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PLM and Innovation Excellence

Learning Campus

Your partner for Business Learning

Expert Training

Test Architects [TeA]

Test Architect Expert Training (TeA)

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Selection of candidates
- 2+ years experience as Test Architect
- current project where learning can be applied
- self perception checklist

Preparation Phase

Workshop 1
(Live as a Test Architect)

Project Phase 1

Workshop 2
(Work as a Test Architect)

Project Phase 2

Workshop 3
(Survive as a Test Architect)

Experience Phase

Certification
- knowledge
- practical experience

Establish and ensure high product quality
- Improving **competencies in architecture and testing**, as well as **fostering business understanding** and **leadership of interdisciplinary teams**
- Establish **networking across organizational boundaries** (also cross-division, cross-sector)
- Introduce a Siemens **quality standard for Test Architects**

Setup
- Scope: R&D for software-centric systems
- Based on and synchronized with the proven Core Learning Programs for Software/System Architects
- Preparation phase, three workshops with practice phases in between, certification
- Run01 started in FY 2016

Link: Test Architect Expert Training (TeA)

The “Test Architect Expert Training” is an element of the Siemens Development System

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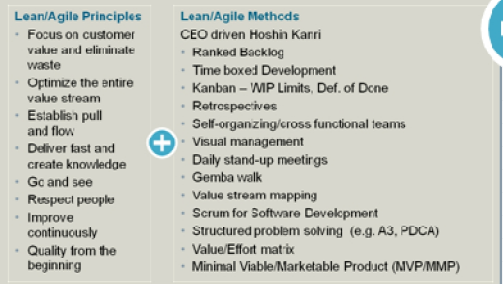
Set of common, business-proven principles and methodologies

8 + 14



One SDS manager per BU

~ 40 till FY17

- **Clear mandate** based on full management commitment
- **Dedicated time and budget** for continuous improvement activities and knowledge exchange
- **Act on behalf of BU** in lean communities and networks

Lean leadership

~ 300 till FY19

PLM heads: CTOs, R&D, ENG and PPM

PLM and Innovation Excellence Board as role model

- **Culture Lab -** 1 day
- **Go and see** with 1-2 visits p.a. to best-in class BUs
- **Lean for Leaders**: 2+2 day coaching & training

Functional experts

~ 1000 till FY21

Strengthen **expert programs based on BU needs**

- → Continue with lean experts
- → Adapt R&D project manager development to SDS
- → Integrate SDS in system / SW architects programs

Also in TeA

The PLM and Innovation Board decided on September 9, 2016 to implement the Siemens Development System (SDS)

SDS = Siemens Development System, p.a. = per annum, SPS = Siemens Production System

Content

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1 **The Siemens Core Learning Program**

2 The Test Architect (TeA)

Architect related (Core) Learning Programs driven by PLM and Innovation Excellence[1)]

