Quality Assurance in the Age of Mobile Healthcare

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ABSTRACT
The increasing adoption and use of mobile technologies is disrupting the healthcare industry. This phenomenon has created innovative ways, channels and tools to deliver healthcare cost-effectively even in the remotest of places. Among the material issues that existing mHealth Applications (Apps) face are quality, accuracy and reliability. Most mHealth Apps aren’t downloaded that often and physicians are generally hesitant to recommend applications because they don’t trust them. One of the biggest challenges is in getting mHealth Apps tested and validated under real-world conditions with a large and constantly growing variety of mobile devices and operating system versions, which need to be supported by such Apps. It could be easily inferred that traditional in-house or outsourced verification and validation methods can no longer cope with the challenges given by today’s exploding world of mobile devices and the global user landscape. Software applications with a high Defect Exposure Factor (DEF) i.e. criticality as a measure of immediate customer exposure post release such as mHealth Apps, are excellent candidates for ‘crowdtesting’.

DIY TOOLS DISRUPTING THE HEALTHCARE INDUSTRY

These developments mark a turning point in the history of the healthcare industry. Mobile Apps are radically changing the way doctors and patients interact and approach healthcare. Using a smartphone, a mobile application and an additional portable device, it is now possible for anyone to instantly get an electro-cardiogram (EKG) reading, giving patients a simple and easy means to keep track of their heart conditions. Wall Street Journal cites a case experienced by Dr. Eric Topol, cardiologist and Director of the Scripps Translational Science Institute in La Jolla, California. Dr. Topol’s patients started E-Mailing him the results of do-it-yourself (DIY) electrocardiograms:

I am getting emails from people saying, “I’m in atrial fibrillation—what do I do?” The first time I saw that in the subject line of an email, I said, the world has really changed.

Doctors regard such developments as real time savers with tremendous potential to eliminate inefficiencies, reduce costs, increase transparency and make health care more affordable by speeding diagnosis, improving monitoring and reducing unnecessary visits to a physician or hospital. Many Apps have been designed in consultation with the doctors themselves and these range from information databases about drugs and diseases to sophisticated monitors that read patients’ symptoms and diagnostic data.

CHALLENGES FACING mHEALTH APPS

Though it is widely agreed that mHealth Apps have the potential to revolutionise healthcare, these trends are not without challenges. Among the material issues that existing mHealth Apps face are quality, accuracy and reliability. Despite the number of mHealth applications available for download from App stores, only a small number of those applications have

MOBILE APPLICATIONS (APPS) IN HEALTHCARE IT

A quick search for “health” on Apple iTunes store returns over 43,000 Apps, demonstrating a high demand for such applications. According to the US Food and Drug Administration (FDA), mobile healthcare (mHealth) Apps were downloaded an estimated 660 million times as of June 2013. By 2015, 500 million smartphone users worldwide are expected to regularly use some healthcare application; by 2018, industry experts expect 1.7 billion mobile users to use mHealth Apps on a fairly regularly basis. These users include general consumers, patients, doctors and other healthcare professionals. Realising this growing interest, independent App developers and companies, such as Nike and Walgreens, alike have released several Apps around weight loss and general physical fitness. Besides these lifestyle Apps, the number of Healthcare Apps supporting serious use cases, such as: Patient diagnosis; remote patient and health information monitoring; patient therapy management; epidemic alerts, etc; and productivity Apps for doctors, physicians, healthcare professionals, hospitals and other healthcare institutions is also exponentially growing.
Quality Assurance in the Age of Mobile Healthcare

April 2014

Quality Assurance in the Age of Mobile Healthcare

The Journal of mHealth

Continued on page 44

In particular, mobile applications catering to these stakeholders should be easy to operate, intuitive and require minimal learning effort. Complex functions and confusing technical implementations should be completely abstracted from the user interface to facilitate adoption. The App should permit easy access to critical information with an absolutely minimal number of user inputs and a high tolerance to any erroneous inputs. Regulatory requirements mandate strict compliance, not only with local data protection and privacy laws, but also with international standards and best practices for quality assurance and quality management. Security requirements mandate advanced encryption techniques to process sensitive information. The Apps should be resilient to sophisticated attacks and permit quick reaction to any actual or intended security breaches or infringements.

