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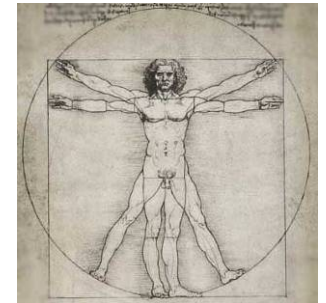
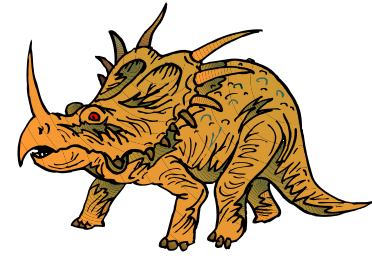
Role of the Test Architect

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Christian Hahn, CT

Embrace change

It is not the strongest of the species that survives,
nor the most intelligent,
but rather the one most adaptable to change.

[Clarence Darrow*]



They always say that time changes things,
but you actually have to change them yourself.

[Andy Warhol **]

* Improving the Quality of Life for the Black Elderly: Challenges and Opportunities :
Hearing before the Select Committee on Aging, House of Representatives,
One Hundredth Congress, first session, September 25, 1987

** The Philosophy of Andy Warhol
US artist (1928 - 1987)

Role of the test architect

Learning objectives

- Understand why Siemens needs professional Test Architects
- Understand the project environment in which Test Architects act
- Get to know the target profile for a Test Architect
- Understand the value and impact of the role Test Architect

Role of the Test Architect

Agenda

Why do we need Test Architects?

Required Knowledge, Skills and Experience

Responsibilities and Interaction with other Roles

Summary and Reflection

Test architect

ISTQB Glossary (<http://www.istqb.org/>)

Test architect

- (1) A person who provides guidance and strategic direction for a test organization and for its relationship with other disciplines.
- (2) A person who defines the way testing is structured for a given system, including topics such as test tools and test data management.

That's ok ... but there is more ...

Focusing on some responsibilities but neglecting others is the root of all evil

Role-play with asymmetrical
Information and Objectives
→ see Hand-Out

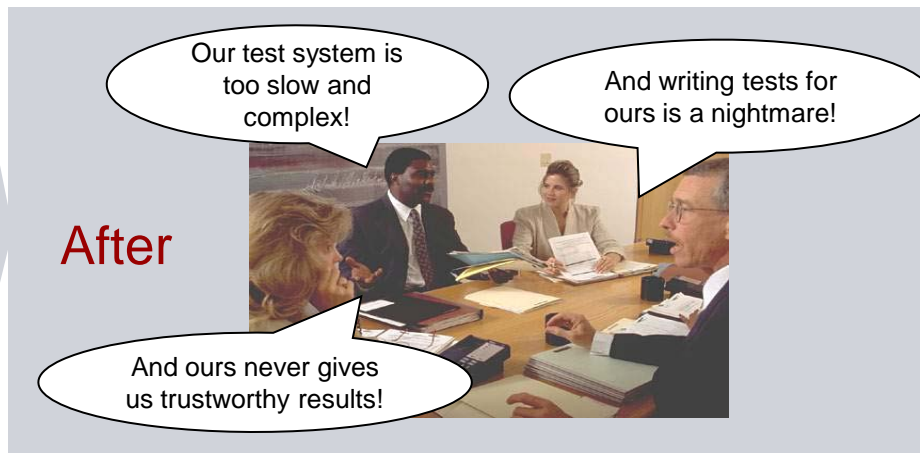
Various real-world cases show:
Strong reliance on technology
or tools leads to failure

What is the root of the problem?

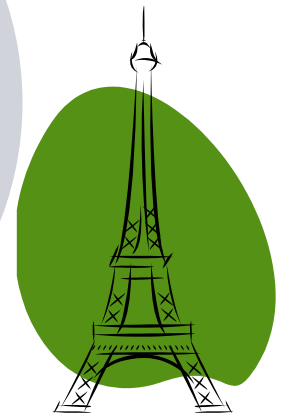
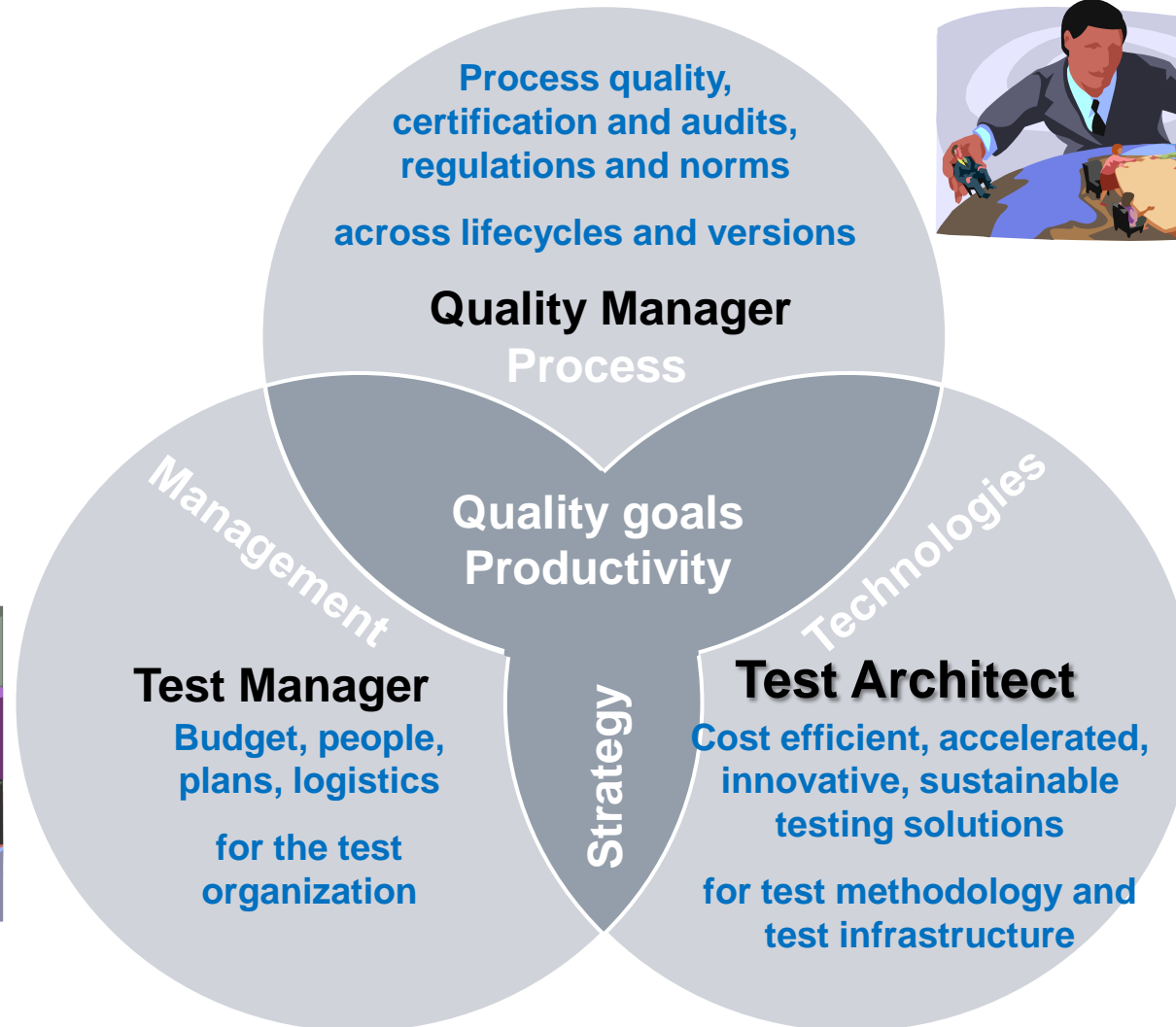
- Are all those technologies just crap?
- Do we need better technologies?
- Do we need better manuals for using our technologies?