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Program, started in

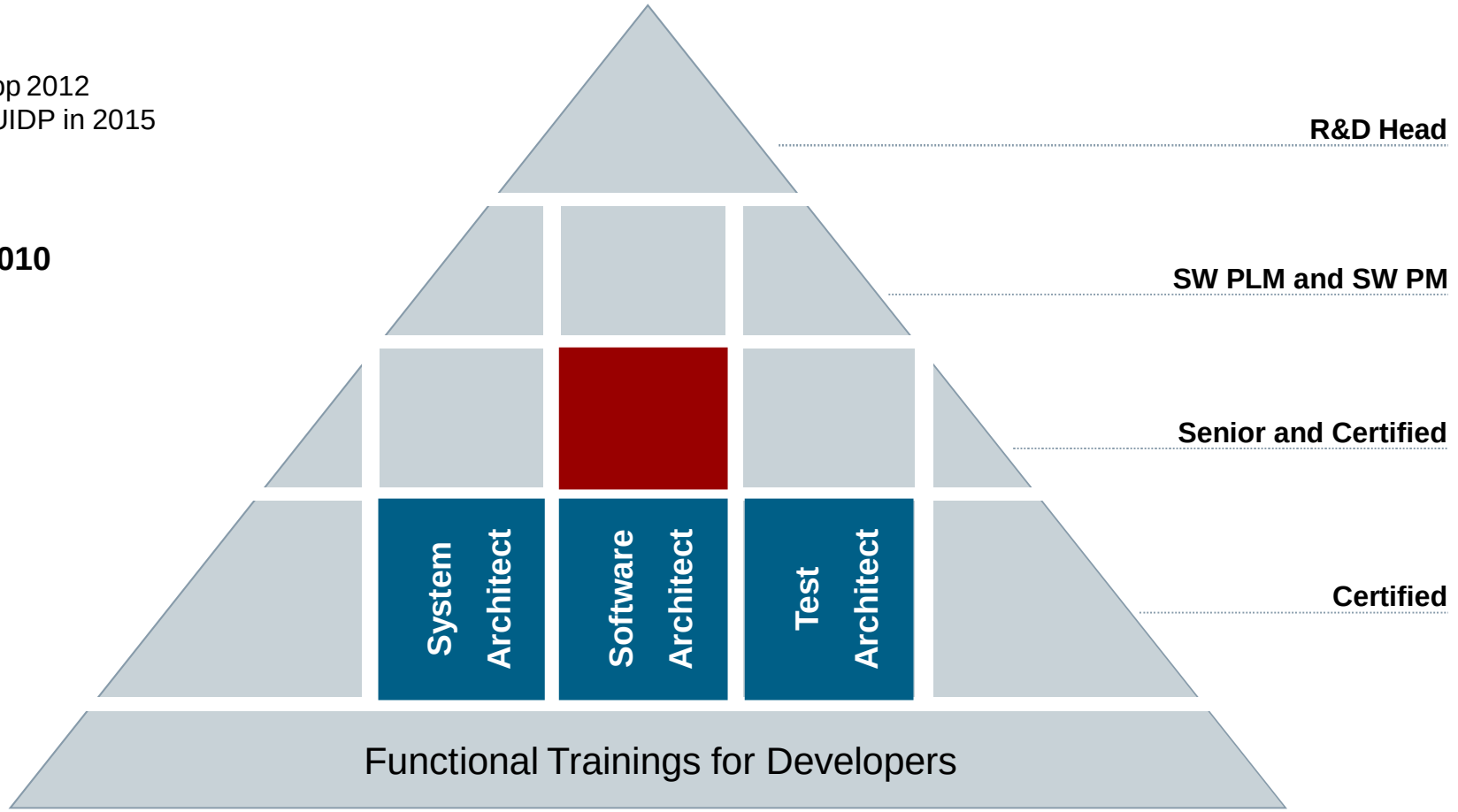
R&D Manager Workshop 2012
Transferred to WBT: GUIDP in 2015

RE for PM / PLM, 2010

SSWA, 2007

SWA, 2009
SyA, 2012
TeA, 2016

Target Group



1) The relevant Core Learning Programs were initiated by the former Siemens Software Initiative (SWI) and transformed to the workstream PLM and Innovation Excellence in 2016.

Architect related (Core) Learning Programs driven by PLM and Innovation Excellence

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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
Certified Architect	**Class B [1] Project:** • Moderate innovation in technology, medium risk • Medium business impact, medium teams **Class C [1] Project:** • Enhancing known technology and requirements, low risk • Single site development, small teams

1) R&D Project classification

Distribution of certified SSWA / SWA / SyA / TeA (500 certified Architects working at Siemens in March 2017)

