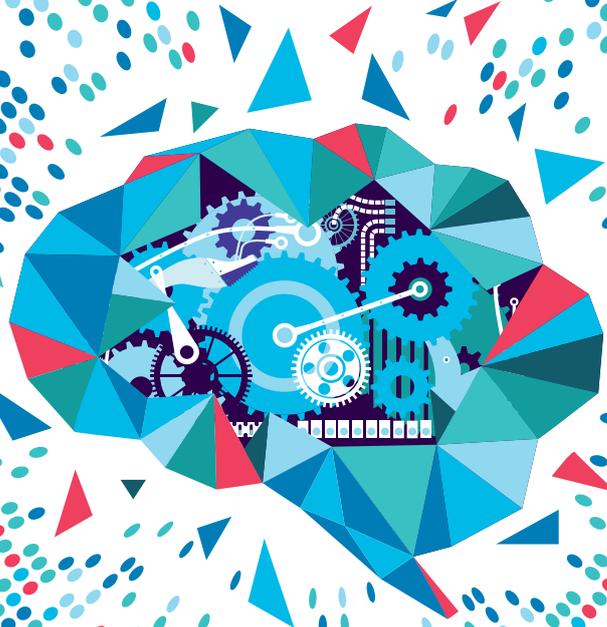


Reimagine

The Future of Quality Assurance



**WAYS OF
WORKING**

**CHALLENGES AND
ARTIFICIAL
INTELLIGENCE**



**CUSTOMER
EXPERIENCE**



**TESTING AND QA
STRATEGIES OF
THE FUTURE**



AUTOMATION



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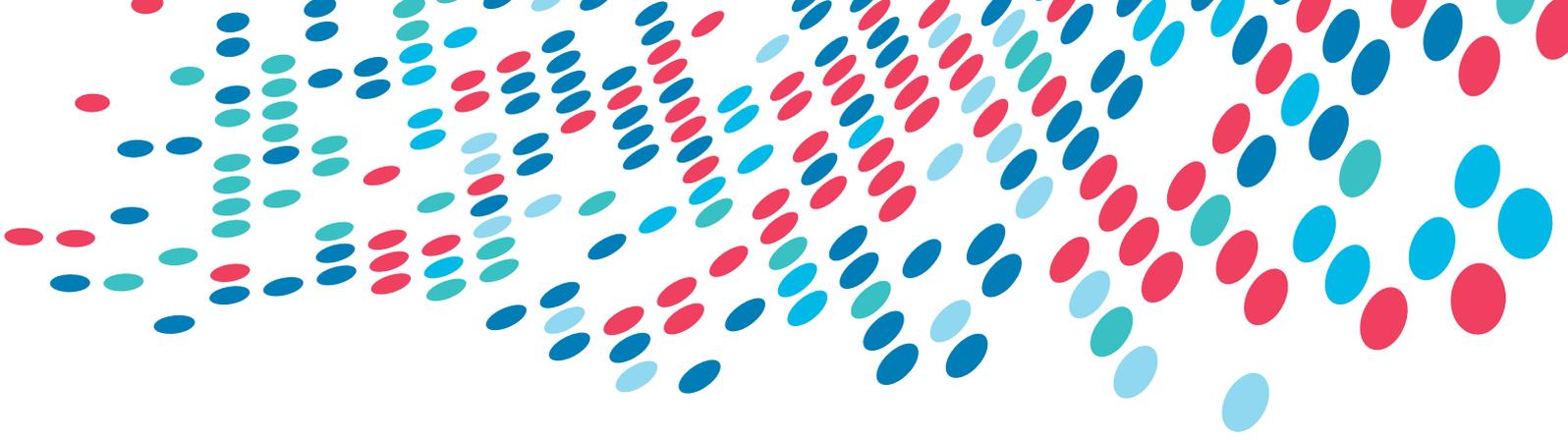
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Reimagine

The Future of Quality Assurance

Featuring the trends shaping the future of quality assurance, and a practitioners' view of how QA can reinvent customer experiences for competitive advantage.

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Foreword



“In this age of agility and increasingly higher customer expectations, organisations are expected to deliver seamless connected experiences at speed. Many CEOs are leading the charge of their digital transformation and scaling digital change more sustainably, all to put customer value first.”



Olaf Pietschner

Managing Director
Capgemini Australia and
New Zealand

The rules of the game have changed. An array of advanced technologies – from artificial intelligence to the internet of things – are reinventing how organisations create value.

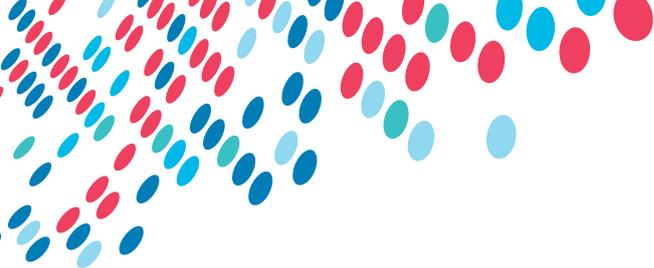
In this age of agility and increasingly higher customer expectations, organisations are expected to deliver seamless connected experiences at speed. Many CEOs are leading the charge of their digital transformation and scaling digital change more sustainably, all to put customer value first.

Recent government regulations and new competitors are disrupting industries and organisations are under unrelenting pressure to create value. To respond more quickly to business demands, organisations need to adopt emerging technology faster and to lay a strong enterprise data foundation. The focus on agile, the leverage of new technologies and quality assurance is imperative to respond more quickly to business demands.