The real questions are:

- Does our test system have an 'appropriate' architecture?
- Does it solve the 'real' needs?



Driving triumvirate for testing & quality engineering



As a **Test Architect** You have **one Role** – but you are wearing **two Hats**



Test Expert

for the system under test (SUT)

- Design the test approach
- Apply innovative test technologies
- Drive the quality of the SUT



Software / System Architect

for the test system

- Design and realize the test architecture
- Apply innovative software technologies
- Drive the quality of the test system



This is the
architect's job!



Quo vadis?

The current practice of Test Architects may have implied that they:

- Worked in an ivory tower
- Were involved in a single testing activity only (e.g. system test or integration testing)
- Were not taken seriously – establishing a test architecture was like tilting at windmills
- Could not leverage a systematic approach to create a test architecture
- Were responsible for some test suites and parts of a testing infrastructure
- Had to communicate with test engineers and test managers but ...
 - ... not necessarily with developers, software/system architects, system integrators, production, logistic, service, refurbishment, ...
 - ... nor to coordinate too much with head of R&D, product (line) managers, project managers, ...

Your target role implies new challenges and opportunities

- Leverage a systematic approach to create a test architecture
- Be technically responsible for the whole test system for a small- to medium-size system or for an important part of a large-scale system
- Be technically responsible for getting the test environment up and running
- Communicate with all testing-relevant stakeholders along the product's lifecycle; balance and coordinate their needs
- Drive long term and cost effective testing solutions; balance development cost with lifecycle cost

Your new role as a Test Architect implies change. Embrace it!

Mind your target role as a Test Architect

**Test Architects are responsible
for an appropriate test architecture!**

To create an architecture is more about

- thinking,
- communicating &
- deciding

and less about tools & technologies

This is the
architect's job!



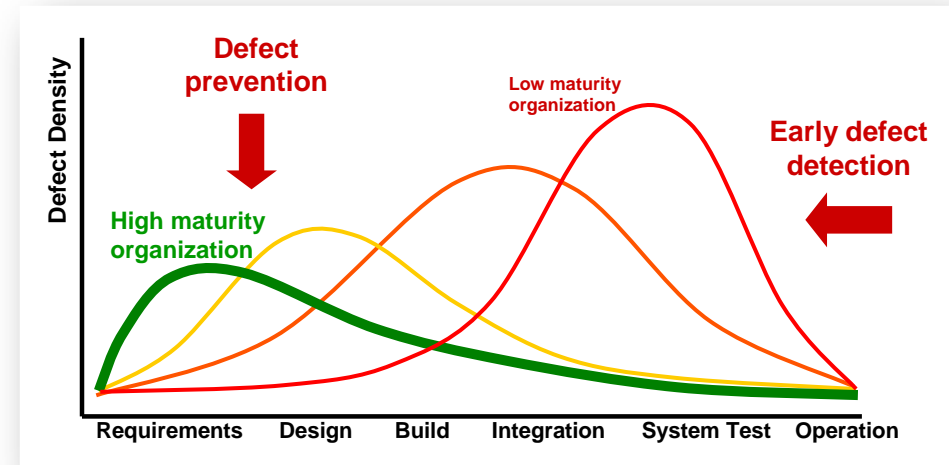
But why should we care at all about Test Architecture and Test Architects?

Test Architecture and Test Architects are key levers for effective and efficient testing

- As of today, too many defects make their way into our products – just to be removed again afterwards. **Defect prevention** is the way to reduce this kind of waste.
- Defect removal gets progressively expensive over time. Many projects and organizational units in our company waste time and money because they find and fix defects in their software intensive systems much too late.

Early defect detection facilitates much easier defect removal – again reducing waste.

- Product risks must be identified and managed.
- Quality must be driven throughout the development process by establishing efficient, quality-oriented processes.



But why should we care at all about Test Architecture and Test Architects?

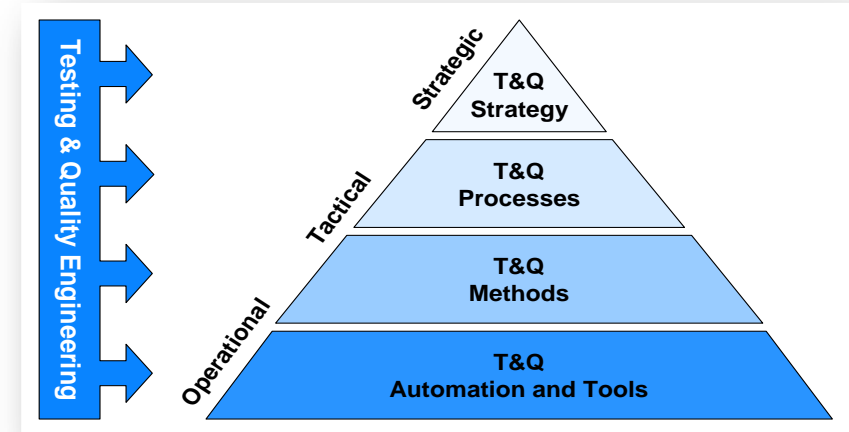
Dealing with product quality involves management, process, and technical aspects on multiple level