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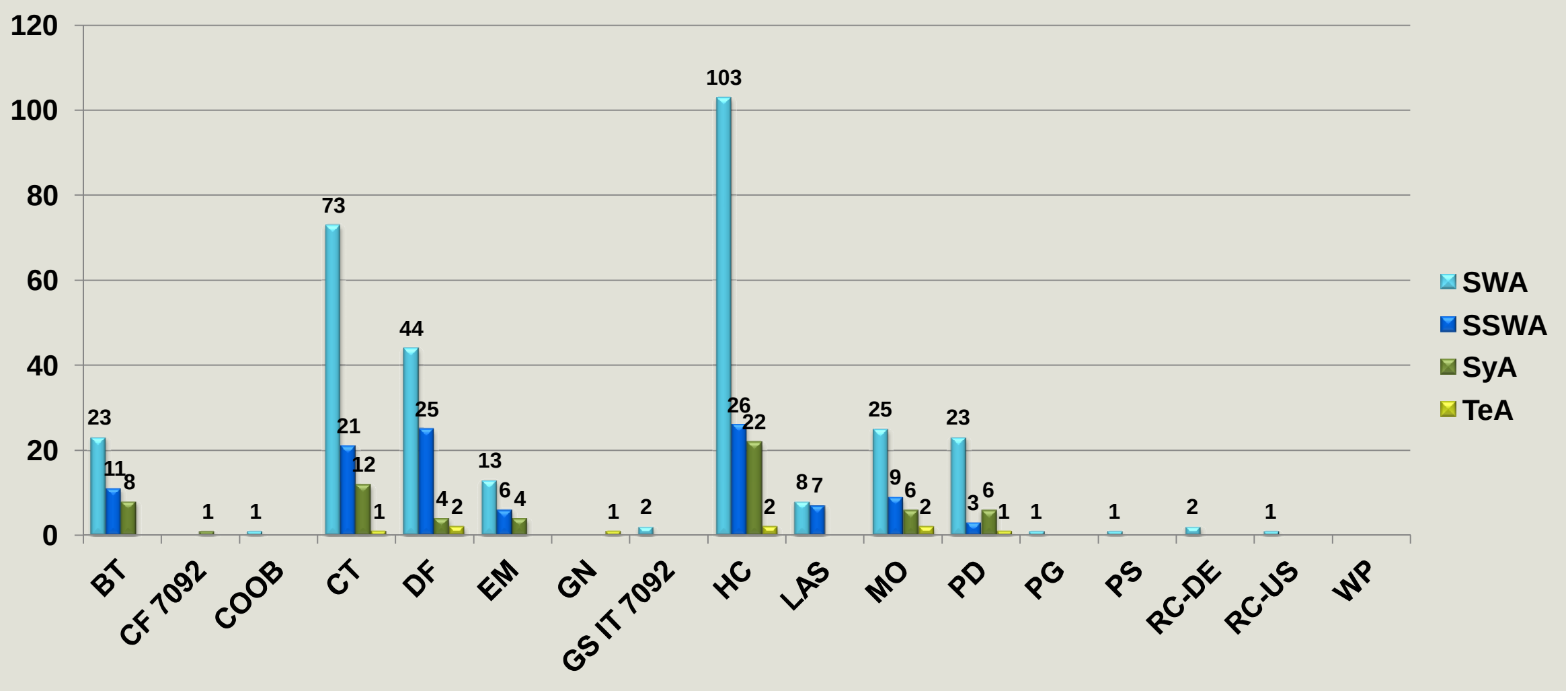

Feedback from learning program participants (quotes from a survey conducted in April 2016)

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"Software Architecture is a part of craftsmanship which must be learnt and practiced in a systematic manner. These learning programs provide a structured and a holistic view, accelerating the whole learning process."

The common understanding among the architect community helps strengthen the voice of the individual architects."

"The qualification deepened my understanding of the iterative/incremental development process
and the different stakeholders with their responsibilities."

"Benefits we have experienced were better results (higher quality and faster), less risk (right level of consideration upfront), take care of non-functional-requirements, identification of cost- and complexity drivers."

"There are several major benefits of the program - a common approach to architecture, the networking aspect, applying the learnings directly in the project, learning from colleagues in other business units."

"The programs help when discussing tradeoffs because there is a common understanding established in the training."

"Topics like systematic architecture design and software testing were most helpful"

The Siemens Architect Learning Programs were also recognized as a best practice by external companies (e.g. SAP, Wipro, Sony Mobile, Samsung, Airbus, …) during the Software Quality Benchmarking in 2014.

Survey summary from an April 2016 survey to the question: "What has changed through the SxA learning program, to what extent?"

