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Digital Transformation – increased demands for Business Assurance

Introduction to this document

Digital Transformation requires a true mind shift for both business and IT operations with increased and adapted demands on process quality and IT quality. These increased demands are centered around four aspects:

- Achieving Customer Value with excellent Customer Experience
- Assuring Business Performance, Business Security and Business Reliability
- Delivering Fit for Purpose solutions with increased velocity and agility
- Integration of the increased complex landscape of devices, systems, services and applications

In this point of view document we will discuss these demands and offer some concrete solutions how they can be met by a new style of Quality Assurance (QA).

The characteristics of Digital Transformation

Digital Transformation is enabled by innovations and developments around Social Media, Mobile Solutions, Big Data Analytics, Digital Marketing, Internet of Things and Smart Devices integrated in core business functions. These technological developments equip companies with the tools to get closer to customers, empower their employees, and transform their internal business processes. This transformation is occurring rapidly in all industries. Digital Transformation is not just about using new digital technologies to become better or faster; it is also about being inventive in using the new digital technologies ahead of the competition. It is about thinking out of the box and creating radical business models. And it is about applying this all with a single core focus on delivering customer value. Three aspects typically come together with Digital Transformation:

1. **Customer centricity.** Customer and end-user experience are put at the heart of IT initiatives. The typical strategic owner of IT development is often changed from the traditional CIO to the Chief Marketing Officer or the Chief Digital Officer.

2. **Increased velocity and agility.** New IT services must be delivered faster than ever in a more entrepreneurial mode. Gone are the traditional long-term release cycles. If not perfect, solutions will be at least minimally viable with the actual usage behavior and user comments tracked to allow on-the-spot adaptation by the agile IT organization. In this way Digital Transformation is the driving force for more agile and DevOps delivery processes.

3. **Adapting new technologies.** Digital Transformation is about rapidly adapting and using cutting-edge technologies. Gartner 2015 Hype Cycle on Emerging technologies gives insights into a wide area of emerging technologies that can catalyze digital transformations.

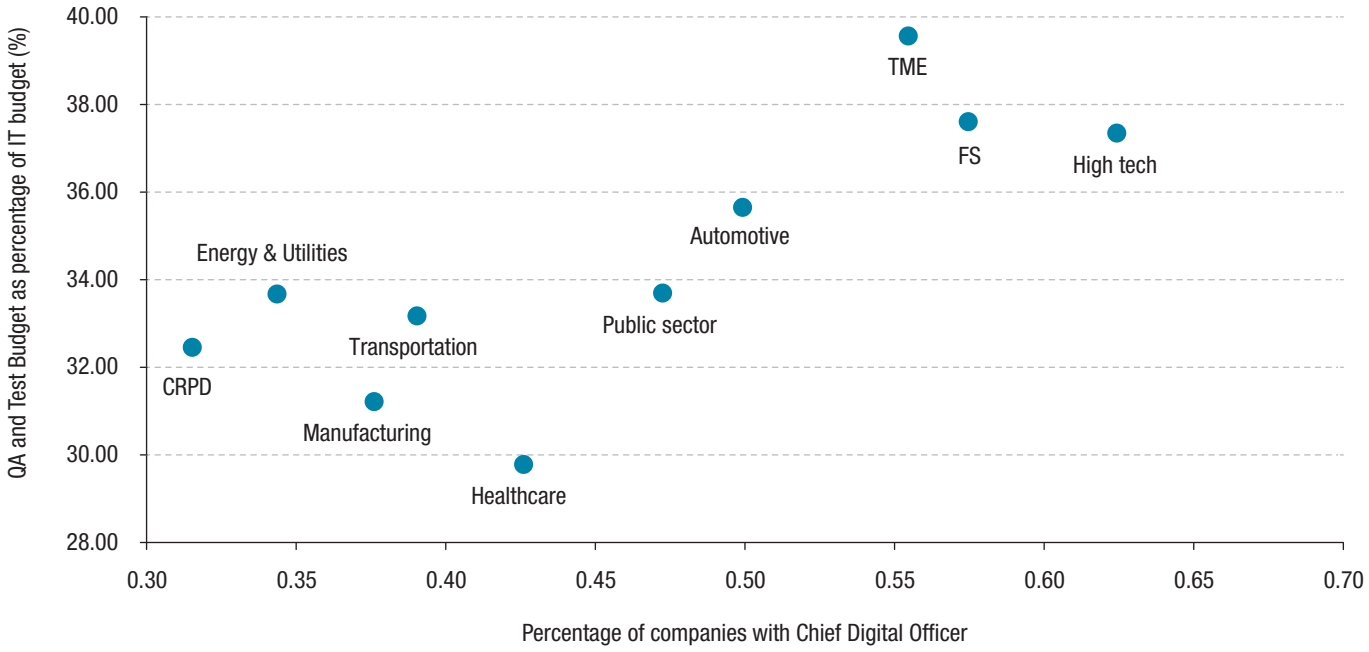
Customer Value and Business Assurance are key focus areas of quality in Digital Transformation

