ISTQB®
International Software
Testing Qualifications Board

ISTQB®
Worldwide Software Testing
Practices Report
2015 - **2016**

"_The survey covers several topics, ranging from organizational and budgetary aspects, to techniques, processes, tools, through skills and competencies;_

we think it provides useful information for all the professionals involved in the testing market, as well as direction for the further evolution of the ISTQB® scheme.**"**

Gualtiero Bazzana, ISTQB® President

MESSAGE FROM THE PRESIDENT

Gualtiero Bazzana, ISTQB® President

ISTQB® (International Software Testing Qualifications Board - www. istqb. org) has created the world's most successful scheme for certifying software testers. As of June 2015, ISTQB® has administered well over 560,000 exams and issued more than 400,000 certifications in over 110 countries world-wide, with a growth rate of about 50,000 certifications per year.

As a nonprofit-organization with its mission of "advancing the software testing profession", ISTQB® regularly conducts international online surveys to assess the trends in testing industry.

After the "2013 ISTQB® Effectiveness Survey", in which we collected market feedback on the impacts of ISTQB® certifications, in 2015 we conducted a survey looking at the " Worldwide Software Testing Practices", the results of which are published in this report.

The survey covers several topics, ranging from organizational and budgetary aspects, to techniques/ processes/ tools, through skills and competencies; we think it provides useful information for all the professionals involved in the testing market, as well as direction for the further evolution of the ISTQB® scheme. This is an exciting time in the testing industry and the survey data will help the significant evolution that ISTQB® is currently undertaking to ensure we develop and maintain syllabi that continue to reflect changing testing practices and that meet market demands.

The survey was designed by the ISTQB® Marketing Working Group and endorsed by ISTQB® Member boards, accredited training providers and exam providers, collecting more than 3,200 responses from 89 countries.

I would like to thank all of you who responded to the survey; your valuable feedback will contribute significantly to the future of the ISTQB® scheme.
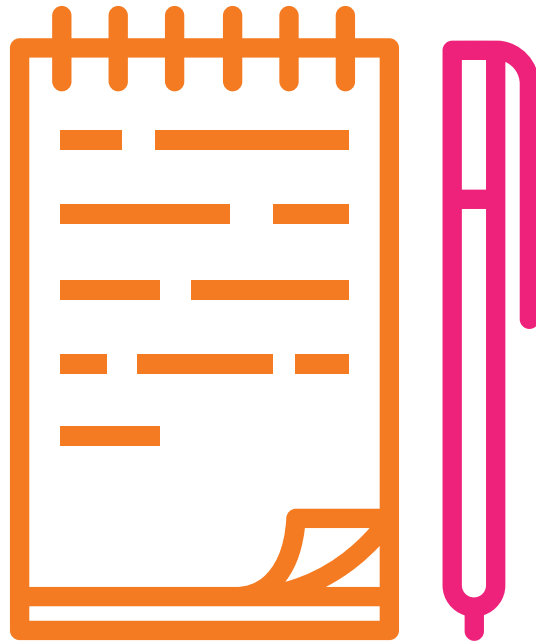
" With its reach to more than 89 countries and about 3,200 respondents, ISTQB®

Worldwide Software Testing Practices Report lays the foundations for an open discussion about the most important topics in the software testing community. **"**

ISTQB Marketing Working Group

EXECUTIVE SUMMARY

The main highlights from the report are:

Budgets assigned to testing are large and keep on growing

The typical IT/ R&D project budget allocated to software testing ranges between 11% and 40%. This is in line with the World Quality Report 2015-16 that indicates an average expenditure of 26% for 2014 and 35% for 2015. Also in line with the World Quality Report is the fact that budgets are expected to grow in the near future, with about 60% of the respondents expecting an increase of the budgets allocated to testing, with an average expected growth rate for next year to be about 14%.

Agile based SDLCs are being adopted ahead of traditional ones (Waterfall or V-Model)

Agile methodologies are significantly increasing in popularity; this emphasizes the need to have appropriate testing processes and techniques for Agile, as well as certification of testing competences.

Segregation of duties has become a standard practice from an organizational point of view

In close to 80% of the cases, the responsibility for software testing is assigned to in-house test teams. Adoption of "segregation of duties" is further confirmed by the fact that in most cases (84%) the test team does not report to Development.

Training and certification of competences are key factors in improving test skills

In addition to training on the job (72%), organizations are improving the competency level of their test teams mostly by encouraging their employees to undertake relevant certifications (51%) and formal training (46%) This means that learning of the theory and the practicing of hands-on activities are both seen as important, and should be used in combination.

Test tools are widely adopted

Adoption of testing tools is becoming commonplace, especially for defect tracking, test execution, test automation, test management, performance testing and test design.

Test automation is a hot topic

Test automation has become very widespread in the market, with 72% adoption. 40% of the respondents suggested that the percentage of automated test cases in use is well beyond 20%. Test tool/automation consulting is also the most sought service from external providers, with test automation being the area with highest improvement potential.

Testing requires a wide range of skills and competencies

A good tester should be able to combine Technical Skills (especially on test design and test execution tools) together with Soft Skills and Domain Knowledge.

Important career paths are available for testers and test managers

Testers typically evolve into technical analysts and test managers who can progress to become Test Department Managers or Project Managers.

The decision of "When to stop testing" is mainly based on requirements coverage

Requirements coverage is by far the most adopted criterion to decide when to stop testing. It is a bit worrisome to see that constraints imposed by scheduling is the second criterion, knowing that this is a dangerous practice

Use cases and exploratory testing are the most adopted test techniques in the business practices

Use cases and exploratory testing are more extensively applied than traditional black-box techniques (like BVA or equivalence classes). Coverage-based white box techniques are used by no more than 20% of the sample.

Performance, usability and security tests are gaining traction

The top three non-functional testing activities that test teams normally perform are performance (63%), usability (56%) and security testing (39%).

Several improvement opportunities are recognized

The survey indicates that there are still significant improvement opportunities in test automation, test process, communication and test techniques that have been cornerstones of the ISTQB® syllabi since the certification scheme began.

Background of Respondents

In which region do you currently work?

Asia **31%**

22% North America

9% South America

1% Africa

1% Oceania

Europe **36%**
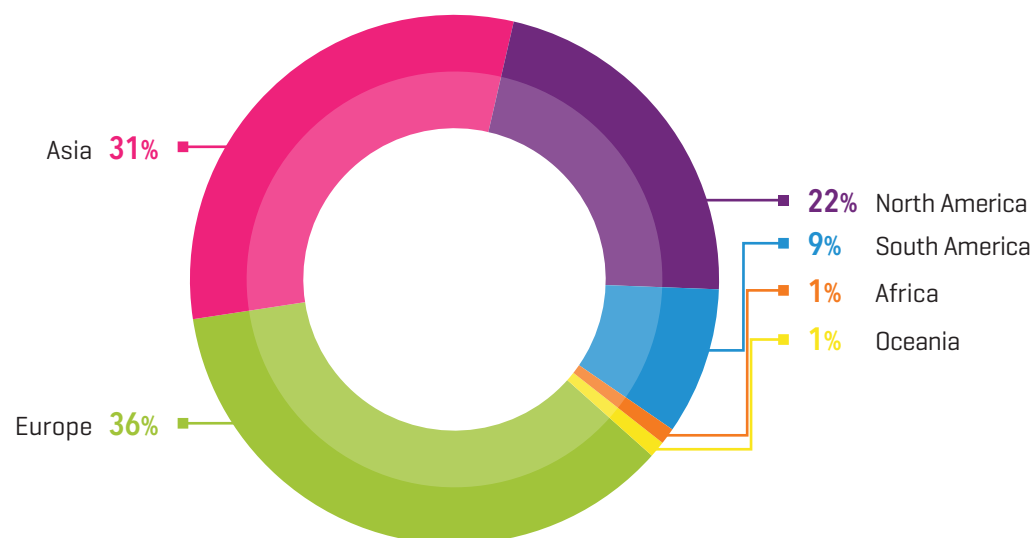
To which industry does your organization belong?

1580
Information Technologies

492
Financial Services

296
Telecom, Media and Entertainment

124 *Healthcare and Medical*
104 *Consumer Products, Retail and Distribution*
93 *Public Sector*
84 *Automotive*
61 *Education*
53 *Transportation*
50 *Manufacturing*
344 *Other*

What is your current job title?

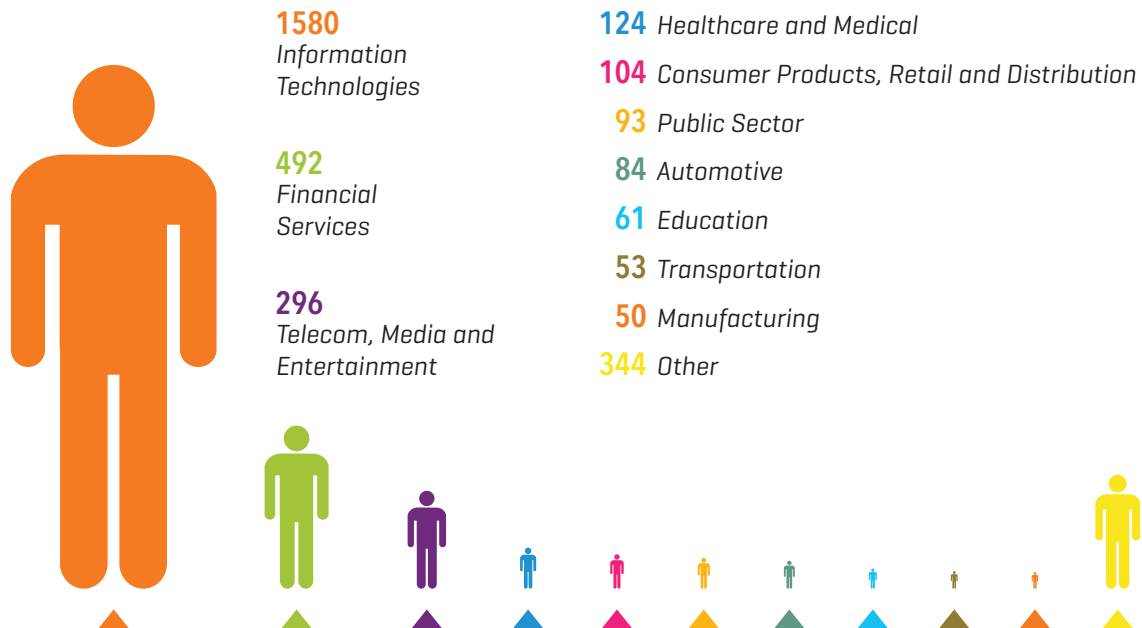|	
Tester	**1288**
Test Leader	**582**
Test Manager	**459**
Business Analyst	**123**
Manager	**106**
Project Manager	**80**
Developer	**80**
System Analyst	**61**
CEO / General Manager	**40**
Business Unit Manager	**33**
IT Architect	**28**
CIO / IT Manager	**26**

Development Manager	**24**
Academic / Professor	**18**
Operations Manager	**10**
Enterprise Architect	**8**
R&D Manager	**5**
Database Admin	**3**
Other	**305**

53%
TECHNICAL

47%
MANAGERS

"Respondents distribution according to functions"

Organizational
Aspects
of
Testing

Who is responsible for software testing in your company?

