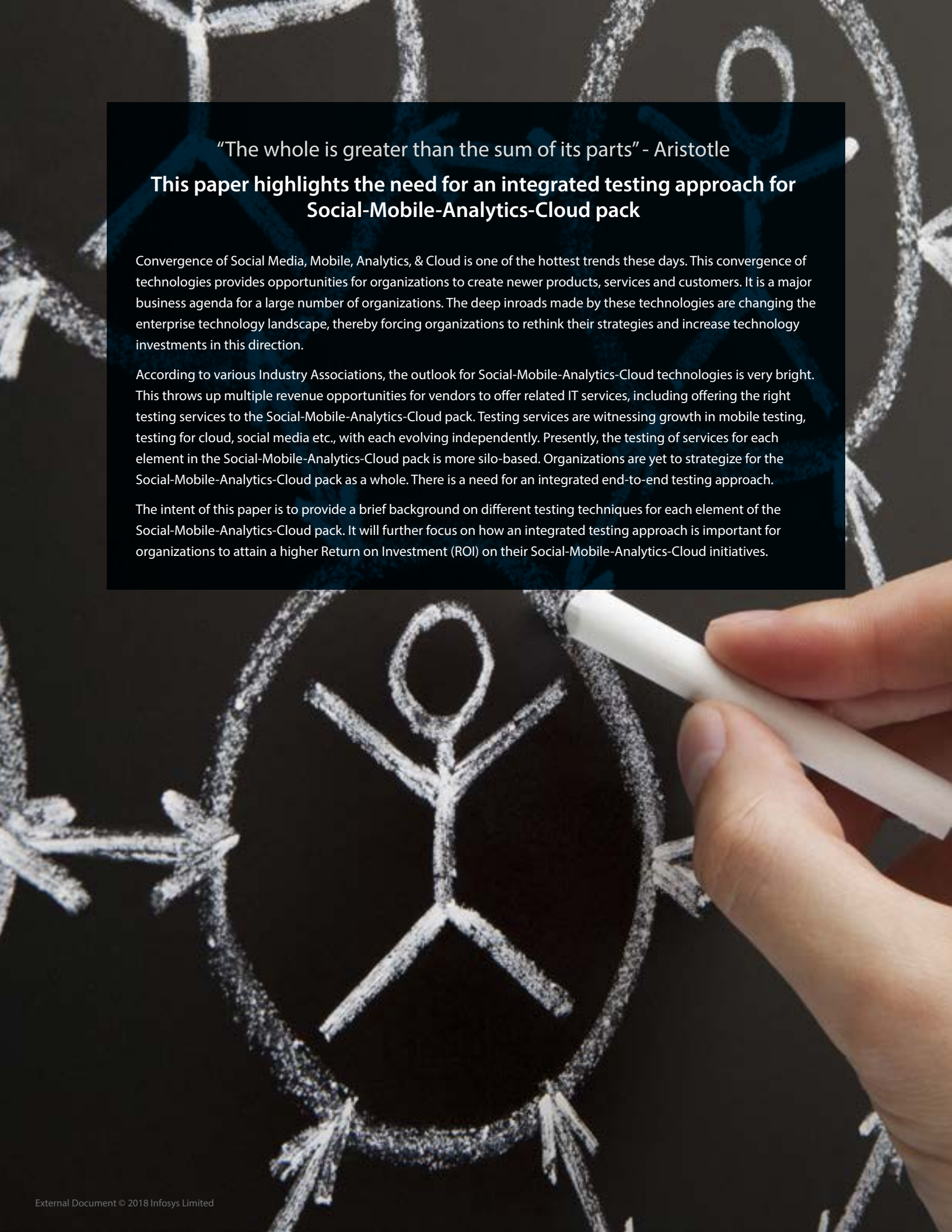




TESTING THE SOCIAL-MOBILE-ANALYTICS-CLOUD PACK: THE WAY FORWARD



“The whole is greater than the sum of its parts” - Aristotle

This paper highlights the need for an integrated testing approach for Social-Mobile-Analytics-Cloud pack

Convergence of Social Media, Mobile, Analytics, & Cloud is one of the hottest trends these days. This convergence of technologies provides opportunities for organizations to create newer products, services and customers. It is a major business agenda for a large number of organizations. The deep inroads made by these technologies are changing the enterprise technology landscape, thereby forcing organizations to rethink their strategies and increase technology investments in this direction.