The digital transformation initiatives require a specific focus from Quality Assurance (QA). The industry leaders in Digital Transformation are leaders in using new technologies to achieve their transformation objectives and are at the same time most aware of the impact of good IT on achieving business goals. They are, as a consequence, more acutely aware of the importance of end-customer satisfaction, and the impact of poor quality on corporate image and business outcomes. The corporate reputation is more fragile than ever, thanks to the ubiquity of social media and likelihood of web-enabled peer criticism to go viral.

The increased usage of devices and business relevant data shared across multiple connections and software solutions also increases the need for security and consistency for all users. In addition to protecting the brand, QA must help to strengthen the brand by achieving seamless IT. New products and services launched ahead of the competition must get to market faster but also with an sufficient assurance of quality. To engage new markets, in particular the current fast decision making clients, a First Time Right Fit For Purpose approach is essential. Without these assurances there is a risk of severe damage to corporate reputations if things go wrong.

The role of QA operations in Digital advanced organization is to assure business outcomes, and to ensure the right level of customer value. These single two aspects drive the QA strategy for any project or program, and are expected as report-out from any QA activities.

Organizations in Digital advanced sectors recognize the quality challenges and risks and are forcing themselves to spend a higher proportion of their IT budget on assuring these risks are mitigated as can be seen in the graph below[1].



[1]World Quality Report 2015-2016. www.worldqualityreport.com

Meeting the quality challenges in new technology areas

With Digital Transformation programs organizations are confronted with multiple quality challenges across different technical areas

- Mobile solutions
- IoT & devices
- Omni-channel solutions
- Cloud services
- Big Data and Analytics solutions

Quality Challenge with Mobile Solutions

The four most important challenging areas with the quality of mobile solutions are : Security, Performance, Functionality and Ease-of-Use.

One of the major risk areas in Mobile Solutions and especially in Mobile Payment Solutions are the vulnerabilities and weak points in the transaction flow from user interface on a smartphone devices to back end system. Addressing the threats in the mobile system requires comprehensive security measures against threats like Malware/spyware, information collection applications and other vulnerable applications that can access sensitive information . Mobile devices are always in switched on and nearly always connected to the internet. This causes increased vulnerability for security breaches.