Measures are necessary on different levels

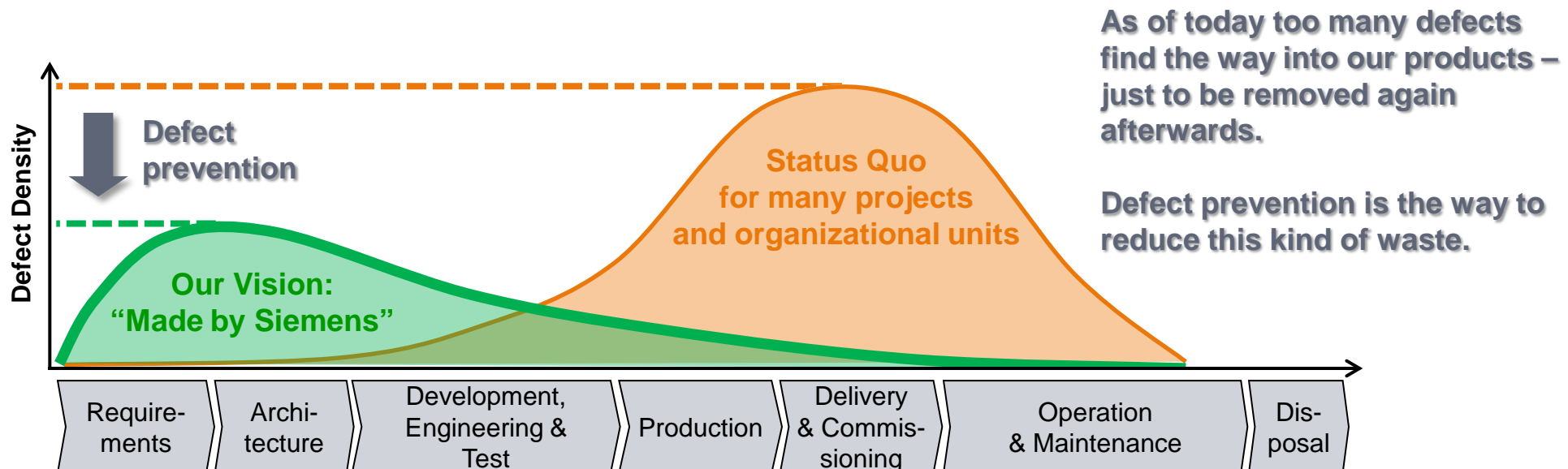
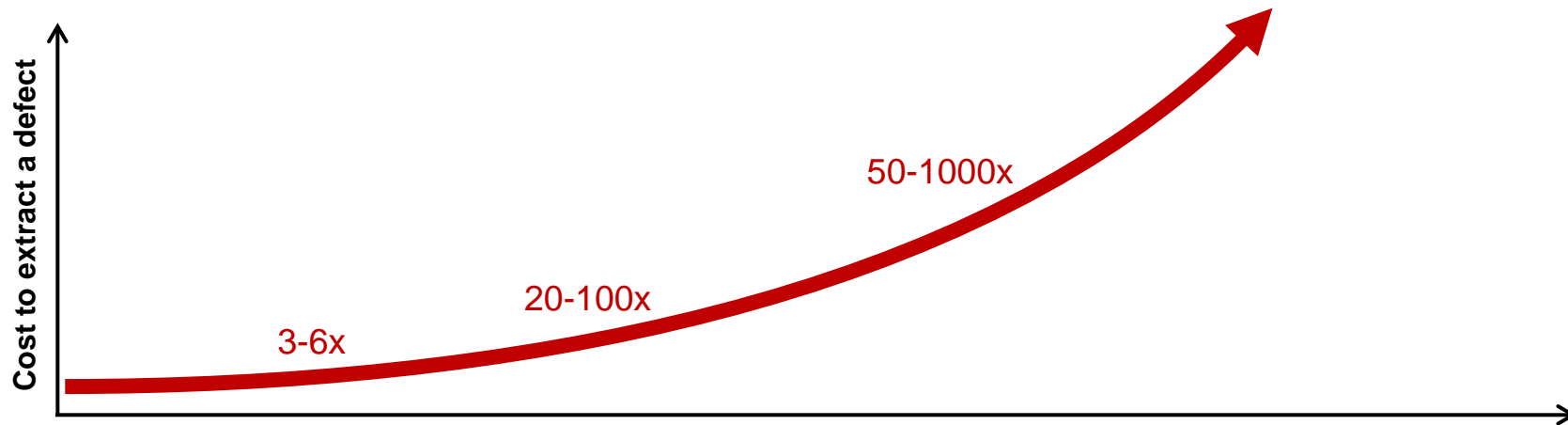
- Business-driven and risk-based T&Q strategies
- Efficient T&Q processes; empowered test teams
- Systematic and model-based test methods & tools
- Quality definition and management methods
- Test architectures and test automation

Measures must be applied in different contexts, e.g.

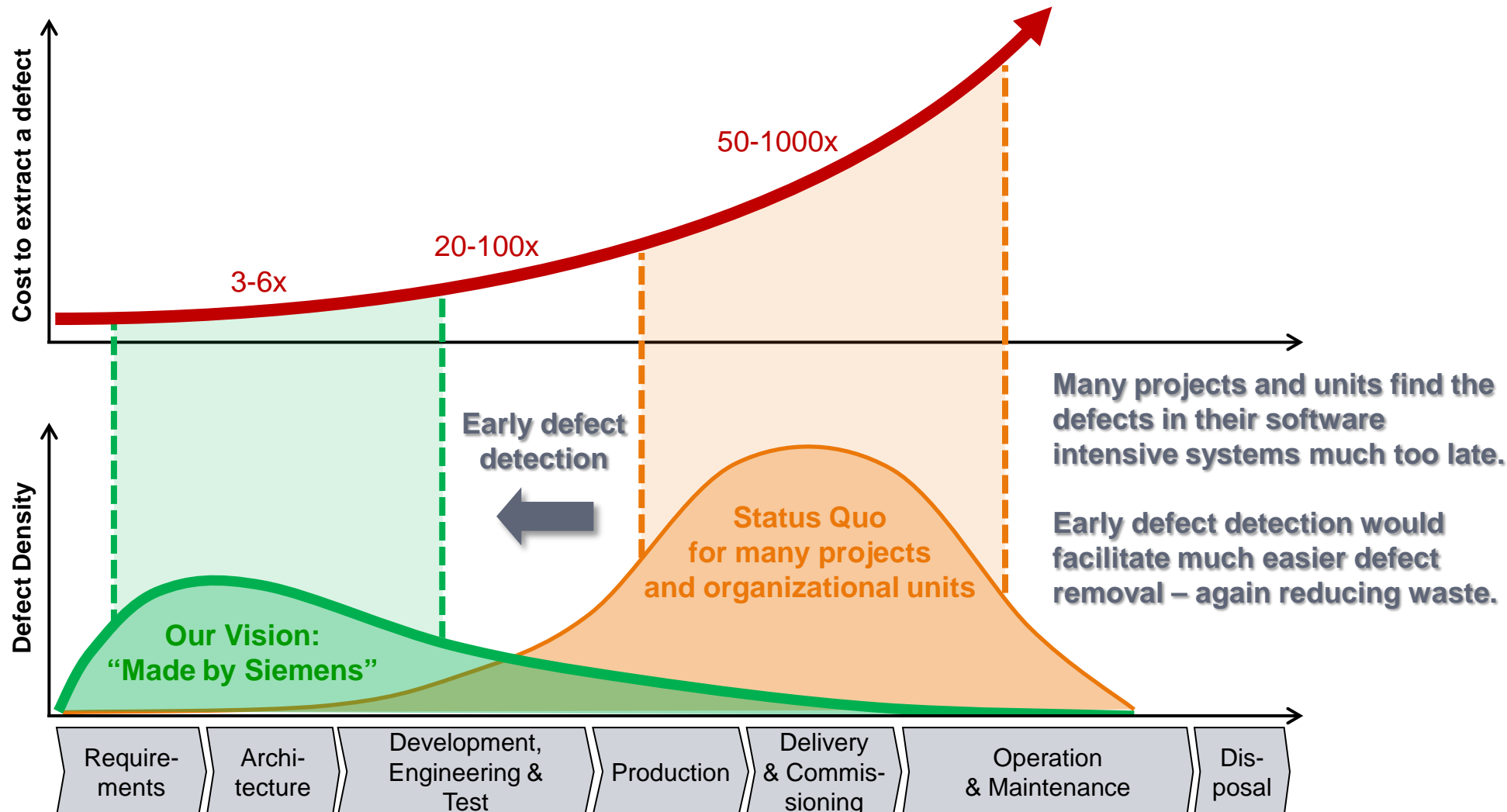
- Incremental and iterative processes
- Agile, lean
- Distributed, enterprise and embedded systems
- Global development