This shift has already initiated changes in the way teams deliver and QA must become agile and deliver valuable services in this new era of application development. Speed is the name of the game now and modern organisations must adapt within an ever-changing environment. This requires continuous innovation in products, services, practices, and most importantly to build the skills of teams for today's digital age.

With QA moving up in the agile value chain, this may well involve both a mindset and a cultural shift. Consider where the stumbling blocks may be – as it all comes down to having the right mix of people, tools, culture, and practices. This publication provides a practitioners' view on how some of the leading organisations are reimagining the future of quality assurance - sharing their perspectives, lessons learned and the way forward.

As organisations evolve to stay relevant in today's ever-changing landscape, the modernisation of your technology is the window to facilitate an effective and sustainable vehicle for change to create value and to meet with your customer demands.



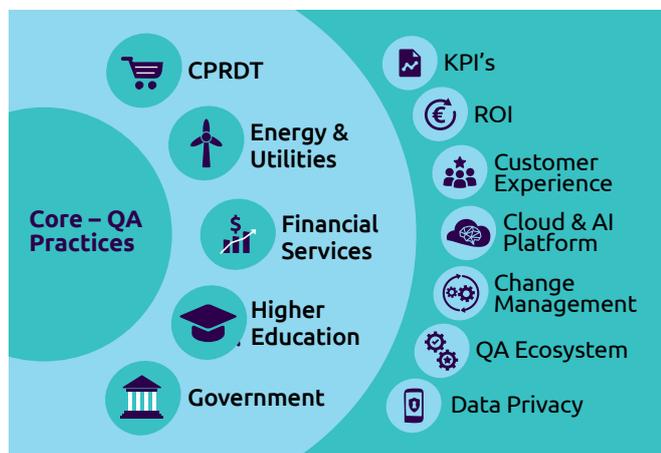
Introduction



“Quality Assurance (QA) is at a point of inflexion and this is very interesting time for QA professionals and ecosystem of QA service providers”

Quality Assurance (QA) is at a point of inflexion and this is exciting time for QA professionals and the ecosystem of QA service providers. The rules of the game have changed. An array of advanced digital technologies – from artificial intelligence to the internet of things – are reinventing how organisations create value. However, significant questions remain about how organisations are/will redefine quality assurance practices and capabilities as a source of competitive advantage.

6. How will testing tools evolve to meet the QA needs for applications built on AI and IoT technologies?
7. Will an organisation's QA tool strategy be limited to commercial off-the-shelf or include Open Source tools?
8. What skills will QA professionals need and what will be expected of them?
9. How will performance and non-functional requirements evolve and be validated by QA teams?
10. Given the stronger data privacy laws, how will QA practices evolve?
11. How are industry bodies around the world (such as ANZTB in Australia) supporting QA practices?
12. What role will systems integrators play in helping organisations achieve business outcomes?



We spoke to CXOs and leaders from large organisations across financial services, higher education, public sector, CPRDT (consumer, products, retail, distribution and transport) and EUC (energy, utilities and chemicals) and asked them to Reimagine the Future of QA.

I am confident that you will enjoy reading this publication as much as we enjoyed putting it together.

To Reimagine The Future of Quality Assurance we started with following questions:

1. How is digital transformation and customer experience influencing QA practices?
2. How QA approaches of Shift-Left or Right-Shift are impacted by DevOps and Agile?
3. Is the uptake of DevOps and Agile driving automation?
4. How will QA KPI's evolve in a DevOps and an Agile world?
5. Will organisations adopt a federated or centralised model for a QA centre of excellence?



Shyam Narayan

Director | Head of Managed Services
Cappgemini Australia and New Zealand

Transforming testing for digital transformation: Speed is the new currency



“There is no silver bullet. Transformations take time, and they must involve all the people, processes, and technologies associated with your application delivery pipeline.”

Continuous Testing was once just an aspiration. Now, the drive towards digital transformation has made Continuous Testing a business imperative.”

In the application development and delivery world, the only constant is change. Today’s software testing professionals have already witnessed seismic shifts in business expectations, development methodologies, system architectures, and more. And, the new focus on digital transformation means that the rate and scope of change will only increase.

Reinventing testing is essential for achieving the speed and agility required to thrive in the digital future. Why? Speed is the new currency but traditional software testing is the #1 enemy of speed.

The same basic story always emerges: Organisations transform Dev and Ops, but then testing cannot keep pace and they get stuck. The testing tools and processes architected for traditional months-long release schedules simply don’t fit modern delivery cadences, which require immediate quality feedback with each new build. It’s a sad but simple fact: if you have a slow testing process standing between highly-accelerated development and operations processes, there’s just no way that you can achieve the desired delivery speed.

Many companies have already recognised this—and they’ve galvanized their digital transformation initiatives by modernising their testing. By re-examining and re-inventing software testing across their organisation, they went beyond removing the “testing bottleneck”—they are also driving the positive user experiences that can now make or break a business.

The Path Forward

Global 2000 organisations who want to transform testing for digital transformation with Continuous Testing—the extreme test automation required for DevOps and digital transformation—need to overcome challenges such as:

- Highly complex application architectures (e.g., processes that cross browsers + APIs + mobile + SAP + other packaged apps + custom Java/.NET apps + mainframes).
- Different application types, planning cycles, development methodologies, and tools existing in parallel.
- Deeply-ingrained quality processes across different groups and projects.
- Scarce test automation resources.
- “Bloated” test suites that delay the process while providing limited business value.