Business and IT operations today have had multiple years of experience with developing, operating and using mobile solutions. Despite this experience there are still major challenges with appropriate testing of mobile these solutions as can be seen in next graph with data from World Quality Report survey:

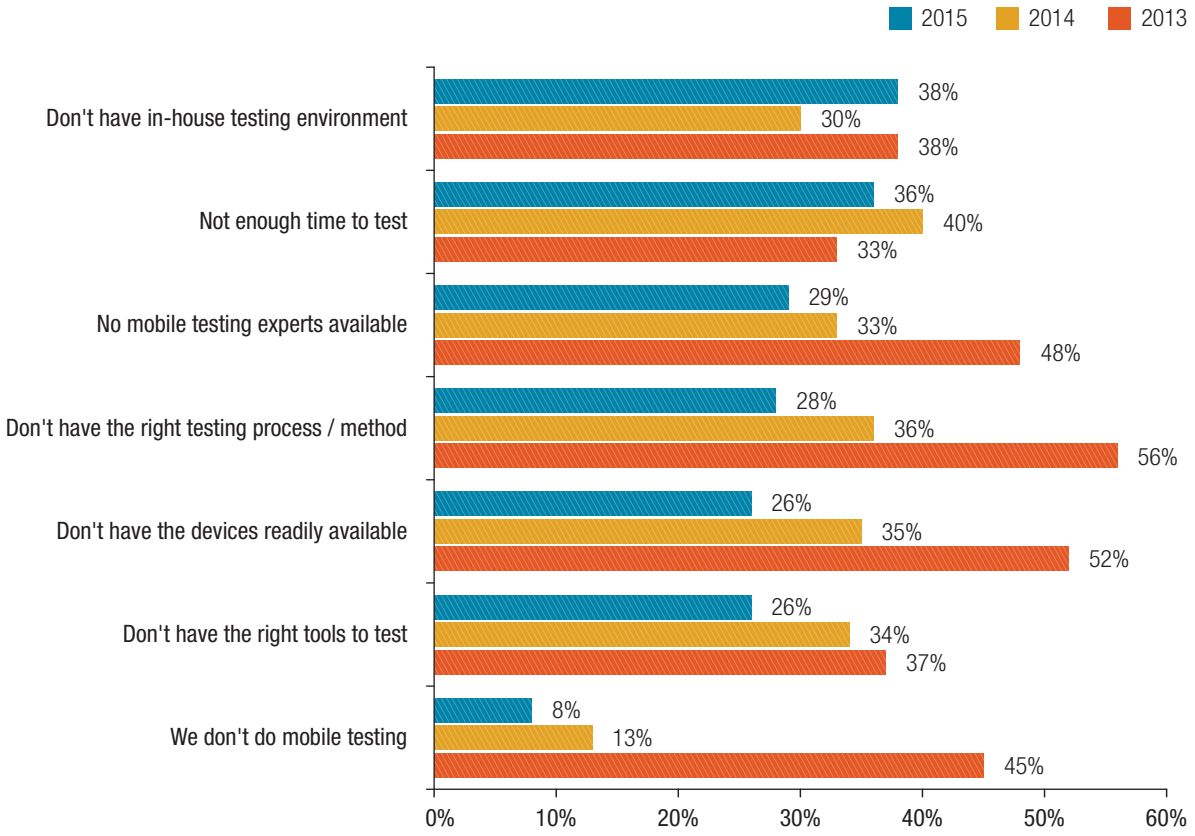


Fig: Challenges with Mobile Solutions Testing. (Source World Quality Report 2015)

The two biggest challenges remaining when it comes to testing mobile and multichannel solutions are: the lack of an in-house test environment (for 38% of organizations) and the lack of sufficient time to test (36%). The first of these is due to the fast growing number of devices in combination with increasing number of operating system versions and various network bandwidth simulations that have to be tested. The latter challenge of insufficient time is aligned with the increased velocity of applications going live, as discussed earlier. This is particularly a challenge for organizations that still look upon testing as a traditional phased activity.