Removing few defects is much cheaper than removing lots of them.



Many projects and organizational units in our company waste time and money.



Thus, failure to take care of your responsibilities has devastating effects in terms of business (1)

Requirements Engineering	<ul style="list-style-type: none">▪ Not all stakeholders included in elicitation and validation▪ Limited understanding of (long-term or platform) requirements▪ Ambiguity, lack of precision and completeness
Test Architecture and Design	<ul style="list-style-type: none">▪ Not all relevant experts involved in solution elaboration▪ Predominant preference for features and developmental qualities, like extensibility and adaptability, rather than for operational qualities, like reliability and performance▪ Test architecture description missing / late, incomplete, or inappropriate▪ Test Architect has insufficient technological breadth and depth – applies just the known approach
Testing & Quality	<ul style="list-style-type: none">▪ Architects and developers views testing, reviews, and quality measurement as a means of undesirable monitoring and waste rather than as a design approach and quality safety net

Failure reasons in Siemens related to test architecture illustrate this!

Thus, failure to take care of your responsibilities has devastating effects in terms of business (2)

Realize

- Test architecture specification started before identifying and specifying key business and technical requirements qualitatively and quantitatively
- Test Architect is not involved in concept changes or in fixing development group spanning technical issues

Business Understanding

- No clear (understanding of) business cases
- No clear understanding (and balancing) of lifecycle costs

Leadership

- Communication with stakeholders often missing or inappropriate
- Test Architect does not involve all relevant stakeholders
- Lack of courage for making architecture decisions for the test system

Failure reasons in Siemens related to test architecture illustrate this!

Here is your new mission: From surviving to driving quality into class B or C projects



You are responsible for driving and guiding the specification and realization of a test architecture for a small to medium-scale system

- You **provide the vision for the test approach and the test architecture**
- You **ensure the testability** of your product
- Your **decisions are driven by clear focus** on the system's intended business and its associated requirements
- You **involve, lead, guide, coach, and motivate** the key stakeholders and experts
- You **involve the relevant management** in important decisions
- You are **guided by vision and experience**



Test Architects are important for the success of business-relevant projects at Siemens

Senior Certified Architect

Class A ¹⁾ Project:

- High complexity (platform / product line)
- High degree of innovation
- Big business impact, high risk
- Cross-functional, distributed structure, big team

Scope on several (or all) systems of the organization

Certified Architect

Class B ¹⁾ Project:

- Moderate innovation in technology, medium risk
- Medium business impact, medium-size teams

Class C ¹⁾ Project:

- Enhancing known technology and requirements, low risk
- Single site development, small teams

Scope on one system

1) R&D project classification

Role of the Test Architect

Agenda

Why do we need Test Architects?

Required Knowledge, Skills and Experience

Responsibilities and Interaction with other Roles

Summary and Reflection

Knowledge of the problem domain

Test architects need sound knowledge of the problem domain

- What are the main users, actors and entities in the domain and how do they relate?
- What are the typical challenges, applications or user stories?
- What are typical qualities (non-functional requirements), norms and regulations?
- What are typical constraints?



Otherwise test architects won't be able to:

- Support and assess the business case
- Understand requirements related to the problem domain
- Create an appropriate test system
- Define effective and efficient test suites

Knowledge of the solution domain

Test architects need sound knowledge of the solution domain, both in theory and practice

- What are the main methods, technologies, and tools available?
- How do they complement or exclude each other?
- When and how are they applicable?

Otherwise test architects won't be able to:

- Ensure their product's quality
- Understand technology implications
- Select the right technologies
- Prepare and support a test system effectively and efficiently
- Guide and coach test engineers and development teams



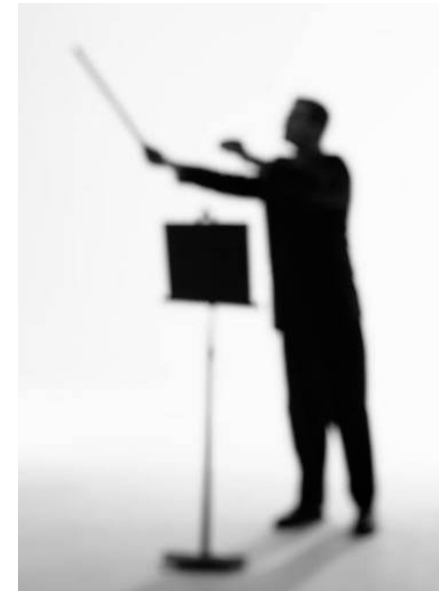
Leadership skills and social skills

Test Architects need leadership skills

- Showing courage to decide even though information is missing
- Getting buy-in from (all) stakeholders
- Balancing stakeholder interests, cultures and interdisciplinary teams
- Dealing with distributed organizations, cooperation partners and suppliers
- Motivating and mentoring test and development teams
- Learning from failure

To meet these challenges, test architects:

- Must be able to lead and decide
- Require motivation and mentoring skills



Project management skills

Test architecture serves as foundation for test management and thus for project success.