There is no silver bullet. Transformations take time, and they must involve all of the people, processes, and technologies associated with your application delivery pipeline. Nevertheless—as the interviews in this report indicate—you can rest assured that your efforts will pay off. These perspectives provide numerous examples of how organisations who committed to transforming testing are now growing the business and enhancing the customer/user experience.

Continuous Testing was once just an aspiration. Now, the drive towards digital transformation has made Continuous Testing a business imperative. Organisations like these are paving the path forward, demonstrating that Continuous Testing can—and must—become a reality in enterprise organisations.



Sandeep Johri

CEO | Tricentis

Consumer Products, Retail, Sector Analysis: Distribution and Transport

Testing times as sector changes



Amit Singhania | **Prashant Chaturvedi**
Vice-President | Vice-President
Capgemini Australia and New Zealand

The Consumer Products, Retail, Distribution and Transportation (CPRDT) industry sectors are going through profound changes as a result of the digitalisation of everything from customer interaction to shopping, products, and channels. This has opened up unparalleled opportunities but also poses existential threats to current business models.



The benefits of test automation include improved test cycles, test coverage and earlier detection of bugs.

As a result, organisations in the CPRDT sectors are now co-innovating and collaborating with partners and customers to enhance products and services.

Some of the key trends across the CPRDT sector are:

- 1. Digital customer experience:** This focuses on offering compelling customer experience and engagement across physical and digital channels – enabled by mobile and online to offline integration. It also supports personalised, relevant and real-time offers based on deep customer insights.

- 2. Digital supply chain:** Encompasses end-to-end supply chain performance using capabilities such as real-time and granular visibility of demand and supply across the ecosystem, and next generation of pick-pack-ship. These capabilities in-turn enable a seamless digital customer experience.
- 3. Sharing economy and crowd-sourced models:** The transportation sector is being disrupted by continuous growth in the sharing economy. Consumers and enterprises are moving away from owning vehicles and subscribing to alternate transportation methods. Models such as crowd-sourcing are disrupting last mile delivery and driving third-party logistics and fleet management firms to adopt or acquire such capabilities.

Although spend on technology as a percentage of overall revenue is amongst the lowest in these sectors, early adoption of digital technologies offers organisations the chance to be at the forefront of innovation and drive consumer engagement.

However, Quality Assurance (QA) is no longer enough when it comes to building and running a business assurance and engineering capability that is geared for continuous change, especially with one eye on improving speed - market, assuring business outcomes and transforming non-stop.

The move from QA to Quality Engineering (QE) is not an option. The equation is simple: Test less and assure more. Serious and continuous disruption in IT means the way testing and QA has been approached in the past must be overhauled.

As the transport and distribution sector is rapidly changing from a product centric model to a customer centric model,

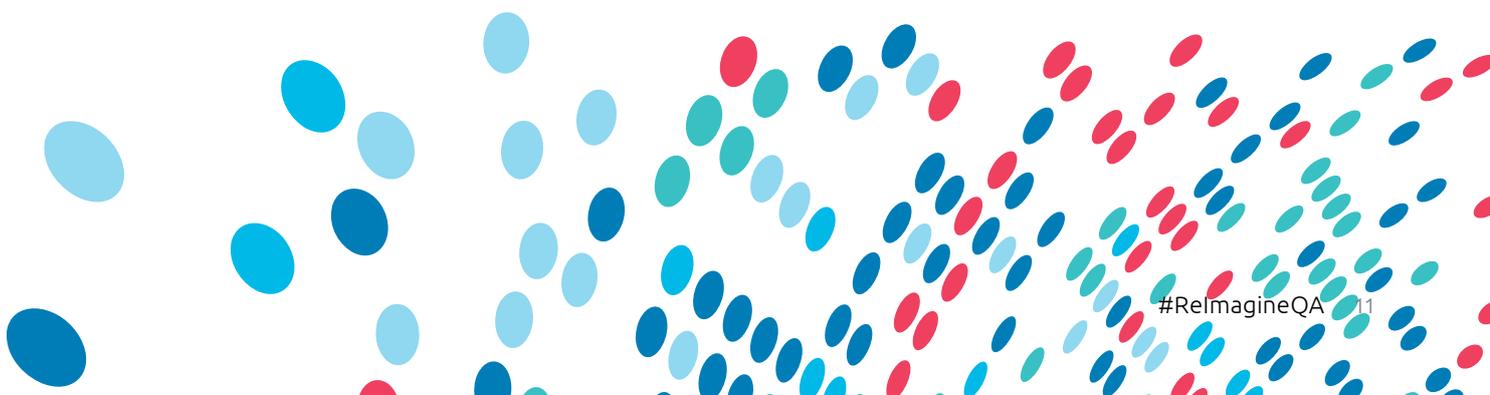
so is the need to try newer channels, technology and integration platforms, value-added services and, above all, better customer experiences. This is critical for success.

Business models are changing to seize new opportunities which need to be supported by new technologies – such as neuro-linguistic programming, bots, mobile and wearables, Artificial Intelligence [AI] and Machine Learning [ML], the Internet of Things (IoT) – and the complex integration of these technologies and legacy systems.

Quality needs to be embedded from the idea inception phase to cut the time and effort of testing towards the end, thereby improving the time-to-market.