(Multiple answers were allowed.)

76,7% — In-house test team

38,1% — Developers

27,1% — End Users

23,5% — In-sourced test team

19,5% — Distributed test team

17,3% — Off-shore test team

8,3% — Near-shore test team

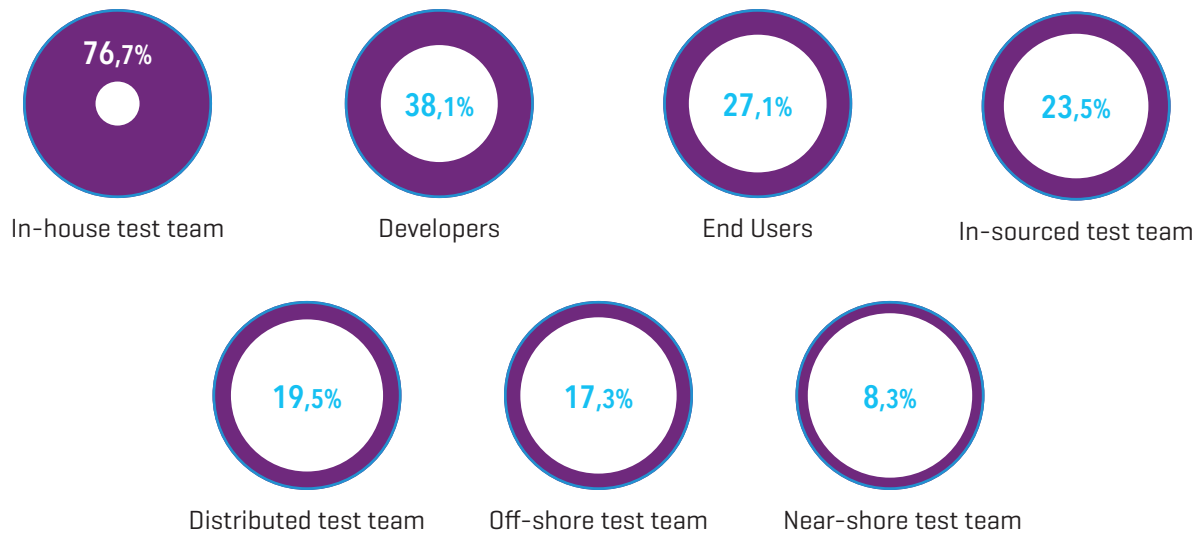In close to 80% of the cases, the responsibility of SW testing is assigned to an in-house test team; this confirms the increasing adoption of "segregation of duties", that is one of the key factors for the effectiveness of testing activities.

Segmentation by Industy

- ■ Information Technologies
- ■ Financial Services
- ■ Telecom, Media and Entertainment

Bar chart showing In - House Test Team, Developers, End Users, In - Sourced Test Team, Distributed Test Team, Off - Shore Test Team, Near - Shore Test Team with percentage scale 0%–80%.
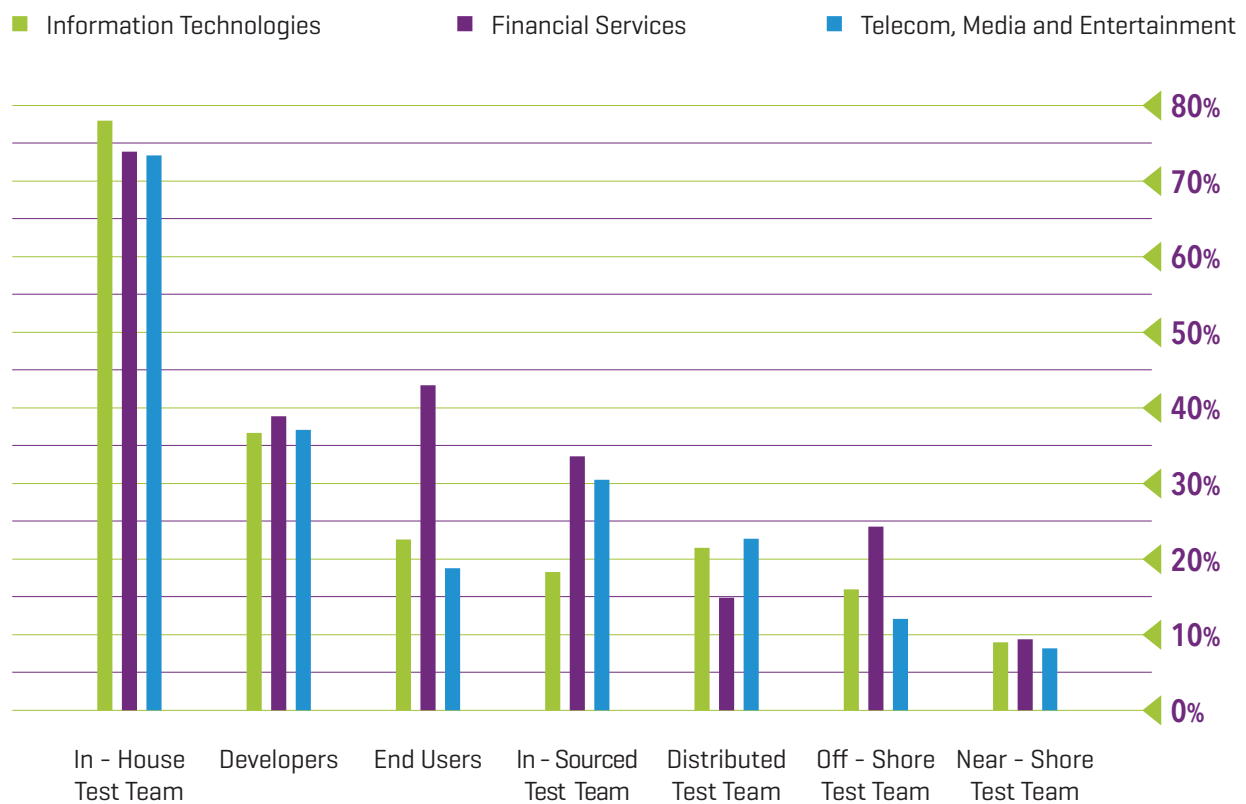
To whom does the test team report?

|			
● **46%** Project Manager		R&D Manager **5%** ●
● **15%** Other		Operation Manager **5%** ●
● **11%** Development Manager		Business Analyst Manager **4%** ●
● **11%** CIO / IT Manager		CEO / General Manager **3%** ●

Test teams are in most cases under the supervision of project managers (46%). 11% of them are reporting to development manager and CIO/IT manager. Only 3% are reporting to the CEO/General Manager.

Segmentation by Industry

■ Financial Services ■ All Industries ■ Telecom, Media and Entertainment
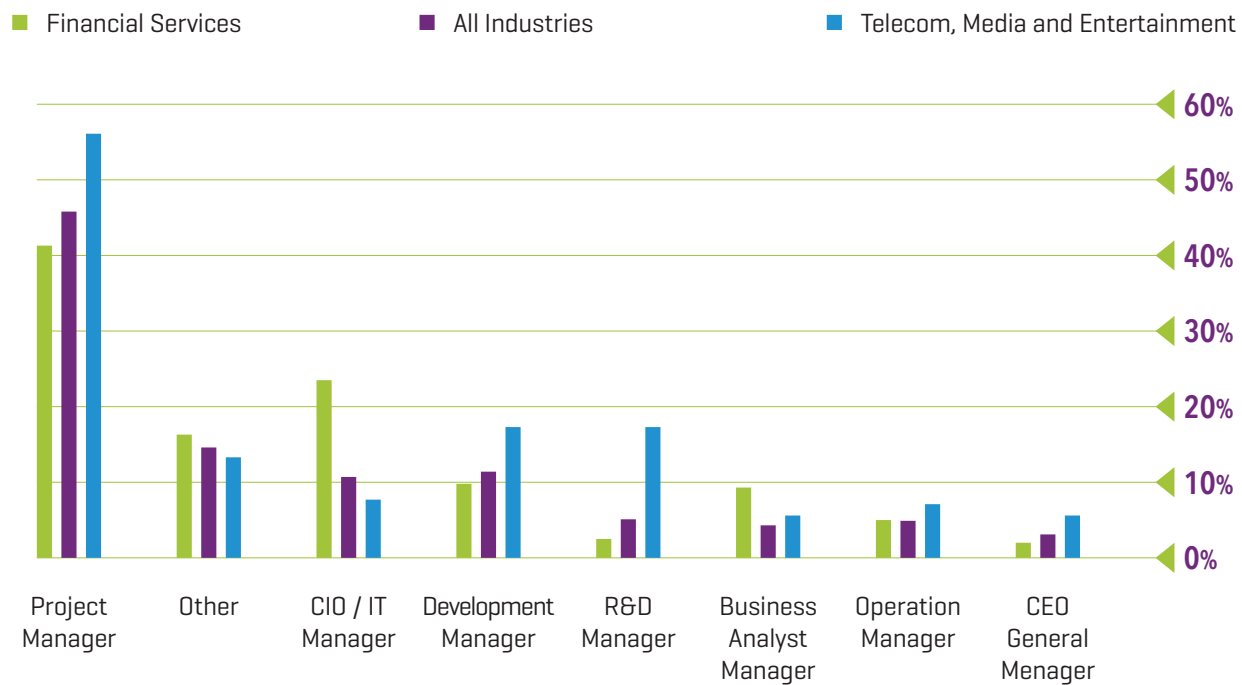
The testing function in Financial Services reports to the CIO/IT manager in more than 20% responses, and only in 6% for Telecom, Media.