Although Test Architects should not act as Test Managers, they shall actively support

- Definition of the test strategy
- Creation of test and project plans
- Definition of (architecture driven) work packages
- Estimation of costs and times for test development and execution
- Estimation of lifecycle costs

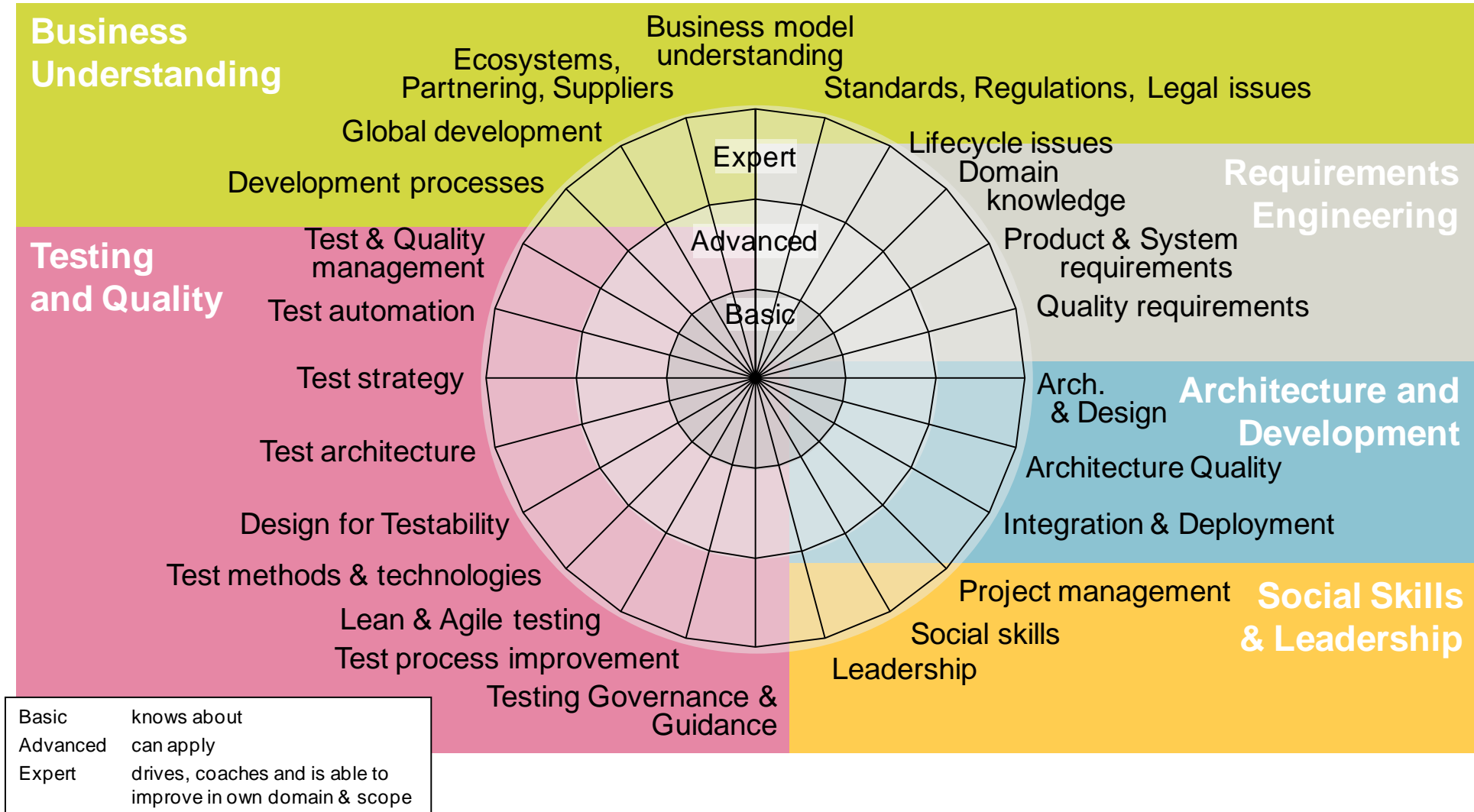
System lifecycle costs are dominated by late phases costs (i.e. production, operation & maintenance and disposal), but are driven by requirements and architecture.

Therefore Test Architects shall know relevant influencing cost factors and how to balance development versus lifecycle costs.

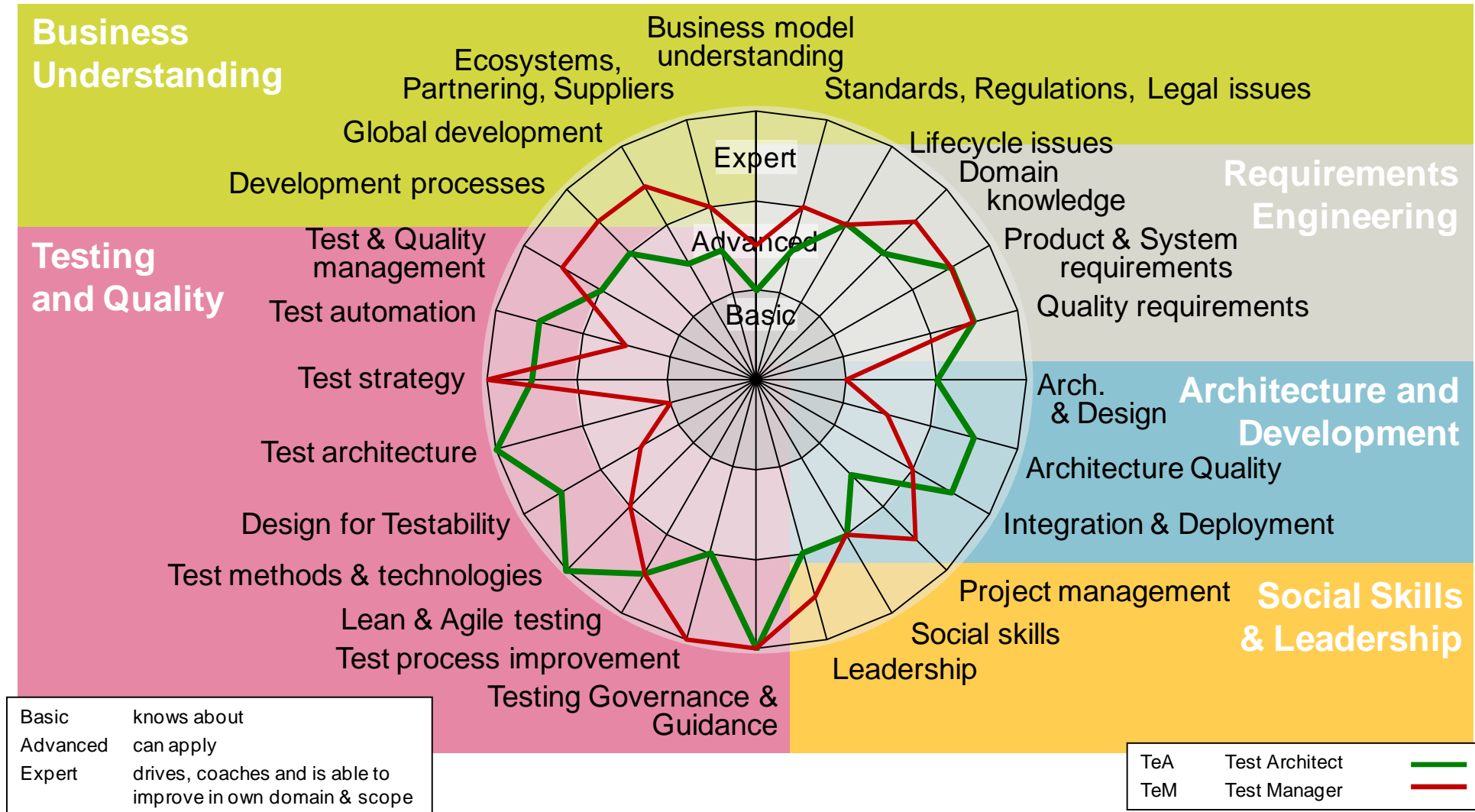


Exercise

Which competence profile do you have?