Quality challenges with Omni channel solutions

Omni-channel retailing is catching on fast across the customer landscape, as retailers are realizing the potential of new business models and the increasing challenges with traditional retailing. The industry has evolved from single-channel, multi-channel, and now on to omni-channel retailing. Today's customer expects a convenient experience and the objective of retailers has been to create a seamless experience across all touch-points. The key challenges in testing these Omni channel applications are:

- **Digital Customer context:** This is a critical element that stays constant across the channels. Customer context has to be secured to ensure that there is no misuse of the same by attacking from one channel and resuming from another channel
- **Customer experience consistency.** Ensuring key elements of the brand and experience are consistent across all channels.
- **Responsive design.** If an app has a responsive design, the automated test-scripts must also be responsive, but there is little support for responsive test-scripts.
- **Dynamic content.** How to test that consumers are seeing the right promotions, news, and other dynamic content etc is a challenge. Test data preparation will be another challenges for such scenarios .
- **Performance.** As per the last data published by Amazon a 100ms increase in their response time reduces their revenue by 1%. So performance has a direct correlation with revenue, but few teams are doing adequate load and performance testing.
- **The digital-non-digital interface.** The non-digital world is just as important to omni-channel as the digital world is. A successful retailer needs to bring these worlds together (e.g. QR codes and RFID tags for example). The points where the digital and non-digital worlds meet are often a source of many defects, but are also very difficult to test.
- **Point-of-sale (POS) devices.** These custom devices are often a key part of omni-channel test-cases, but few automation tools can drive and verify them.

- **Frequency of release.** Digital retail apps are often updated and released frequently (e.g. weekly or more). This poses more challenges in the test coverage
- **End-to-end test-cases.** Omni-channel test-cases often involve interacting steps across multiple mobile devices, a consumer desktop, a server, a back-office desktop, a database, and a legacy transaction system. Few test automation tools easily support co-ordinated distributed tests.

The list above reflects how challenging it is to ensure the quality and the consistency of graphical user interfaces and application operations across different customer channels (front desk support system, customer accessible web portals, and customer accessible mobile apps). This is especially so in the light of a rapidly escalating number of machine configurations and browser versions, as well as proliferating mobile devices, including smartphones, tablets, wearables and their operating systems. One of the major digital implementation challenges is directly related to the validation of customer experience.

The 2015 World Quality Report survey shows that (on a scale of 1-7) the most pressing challenge in testing multi channel solution is to get the right coverage of end-user expectations and requirements in the test set (with an average of 4.8). This reflects the multitude of ways and situations in which a customer will interact with these systems, and what their – often implicit or situational – expectations are. This priority is followed by: having test tools for customer experience testing (4.7); and difficulty in designing the test cases for these tests (4.7). This is clearly a signal that testing customer experience demands a different approach and a different set of skills to traditional system testing.