While automation in testing was as the heart of QA in 2018, it was only a start and as we continue to embrace DevOps and Agile, test automation will play a key role in QE. [quote] The benefits of test automation include improved test cycles, test coverage and earlier detection of bugs. As DevOps spreads it is imperative that software – with the continuous development – needs to be continuously tested. This needs a paradigm shift in the skills of a developer and tester as the thin line between these skills is disappearing and same individuals are required to do both.

Automation allows the user to do more and faster. The Internet of Things, AI and ML are proving to be key drivers of test automation. Much like QA to QE, performance testing is going through a similar change to performance engineering. Simply, performance is key for customer experience and needs to be thought through and embedded in the process from the start.





Delivering Post to the future

Donna Shepherd
Head of Testing and Service Assurance
Australia Post

Australia Post is a large organisation and has been around for more than 200 years. As a result, it has a complex hybrid landscape and a large number of legacy systems, however, the organisation is transforming to embrace emerging technologies and moving progressively towards Agile and DevOps practices.

The expectation from quality assurance (QA) is to ensure the systems Australia Post provides to its customers are functional, reliable and available. We deploy high standards to ensure the quality of the systems and need to be Agile to deliver at speed. To enable this, we adopt a variety of different approaches as the organisation operates in both Waterfall and Agile methodologies and is also moving towards a DevOps model.

Performance of systems and applications, and ensuring the quality, integrity and security of those systems is of the highest importance within Australia Post. We have seen large scale organisations fallen foul of security incidents in recent times and we realise it is absolutely paramount that we protect our systems so we have invested significantly to ensure robust controls are in place.

The focus on customer experience (CX) has heightened with the explosion of consumer demand for immediate access and readily available information. CX is very much a part of the testing lifecycle now, and this has seen a change in the approach to quality assurance where testers need to understand the full customer journey and test all aspects of the customer experience.

AI and machine learning will improve the customer experience

To stay competitive, deliver at speed and deliver a great customer experience, Artificial Intelligence (AI) and Machine Learning (ML), data analytics, and embracing new ways of working, are core elements of delivery. With technology evolving at pace, the opportunities are immense. We need to embrace them and explore how to maximise the benefit it can bring to the business.



Automated testing is at the heart of this transformation, building reliable and scalable test automation that is fully integrated into Australia Post's CI capabilities.

For instance, Australia Post is very interested in AI and ML technologies as they evolve in the quality assurance space. To date we haven't introduced them into our enterprise testing offering, but have embarked on proof of concept activities centred around test case deduplication, using algorithms to optimise test suites, and secondly, model based testing. This may help maintain our test cases in the form of models and predictive analysis. The tool we are considering also has the capability to reverse engineer requirement models using natural language processing techniques.

The digital transformation journey

Australia Post, like many large national organisations is on a digital transformation journey with a focus on four areas: Speed (enterprise Dev Ops), Agility (Hybrid IT management), Security (governance of risks/threats) and Insights (data management and predictive analysis).

The Digital Delivery Centre at Australia Post has been on the digital transformation journey for some time and is mature in its processes. The team showcased its capability at the recent Agile Australia event and is regarded as a leader in this area.



With technology evolving at pace, the opportunities are immense. We need to embrace them and explore how to maximise the benefit it can bring to the business.

The enterprise testing team is adopting similar practices, however, the challenges differ with the complex technology and delivery landscape we are servicing. With the emergence and popularity of Agile and DevOps practices, organisations of all sizes are adopting full continuous integration and continuous delivery (CI/CD) practices. The testing services team at Australia Post is no different and is evolving its ways of working to support this shift.

Automated testing is at the heart of this transformation, building reliable and scalable test automation that is fully integrated into Australia Post's CI capabilities. The role of the tester is also changing, moving away from large scale manual testing and embracing automation into a more technical role, and becoming more closely integrated with the development and operational teams. This requires a different skillset and offers an opportunity to reskill staff, uplifting capability across the team.

Automation vital in QA and testing

As an organisation we recognise the need to increase test automation. Australia Post has been actively progressing its strategy over the past couple of years. It has a diverse application landscape supporting many technologies, therefore to enable automation at an enterprise level, we need to think more broadly than just 'one solution fits all'. Our strategy focuses on four main areas with supporting frameworks: Web, API, mobile devices and legacy applications. We use a blend of different approaches, tools and frameworks to deliver on our goals.

Executing on our strategy, the automation framework, delivery model and supporting processes have undergone considerable change. The automation team support a centralised repository of test automation code, enabling integration with CI/CD toolsets. The scripts are maintained, version controlled and widely accessible promoting re-use. This has provided a solid foundation from which to scale.

Australia Post has numerous automation tools in use to support the differing needs of the business. Adoption of the tool of choice to meet a business need, while beneficial, also presents challenges. The team has recently implemented an orchestration tool to improve integration across the various toolsets and the QA tools strategy supports streamlining of the tools across the enterprise. Automation will play a big part in our testing and quality assurance going forward.



As testing evolves it will be embedded in teams

Security testing has grown exponentially within Australia Post over recent years. We have a dedicated team that manages security testing given the significant focus on ensuring the safety and integrity of the data held by Australia Post. Information security and cyber security are managed centrally under the chief information security officer and ensure the necessary controls and processes are in place.