Test Architects need a broad set of competencies



Test Architect

Role Profile: Project scope and experience level

Project scope	Project category	<ul style="list-style-type: none"> • Class B* and C* projects
	Project scope	<ul style="list-style-type: none"> • Business unit
	Project type	<ul style="list-style-type: none"> • Integration, Test & Approval
Experience level	Professional experience	<ul style="list-style-type: none"> • More than 3 years of professional experience in testing, research, development and engineering in different roles and functions
	Project experience	<ul style="list-style-type: none"> • Has minimum 2 years experience in successfully working as a test architect or in a similar role for a project of category C or higher
	Leadership experience	<ul style="list-style-type: none"> • Has been responsible for the test architecture/infrastructure of a project and the work of other test engineers (or people in similar roles)
	Intercultural experience	<ul style="list-style-type: none"> • Has worked and lived abroad: optional • Has cooperated in international teams: Recommended
Capabilities	Focus and execute	<ul style="list-style-type: none"> • Analytics skills • Result and Quality Orientation • Decision enforcement
	Impact and energize	<ul style="list-style-type: none"> • Coaching and mentoring • Communication Skills: Mediation and Intervention • Team Player: Team Building

* R&D Project Categorization

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Test Architect

Role Profile: responsibilities (1)

Business Understanding	Analyze the current testing process and practices and drive improvements	responsible
	Evaluate and select technologies (e.g. by prototyping)	responsible
	Provide detailed planning information for testing-related tasks (esp. w.r.t. testing of requirements and testing infrastructure)	involved
	Identify and manage technical product risks	involved
	Provide input for product certification (e.g. with regulatory bodies)	involved
	Reduce non-conformance cost	involved
	Setup supplier agreements for outsourced testing infrastructure development	involved
	Define acceptance criteria for outsourced product development	involved
	Perform make-or-buy decisions	involved

Requirements Engineering	Ensure testability of requirements engineering artifacts	responsible
	Define testability requirements	responsible
	Foster the use of test-driven approaches in requirements engineering	responsible
	Enforce traceability in testing artifacts	responsible
	Analyze requirements and derive test cases	involved
	Prioritize requirements	involved
	Review requirements engineering artifacts	involved

Test Architect

Role Profile: responsibilities (2)

Testing & Quality	Define and implement a justified, effective test strategy for the project, aligned with the business and quality goals	responsible
	Measure efficiency and effectiveness of the test strategy	responsible
	Measure, control and continuously optimize coverage and degree of test automation	responsible
	Evaluate and define test tools and methods and introduce them in the organization	responsible
	Define and maintain an effective and efficient test architecture in close cooperation with system integration and test managers	responsible
	Govern the design and improvement of test automation framework and test suites	responsible
	Ensure quality of the test code	responsible
	Guide/Coach testing engineers in advanced testing issues	responsible
	Discuss and elaborate test aspects in early development phases	involved
	Identify and manage testing stakeholders	involved
	Define coverage goals and doneness criteria for testing	involved
	Drive the resolution of identified defects	involved
	Perform impact analysis for changes in the system/software	involved
	Monitor and improve the system/software integration process	involved
	Supervise testing activities on all testing levels	involved
	Make test progress, test results and quality of tests transparent for the different testing stakeholders	involved
	Specify and select test cases on all levels	involved

Test Architect

Role Profile: responsibilities (3)

Test Architecture and Design	Ensure that testability requirements are incorporated into product design	responsible
	Identify and create patents in own area of competence	responsible
	Create design prototypes for testing infrastructure	responsible
	Provide testing infrastructure requirements	responsible
	Define reuse strategy for testing infrastructure components	responsible
	Identify and manage technical risks for the testing environment	responsible
	Setup integration plan for the testing infrastructure	responsible
	Drive integration of testing infrastructure with the SUT	responsible
	Guide/Coach system/software architects in testing related topics	responsible
	Identify and implement reuse for test cases and testing infrastructure components	responsible
	Review architecture artifacts	involved
	Conduct architecture reviews	involved