Challenges for Testing Customer Experience in Multi-channel solutions

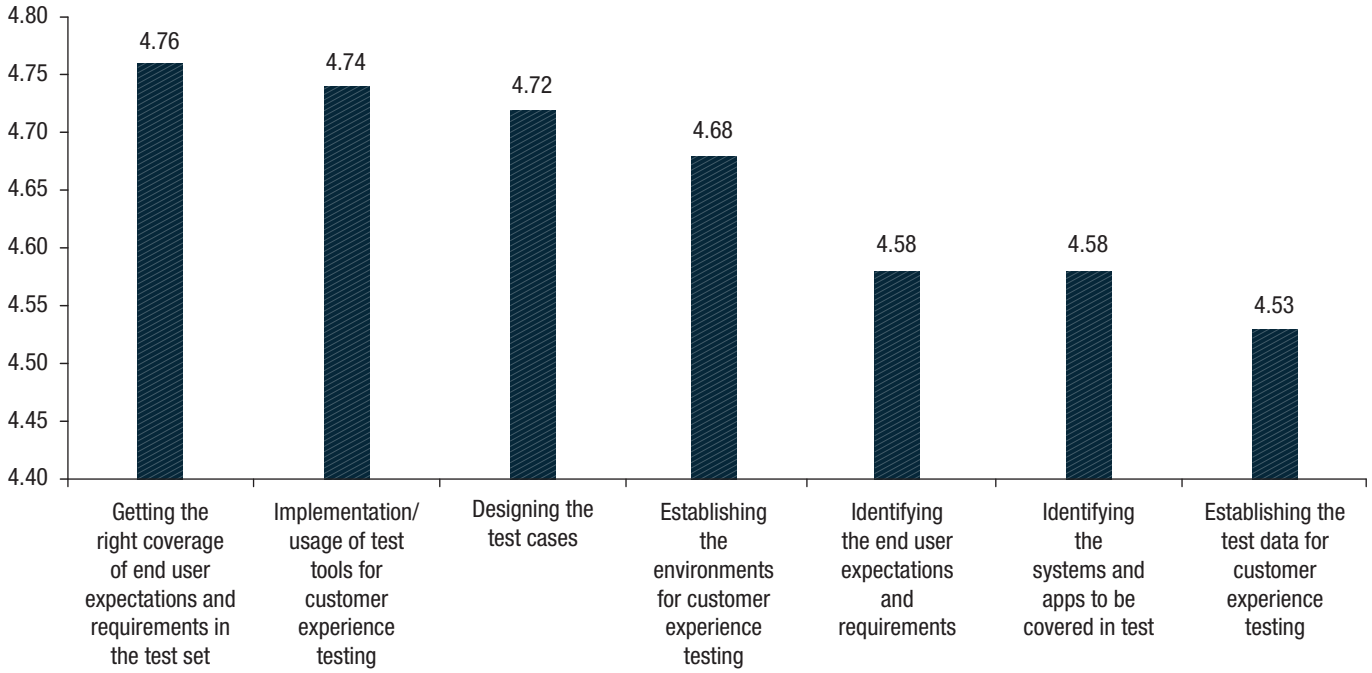


Fig: Challenges with Mobile Solutions Testing. (Source World Quality Report 2015)

Quality challenge of cloud based services

Cloud-based applications delivered as a service (SaaS) are another enabler of Digital Transformation. Cloud solutions enable organizations to adapt and use their IT and software architecture almost instantaneously on an as-needed basis.

The adoption of cloud-based solutions is progressing, with a clear preference for private cloud. Of all cloud-based applications, 43% run in private cloud, 28% in hybrid cloud, and 27% in public cloud.

When testing cloud-based SaaS applications, 52 % of respondents pay special attention to both security and performance risks. In addition, 38% report focus on peak load performance. These focus areas demonstrate that organizations accept the functionality of SaaS as a given, but need to ensure the safety, responsiveness and performance capacity of the service.

Cloud based SaaS technologies such as Salesforce.com are characterized as customized cots channel implementations. Such implementations have to integrate with custom platform business models and on-premise enterprise systems on a as need based scenarios. Digital testing focus on salesforce implementations will focus on

- Custom created business entities and workflows
- Any integrations with enterprise data centers
- Integrated workflows created by mixing various systems of records
- Channel usability testing
- Concurrency & Performance testing

The World Quality Report predicts continued growth in the adoption of cloud-based solutions to increase organization agility and scalability. The improved control and management of risks relating to performance and security will enable organizations to use cloud solutions to their advantage without jeopardizing their corporate image or operations.

The Quality challenge of Big Data Analytics Solutions

Big Data and Analytics validation is highly dependent on the chosen implementation. For traditional BI/BA solutions based on data warehouse architectures need to be tested for the validity of data processing according to the business rules, as well as for robust Data Integration and Reporting processes. Business Data Lakes needs to be tested for ease of use, responsiveness and load&stress. And Elastic Analytics and Big Data Apps in addition need to be tested on Security.

Overall, the main challenge today lies in finding the right skilled experts to perform BI testing (44%). This is followed by the validation of both the correctness of aggregated data results and the validation of the performance of the BI system (both at 41%). The hierarchy of challenges is clearly changing with a lack of BI testing expertise being a growing problem. Last year data validation scored highest at 57%, followed by a lack of right testing automation tools at 41%.