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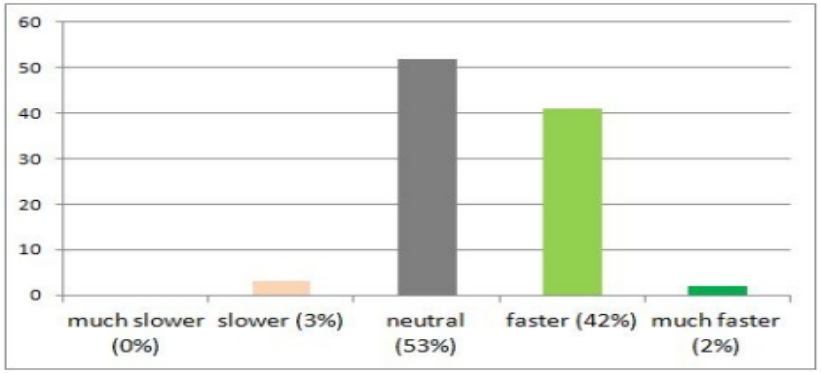
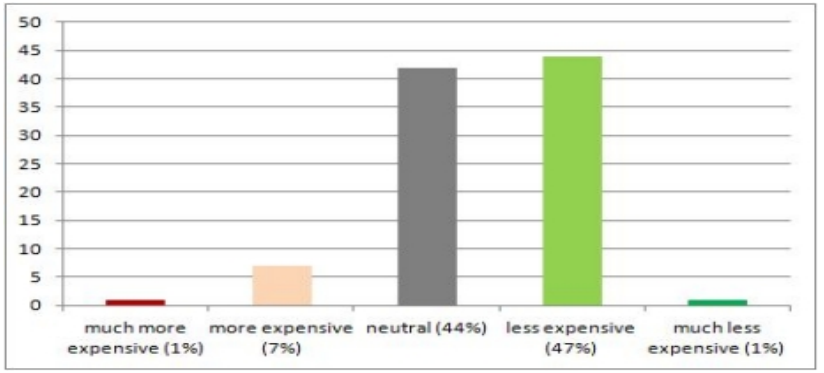
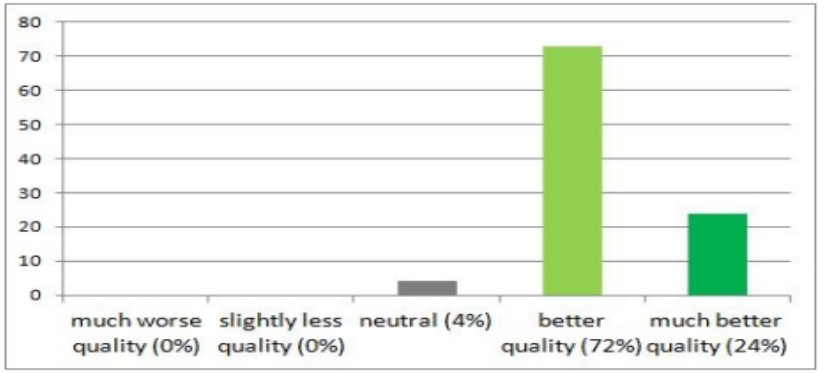
(Development) Time



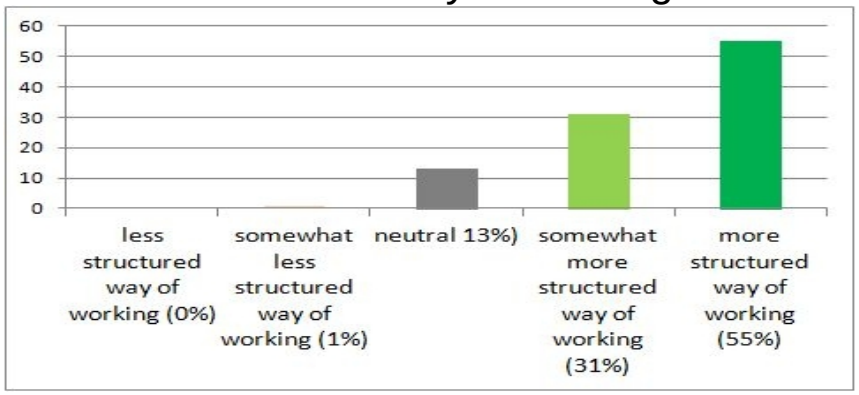
(Development) Cost



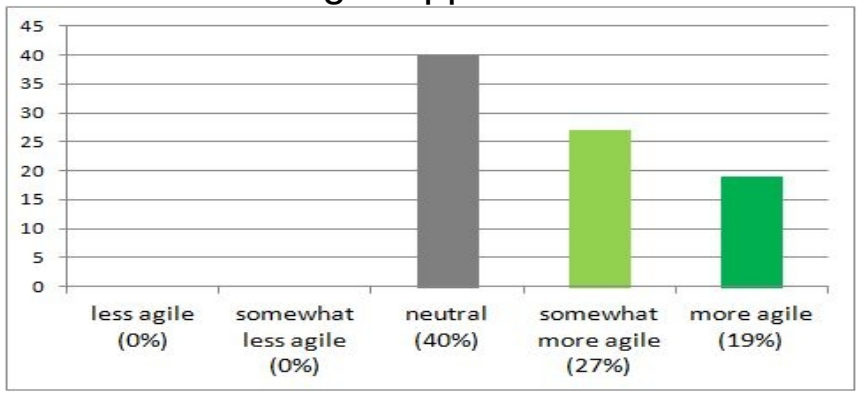
Quality



Structured way of working



Agile approach



Initial Insights:

- In time / cost / quality there are significant improvements, especially strong on quality
- Very positive regarding structured way of working
- All persons neutral or positive regarding increased agile (many are already very agile, thus answer "neutral" as no change)

Content

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1 The Siemens Core Learning Program

2 **The Test Architect (TeA)**

Driving triumvirate for testing & quality engineering

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Process quality, certification and audits, regulations and norms

across lifecycles and versions

Quality Manager

Process

Management

Technologies

Quality goals

Productivity

Strategy

Test Manager

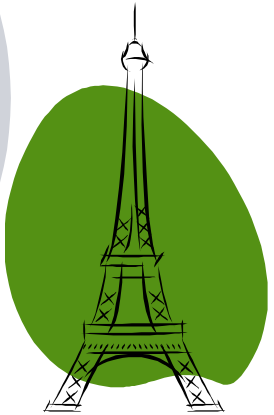
Budget, people, plans, logistics

for the test organization

Test Architect

Cost efficient, accelerated, innovative, sustainable testing solutions

for test methodology and test infrastructure



The Test Architect as a technical communication hub

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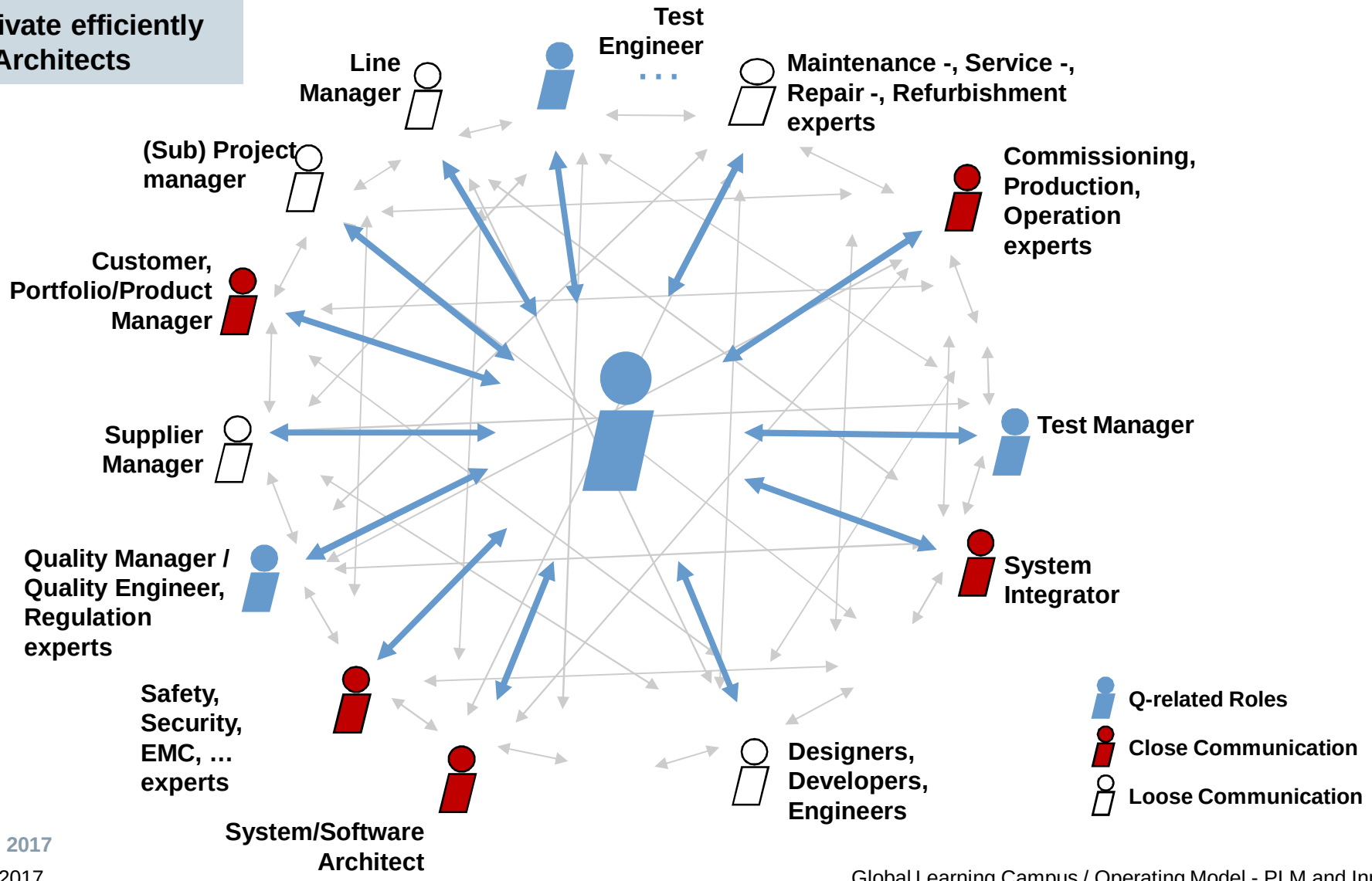
"To interact & motivate efficiently is crucial for Test Architects