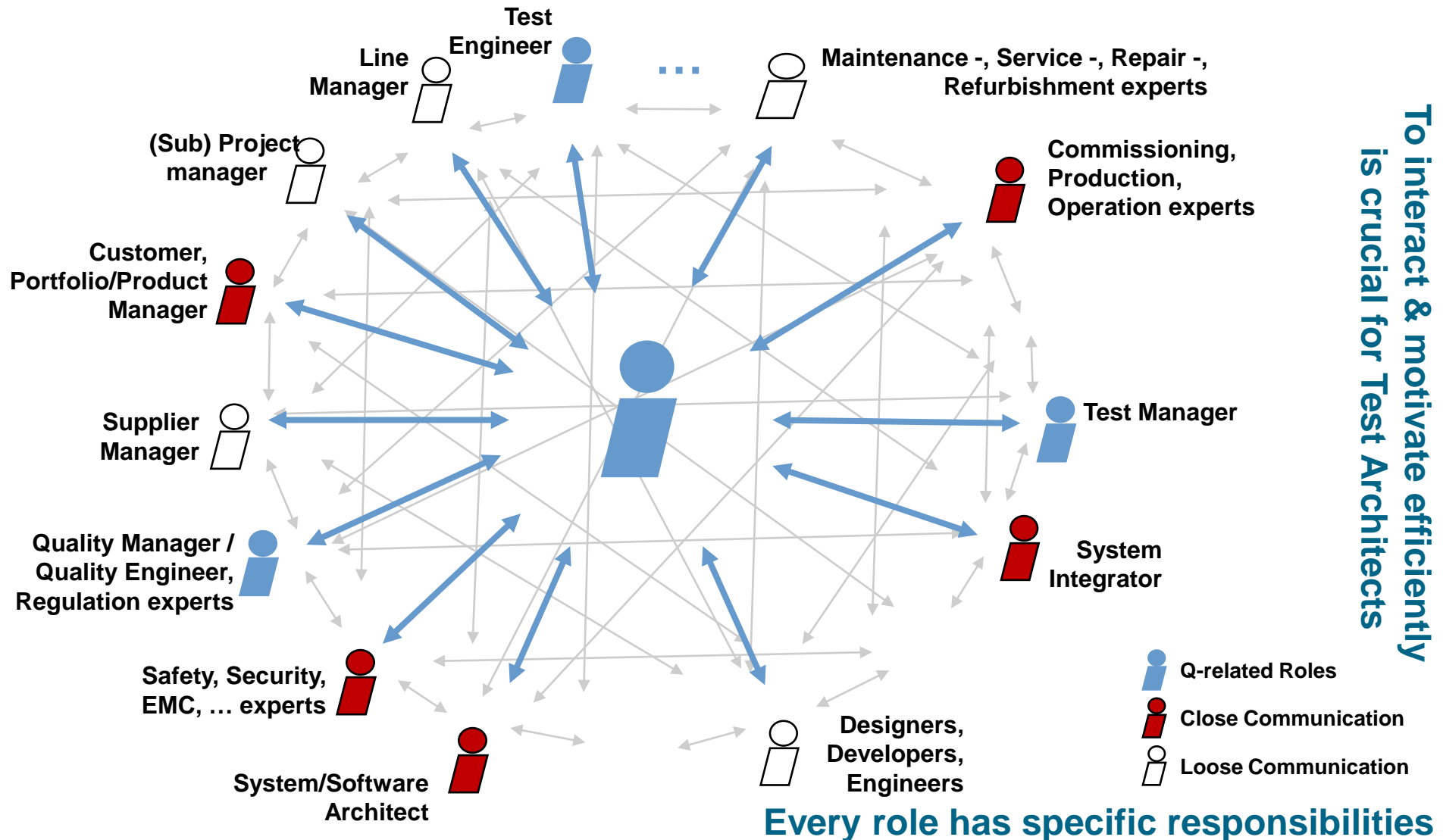
Test Architect

Role Profile: responsibilities (4)

Realize	Incorporate automated testing into the regular build / continuous integration process	responsible
	Guide/Coach the development teams in testing related topics	responsible
	Foster the use of test automation and test-driven approaches in development	responsible
	Perform reviews of unit testing environments	involved
	Establish and maintain a regular build process for testing code	involved
	Review detailed design artifacts	involved

Maintenance	Perform continuous architecture management for the testing environment	responsible
	Manage the internal quality of the whole testing environment	responsible
	Provide comprehensive documentation of the testing infrastructure's architecture	responsible
	Establish and maintain configuration management for testing artifacts	responsible
	Drive the removal of defects found in the testing environment	responsible
	Ensure that testability requirements from post-development phases are taken into account	responsible
	Analyze customer feedback	involved

The Test Architect as a technical communication hub



To interact & motivate efficiently is crucial for Test Architects !

- **Clarify requirements, especially the needed quality attributes
(non-functional requirements)**
- **Identify cost contributors and cost drivers
along the products lifecycle**
- **Elaborate and specify appropriate and balanced test environments**
- **Drive an integrated solution approach**
- **Verify and validate the product**

Stakeholder Analysis

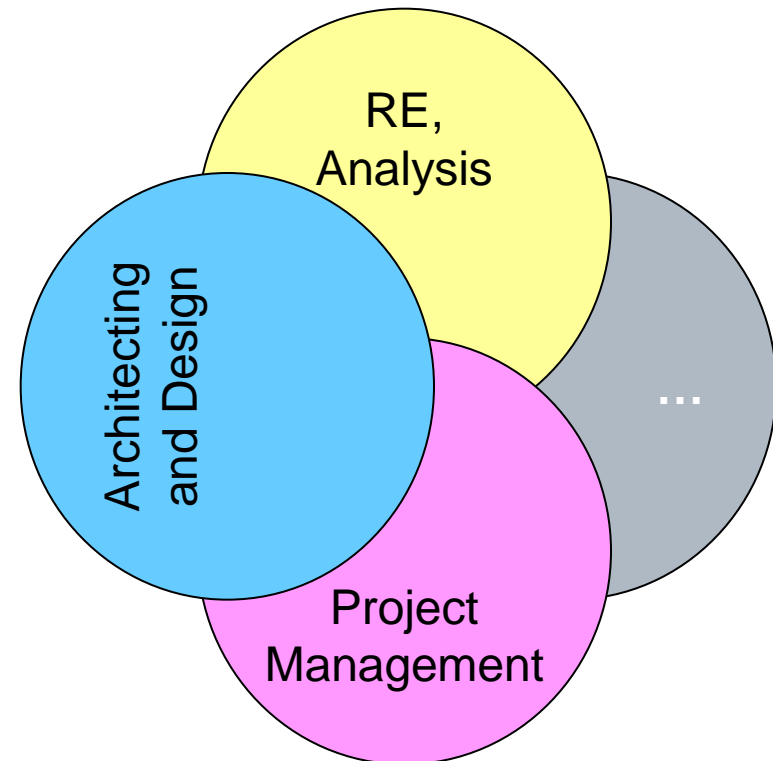
Intersecting Groups

A "stakeholder" is a person with a dedicated interest in the project or the project's results or that becomes somehow involved; e.g.:

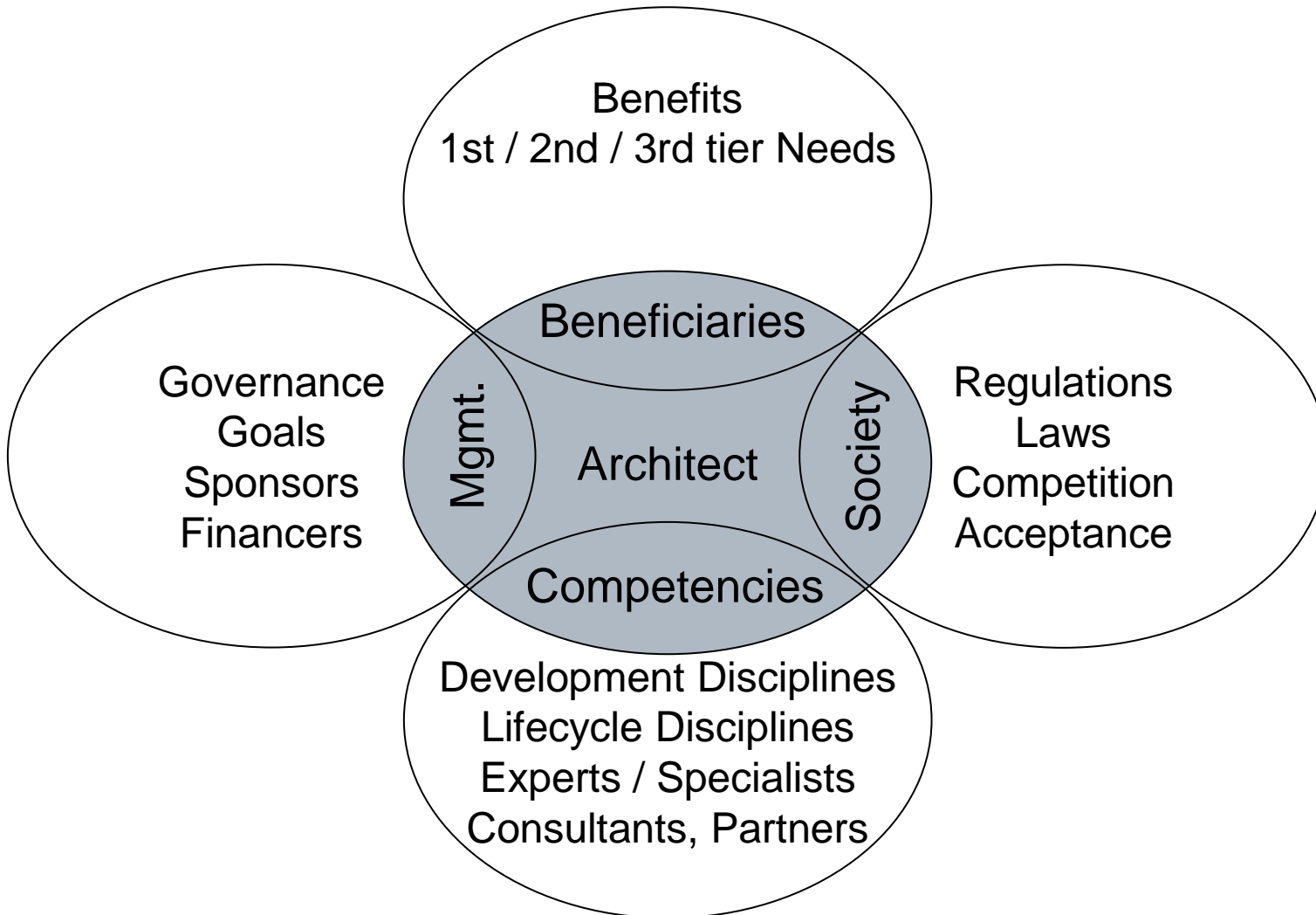
- provides input (needs, knowledge, ...)
- expects (intermediate) results
- participates in the work to be done