Thus, it could easily be recognised that healthcare is a sector that requires superior user experience and buy-in from all stakeholders – doctors, healthcare professionals and patients alike, while abstracting much of the intricate and complex details typical of the healthcare industry. In other words, both form and substance are material in developing mHealth applications for them to be of any value to their intended users.

It is, therefore, obligatory that mHealth applications perform exceedingly well along all of these dimensions:

mHealth Apps should comply with regulatory and legal standards prescribed under HIPAA, FDA, etc., if users transform a mobile platform into a regulated medical device, or they connect to such device.

mHealth Apps should have easy-to-use and intuitive interfaces that are usable by medical professionals and patients alike.

mHealth Apps should meet the highest quality, reliability and precision requirements. Such applications should be able to suppress false alarms, while automatically sensing and detecting symptoms based on users’ health patterns and vital parameters.

QUALITY MANAGEMENT STRATEGIES FOR mHEALTH APPS

mHealth applications require extensive, time-consuming, and costly testing efforts to validate their efficacy, quality and safety, before they can be safely delivered to users and health care providers. According to Roderic Pettigrew, Director of the National Institute of Health’s National Institute of Biomedical Imaging and Bioengineering:

This smartphone-enabled technology is superior technology [to standard diagnostic procedures] and is an example of the type of rigorous evaluation that we need to establish the real value for these mobile and wireless tools.

As the mHealth technology is relatively new, most software development companies are still struggling to develop and implement effective software or system verification and validation strategies. One of the biggest challenges is in getting mHealth Apps tested and validated under real-world conditions with a large and constantly growing variety of mobile devices and operating system versions, which need to be supported by such Apps. It could be easily inferred that traditional in-house or outsourced verification and validation methods can no longer cope with the challenges given by

Continued on page 44
today’s exploding world of mobile devices and global user landscape. But, the situation does not appear all that bleak and highly effective solutions could be crafted by combining in-house and outsourced software testing activities with crowd-sourced testing (‘crowdtesting’) approaches.

Crowd-sourced software testing is a recent innovation driven by product and service innovations in mobile and cloud computing technologies. Software applications with a high Defect Exposure Factor (DEF) i.e. criticality as a measure of immediate customer exposure, post release, are excellent candidates for crowdtesting. mHealth Apps are particularly suitable for crowdtesting due to the dangers and risks they pose to the lives or property of their users in case of device or software failures.

Crowdtesting is a software testing methodology that leverages a “community” of carefully curated external professional software testers and App users with specific demographic and health profiles, across the globe. Here, software testing is carried out by a larger number of testers, from different locations rather than by a handful of local testing professionals. Crowdtesting subjects the application under a set of realistic scenarios, loads and user paths, which cannot be replicated by an internal testing team; many technical issues and bottlenecks, only come to light only when the product is tested “in the wild”. Knowing how well an application performs under real-world conditions in advance makes refactoring much easier and cheaper. Crowdtesting is also a quick and flexible way of scaling up the number of test personnel, while simultaneously keeping the costs under control. Furthermore, crowdtesting is several times faster in identifying standard defects than conventional testing as the following representation demonstrates.

Crowd testing has proven to detect a large number of bugs and issues which passed internal QA, verification and validation as the real-world experiential case by Passbrains demonstrates.

Crowdtesting offers a particularly easy and scalable way to engage all stakeholders in addressing the various considerations that are captured in such applications. For instance, usability experts with specialised know-how in the healthcare domain could be sought to propose various recommendations that facilitate adoption and usage. Similarly, healthcare practitioners and legal experts could easily contribute insights and consultation that help application developers meet the technical, functional and compliance requirements.

