competence	basic competence in software development processes (e.g., agile, iterative, sequential)	basic competence in software development processes (e.g., agile, iterative, sequential) and project organization
Domain competence	basic domain competence in the environment of the test object, e.g., basic application, data models, interfaces	domain competence in the environment of the test object, e.g., application, data models, interfaces
Social competence (soft skills)	analytical thinking, systematic, conscientious approach, responsible, able to communicate, able to work in a team;	analytical thinking, IT-savvy, conceptual and constructive thinking, structural, conscientious approach, responsible, presentation and assertiveness skills, able to communicate, able to deal with conflicts/ discussions, able to work in a team;

	DESIGN + Strategic level	AREA
	Performs and is responsible for the deployment of a complex test environment in coordination with test management or test architecture. May lead a team and is responsible for the deployment of. *See 'Do' for scope of duties.* *Has experience in configuration and deployment management (> 6 years).* *May also be part of configuration and deployment management or an infrastructure team (OPS team).*	***Task / Responsibility / Competence***
	basic test competence (CT_FL: test process, test implementation, test tools, documentation, ...), as well as in-depth skills of test tools; optional: CT - Agile Tester	**Test competence**
	in-depth IT competence on programming/scripting languages, databases and on system architectures; in-depth competence (training) in build and configuration management, especially for the 'System under Test' (SUT); in-depth skills of the productive environment of the SUT with infrastructure and interfaces used;	**Technology competence**
	in-depth competence in software development processes (e.g., agile, iterative, sequential) and project organization	**Process competence**
	domain competence in the environment of the test object with focus on application area, application risks, data models, interfaces	**Domain competence**
	analytical thinking, IT-savvy, conceptual and constructive thinking, structural, conscientious approach, organizational skills, presentation skills, responsible, able to communicate, able to deal with conflicts/ discussions, able to work in a team, able to lead/motivate;	**Social competence (soft skills)**

TEST AUTOMATION

AREA	DO Working level	RESPONSIBLE + Operational level
Task / Responsibility / Competence ***(detailed information about the task see GTB: CT Test Automation Engineering syllabus)***	*Performs coding of test cases for automated execution according to instructions.* *Coding is performed based on the technical test case specifications following a test automation design in the defined notation / programming language for the defined execution environment / test tool.* *May design and code utilities (e.g., stubs, drivers, generators) necessary for the test execution environment.* *Checks the correctness of the coding against specifications or together with the test.*	*Performs independently test case design and coding for automated execution. Can lead a small team (1-3 people).* *May create a design to implement test automation based on test requirements, test IT, and existing test tools.* *See 'Do' for coding tasks.*
Test competence	basic test competence (CT_FL: test process, test techniques, test implementation, documentation, ...; optional: CT - TAE)	in-depth test competence (CT - TAE: Test Automation Engineering; optional CT_AL - TTA / TA: focus on test implementation and test tools)
Technology competence	in-depth IT competence on IT components, data models, system architectures and programming interfaces, e.g., scripting/programming languages, SQL, ...; Experience in coding and module test (> 2 years);	in-depth IT competence (training) on system architectures, software design and programming; in-depth competence about IT components and data models; in-depth IT technical skills about the test object, the test automation environment used and the development environment; Experience in software design and coding (> 3 years);
Process competence	basic competence in software development processes (e.g., agile, iterative, sequential)	basic competence in software development processes (e.g., agile, iterative, sequential) and project organization
Domain competence	basic domain competence in the environment of the test object, e.g., basic application, quality criteria, data models, interfaces	domain competence in the environment of the test object, e.g., application, quality criteria, data models, interfaces
Social competence (soft skills)	analytical thinking, IT-savvy, structural, conscientious approach, responsible, able to communicate, able to work in a team;	analytical thinking, IT-savvy, conceptual and constructive thinking, structural, conscientious approach, responsible, presentation and assertiveness skills, able to communicate, able to deal with conflicts/ discussions, able to work in a team, able to lead/motivate;