Changing the Quality Assurance Operations to meet the needs of Digital Transformation

The disruptive mind shift of Digital Transformation is affecting the role and focus areas of QA and Testing, with a direct impact on the professional skills and a change in focus of software testing. This is reflected in the changed perception amongst executives of the most important QA and Testing objectives. There is a shift from simply detecting and preventing defects in software, to protecting the corporate image, which has strategically important security ramifications for corporate IT. This requires real focus and understanding of how the IT features used today (and the end-user experience of these features) can have a direct impact on the brand reputation.

The end-user satisfaction priority implies that QA strategy will have to be targeted not only at the validation of pure technical software operation, but also at more meaningful IT outcomes and real end-user value. The need for increased quality awareness is, again, reflective of the role IT now plays in ensuring end-user value. It highlights the need to focus testing teams on the implications of IT failures for corporate image.

The three top QA and Testing objectives mesh with the wider IT strategy priorities. Across all industries, security, customer experience, cost optimization, higher quality of software, and better responsiveness to business demands are the top five IT strategy priorities.

However there is a concern that, until now, QA and Testing has not kept up with the requirements needed to ensure IT achieves these objectives. A higher level of IT spend allocated to QA and Testing this year indicates a need for greater levels of testing efficiency to keep pace with Digital Transformation initiatives.

So to be relevant in today's Digital Transformational world we recommend the following changes in QA & Test operations

1. **Re-focus QA and Testing on customer experience and business assurance.**
   Digital Transformation has brought customer experience and security into sharp focus. This demands a new business assurance focus on the part of the QA and Testing function. It will help to determine whether or not new and/or changed applications are leading to increased end-customer satisfaction.

   Consumer usage patterns must drive the setup of testing scenarios, which should be the principle basis for designing the focus area of quality checks. In addition, a business assurance focus enables teams to correlate identified risks and test outcomes with the implications for business, such as increased revenue, customer retention, corporate image, and innovation capabilities. It will see a new style of testing focused on these risks, with a particular emphasis on end-user experience, security and performance aspects.

2. **Transform the traditional Test Center of Excellence (TCOE) in Digital Test Factories.**
   The future of testing will be a maximized digital environment in which test services can be requested, delivered and consumed on as needed basis with real time digital performance and progress management.

   Quality-based performance indicators on throughput, such as percentage of delivered features accepted for go-live first time, price point per accepted feature, and test velocity, will help to control QA costs and still allow flexible and agile QA activity across disciplines.

   Process optimization initiatives using agile and DevOps need to be supported in a way that enables QA and testing activities to be performed by all roles. There should be maximum use of automated solutions, but still with a continuous focus on maintaining the efficiency and effectiveness of QA and Testing activities. This requires provisioning of environments, automated solutions and specialist QA expertise on an as-needed basis.

   Shift left techniques, such as structural unit testing, TDD, BDD, and application program interface (API) testing and services, are viewed as the greatest lever for agile delivery.

Such techniques, along with test automation frameworks, cloud-based environment provisioning, as-needed-QA expertise, and on-demand specialist test services, can be managed and organized in the distributed TCOE for agile and DevOps.

3. Make continuous and automated security testing a key strategy.

Security testing is a top priority for IT strategy. While the results show an increase of security QA and security test activities in almost all phases of the application lifecycle, security testing is still largely conducted as a manual testing activity relatively late in the development lifecycle.

Organizations should increase their own security checks in the design phases and focus on increasing the automation level of dynamic application security testing. In addition to this, they should seek ways to leverage the expertise of external security specialists for increased scalability and to secure state-of-the-art expertise and tools for the security test activity.

Existing or planned TCOEs should be expanded with a shared specialist function that can provide security test activities on a continuous basis.