According to various Industry Associations, the outlook for Social-Mobile-Analytics-Cloud technologies is very bright. This throws up multiple revenue opportunities for vendors to offer related IT services, including offering the right testing services to the Social-Mobile-Analytics-Cloud pack. Testing services are witnessing growth in mobile testing, testing for cloud, social media etc., with each evolving independently. Presently, the testing of services for each element in the Social-Mobile-Analytics-Cloud pack is more silo-based. Organizations are yet to strategize for the Social-Mobile-Analytics-Cloud pack as a whole. There is a need for an integrated end-to-end testing approach.

The intent of this paper is to provide a brief background on different testing techniques for each element of the Social-Mobile-Analytics-Cloud pack. It will further focus on how an integrated testing approach is important for organizations to attain a higher Return on Investment (ROI) on their Social-Mobile-Analytics-Cloud initiatives.



Overview

The testing discipline is undoubtedly a major enabler for improving critical business outcomes such as improved customer satisfaction levels and lower total cost of ownership. Traditional testing techniques predominantly operate independently and lack the ability to integrate various aspects of the testing process. Each of the testing techniques for the Social-Mobile-Analytics-Cloud pack is evolving. The section below looks at the various testing techniques currently being followed for each element of the Social-Mobile-Analytics-Cloud pack.

Testing & Social Media

Today, majority of organizations leverage social networks like Twitter, YouTube, Facebook and other online networking channels for launching, marketing or selling their products and services. A typical social media application or a social networking platform run on multiple browsers, operate on different platforms, encounters frequent security revisions, face spyware blockers, etc. Hence, the biggest priority for the social media application testers is to have a sound test approach which takes into account all the above factors and still make sure that the application performs the task expected of it.

Any social media application has to be tested for the following six parameters: Security, Functionality, Localization, Load, Performance, and Usability.

Software testers are employing a variety of techniques for social media application testing. The commonly employed are compatibility testing (browser and devices), integration testing, performance testing, security testing, user profile testing, etc. Some organizations have also extended social media application testing services in areas such as Web 2.0 testing, Search Engine Optimization (SEO) testing, Quality Assurance (QA) services, website testing, content management system testing, web analytics testing, etc.

Testing & Mobility

The rapid proliferation of mobile devices (smartphones/tablets) is forcing testers to rethink their testing strategies as they cannot follow the same approach followed for desktop applications. The mobility landscape faces unique challenges because of multiple device models, operating systems/platforms (iOS, Android, Blackberry and Windows), carriers, mobile apps, etc. for device manufacturers and application developers to develop, test and launch new products.

Testing Criteria	Driving Factors
Security	To ensure safety of social media apps from security exploits from fraudsters and hackers
Functionality	To ensure consistent user experience
Localization	To ensure accuracy of localized apps (Regardless of size)
Load	To ensure seamless coverage even at peak usage
Performance	To ensure speed and responsiveness even at peak loads
Usability	To have an intuitive, and user friendly interface

Figure 1: Social Media Application Testing

In order to ensure that mobile applications run effectively on varied platforms and across multitude of networks, an effective mobile testing plan is essential. Also, with the industry facing increased pressure of short development cycle for mobile apps, quality testing is imperative. Mobile testing techniques should ensure that applications work accurately on all type of devices, supplied by major brands, & across platforms. Also, with the screen size changing constantly, usability and user experience testing is quite critical. Testing also ensures that mobile apps are secured from intruders and fraudsters.

The figure below summarizes the most commonly employed mobile testing techniques:

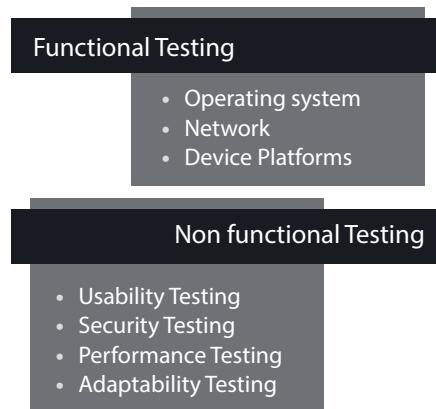


Figure 2: Mobile Testing Techniques

Effective application of the mobile testing techniques by device manufacturers and developers help them to gather right metrics, consequently improving the product quality.