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

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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

Test Architects need a broad set of competencies

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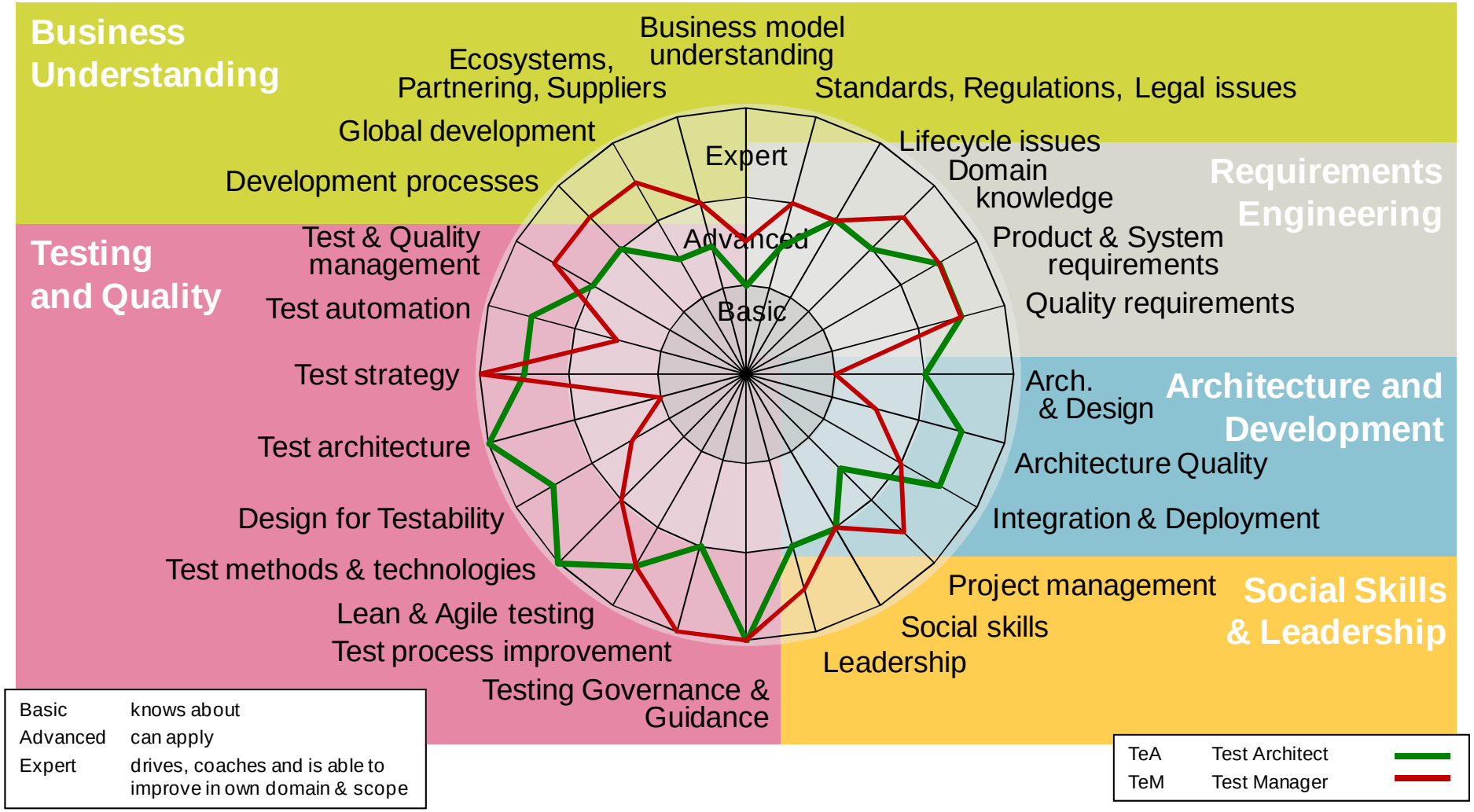