Change within the quality assurance process is inevitable. I don't believe testing will continue to be delivered in its current form. With increased emphasis on agility, continuous integration and rapid delivery, the shift is towards quality engineering and multi skilled teams. The goal, the way that we work, and the structure of teams are all evolving and that is steering quality to be increasingly considered from the outset of any project; it is a change in the right direction. Quality is an indispensable part of any software development process and is everybody's responsibility.

Testing will potentially be embedded within the teams so it becomes a way of working rather than a phase. Independent governance of the testing is required to ensure it meets the required standards, but how that governance is applied is open for discussion. Education of best practices and testing techniques across the team will help drive higher levels of quality throughout the process, with a QA governance layer having oversight of deliverables.

However, the quality assurance team are the gatekeepers, and despite the changes in delivery approaches, automation and skillset, QA will continue to play an important role in the future.

Developing testing environments to meet today's challenges

Since the introduction of Cloud hosting, improved service virtualisation capabilities and increased automation, it is much easier to spin up and provide test environments and data in a timely manner. On our Cloud-first journey, we will have the ability to host and scale environments in a more cost effective manner, resolving some of today's challenges, including provision of additional environments and availability of production sized environments for performance testing. Test data is still a challenge, however with the enhanced capabilities in data analytics and machine learning, there are opportunities to generate 'production like' and targeted test data automatically.



Education of best practices and testing techniques across the team will help drive higher levels of quality throughout the process, with a QA governance layer having oversight of deliverables.

The increased requirement to test at speed demands timely environment availability, however, providing a fully integrated environment can cause delay. The availability of stubbing and service virtualisation tools has provided solutions to support early testing and provisioning of E2E environments and we

of development. Knowledge of emerging testing tools and technologies is also very important.



Bringing innovation and thought leadership into partner organisations is a must for our service providers.

Testing roles are changing – shifting left, working more closely with the developers to introduce testing early in the lifecycle, and shifting right to support continuous testing, especially in the context of Agile development and DevOps. Testing plays a major part in both areas, but we should view it



continue to see enhancements of these offerings to assist in addressing pain points.

Australia Post is also continuing to explore automation opportunities to pro-actively identify environmental issues and take action to reduce outage impacts.

Equation for service providers and the changing role of the tester

Having access to skilled resources and SMEs to meet the changing demands of the business is a critical requirement of any service provider. For quality assurance, skills such as automation and performance engineers, mobility, API, Security, CX, AI and ML and quality engineering (SDET) are in increasing demand. Experience working in a CI/CD environment is also valuable because testing is moving away from the 'phased' approach as it becomes an intrinsic part

as 'holistic testing' rather than left or right – an opportunity to integrate testing into every development and operations activity that the teams perform.

The insights gained from testing can provide valuable feedback to the business, operations and development teams in all aspects of the customer experience. The testers become the 'glue' between the different worlds.

However, some of the concepts of shift right, such as production testing, are a shift in thinking from the traditional 'test until you are confident all issues have been identified and fixed'. With shorter implementation and release cycles, testing, development and production teams do come closer together.

Overall, bringing innovation and thought leadership into partner organisations is a must for our service providers.



The technology behind the taste

David McMullen, Director of Technology,
Matt Cottee, Manager – POS Systems, Cashless,
Digital and Technology Deployment
McDonald's

McDonald's is the world's leading global foodservice retailer with over 38,000 locations in over 100 countries. Approximately 93% of McDonald's restaurants worldwide are owned and operated by independent local business men and women.

From a global tech space, we report into our Global Technology team. We are split into five disciplines in market. The first is IT solutions, everything back of house including back office, crew communication, engagement and recruiting. The second is Technology, which focuses on restaurant technology including point of sale (POS), kiosk, or associated peripheral systems. Basically, everything the customers and crew touch that allows us to make burgers and fries, and sell them to our customers. Then there's Support, which includes our restaurant support desk and on-site maintenance.

We have Foundations which is the bare bones of the restaurant infrastructure network, our corporate side of operations, our corporate internet, and our restaurant internet. Finally, digital which is obviously the big future

play. We enable the technology, and the digital team own everything the end user sees and experiences – the customer journey, the customer touch points and all that's associated with those, including menu boards.

Where Quality Assurance (QA) plays a significant part is in that technology space which is the crew and customer side of things – kiosk and point of sale.

As a global team, we are part of what McDonald's calls the lead International Operated Markets which are the five key countries: Australia, Canada, UK, Germany and France. We are on the cutting edge of our technology and development and are used as a leader and, in some cases, a pilot market, to test and validate certain technologies that don't currently exist in our restaurants. We listen to our customers to try to understand what they want and how they want to engage with us, and then we work with our global development team in collaboration with our local operations team, to scope out the features and functionality and get them into a QA test environment.

How back office works

Back office is a little bit different to anything front of house because it's generally a different model. The technology in the digital space is typically led by the global business, however with the back office, the markets determine what's best for their needs. Imagine how hard it is to have a POS solution across 35,000 restaurants in the system that is fit for purpose, that takes into account the different tax rules, the different requirements, different cashless priorities and everything else needed to have a back office system, that then has to account for tax reporting, and payroll and scheduling rules.



Back office is a little bit different to anything back of house because it's generally a different model market.