Segmentation by Function

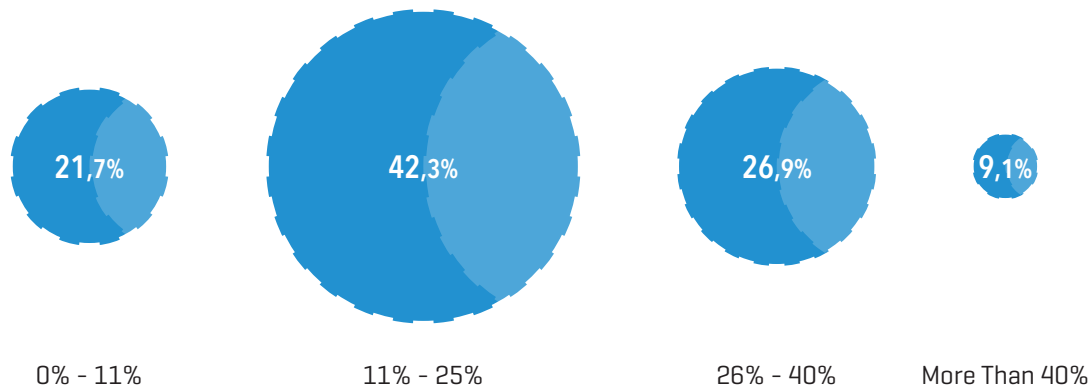**51%** To Operation **18%** To Business **16%** To Development **15%** Other
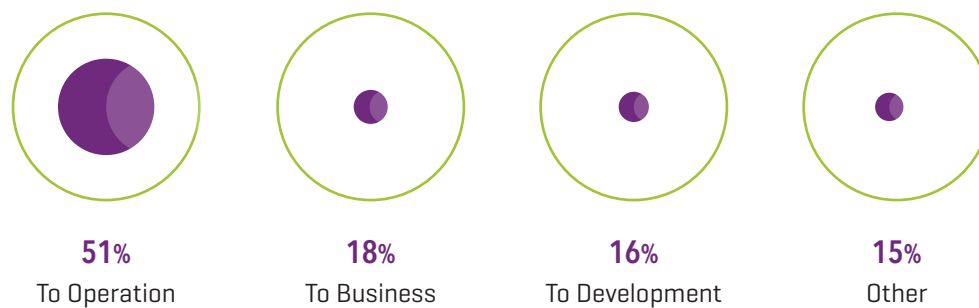
Wide adoption of "segregation of duties" is confirmed by the fact that in most cases (84%) the test team does not report to Development

Economic Aspects of Testing

What percent of a typical IT/ R&D project budget is allocated to software testing?

21,7%	42,3%	26,9%	9,1%
0% - 11%	11% - 25%	26% - 40%	More Than 40%

The large majority of respondents indicate budgets between 11% and 40%.
This is in line with World Quality Report 2015-16 that indicates an average expenditure of 26% for 2014 and 35% for 2015.

Segmentation by Industry

■ Information Technologies   ■ Telecom, Media and Entertainment   ■ Financial Services
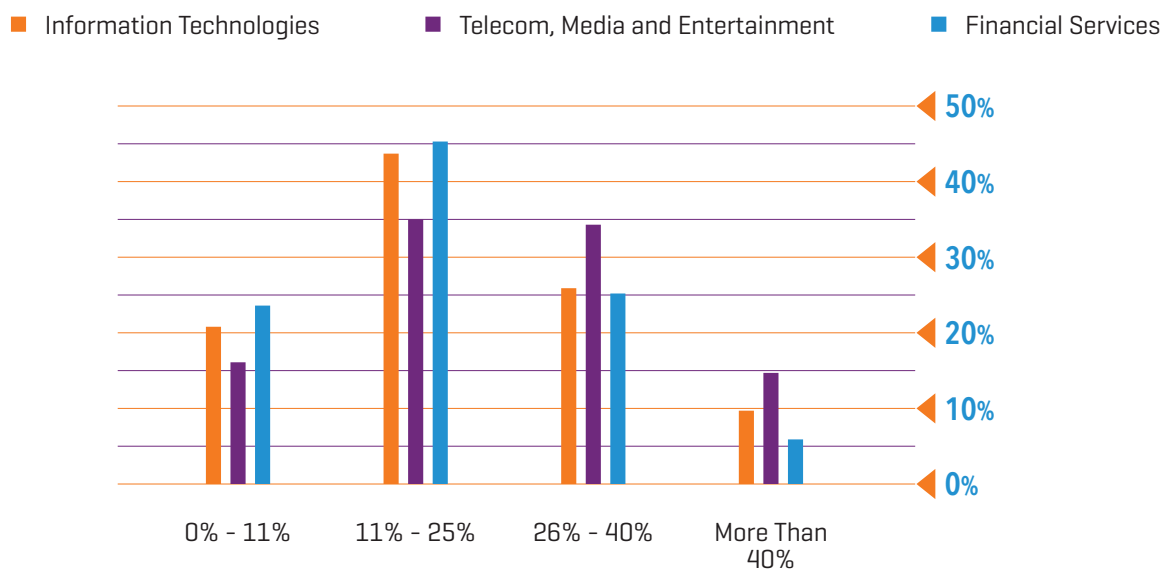
Telco/ Media companies devote more of their budget to testing activities than do IT or Financial Services companies.

What is your expectation for your organization's software testing budget in the next 12 months?

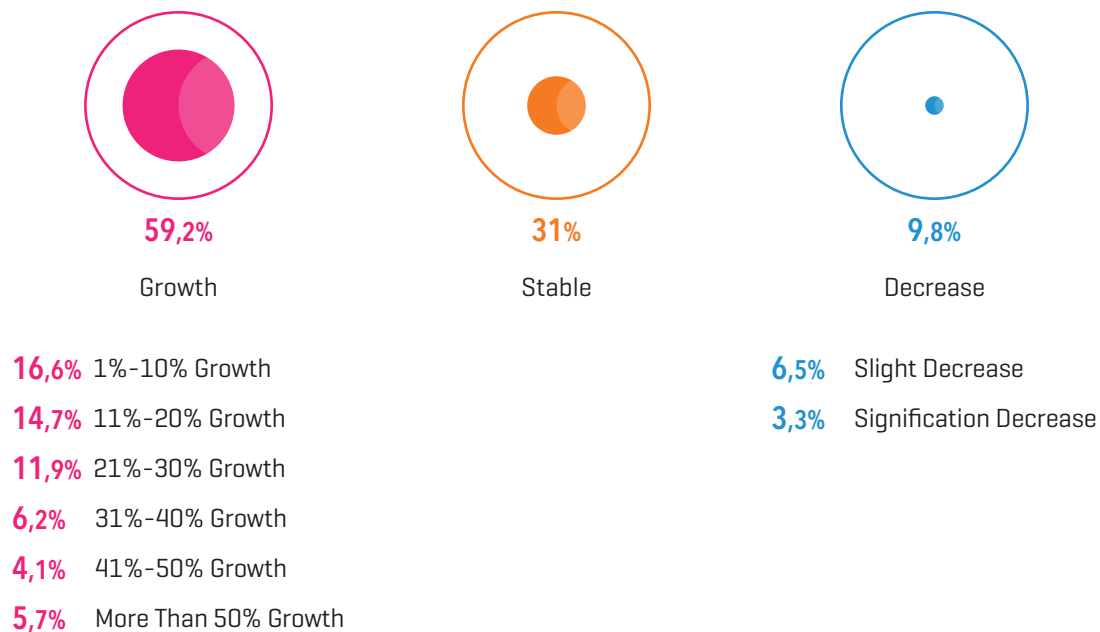| 59,2%	31%	9,8%
Growth	Stable	Decrease

16,6% 1%-10% Growth

14,7% 11%-20% Growth

11,9% 21%-30% Growth

6,2% 31%-40% Growth

4,1% 41%-50% Growth

5,7% More Than 50% Growth

6,5% Slight Decrease

3,3% Signification Decrease

About 60% of the respondents expect an increase of the budgets allocated to testing; this confirms the growing trend exhibited in the World Quality Report 2015-16, which forecasts that by 2018 the IT budget allocated to QA & testing will rise to 40%.

Average expected growth is 14% which is in line with the forecasted CAGR of the Global Testing Market in 2015-2019 in the Technavio Report (www.technavio.com)

To which test level (s) is most of your budget allocated?

(Multiple answers were allowed.)

71,3%	48,7%	44%	24,1%
System	Integration	User Acceptance	Unit / Component
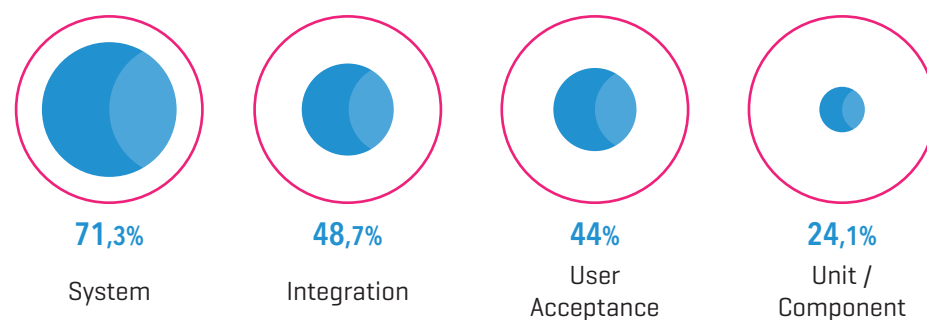
System testing is by far the activity absorbing most of the testing budget. This is in line with the EuroStar 2014 Survey.