4. Prioritize testing using predictive analytics and continuous feedback during the software development cycle (SDLC).

The integrated and collaborative SDLC using DevOps brings all the activities and disciplines, from business to development and operations, in a continuous process of application development and deployment.

One of the leading challenges in these ultra-short development cycles today is the inability to decide on what to test and what not to test. This is needed to enable QA and Testing teams to define minimum viable, yet sufficiently secure, quality solutions to go live. Predictive analysis and continuous feedback will become major enablers for the prioritization of tests: with continuous feedback from real-world monitoring, QA teams will be able to predict the risk levels and identify the areas to test.

Predictive analytics will enable QA and Testing teams to construct strategies for effective testing of upcoming project/release/sprint/build using automated solutions for analyzing historical data on projects, releases and builds. This Big Data analysis will enable testers to understand the impact of changes made in development on the whole lifecycle, and to identify the required associated test coverage to achieve a minimum viable product.

This analysis will also help testers to identify focus areas for testing based on production feedback, as well as the size and skills of the testing team required to ensure on-time delivery. These data points will also be input parameters for any risk-based testing taking place. The use of predictive analytics will drive shift left testing approaches earlier in the application development lifecycle.

5. Expand test automation to the level of continuous integration testing.

Increased and instantaneous levels of test automation will be mandatory for coping with the growing demand for velocity. The reliance on manual testing has been identified as the most important technical challenge for application development.

With the further advancement of QA and Testing tools, organizations will be able to build a solid backbone for automation that can be expanded with specialist niche solutions to be consumed on an as-needed basis.

As noted above, predictive analytics tools will further enable automation of the test strategy for each project/release/build by identifying the appropriate coverage areas for testing. Test case generation and test data generation tools will get more advanced, and migration of manual test cases to automated test cases will become simpler.

6. Increase virtualization and cloud testing platform capabilities to align with the need for greater speed.

Virtualization and cloud platforms provide the flexibility and instantaneous setup of complex test environments needed to perform testing as required, including at early phases in the software lifecycle. The future QA and Testing function within agile and DevOps requires this investment to support iterative delivery.

Greater adoption of test data and environment automation techniques will speed time to market, as will an increase in the use of deployment tools and cloud technology.

7. Expand the skills of testing teams beyond manual and test automation.

Digital Transformation, along with wider adoption of agile, DevOps and cloud practices, demands specialist skill sets. Testers are required to test not only the functionality of the applications, but the customer experience aspects as well.

They must be able to work at a cross-functional level, collaborating effectively with business analysts and development teams to create test acceptance criteria. They should have the ability to use virtualization tool sets to enable them to work effectively with the teams building test environments.

An understanding of application architecture and the ability to deploy effective automation (UI or non UI services level) strategies are now part of the modern testing skill set. Predictive analytics and the ability to interpret feedback from production will enable them to prioritize and ensure the right amount of testing is targeted at the right things.

Finally, testers need to become the enabler of continuous delivery, whilst effectively detecting and helping eliminate the application defects and risks earlier in the lifecycle. Thus collaboration and strong technical know how about tools, TDD and BDD techniques are key elements, alongside functional and manual testing, in the new DNA of QA and Testing.

New specializations are also emerging with the move to more experience-based and behavior-driven testing. Increased expertise on business and predictive analytics is required. These specialisms enable to identify the risk areas of new developments based on the growing amount of insight from real-life application usage and collected historical project data.

Mobile Solution expertise is required to be able to test with different devices across multiple platforms and understand the risk areas of each. Mobile Solution testing also demands a thorough understanding of the specific tools available for automated mobile testing, simulation of networks, and simulation devices. Finally, data expertise is required for analyzing data and validating data quality and data correctness, especially for BI/BA testing.

By organizing these specialist teams as virtual shared service teams in an industrialized Testing Center of Excellence model, and by involving specialist vendors in a co-managed relationship, organizations can shift to a continuous level of on-demand and as-needed delivery models for the many different types of testing.

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