Testing & Analytics

The focal point of any business strategy revolves around the customer. In today's fast paced competitive environment, nurturing long-term relationships with customers is the key to proliferate wallet share. To know more about the customer, organizations analyze the various sources of data (structured and unstructured) available at their disposal. Analytics is the weapon of choice for organizations as it assists them to get a complete view of the customer by analyzing the various sources of data. The rapid adoption of social media, mobile and web applications has resulted in an even higher percentage of unstructured data being generated. There is an increasing requirement within organizations to inquire and analyze this big data explosion, across structured and unstructured data. Organizations need to have robust test offerings like- big data, business intelligence (BI) and data testing to validate structured and unstructured data in various databases, business intelligence analytics applications. Different testing techniques like functional and non-functional testing are necessary for testing such applications. Commonly used testing techniques for analytics platforms are usability testing, performance testing and security testing.

These testing techniques help validate functional and non- functional requirements (NFRs), identify coding and requirement related issues, and bottlenecks in performance.

Testing & Cloud

Cloud computing is a new computing paradigm that IT departments are embracing to reap benefits of cost, efficiency, control, new service capabilities, self-service experience, etc. Cloud provides virtualized hardware & software resources that are hosted remotely and also provides suitable infrastructure for data-intensive computing. In light of its benefits, software vendors are increasing their application development services in the cloud.

Usually such cloud application development efforts begin with some form of testing service thus highlighting the growing need to have a sound cloud testing plan.

Presently, organizations that test in non-cloud environments are challenged by stringent deadlines, limited test budget, high costs per test, increasing number of test cases, and geographic distribution of end users. Cloud testing is perhaps, the answer to such challenges by testing web based applications that use resources (hardware, software and infrastructure) existing in the cloud.

In cloud testing, software testing services are conducted in a cloud environment (On-Premise/On Demand). In other words, here testing is offered as a service (Testing as a Service).

The key cloud testing techniques employed in the industry are:

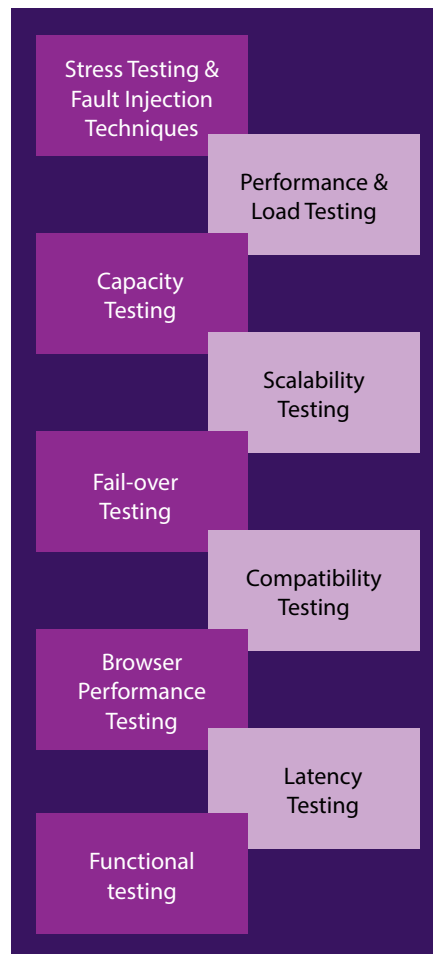


Figure 3: Cloud Testing Techniques



The key benefits for firms leveraging cloud testing techniques are reduction in capital expenditure, high scalability, minimal start-up time, location independent access, reduced cost of ownership, reduced carbon footprint, etc. Cloud testing also reduces the execution time for testing large applications by providing immediate availability of infrastructure with scalability, and a distributed testing environment with unlimited storage.

With these benefits, organizations also need to plan for the issues & challenges related to cloud testing techniques such as high initial setup cost due to testing migration to cloud, security issues, modification of legacy systems to suit cloud environments, lack of standards etc.