(http://testhuddle.com/practices-attitudes-in-software-testing-study)

Which of the below services is your organization going to obtain from external providers in the next 12 months? [Multiple answers were allowed.]

Service	Percentage
Test Tool/Automation Consulting	47,6%
Certification of Testing Competences	33,4%
Test Training	32,2%
Will not Obtain any Services	21,4%
Test Process Consulting	17,3%
Test Design	15,8%
Testing Service Charged by Time	15,4%
Full Outsourcing of Testing Service	10%
Other	4%
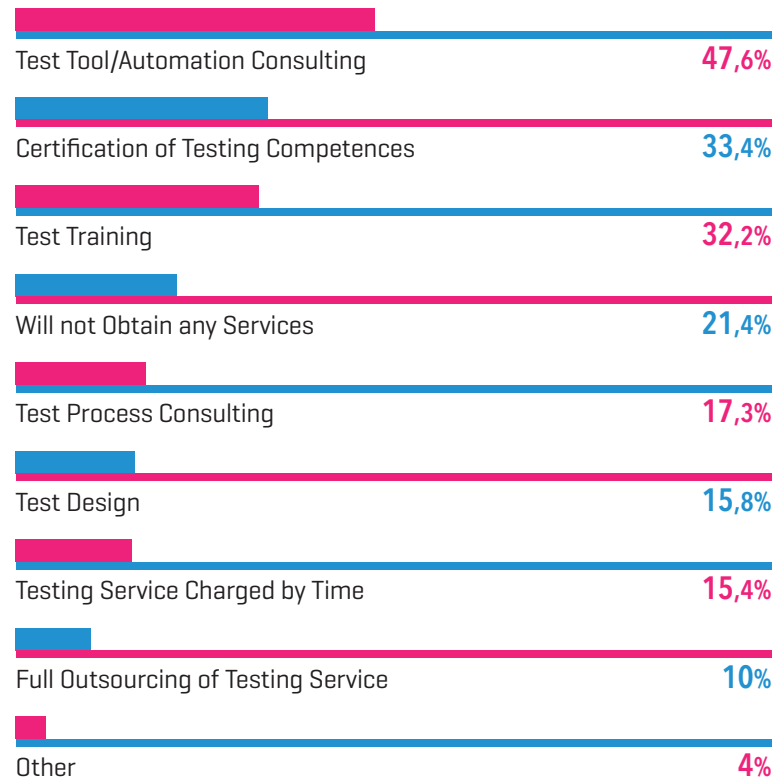
Test tool/automation consulting (47.6%) is the most sought service from external providers.

Certification of testing competencies (33.4%) and test training (32.2%) deserve a strong interest.

Only 21.4% of the respondents do not plan to benefit from external services in the next 12 months.

Segmentation by Industry

Legend:
- Telecom, Media and Entertainment
- Financial Services
- Information Technologies Technologies

Categories: Certification of Testing Competencies, Test Training, Will not Obtain any Services, Test Process Consulting, Test Design, Testing Service Charged by Time, Full Outsourcing of Testing Service, Other
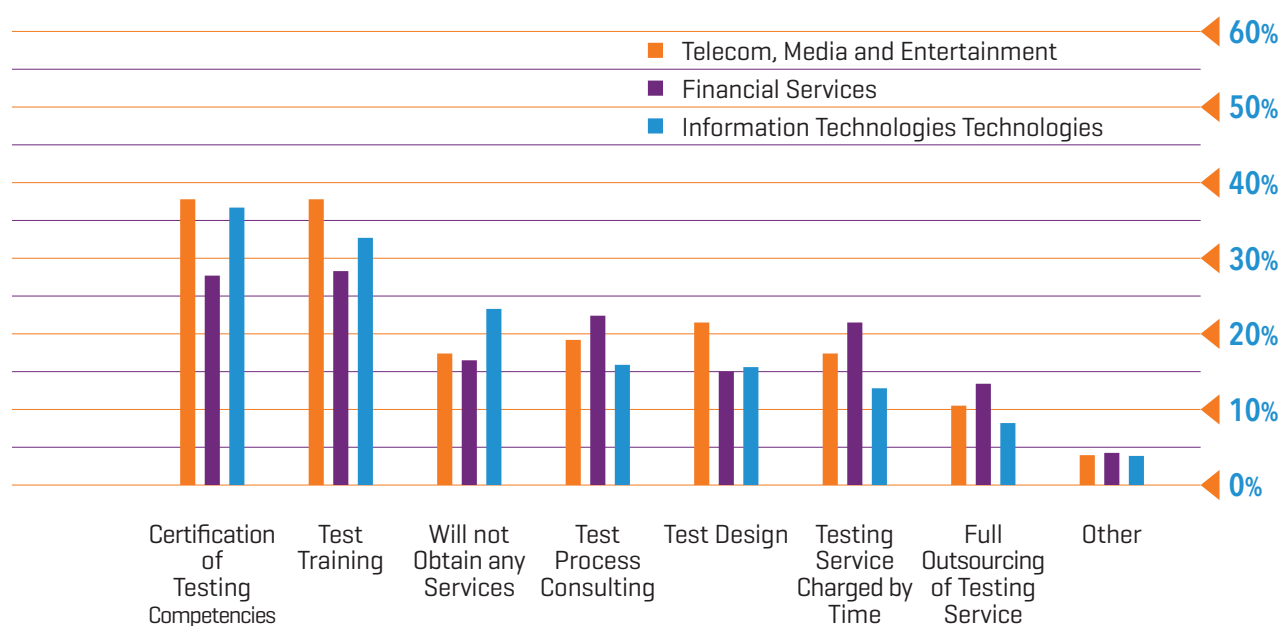
Testing in the SDLC

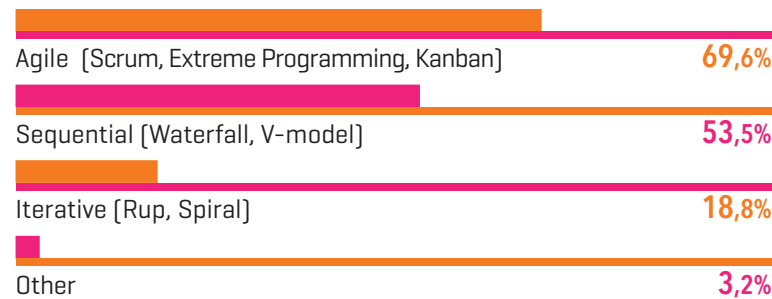# Which Software Development Lifecycle (SDLC) model are you using? [Multiple answers were allowed.]

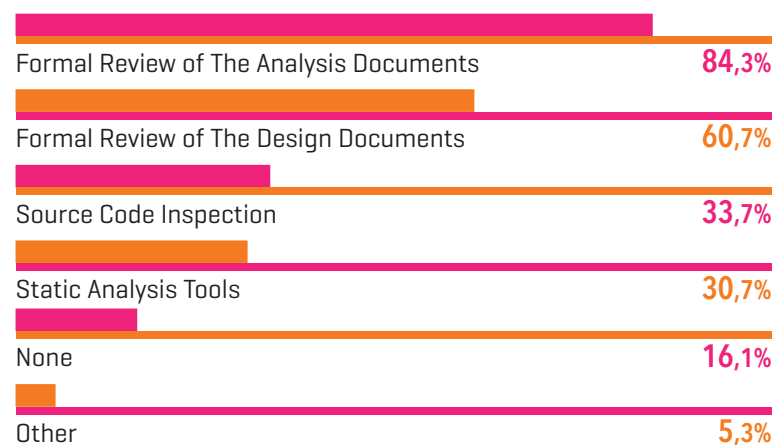|	
Agile [Scrum, Extreme Programming, Kanban]	**69,6%**
Sequential (Waterfall, V-model)	**53,5%**
Iterative (Rup, Spiral)	**18,8%**
Other	**3,2%**

Agile based SDLCs are being adopted significantly more often than traditional ones.(Waterfall or V-Model)

Agile methodologies are significantly increasing in popularity; this underlines the need to have appropriate testing processes and techniques also for Agile, combined with certification of testing competences.

ISTQB® has recently launched a specific certification module for "Agile Tester" with a strongly positive reply by the market, and in the near future will further extend the certifications on Agile testing at an Advanced level.

Which activities do you use to find defects before test execution? [Multiple answers were allowed.]

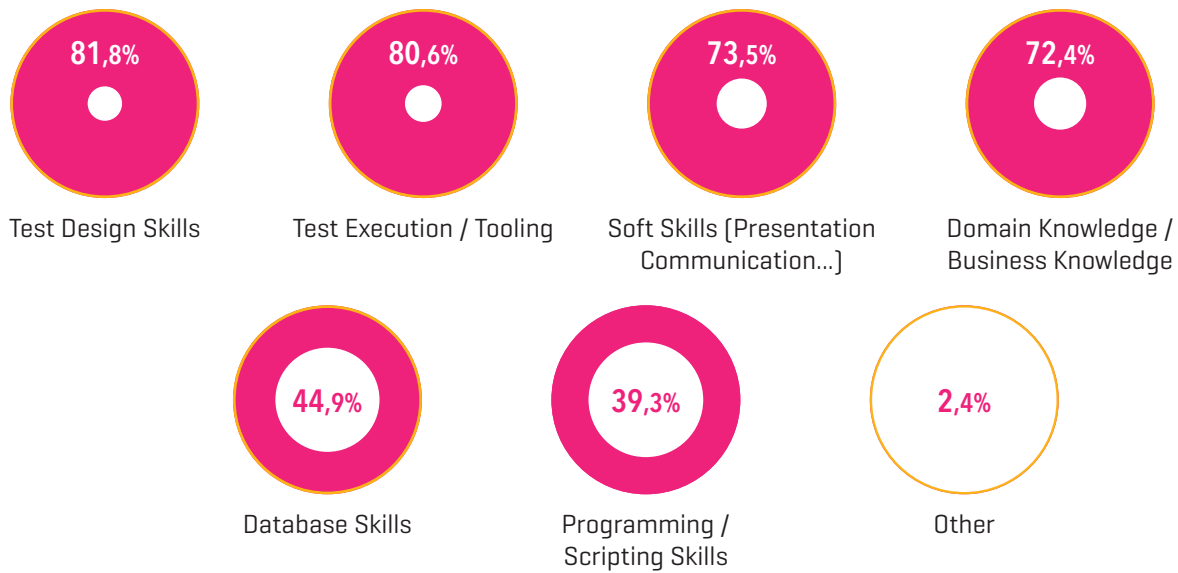|	
Formal Review of The Analysis Documents	**84,3%**
Formal Review of The Design Documents	**60,7%**
Source Code Inspection	**33,7%**
Static Analysis Tools	**30,7%**
None	**16,1%**
Other	**5,3%**

Review of the analysis documents/requirements remains the most widespread activity for early detection of defects.