Test Architect
Role Profile: Responsibilities (1)

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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

Test Architect
Role Profile: Responsibilities (2)

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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 (3)

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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 frameworks and test suites	Responsible
	Ensure quality of the test code	Responsible
	Guide/Coach test 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 (4)

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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 (5)

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Realize	Incorporate automated testing into the regular build / continuous integration process	Responsible
	Guide/Coach the development teams in testing related topics	Responsible
	Forster 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

Test Architect Expert Training (TeA) Schedule

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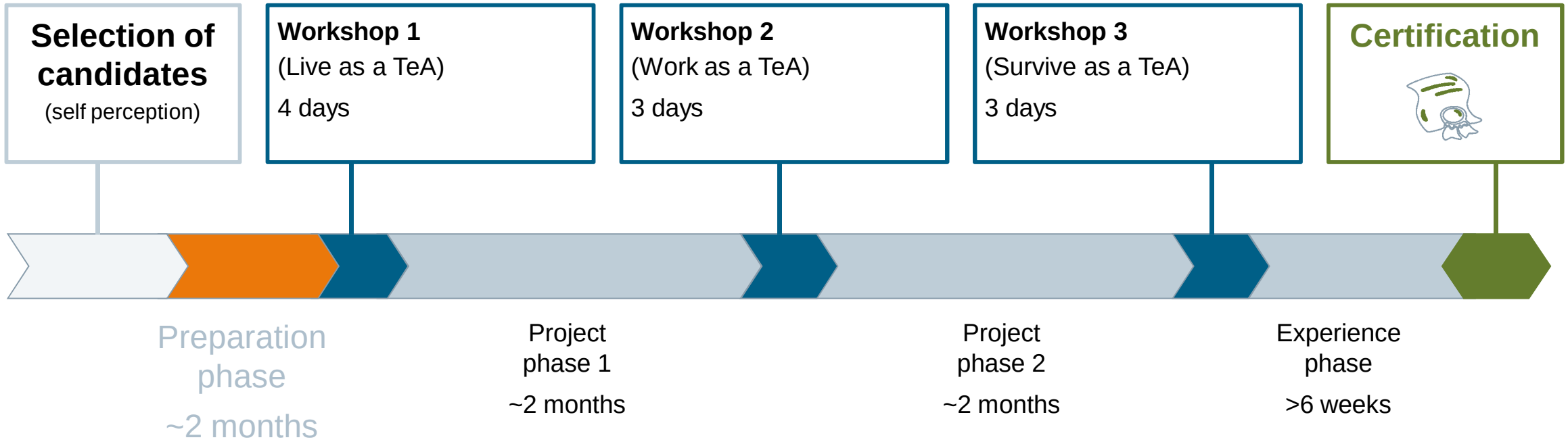

In parallel setup and maintenance of networking by centrally organized events and exchange platforms

Test Architect Expert Training (TeA)
Prerequisites for participation (extract)

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- Participant has at least 3 years of experience in research, development or engineering.
- Participant has worked at least 2 years as a test architect or in a similar role; e.g. a test engineer, test manager, key developer, software/system architect
- Participant has been responsible for the test architecture/infrastructure of a project and the work of other test engineers
- Participant has successfully established test architecture within the project according planned time/budget/quality

Some examples for further detailed prerequisites:

- Participant is certified according to ISTQB Foundation Level (or equivalent) or can prove that he/she has the corresponding knowledge and experience; ISTQB Advanced Level is recommended.
- Participant is able to read and understand the development and documentation notations (terminology, languages, models, diagrams, …) used in his/her domain's relevant development disciplines.
- Participant knows the most important qualities (e.g. testability, flexibility, maintainability, reliability/availability; Safety, Security, ...) in his/her project and related testing concepts.