In the above sections we have discussed the current state of testing for Social-Mobile-Analytics-Cloud elements. While testing techniques for each element in the Social-Mobile-Analytics-Cloud pack is maturing independently and we see lot of developments in this direction, however all of these are discrete and operate in silos. By testing in silos, organizations face challenges in the form of increased cost (high costs per test, increasing number of test cases, etc.), inefficient operations, time & effort duplication, etc. To overcome these challenges, organizations should look at integrating the silo testing techniques of the various elements in the Social-Mobile-Analytics-Cloud pack.

Testing the Social-Mobile-Analytics-Cloud pack

Testing the Social-Mobile-Analytics-Cloud pack requires software vendors to start developing integrated Social-Mobile-Analytics-Cloud testing approaches and techniques. IT organizations should gear up to strategize for the Social-Mobile-Analytics-Cloud pack from an integrated end-to-end testing perspective by developing a comprehensive strategic test approach.

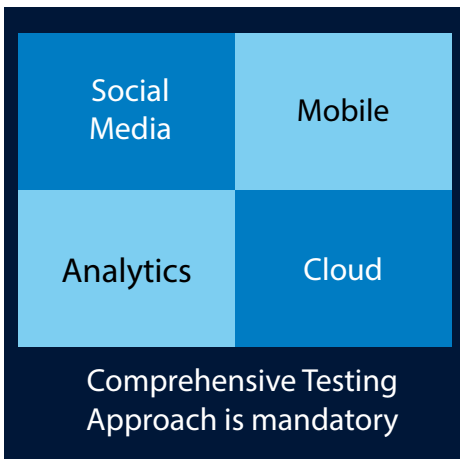


Figure 4: Social-Mobile-Analytics-Cloud pack Testing

Integrated Social-Mobile-Analytics-Cloud Testing Approach for higher ROI

To reap the benefits of Social-Mobile-Analytics-Cloud technologies pack, integrated testing techniques, new QA capabilities, and niche tools are the basic building blocks. Here integrated testing techniques do not simply mean aggregation of various testing technologies together. What is required is a strategic and comprehensive testing approach such that the end-to-end platform delivers higher benefits than that derived from testing Social-Mobile-Analytics-Cloud elements independently.

IT departments would need to bring together and maintain scattered, disparate testing platforms, networks and equipments. By integrating discrete testing techniques that are working in silos, resources such as data, people, and processes can work in tandem by effective collaboration. This could also result in resource optimization and potential cost savings for organizations, thus resulting in higher ROI.

For developing such an integrated testing approach for Social-Mobile-Analytics-Cloud pack, IT organizations should look at a combination of common testing and custom testing techniques (illustrated in Fig. 5).

By common testing, we mean the testing techniques that are common for each element of the Social-Mobile-Analytics-Cloud pack. For instance, usability testing, performance testing, scalability testing etc. are common testing techniques employed across Social, Mobile, Analytics, etc. Customized testing here refers to testing techniques which are specific to each technology in the Social-Mobile-Analytics-Cloud pack. For instance, OS testing and Device platform testing are employed more specific to mobile testing.