Skills and Career Paths

Which skills do you expect from testers?

[Multiple answers were allowed.]

81,8%	**80,6%**	**73,5%**	**72,4%**
Test Design Skills	Test Execution / Tooling	Soft Skills [Presentation Communication…]	Domain Knowledge / Business Knowledge

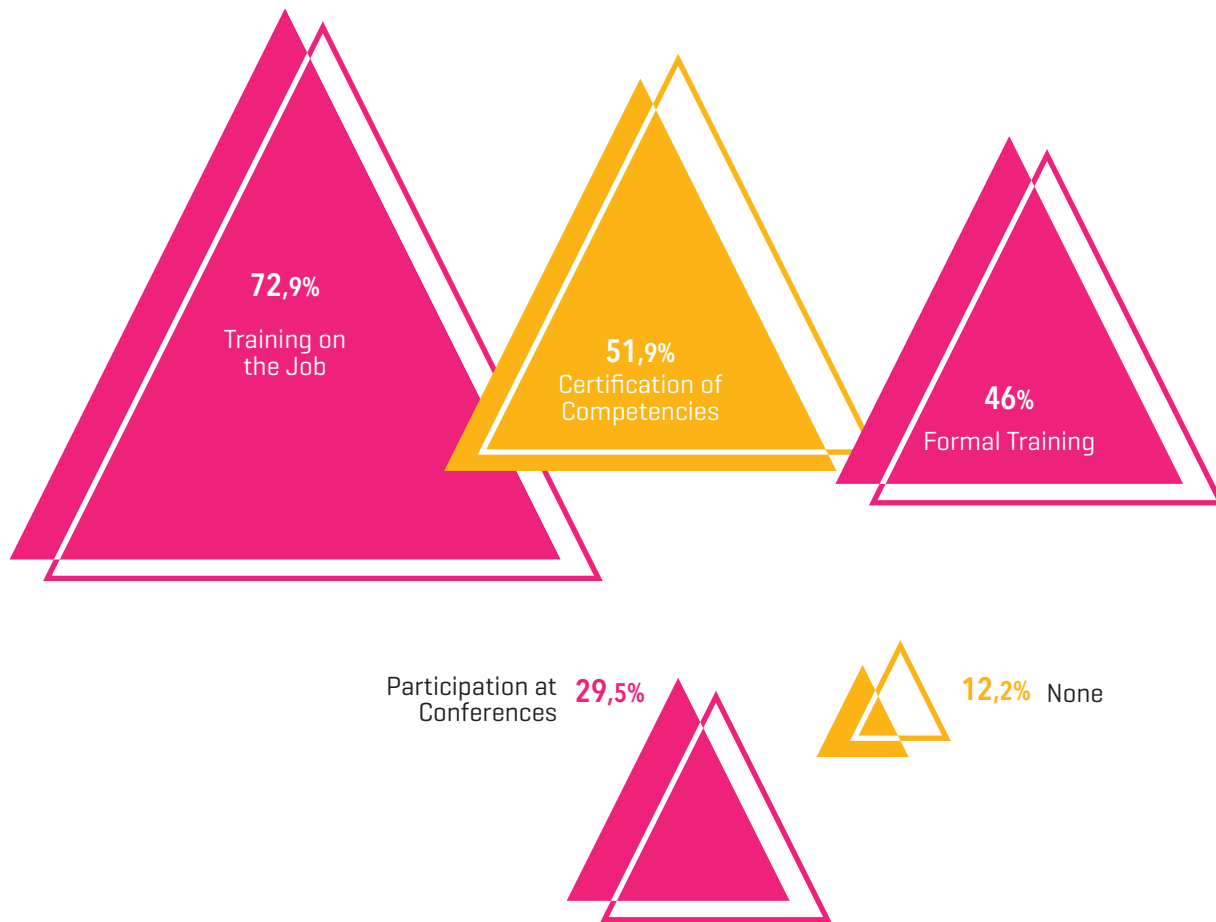|		
44,9%	**39,3%**	**2,4%**
Database Skills	Programming / Scripting Skills	Other

A good tester should be able to combine Technical Skills [especially on test design and test execution tools] together with Soft Skills and Domain Knowledge.

Segmentation by Roles

■ Technical   ■ Managers
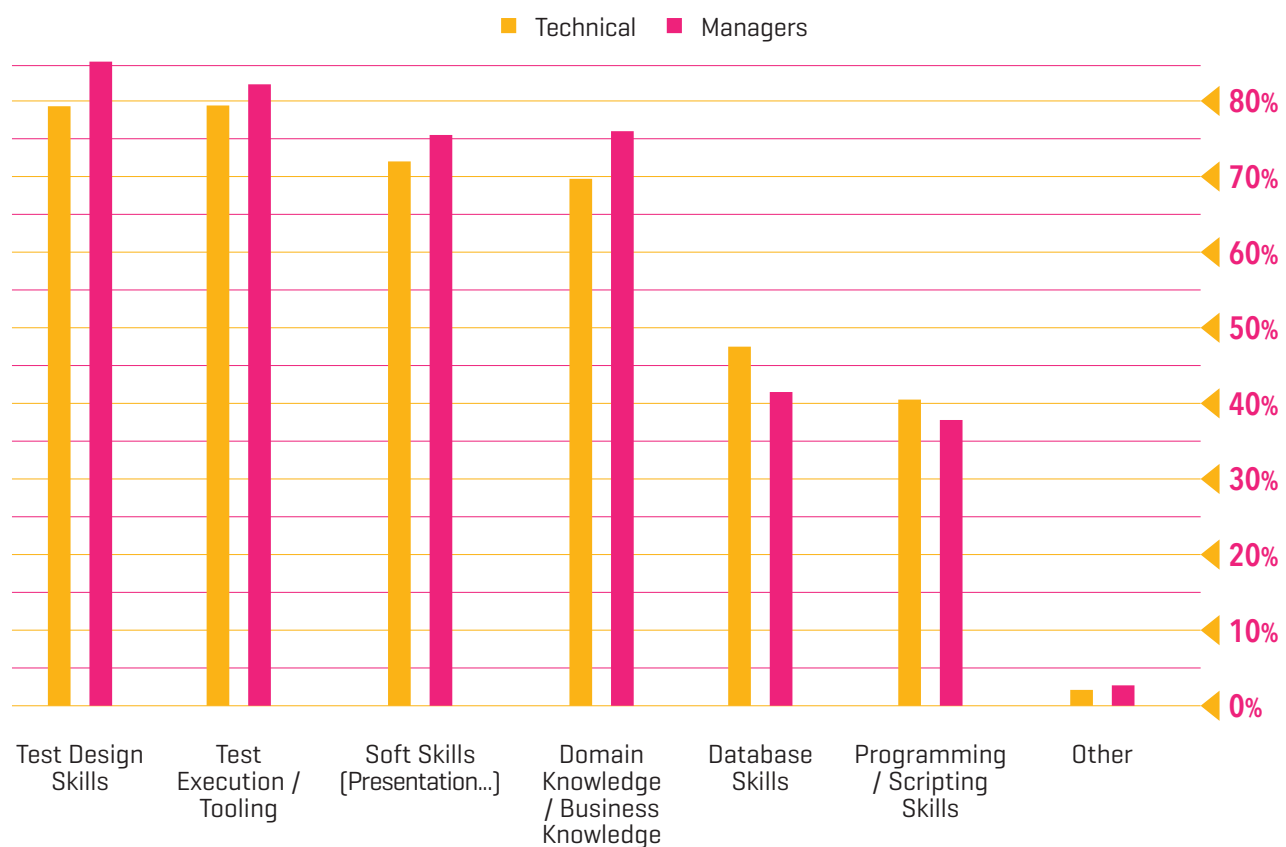
The evaluation of the most important test skills does not vary, depending on the role of the testers.

How does your organization improve the competency level of your testers? [Multiple answers were allowed.]

72,9%
Training on the Job

51,9%
Certification of Competencies

46%
Formal Training

Participation at Conferences **29,5%**

12,2% None

Besides training on the job (72%), organizations are improving the competency level of their test teams by encouraging their employees to undertake relevant certifications (51%) and formal training (46%).

This means that learning theory and practicing hands-on activities are both seen as important and should be used in combination.

Formal Training and Certification are used in combination by 31% of responders.

This is well in line with the 2013 ISTQB® Effectiveness Survey in which Test Engineers and Test Managers a like declared to be highly satisfied with the ISTQB® CTFL certification and happy to recommend these to their colleagues (91% - Test Engineers, 94% - Test Managers)

This is also confirmed by the EuroStar 2014 survey in which 74% of the respondents declared that certifications are valuable to them.

Which Career Path is more Common for a Tester in Your Organization?