As a result, decision making is a little bit different. The testing is as robust as ever but it also requires more understanding of the complete business and how it operates. For instance, how to do a profit and loss (P&L), how to understand how an inventory works, how to do a schedule, how to do payroll reporting, making sure we meet all our payroll requirements from a government reporting perspective and considering the management implications on the payroll system of a franchisee. When we talk about our customers, we don't just talk about the people that come into our restaurants – we talk about our franchisees, as well, because they are



our business customers. We have around 253 franchisees in Australia that own about 86 per cent of restaurants, so a significant portion of our restaurants are franchised.

Driving the customer experience and enabling the business plan

If you look at retail and business in general, these days everybody has an app and everybody has a channel to communicate one-on-one with their customer base. It's equally important for us to have that channel with our consumer base. It doesn't necessarily mean we need to have an app because everybody else does, but our customers were telling us that they wanted that connection. They wanted to have the rewards and the loyalty program. It's also another way for them to engage with us on a convenience level.



Originally, our approach was very much Waterfall and some segments of the business still use it, but the digital space uses a far more iterative approach. We're getting drops of code or software monthly; we've taken the approach globally that it's not okay to wait six months for something that's 100 per cent to complete because it's probably not going to be. So it's about providing small, bite-size functionality or features on a more routine, predictable basis – monthly – that we can keep building upon.

How we test and pilot also needs to shift in line with the design. We have multiple labs set up – testing, development, the whole kit and caboodle – and we go through each of those phases quickly because we know what our requirements are and what we're testing against. We can move through the testing cycle quickly because we know what the requirements are. We pilot in market, do a test in a restaurant, and then we extend the pilots to build confidence.

It's one thing to have it working in the lab, but it's another thing to have it working in a restaurant because it's a different environment and we need that confidence of it being in a restaurant and stable for a period of time before we start talking about mass deployment across the country.

Our CEO since 2014 has used the mantra of progress over perfection – let's do the things that we can do quickly to get them into the hands of our customers and crew, and improve it over time. It doesn't work for everything because there's security and compliance that must be kept front of mind when it comes to any sort of technology, which is incredibly important. Whereas testing and QA in the past has always been a segmented piece on your roadmap; delivery would be a particular day, so there would be a testing phase, followed by QA, the pilot would begin and so on. Now it's an ongoing conversation that never stops; it's a by-product of what we do day-to-day.



Technology within the McDonald's world isn't necessarily the same as that found elsewhere.

It's also important to understand that technology within the McDonald's world isn't necessarily the same as that found elsewhere. Our first function is to be a strategic enabler of the business. If Marketing wants to do a promotional activity, we have to enable that. If Operations need the screens around the restaurant to show something in a particular way, that's our first job. We are trying to enable the business plan we've set out for the next 18 months, and then there

are times when an idea comes up and there are challenges around how we bring it to life, particularly now that there are multiple customer facing platforms to consider. It's a hard world to live in.

Keeping all that data and analytics secure

As far as the analytics go, we have all the obvious hooks that you would expect in our customer-facing platforms to be able to feed into an Adobe platform and see the customer journey – what people are clicking on, their path from order to delivery and whether there are any friction points within that journey. Our Digital and Insights team interrogate that data and information, and that forms the basis of how we construct our menu on the customer facing platforms so it has the least amount of friction possible.

From a customer perspective, we take data privacy and security very seriously, which includes compliance with Payment Card Industry Data Security Standard (PCIDSS). At the core of this is ensuring we are keeping our customers' data and card information secure. When we talk about the security of our platforms, including security penetration testing of any new platform, we're talking end-to-end

validation for PCI reasons and ensuring we aren't storing customer information in plain text and are complying with everything else that is required.



We're not in this space to play a risky game – we have to be really, really careful.

We have global teams that set very clear processing guidelines as to how we adhere to this security and compliance, and we follow all requirements. It's pertinent that we comply fully given the complex nature of a business of our scale.

We have some great partners and suppliers that work with us to ensure our systems are secure, that we have the right hardware, and the right architecture from a network segmentation perspective. At the end of the day, we're a burger company, not a security company – but it's our responsibility and we have the right partners to allow us to ensure the security of every single customer.

Sector Analysis: Energy, utilities, mining and chemicals

Digital value chain automation – safe, secure and compliant



Jan Lindhaus

Vice - President | Head of Sector EUC,
Capgemini Australia and New Zealand

Energy and utilities

The Australian energy industry is transitioning from fossil fuels to renewables. This change in the energy generation mix is increasing the complexity in the management of energy supply, requiring new technologies to monitor, automate and analyse the large amount of data being gathered as well as an improvement in technology to ensure a continuous energy supply to customers.

The integration of information is becoming a key focus in this market in order to manage the complex network of energy resources, energy players and government requirements. Traditional players are realigning their businesses to stay relevant. New market entrants are arriving with cheaper Agile

operations forcing traditional energy players to rethink their business models.

With increasing renewable targets, cheaper renewable technologies and new players entering the mix, the transition is well under way and will continue to evolve over the next five to ten years. The use of digital technologies and methodologies to assist is a key part of the success of this transition.

Mining

The mining sector is in recovery mode, thanks to the



long-expected uptick of the commodity market. There is increased investment in capital projects and in mergers and acquisitions. Mining companies had to learn the hard way that they cannot rely on steady global market growth that fuels ever-increasing commodity prices. While the focus was always on low-cost operational excellence, the profits were mostly earned from trading rather than driving cost out of operations on the ground.