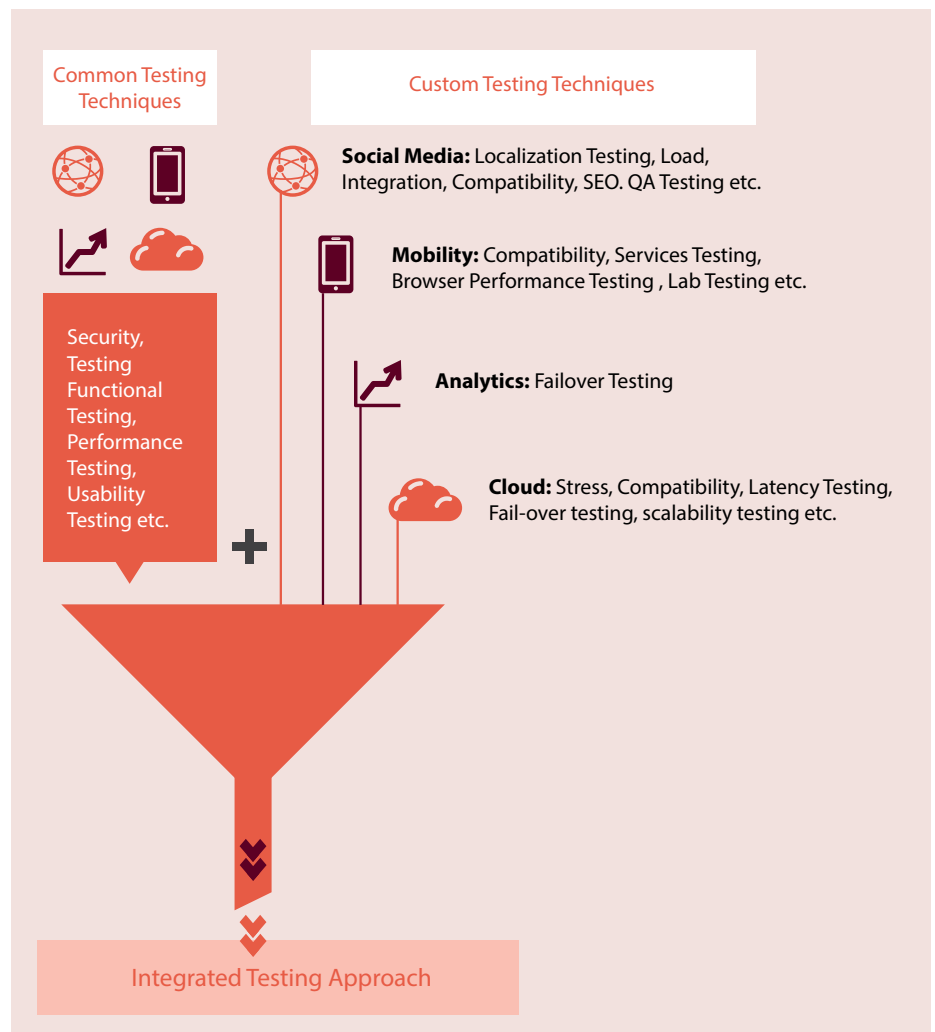


Figure 5: Integrated Testing Approach

The table below highlights the common and custom testing techniques for the Social-Mobile-Analytics-Cloud Pack elements

Social-Mobile-Analytics-Cloud PACK Elements	Common Testing Techniques	Custom Testing Techniques
Social Media	<ul style="list-style-type: none"> • Security Testing - Social media apps are at a higher target for scammers and hackers; their security testing involves review of static code for common security holes and using automated tools and live testers for dynamic security testing. Sometime a team of experts manually probe the application for common security vulnerabilities • Functional Testing - starts with specifying test requirements for social media applications, then selecting testers, reviewing bugs and test cases. It involves both manual as well as automatic testing techniques for social media apps functionality • Performance Testing - Social media apps should be tested for intuitiveness, precision, performance under peak loads, fault tolerance in the website, ease with which new users can learn to operate in the social media app and if they can perform the desired tasks optimally etc. • Usability Testing - To ensure an intuitive and easy to use social media application is in place, usability testing should mainly focus on the following factors: readability (legible fonts, ease of comprehension etc.), navigability of the website, accessibility of the social media app (color choice, compatibility with other browsers and platforms), website speed (size of webpage, response time etc.), and user experience 	<ul style="list-style-type: none"> • Localization Testing - Social media apps should function the same regardless of location • Load Testing - Social media applications should be tested for load, how the app would perform under real-world usage, high peaks, low hit rate etc. • Integration Testing - Integration of social media apps to other applications • Compatibility Testing - Browser and Mobile Devices • Search Engine Optimization (SEO) Testing - to check the social media application's on-page optimization, website SEO strength, validity etc. • Quality Assurance (QA) - for social media applications to be more agile and creative • Advertisement Application Testing – ensures information is safe when accessing advertisements on the social media apps
Mobility	<ul style="list-style-type: none"> • Security Testing - Mobility solutions should be tested for every known and possible security threat. Best of breed security solutions like Mobile Device Security, Data protection solutions, Mobile Application Management Infrastructure etc. are essential • Functional Testing - ensures that the mobile application is working as per the requirements. Majority of the test conducted for functional testing is driven by user interface and call flows • Performance Testing - is conducted to check the performance of the mobile application under conditions like bad network coverage, low battery, access to application's server by various users at same time and other conditions. Performance of a mobile application is affected from two sides: client's side and application's server side. Performance testing is conducted to check both • Usability Testing - Usability testing is undertaken to confirm if the application is getting a favorable response from users. This is most important in mobile testing as the usability of an application is critical for success 	<ul style="list-style-type: none"> • Compatibility Testing - Validation across mobile devices, browsers with different screen sizes & resolutions, and OS versions etc. • Services Testing - to check response time, and downtime of mobile apps etc. • Low-Level Resource Testing - to check for cleanup of mobile app temp files, size of local database etc. • Laboratory Testing - Generally carried out by network carriers, finds out glitches when a mobile app uses voice/data connection to carry out certain tasks • Browser Performance Testing – includes checking for browser speed and responsiveness etc. • Interrupt Testing - to ensure with what ease the mobile app handles interruptions such as incoming calls, battery removal, network coverage outage and recovery, and incoming notifications etc. • Installation Testing - to ensure that the installation process (installation, updating and uninstalling) of the mobile app is smooth and seamless for the user • Certification Testing - Mobile devices need to be tested against the guidelines set by different mobile platforms in order to get a certificate of compliance • Localization and Internationalization Testing - to ensure localization and internationalization features are supported by the mobile devices and apps as per specifications • Communication Testing - to verify protocols and handshakes occurring in a call flow between multiple users