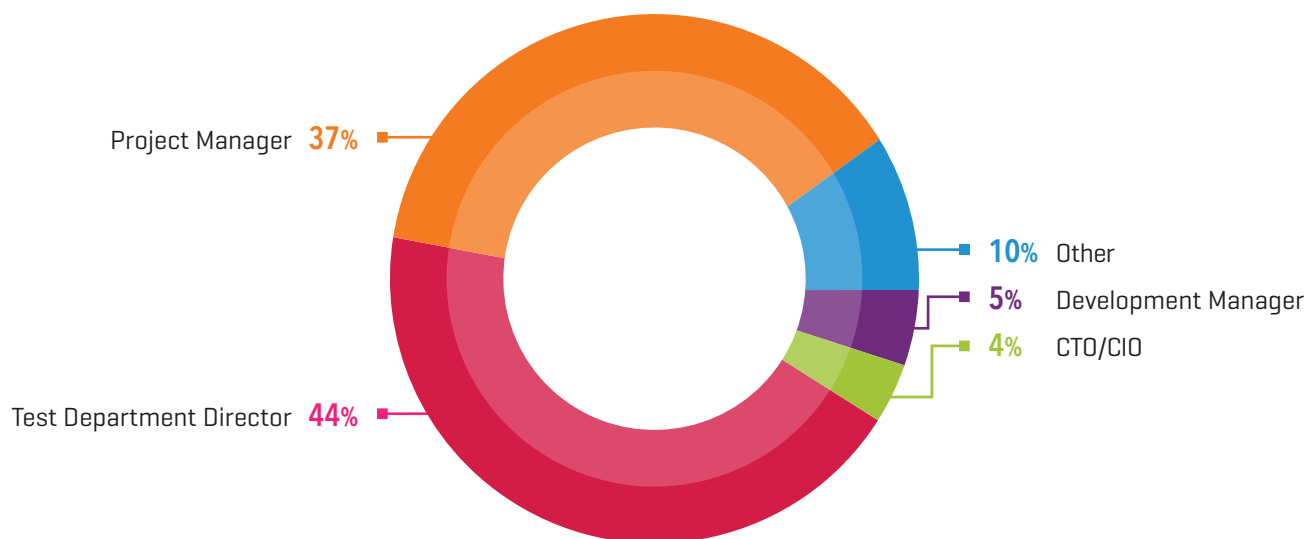Tester ~> Test Manager **27,6%**

Tester ~> Test Analyst **31,6%**

11% Tester ~> Technical Test Analyst (Performance, Security, Automation etc.)

8,6% Tester ~> Business Analyst

5,1% Tester ~> Developer

3,1% Developer ~> Tester

3% Business Analyst ~> Tester

2,2% Tester ~> Scrum Master

0,9% Tester ~> IT Architect

7% Other
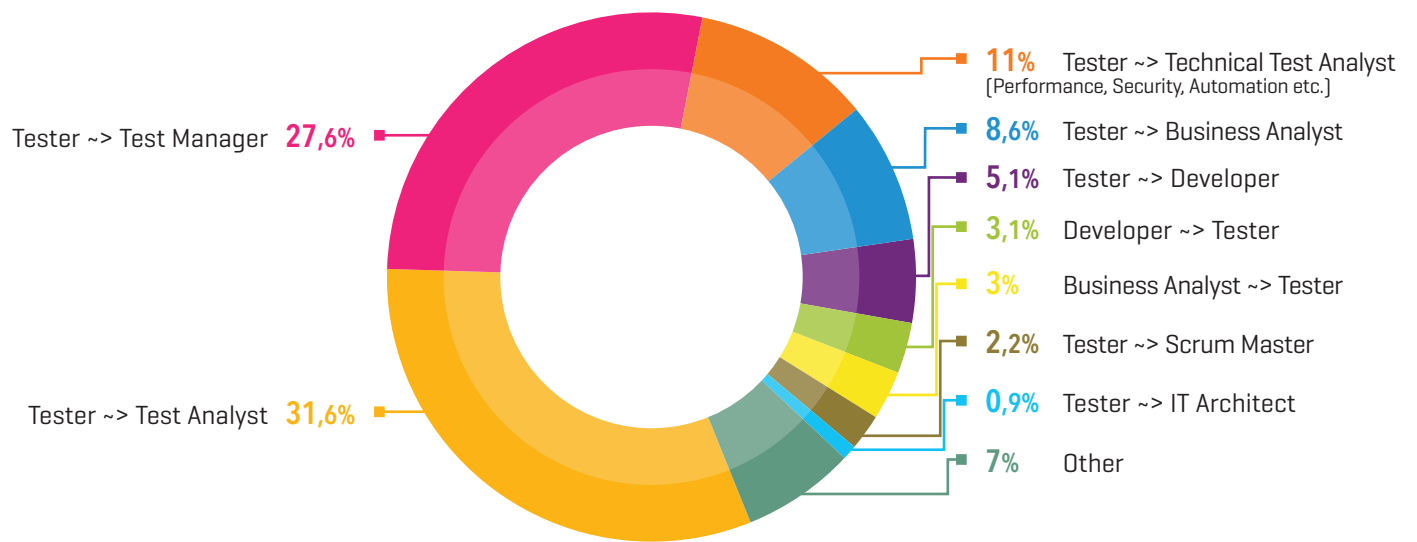
In a typical tester's career path the next step is either becoming a test analyst (31.6%) or a test manager (27.6%).

What could be the next level in the career path for a Test Manager?

Project Manager **37%**

Test Department Director **44%**

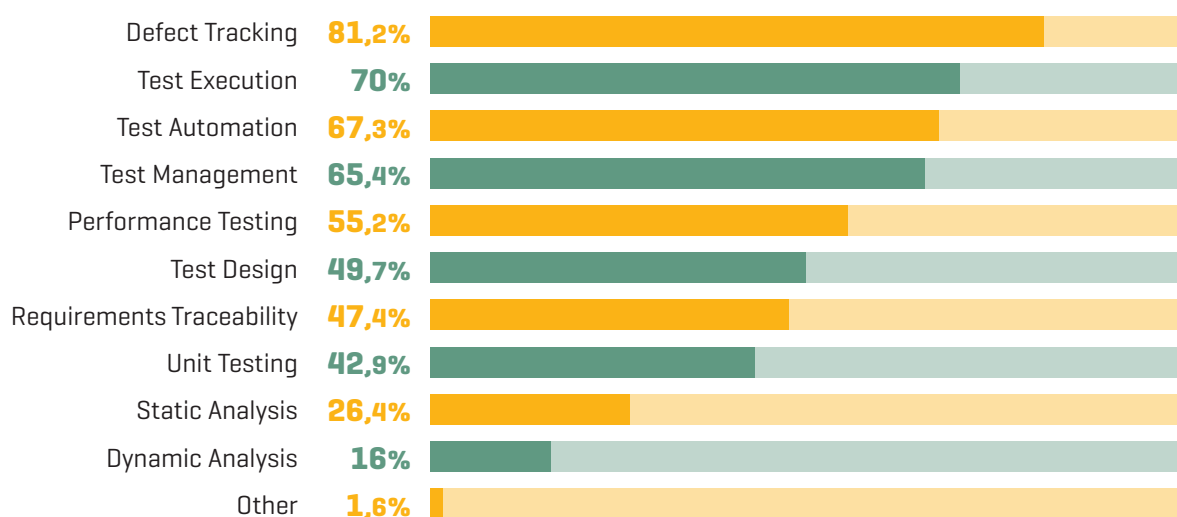**10%** Other

5% Development Manager

4% CTO/CIO

The most common next step in the career path for a test manager is becoming test department director (44%) or project manager (37%).

Tools and Automation

Which tools do you use in your organization?

(Multiple answers were allowed.)

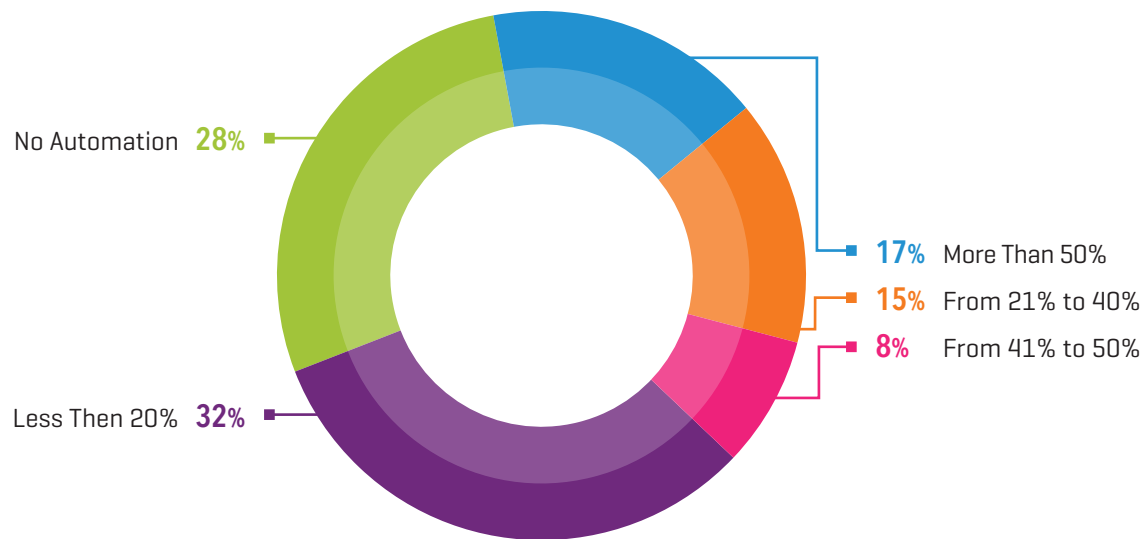| Tool	Percentage
Defect Tracking	81,2%
Test Execution	70%
Test Automation	67,3%
Test Management	65,4%
Performance Testing	55,2%
Test Design	49,7%
Requirements Traceability	47,4%
Unit Testing	42,9%
Static Analysis	26,4%
Dynamic Analysis	16%
Other	1,6%

Adoption of testing tools is becoming commonplace.