Different stakeholder groups are needed for different tasks; therefore

- identify stakeholders early
- manage them
- involve them as appropriate



Stakeholder Analysis Clustering



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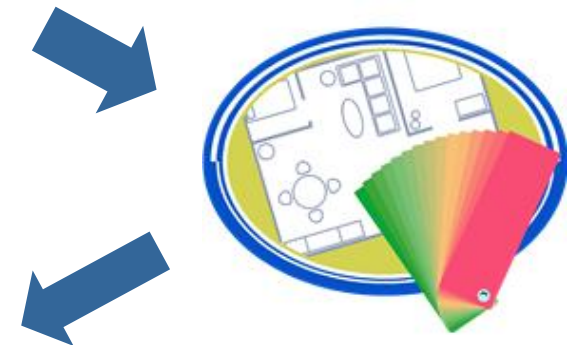
Summary and Reflection

What we learned (1)

The (business) success of projects depends significantly on experienced and skilled Test Architects

Test Architects take explicit responsibility for the business success of their (test) system

Providing (technical) leadership is essential for success!



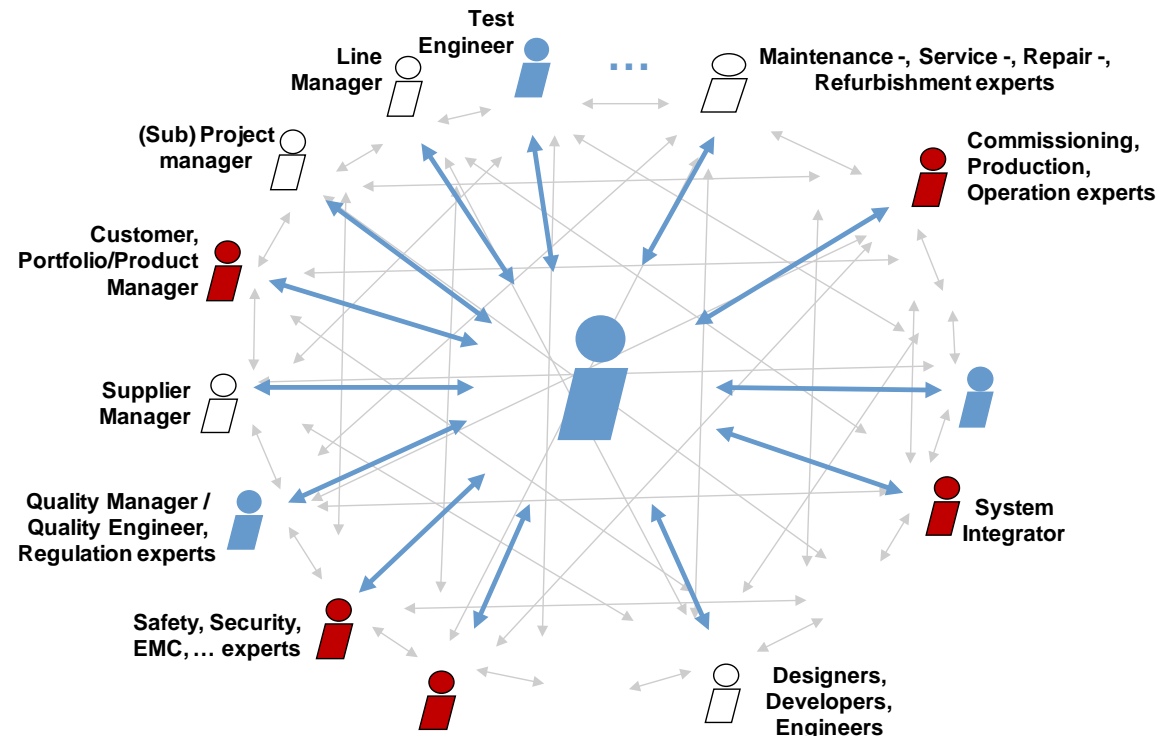
**Being a Test Architect is challenging but rewarding:
Do you want to be a Test Architect?**

What we learned (2)

Test architects need to act and interact with stakeholders from the whole lifecycle

For this purpose they need a broad set of skills such as:

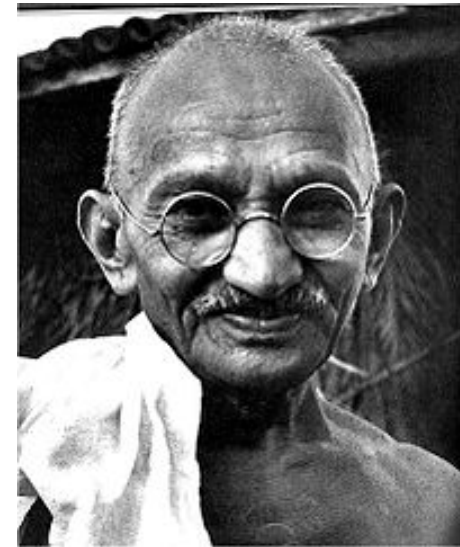
- Communication skills
- Leadership skills
- Technology experience
- Knowledge of the solution and problem domain
- Project management skills



Departing thought

**First they ignore you,
then they ridicule you,
then they fight you,
then you win.**


[Gandhi]



Further readings

Use the SSA Wiki :
<https://wiki.ct.siemens.de/x/fReTBQ>

and check the “Reading recommendations”:
<https://wiki.ct.siemens.de/x/-pRgBg>

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