Through crowdtesting, it is also possible to target mobile
healthcare applications to a specific subset of testers and gather their views and opinions on the fitness for purpose (utility) and use (warranty) considerations. Expert software testers conduct a battery of tests under the most unforgiving of situations and device configurations to ensure that the application works correctly, requires the absolutely minimal system requirements, and is resilient to user errors, etc. Business and Process integrators could critically evaluate the adequacy of functions and processes for mission critical applications that deal with emergency situations.

mHEALTH AND CROWDTESTING

Despite the various models at a company’s disposal, crowdtesting demands some special attention, especially in the mHealth context. Given the complex nature of mHealth Apps and the need to include as many stakeholders as possible to articulate a coherent mHealth adoption strategy, crowdtesting offers a particularly easy and scalable way to engage all stakeholders capturing their expectations from mHealth applications. The following graphic represents how crowdtesting could help mHealth companies at various stages of their software development life-cycle (SDLC):

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Through a mix of in-house, outsourced and crowd-sourced testing, several best practices could be properly combined to maximise efficiency in terms of both, resources and costs. In-house staff and outsourced teams deliver value by focusing on technological, regulatory and business challenges requiring immediate attention due to its proximity to the development team. Crowdtesting team’s laser focus, single-minded efforts, inherent motivation and scalability deliver tremendous value by detecting further issues before the software is released.

The crowd’s knowledge is diffused among its tester base, but the collective testing knowledge base is larger than that within any company. Given the complexities of the modern IT landscape, an optimum testing scenario should include elements of in-house, outsourced and crowd-sourced testing teams in the right proportion.

CHOOSING A SOFTWARE TESTING SERVICE PROVIDER

Choosing the right software testing service provider is by and far one of the most important decisions for companies developing mHealth Apps. It is mandatory that the company performs extensive due diligence and evaluate service providers’ offerings, client base, capabilities, resources scalability, and in case of crowdtesting service providers, the community size, skill-sets and expertise, demographics, and device configurations coverage, as well as their crowdtesting platform technology and processes.

In general, selecting a proven and experienced software testing vendor with crowdtesting offerings makes the operational activities much easier, as there is usually less maintenance and governance required during the strategy development and execution stages because the service provider has already addressed many of the relevant aspects of engagement from...
past experiences with other clients.

Regardless of the service provider chosen, an assiduous review of the Terms & Conditions, Non-disclosure Agreements (NDA), Escrow arrangements, Service Portfolio and Service Level Agreements (SLA) must be conducted. A Sourcing Hierarchy of Constraints & Criteria document could be used for evaluating platform operators for every major crowd testing project. The client company could use this document to evaluate the various software testing vendors based on diverse criteria.

CASE STUDY

PASS Technologies regularly helps mHealth App development and Healthcare IT companies with their specialised software testing requirements through hybrid combinations of onshore, offshore and crowd delivery models. By bringing in complementary skills, aligning the development efforts on design thinking principles and placing users’ needs at the core of software development by engaging in conversations with the community, PASS helps customers to successfully verify, validate and deploy mHealth applications, thereby improving care for patients as they transition throughout the continuum of care.

SUMMARY

It is easy to envision how crowdtesting could be a valuable asset to companies developing software and mobile applications for the healthcare industry. It is an absolutely indispensable tool for companies and developers aspiring to disrupt the healthcare industry through their innovations. By seeking the vested knowledge and professional expertise distributed among the diverse members of a crowdtesting community, the power of the crowd could be easily leveraged to benefit all stakeholders and in delivering superior healthcare where and when it is the most required.

AUTHORS

Dieter Speidel is the Founder & CEO of PASS Group, a leading Swiss provider of software and system testing services. PASS Group owns passbrains.com, a global platform for on-demand crowdtesting services, with offices in Zurich, Berlin, Boston, Belgrade, Bangalore and Mumbai. An entrepreneur in the Software Development and Testing domain for more than 30 years with strong focus areas within the Healthcare & Life Sciences industry, Dieter Speidel founded and successfully expanded PASS Group, offering managed QA and testing services through global delivery, including near-/off-shoring and crowdsourcing. In 2011, he developed the Passbrains platform and global community for crowdtesting and knowledge services. Within a very short time, Passbrains has become a leading vendor of crowdtesting services, engaging thousands of software testers in more than 100 countries.

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