Social-Mobile-Analytics-Cloud PACK Elements	Common Testing Techniques	Custom Testing Techniques
Analytics	<ul style="list-style-type: none"> • Security Testing - Analytics solutions should be tested for all the possible security threats as it involves lot of data, structured as well as unstructured. Parameters like authentication & authorization of users, availability of data forms major part of analytics security testing as it involves access to confidential data • Performance Testing - Analytics application should be tested for accuracy of data, performance under high loads, ease of usability etc. • Usability Testing - Analytics Usability testing is performed to check if the analytics application is providing the right information. For e.g., is it providing a complete view of the customer by analyzing the various sources of data. This is most important in analytics testing as getting the desired information is critical for success 	<ul style="list-style-type: none"> • Failover Testing - To ensure that data would be available even during any critical failure or at a point where the application reaches a predetermined performance threshold. This testing is very crucial for any analytics application to be deployed
Cloud	<ul style="list-style-type: none"> • Security Testing – Undertake web application security audit (specifically aligned to Open Web Application Security Project (OWASP) standards) • Functional Testing – it enables to conduct testing for both internet as well as non-internet applications • Performance/ Load Testing - in cloud environment look for bottlenecks & limitations. For this, testing performance under a specific workload is necessary 	<ul style="list-style-type: none"> • Stress Testing & Fault Injection techniques - Determines the effectiveness of cloud applications beyond breaking point by simulating peak load scenarios. Also fault injection techniques that help create robust software by introducing faults to test codes are often used with stress testing techniques • Compatibility Testing - To check for the compatibility between applications in the cloud infrastructure and their interoperability • Browser Performance Testing - To validate if the application supports various types of browsers • Latency Testing - To check for an application's latency between an action and subsequent response after cloud deployment • Fail-over Testing - To determine the effectiveness of an application under peak anticipated load with component failures that are generally simulated during the test procedure • Capacity Testing - To determine the maximum capacity that might be required for current/future hardware, and for other requirements under various usage scenarios • Scalability Testing - To determine the scale in and scale out capabilities that are in place depending on varied demands/requirements

**These testing techniques are an indicative representation only and is not exhaustive*

Depending upon the specific requirements, testing teams can consider combinations of different common and custom testing techniques.

Also, while testing for a Social-Mobile-Analytics-Cloud application, new testing techniques may emerge over the course of time during integration with some techniques gaining more prominence over others.

There could also be a scenario where some techniques may lose relevance and become redundant. What is thus required is a comprehensive test approach to decide the right mix of common and custom testing techniques to address the specific application's requirements.

Putting the approach into practice

Benefits attained by a bank using integrated Social-Mobile-Analytics-Cloud testing approach

Social Media

- A bank plans to launch a new alert feature that sends automatic alerts on card transactions to the registered customers
- The alerts are to be sent across multiple channels such as email, mobile, and social media platforms
- The bank also intends to send the usage data (by vendor, card type, transaction type, etc.) on monthly basis to customers using an analytics platform
- The application development team has already developed the alert application and now the onus is with the testing team to perform an end-to-end testing

The testing team now has two options:

Option 1

Test the functionalities in silos for mobile apps, social media platforms, online channels and the analytics platform.