As a result, companies now face the challenge of truly transforming their value chain by leveraging digital technologies, automation and Artificial Intelligence (AI). They also need to increase flexibility in their business models and develop clear plans on how to react to the inevitable market downturn. It is important to develop strategies that can attract and retain a skilled and diverse workforce, while addressing the markets and communities' expectations for sustainable products and operations.

Key areas of technology assisting clients

Our asset-heavy clients have embarked on a digital transformation journey with varying degrees of progress and success. The key focus areas are in : improving customer focus; achieving excellence in operational performance; and developing new business models to remain relevant and increase market share.

Safety for employees, customers and community is very important, as is regulatory compliance – in far more dynamic local and global markets.

Despite each customer setting their individual strategic priorities and transformational delivery roadmap, there are common challenges in turning their ambitions into reality:

1. The existing core operations system landscape is often outdated and inflexible. The business criticality of this core limits the ability to leverage high-speed methods and tools such as Agile and DevOps.
2. The “digital hype” has led to a colourful set of new tools that – while enabling new capabilities and supporting strategic ambitions with excellent time-to-market and at reasonable cost – are only loosely integrated and not well governed. The low hanging fruit having been harvested, achieving step changes in operational excellence requires far deeper – and more costly - transformational projects.
3. Robotics automation tools are spreading across the landscape, achieving immediate benefits and freeing up valuable resource capacity. But often they are also poorly governed, leading to inefficiencies and significant re-work if the supported processes or underlying system landscape changes.

4. Safety, security and regulatory compliance requirements are business critical. These are evolving far more dynamically than in the past (such as the Security of Critical Infrastructure Act, new licence conditions for network operators, and the Victorian Default Offer (VDO) for energy prices), and often require significant time and effort for validation and Quality Assurance (QA) when related processes or systems are changing.

All of the above leads to fundamentally changing requirements towards a supporting QA function. QA needs to move away from a technology and application product/module focused service and become an end-to-end assurance partner with deep understanding of business processes and outcomes. Smart QA needs to cover integrated ecosystems supported by cognitive and analytical capabilities along end-to-end business value chains with high speed, agility and robustness.

Customers are broadening the use of Agile and DevOps to find solutions. A theme gaining in popularity is new ways of working (NWW), which looks beyond Agile project delivery for a discrete capability. Essentially, entire business units are being challenged to develop new ways of working, looking at empowerment, speed and productivity. NWW envisages new engagement models of employees working with customers, partners, regulators and policy makers in much closer collaboration.

The rapid increase in the use of open application programming interfaces (APIs) has created many opportunities in testing services related to security and robustness of these. However, finding the right talent for such roles – a workforce equally skilled in integration functions and testing – will be a challenge. The search for skilled workers is tougher in engineering-heavy companies in Power Generation, Network Operations, Mining and Chemical Manufacturing. Testing industry applications requires test professionals who have respective expertise and understand the business.

Conclusion: QA needs to be tightly integrated in the transformational journey of asset-heavy organisations. It has to be seen as a value-adding partner and enabler – and not as a burden to progress and innovation. The dynamic evolution of highly integrated, specialised and automated ecosystems requires a Smart QA that understands the specific industry requirements, end-to-end processes and outcomes of customers, combined with expertise and experience in standard and specialised software solutions and tools. Collaboration with service providers requires deeper trust and willingness of the provider to manage risk in a true partnership.



Living in the future

Uthkusa Gamanayake
Test Capability Manager
AGL

AGL is a utility provider (gas and electricity). It is a leading integrated energy business that has been operating for more than 180 years and has a proud heritage of innovation. AGL is an active participant in gas and electricity wholesale markets with 3.7 million customer accounts, including residential, small and large business and wholesale customers.

We operate Australia's largest private electricity generation portfolio, with a total capacity of 10,413MW, accounting for about 20 per cent of the total generation capacity within Australia's national electricity market.

Customer experience drives everything we do at AGL. Quality Assurance (QA) plays a key role. We encourage innovation and ask our employees to think differently. This brings a competitive advantage. We take calculated risks as long as the results are rewarding for our customers. We find ways to try to implement new technologies as quickly as possible and we are the first to implement many innovative technologies in Australia. We are an organisation living in the future.

The changing role of testers

With the digital transformation of AGL, testing has changed from a centralised function to a distributed service to support an Agile way of working. Testers are part of scrum teams. This helps them to work closely with developers and provides opportunities to take on development tasks in addition to testing. The QA responsibility has moved from the quality assurance team to the scrum teams. This is a cultural and mindset shift.



Testing has been changed from a centralised function to a distributed service to support an Agile way of working.

There is a trend in the market where some organisations don't recruit testers anymore. They are looking for test developers.

This interplay of roles is critical for successfully transforming from a Waterfall to an Agile way of working. Not only for developers and testers, but also for other roles as well. There are many tools that can help this shift. Test automation tools and frameworks are a key contributor. In general, all CI/CD-related tools can help.

In relation to processes, Agile has many flavours. Organisations have their own customised versions of Agile practices. This is where things can go wrong. If not done

properly, the framework won't support the interplay of roles, resulting in Waterfall running under an Agile banner.

Automation and transformation go hand-in-hand

We can't talk about testing without automation. AGL's test automation improved and matured with digital transformation. Certain areas in the organisation are more mature than others but overall, the organisation has made good progress.

Test automation was initially considered as an "additional task" or something nice to have. It has now become part of the delivery. This is another cultural shift. Individual teams within an organisation will use their own automation tools and frameworks that best suit their requirements and platforms. There is no single solution or framework that will work for the entire organisation. We should not be trying to standardise test automation. It can slow down delivery.