Defect tracking (81.2%), test execution (70%), test automation (67.3%) and test management (65.4%) tools are the most commonly used among test teams.
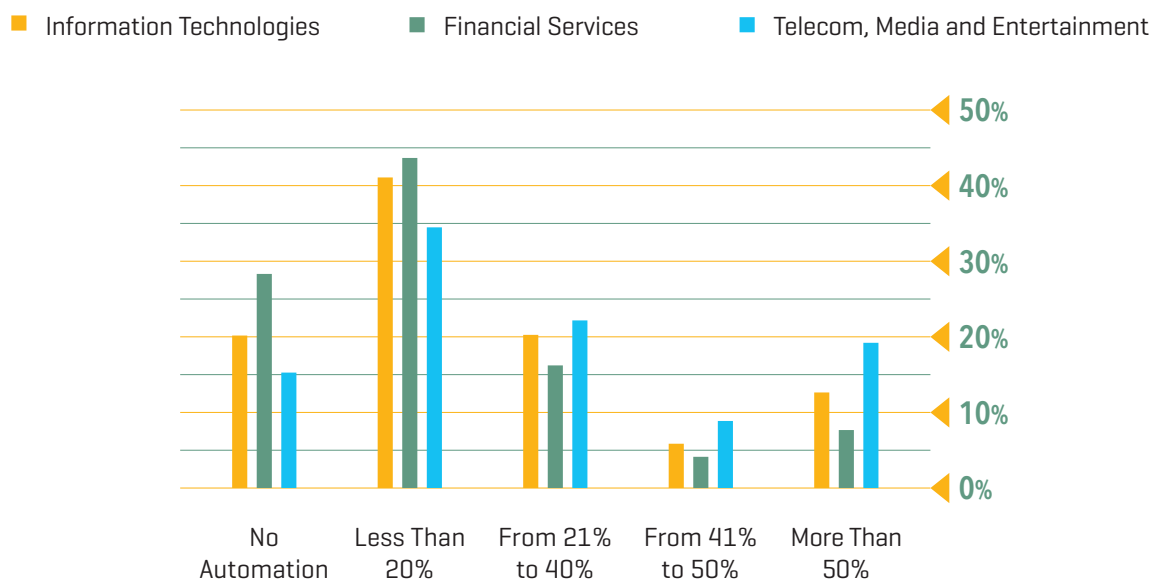
Also Performance testing and Test Design tools are used by about a half of the respondents.

What is the percentage of automated test cases you use with respect to your overall test cases?

No Automation **28%**

Less Then 20% **32%**

17% More Than 50%

15% From 21% to 40%

8% From 41% to 50%

Test automation has become very widespread in the market, with 72% adoption; in 40% of the cases the percentage of automated test cases is well beyond 20%.

Segmentation by Industry

■ Information Technologies   ■ Financial Services   ■ Telecom, Media and Entertainment

50%

40%

30%

20%

10%

0%

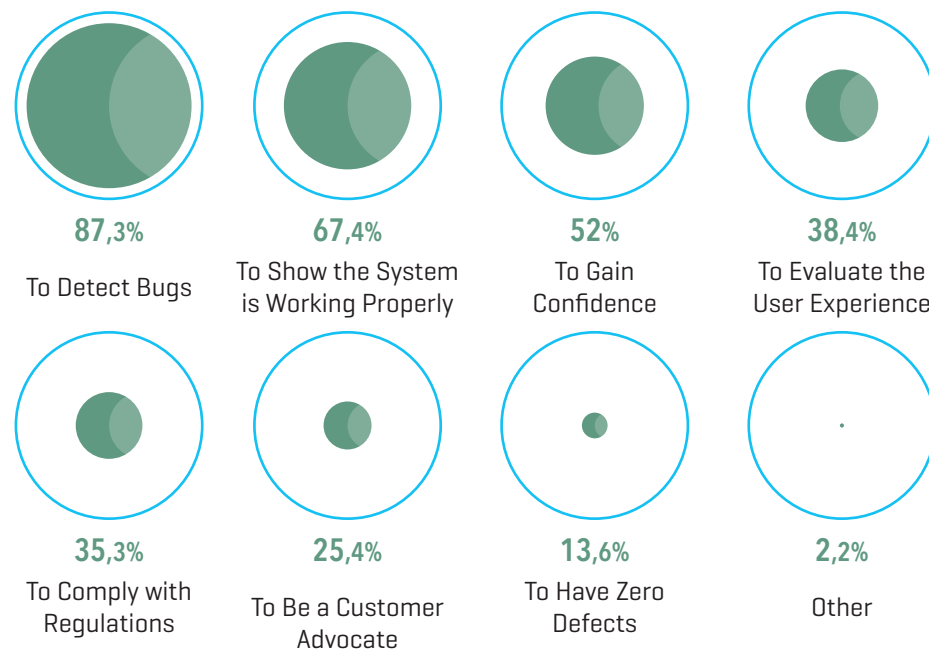No Automation | Less Than 20% | From 21% to 40% | From 41% to 50% | More Than 50%

The use of test automation in the Telecom & Media industries is more prevalent than in IT and Financial Services.

Test Processes and Techniques

What are the main objectives of your testing activities?

(Multiple answers were allowed.)

87,3%	67,4%	52%	38,4%
To Detect Bugs	To Show the System is Working Properly	To Gain Confidence	To Evaluate the User Experience

35,3%	25,4%	13,6%	2,2%
To Comply with Regulations	To Be a Customer Advocate	To Have Zero Defects	Other

Top three testing objectives are detecting bugs (87,3%), showing the system is working properly (67,4%) and gaining confidence (52,0%). Evaluating user experience (38,4%), complying with regulations (35,3%), being a customer advocate (25,3%) and having zero defects (13,6%) are the following objectives.

What are your test exit criteria? (Multiple answers were allowed.)
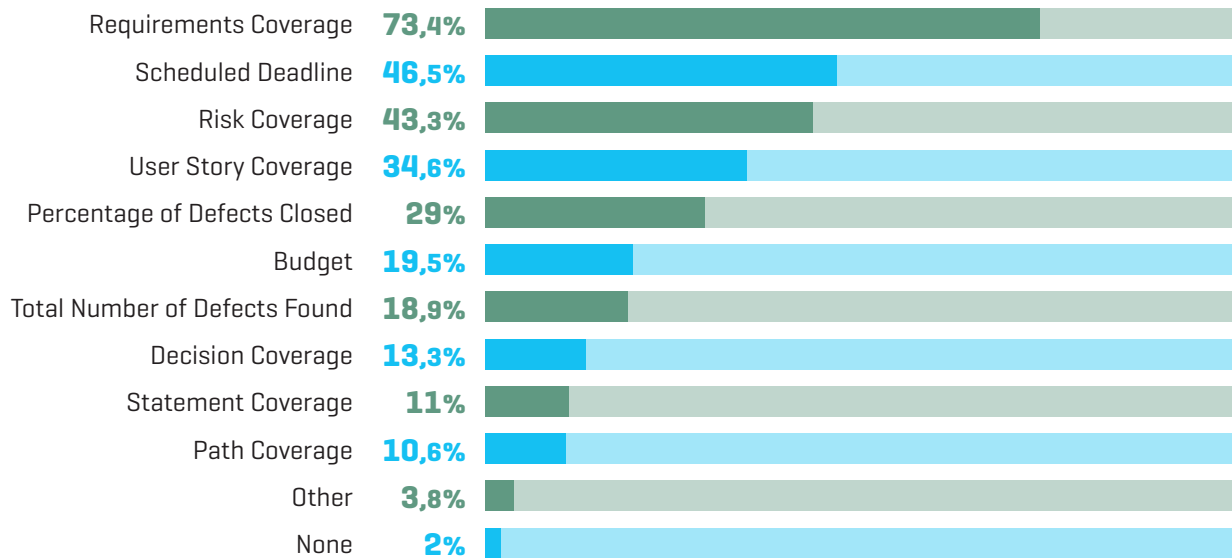
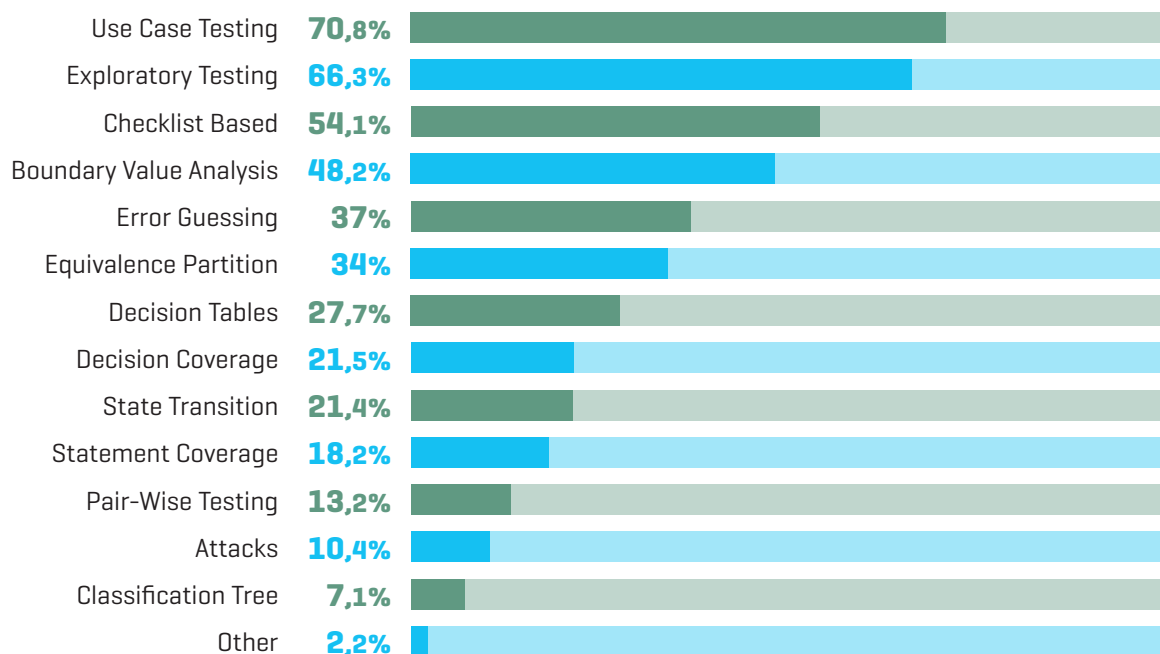|	
Requirements Coverage	**73,4%**
Scheduled Deadline	**46,5%**
Risk Coverage	**43,3%**
User Story Coverage	**34,6%**
Percentage of Defects Closed	**29%**
Budget	**19,5%**
Total Number of Defects Found	**18,9%**
Decision Coverage	**13,3%**
Statement Coverage	**11%**
Path Coverage	**10,6%**
Other	**3,8%**
None	**2%**

Requirements coverage is by far the most adopted criterion to decide when to stop testing. It is a bit worrisome to see that constraints imposed by scheduling is the second criterion, knowing by the quantitative analysis of Capers Jones (http://namcookanalytics.com/about/) that this one of the most dangerous practices in terms of quality and costs throughout the whole life cycle (including maintenance).