For instance, security testing would be done independently for each of the channels in the alert application.

Option 2

Use integrated Social-Mobile-Analytics-Cloud testing approach i.e. a combination of common and custom testing techniques

- Step 1 – Perform Common Testing for functionalities which are common across the Social-Mobile-Analytics-Cloud pack. As security functionality is common across mobile, social media, online channel, the testing function can be common for all channels. Similarly the same approach can be followed for doing performance testing for this alert application.
- Step 2 – Perform Customized Testing for those functionalities which are unique to each element of the Social-Mobile-Analytics-Cloud pack. For instance, specific testing techniques like OS testing, Device Platform testing should be performed for alerts to be sent to mobile users. Similarly, browser performance testing, user profile testing should be done for customers viewing the alerts on their social media platforms. The analytics platform (Big Data/BI) should also be tested to make sure the right data is sent to the right customer across the channels.

Challenges in this Approach:

In a silo-based approach, multiple testing teams operate in parallel with the development teams which results in effort duplication, higher costs, schedule-slippages, increasing number of test cases, coordination issues between different testing teams, etc.

Benefits of this approach:

Effort and resources optimization, time & cost savings, fewer test cases, resulting in higher ROI

In addition to having an integrated Social-Mobile-Analytics-Cloud testing approach mentioned above, organizations need to also have a strategic framework for Social-Mobile-Analytics-Cloud pack testing. For the success of the integrated testing approach, organizations should be governed by the four tenets i.e. Platform, Planning, People & Process:

- **Platform** – For instance, Integrated test management SAAS platform
- **Planning** - End to end plan for software testing life cycle; R&D investment for test automation
- **People** - Better coordination among Social-Mobile-Analytics-Cloud development and testing teams; Social-Mobile-Analytics-Cloud specific testing training
- **Process** - Investment in Quality Assurance tools

Of the 4 P's mentioned above, the most important one would be 'People'.

For the true success of an integrated approach for Social-Mobile-Analytics-Cloud testing, organizations need to strategize on acquiring the right resources for forming the 'Social-Mobile-Analytics-Cloud Testing team' together in place. Such a team would typically have two sub-teams: One that focuses on 'common testing' for Social-Mobile-Analytics-Cloud pack while the other one carries out 'customized testing' for social media, mobile, analytics, and cloud. For instance, the testing team dedicated for common testing techniques would be performing end to end functional tests, security tests, usability tests, and performance tests across all the Social-Mobile-Analytics-Cloud pack technologies.

In such an approach, critics may argue that the common testing techniques differ from each other – i.e. security testing for mobile is fundamentally different from security testing for cloud, etc. While this is true to some extent, the key point here is the fundamental approach to testing for security vulnerabilities which would always remain the same.

What is thus most important is to get the management buy-in to such an idea, allocation of dedicated time and budget for forming an Integrated Social-Mobile-Analytics-Cloud testing team and judicious investment in specialized Social-Mobile-Analytics-Cloud testing training. Having a right team in place and training, testers would eventually gain specialized Social-Mobile-Analytics-Cloud specific expertise over the course of time making it easier to execute end to end test cases for all elements of Social-Mobile-Analytics-Cloud as a pack. The onus is with organizations to make meticulous efforts in this direction by investing in training and resources -upfront to get the desired ROI in the long term.

Firms adopting such an integrated Social-Mobile-Analytics-Cloud testing approach (common + custom technique) along with four tenets will be able to differentiate against the firms who operate in a silo testing environment.



Conclusion

Organizations are focusing majorly on Social-Mobile-Analytics-Cloud technologies leading to an accelerated demand for testing. Those following a silo based testing approach are at a disadvantage over firms having an integrated testing approach (Common + Custom). Integrated Social-Mobile-Analytics-Cloud Testing Strategy is the solution which organizations need to look at from a long term perspective. This approach when coupled with the right platform, right people, right planning and quality processes will ensure that firms stand out in the crowd.

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