Participant's project

- System or Software Project with medium or high business impact
- Not a customizing project

Test Architect Expert Training (TeA)
Workshop split

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Workshop 1 – Live as a Test Architect

- Introduce all course topics

Business Understanding	Requirements Engineering	Architecture	Testing & Quality	Social Skills

  - why is the topic important at all and why for test architects
  - what is the test architect's responsibility in each topic
- clarifying and managing the problem and solution space

Workshop 2 – Work as a Test Architect

- important methods for the test architect in each topic …

Workshop 3 – Survive as a Test Architect

- dealing with uncertainty, change, and conflicts
- sustaining test architecture

Test Architect Expert Training (TeA) Topics

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Business Understanding (~15%)

- Product Lifecycle Models (PLM)
- Lifecycle models and processes
- Portfolio management
- Risk & Uncertainty
- Estimation and prioritization

Architecture (~15%)

- Systematic architecting
- Design strategies & tactics
- Design patterns
- Architectural views and documentation
- Architecture quality
- Architecture reviews
- Refactoring

Testing & Quality (~40%)

- Value of testing
- Test strategies, risk-based testing
- Design for testability
- Test management
- Agile testing
- Test design techniques
- Test automation
- Test environment, test architecture
- Test documentation
- Internal quality
- Test Architect revisited

Requirements Engineering (~10%)

- Good requirements
- Reviewing requirements
- Configuration and change request management

Cross-Cutting

- Role of the Test Architect
- Dealing with quality attributes (non-functional requirements)
- Agile / Lean development

Social Skills (~20%)

- Communication with stakeholders about testing and quality
- Situational leadership model
- Leadership and motivation
- Conflict management

System Architect Learning Program

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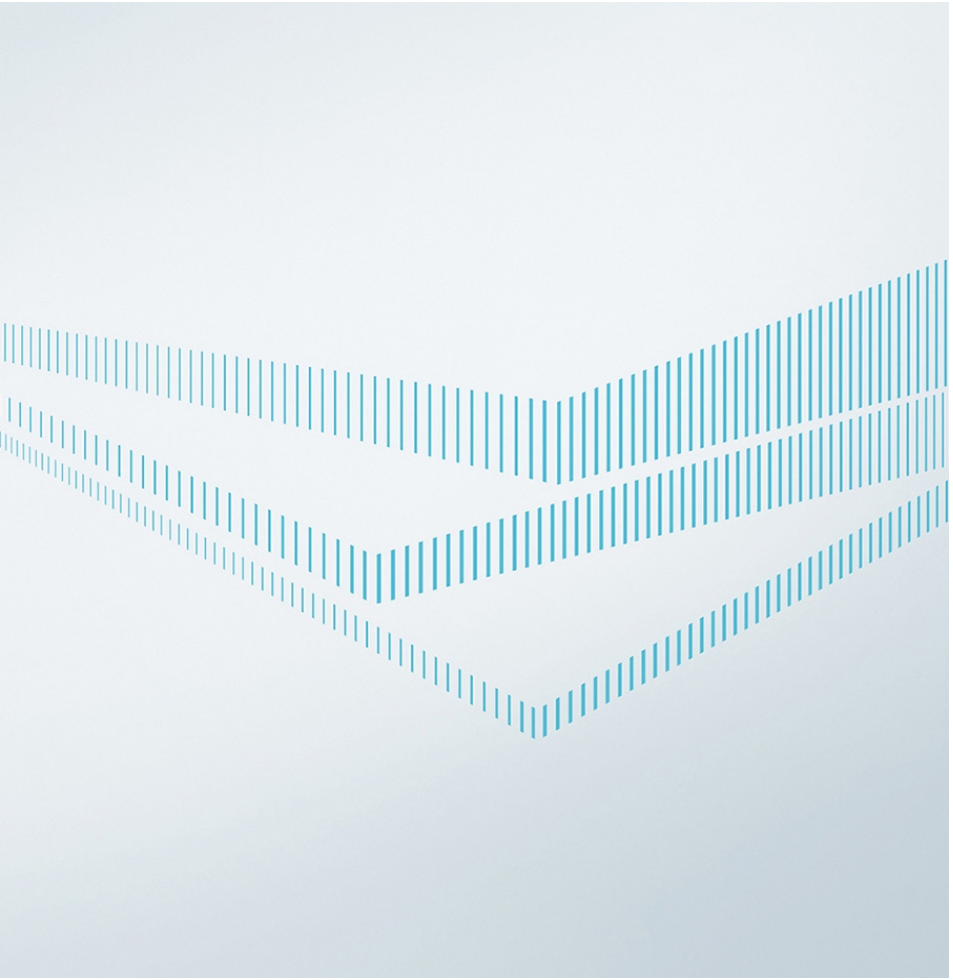
Schedule Europe

Application Procedure: https://wse02.siemens.com/content/P0002864/wppages/Application%20Procedure.aspx

Contact and further information



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