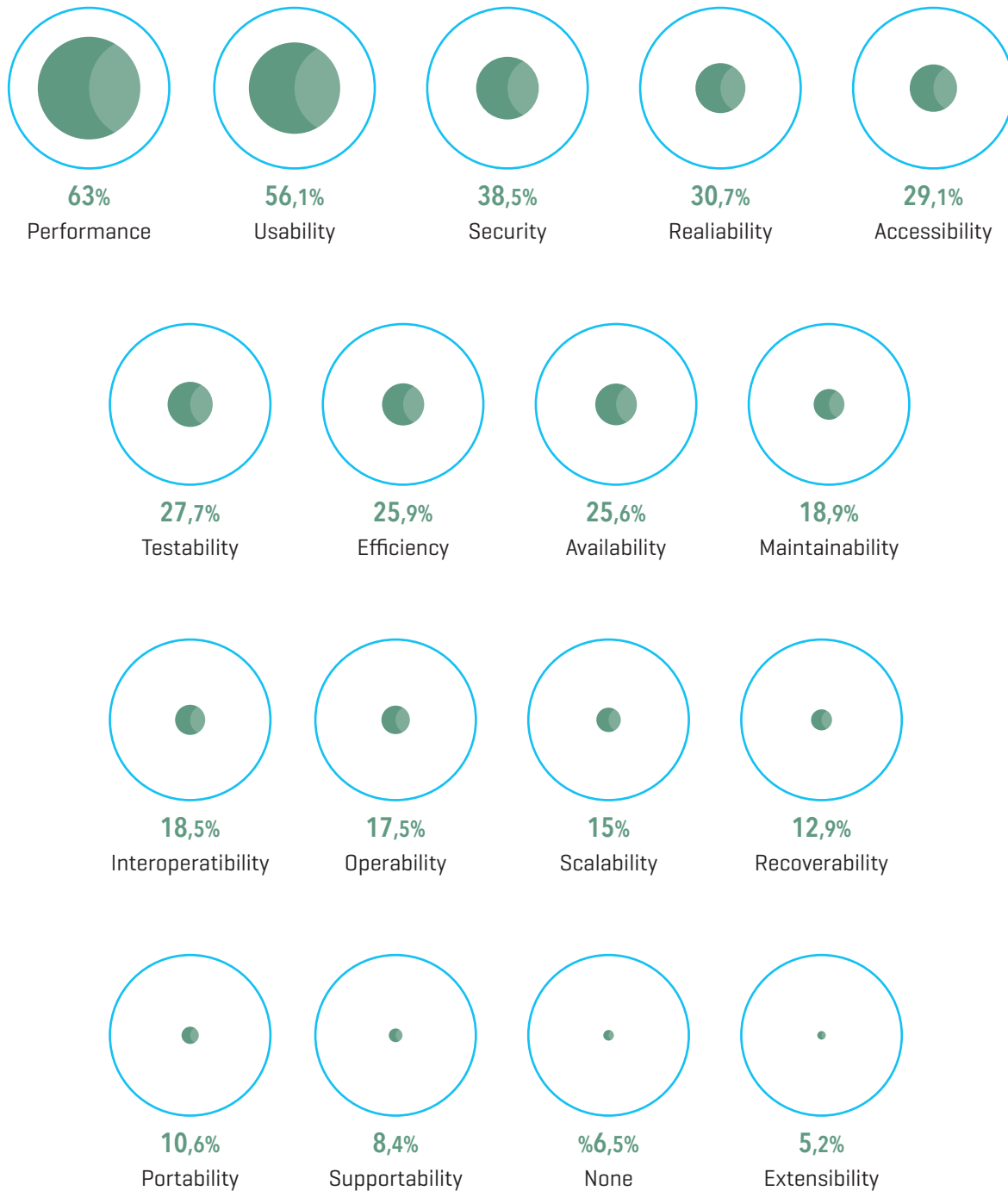## Which are the most adopted test techniques?

(Multiple answers were allowed.)

Use Case Testing	**70,8%**
Exploratory Testing	**66,3%**
Checklist Based	**54,1%**
Boundary Value Analysis	**48,2%**
Error Guessing	**37%**
Equivalence Partition	**34%**
Decision Tables	**27,7%**
Decision Coverage	**21,5%**
State Transition	**21,4%**
Statement Coverage	**18,2%**
Pair-Wise Testing	**13,2%**
Attacks	**10,4%**
Classification Tree	**7,1%**
Other	**2,2%**

Use cases and exploratory testing are more extensively applied than traditional black-box techniques (like BVA or equivalence classes); coverage-based white box techniques are used by no more than 20% of the sample.

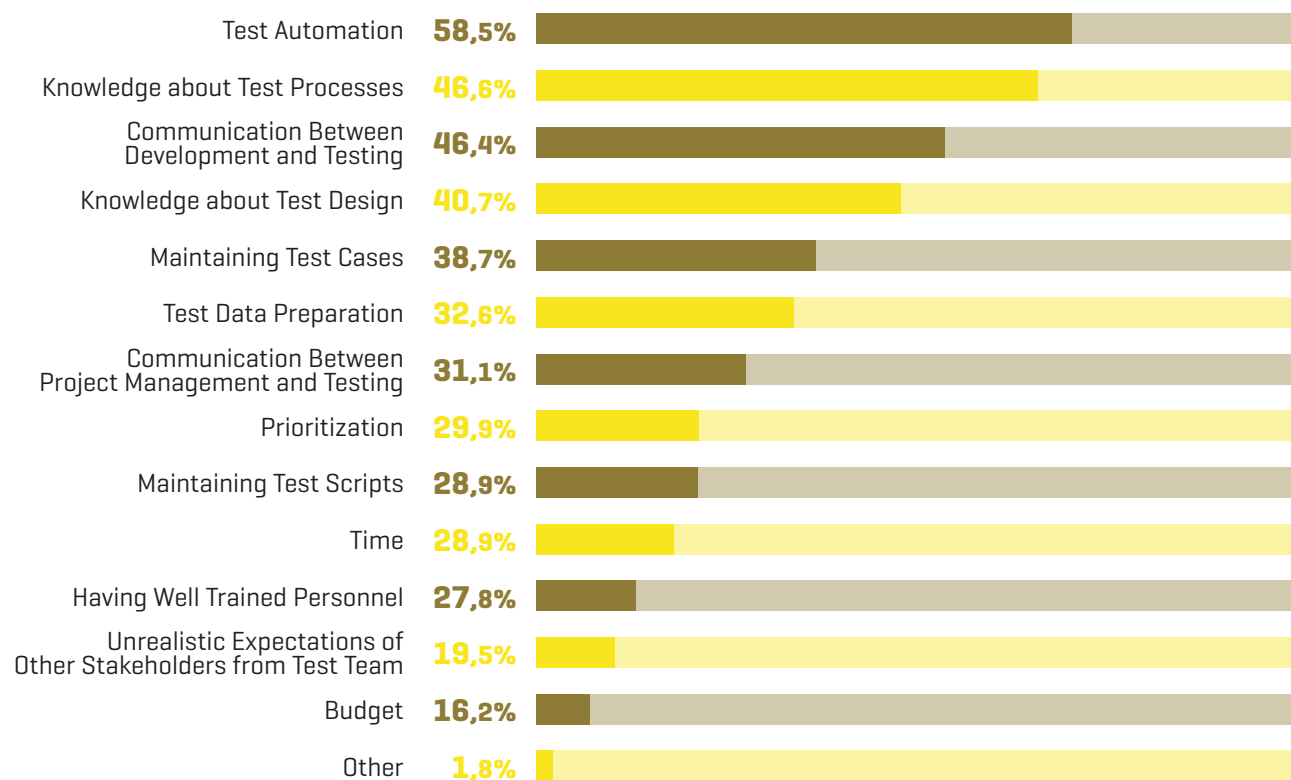# Which of the non-functional testing activities does your test team normally perform?

(Multiple answers were allowed.)

63% Performance

56,1% Usability

38,5% Security

30,7% Realiability

29,1% Accessibility

27,7% Testability

25,9% Efficiency

25,6% Availability

18,9% Maintainability

18,5% Interoperatibility

17,5% Operability

15% Scalability

12,9% Recoverability

10,6% Portability

8,4% Supportability

%6,5% None

5,2% Extensibility

Performance, Usability and Security testing are the top-three non-functional testing activities. In the ISTQB® product portfolio evolution road-map these are among the highest priorities.

Improvement Opportunities in the Testing Activities

What are the main improvement areas in your testing activities? (Multiple answers were allowed.)

Area	Percentage
Test Automation	58,5%
Knowledge about Test Processes	46,6%
Communication Between Development and Testing	46,4%
Knowledge about Test Design	40,7%
Maintaining Test Cases	38,7%
Test Data Preparation	32,6%
Communication Between Project Management and Testing	31,1%
Prioritization	29,9%
Maintaining Test Scripts	28,9%
Time	28,9%
Having Well Trained Personnel	27,8%
Unrealistic Expectations of Other Stakeholders from Test Team	19,5%
Budget	16,2%
Other	1,8%

Test automation confirms to be a very hot topic, because it is at the same time one of the most adopted practices, an activity for which external support is sought and the area with highest improvement potential.

In this respect, ISTQB® is completing additional certification modules dedicated to test automation for both the traditional SDLC and for the Agile context.

The survey indicates that there are still significant improvement opportunities in test process, communication and test techniques, that have been cornerstones of ISTQB® syllabi since the certification scheme began.

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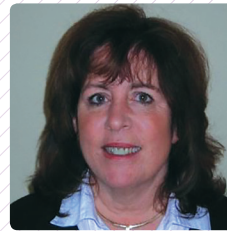

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Awards Panel member

Representative
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Co founder and CEO

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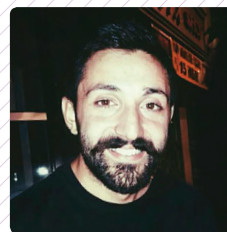

Patricia McQuaid

*ISTQB® Marketing Working Group-Strategy
and Mentoring; Academia projects*

*Co-founder and Past-President,
American Software Testing
Qualification Board (ASTQB)*

*Professor of Information Systems,
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