	DESIGN + Strategic level	AREA
	Performs and is responsible for test automation design and performs and is responsible for test case design and coding for automated execution. May lead an appropriate team (> 3 employees). *Creates the design to implement test automation based on the test requirements, test IT and existing test tools and is accountable for the results to the requirements side.* *See 'Do' for coding tasks.*	***Task / Responsibility / Competence*** ***(detailed information about the task see GTB: CT Test Automation Engineering syllabus)***
	in-depth test competence (CT - TAE: Test Automation Engineering; reasonable CT_AL - TTA / TA: focus on test implementation and test tools) and test (implementation) experience (> 3 years);	**Test competence**
	in-depth IT competence (training) on system architectures, software design and programming; in-depth competence about IT components and data models; in-depth IT technical skills about the test object, the test automation environment used and the development environment; Experience in software design and coding (> 6 years);	**Technology competence**
	in-depth competence in software development processes (e.g., agile, iterative, sequential) and project organization	**Process competence**
	domain competence in the environment of the test object with focus on, among other things, application, quality criteria, data models, interfaces	**Domain competence**
	analytical thinking, IT-savvy, conceptual and constructive thinking, structural, conscientious approach, organizational skills, presentation skills, responsible, able to communicate, able to deal with conflicts/ discussions, able to work in a team, able to lead/motivate;	**Social competence (soft skills)**

TEST DATA MANAGEMENT

AREA	DO Working level	RESPONSIBLE + Operational level
Task / Responsibility / Competence ***(detailed information about the task see GTB: Test Data Specialist syllabus)***	*Position not occupied at this level of responsibility as it requires independent action and is not meaningful based on guidance and instruction.*	*Performs independently the design, implementation and management of large test data sets (data protection, compliance). This may include creating synthetic data, anonymizing productive data, or modeling specific test data, as well as parallelizing data for multiple test environments and reconfiguring data after test execution.* *Supports the test in test implementation and test execution in areas with high data complexity or large data volumes. Supports test in analyzing and evaluating test case results as appropriate.* *Has experience as a tester, test engineer and/or database developer.*
Test competence		basic test competence (CT_FL: test process, test techniques, test implementation, test tools, documentation, ...), supplemented by GTB Test Data Specialist
Technology competence		in-depth IT competence on data modelling and data management as well as data manipulation languages, e.g., SQL / PL-SQL; basic IT competence on system architectures
Process competence		basic competence in software development processes (e.g., agile, iterative, sequential) and project organization
Domain competence		basic domain competence in the environment of the test object, e.g., application area and application scenarios; in-depth domain competence in the area of application data and its modelling;
Social competence (soft skills)		analytical thinking, good comprehension skills, capable of structuring and modeling, structural, conscientious approach, responsible, able to communicate, able to work in a team;

	DESIGN + Strategic level	AREA
	Is responsible for the design, implementation and management of large test data sets (data protection, compliance), performs the related activities independently or in a steering role in a team (>3 persons). (Tasks: see 'Responsible') *May also lead the test data management task for a test area and represent in appropriate committees.* *Supports the test in test implementation and test execution in areas with high data complexity or large data volumes. Supports Test in the analysis and evaluation of test case results as appropriate.* *Has several years of experience as a tester, test engineer and/or database developer.*	***Task / Responsibility / Competence*** ***(detailed information about the task see GTB: Test Data Specialist syllabus)***
	in-depth test competence (GTB Test Data Specialist; CT_AL - TA / TM: focus on test design, test implementation and test management) and test (data) experience (> 3 years);	**Test competence**
	in-depth IT competence (training) on data modelling and data management as well as data manipulation languages, e.g., SQL / PL-SQL; basic IT competence on system architectures	**Technology competence**
	in-depth competence in software development processes (e.g., agile, iterative, sequential) and project organization	**Process competence**
	domain competence in the environment of the test object, e.g., application area and application scenarios including variants and data dependencies; in-depth domain competence (demonstrable experience) in the area of application data and its modelling;	**Domain competence**
	analytical thinking, good comprehension skills, capable of structuring and modeling, structural, conscientious approach, organizational skills, presentation skills, responsible, able to communicate, able to deal with conflicts/ discussions, able to work in a team, able to lead/motivate;	**Social competence (soft skills)**

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CONTACT

German Testing Board e. V.
Tel +49 (0) 9131/ 97 61 06
info@gtb.de

www.gtb.de