Artificial intelligence is the future of test automation.



The automation industry is rapidly changing. New tools with better features are coming to the market. In my view Artificial Intelligence (AI) is the future of test automation. AI will replace some testing roles in the future. Vendors that use AI technology in their tools will dominate the future. AI can and will also play a big role in data mining/creation in the future. This will be a subset of AI's overall involvement in QA in the future.

How service virtualisation fits in

Every organisation faces test environment challenges. They have an impact on speed and quality, as teams may decide to cut corners to overcome environment issues – that is, issues related to environment availability, environment stability, and data.

One solution organisations are adopting is to move test environments into Cloud. This can help as we can develop an automated solution to spin-up environments on demand and then shut them down when not in use to save running cost. At AGL, we have made good progress in this direction.

We also need to upskill scrum teams to prevent or detect and fix minor environment issues rather than having

an “environment support team” to fix them. Service virtualisation is another solution for integration issues.

“ *Service virtualisation is another solution for integration issues.* ”

It is very useful in unit and system testing, especially when testing with third parties. There are testing tools such as Tosca coming with test automation and service virtualisation capabilities.

Of course, data and privacy policies amplify challenges in building and maintaining test environments. Many organisations hold sensitive customer information and have strict guidelines on how to use that data for testing purposes. You don't want to mess around with this.

There are a few solutions. Sensitive data masking is one solution. The second option is to create new data instead of using existing data in test environments. Data creation can be automated by test engineers — an automated test script is creating data and running tests using that data. This is where the industry is going.



Protecting data privacy

A good practice is to avoid the use of production data in test environments. Worst case, sensitive and personal data must be masked to protect privacy. Basically, we need to scramble personal information so that the individuals can no longer be identified.

It is also important to block test environments from the outside world where possible, especially in the Cloud.

The role the Internet of Things plays

We are using machine learning to improve customer support and enhance customer experience. AI-backed platforms are answering common customer questions and providing basic support. In this way, customers don't need to wait in a queue to talk to a customer support person.

The Internet of Things (IoT) is a broader concept. Many organisations are using IoT in some form. AGL, as a utility provider, needs to collect large amounts of data from meters at its customers' premises, and get it transferred and processed quickly and accurately. IoT devices play a major role in this process. Multiple utility industry-specific tools are being used to monitor and support the entire process.

What the market needs

We still need better test automation tools. The majority of the tools in digital testing are open-source. We don't know the future of these tools. On the other hand, off the shelf tools have limited capability and are expensive.

Implementation of these tools can take time and involve costly infrastructure. We need solid, lightweight tools.

Lack of skills in new technologies and tools will be an issue in the future. The testing world is changing rapidly. It will be difficult for the testing community to stay up to date with this rapid development.

There is also another gap in the market. There are many people who can test and provide results, but it is hard to find people who have a vision and can implement it.

Changing QA team structure

The Agile way of delivering autonomy to teams will change the testing world. Testing is part of overall QA. Execution and management will be distributed to teams, and the entire team will be responsible for quality. The role of the tester will move left, with potential development tasks. The developer role will move right, with test automation tasks. We will see more test developer vacancies in the future.

As for the role of head of testing, it will still exist. It won't go away, but its function will change. This role will have broader QA responsibilities. The head of QA role does exist in some organisations. I think the responsibilities are still limited to testing practices.

The role of testers is changing and new technologies like AI will improve QA as they come on board. AGL is committed to maintaining its forward looking outlook and its leadership role on this issue.



Control over data is imperative

David Hayman

Chair, Australia and New Zealand Testing Board (ANZTB)
& Test Practice Manager, Genesis

ASX-listed Genesis Energy is an energy retailer and generator, and also has an interest in the Kupe oil and gas field. It is New Zealand's largest electricity and gas retailer, connecting over 650,000 customers. It also owns and operates a portfolio of thermal generation and renewable generation assets located in different parts of New Zealand.

Data Quality and testing

We have a lot of contention for environments. We have a lot of contention for data, especially test data that's come from the production side, and been obfuscated. The issue we have is that each squad/project has a development environment in which they do some basic testing. The main function, integration and the main UAT environments are shared across all the projects. There are often clashes, there are often people changing data or configurations or tables. Somebody else then tries to put their software in, and build it locally. Then they connect up to the database and it doesn't work. This same problem goes around and around and has impacts on delivery quality and speed.



To address this problem the Test Chapter has put forward a five-layer proposal to build independent environments, that are controlled by the squads. They can upload them. They can stand them up, take them down as and when they want. There will be subsets of core data, and then there will be data that they can add for their own specific tests, or their own products. They manage that on a local basis, until they get to the point of deployment. Then that will be pushed into a staging environment where all the usual release and implementation controls are in place. We move into production with a stable and known deliverable.

This will give us a controlled production environment, a controlled staging that looks like production, and then half a dozen or so scratch-pad areas, where the teams can do their own thing.

Obviously, it's an investment. Supporting all that will have to be an automation framework including automated builds, automated releases, and automated testing.



The goal is to speed up the ability of the squads to deliver, and to give them greater confidence in the quality of what they're delivering.

It's a topic that's very dear to my heart. Developers, scrum masters, BAs and testers all raised issues at the workshop. The generic theme was the clash of environments, the lack of integrity, or perceived integrity of the test data. So those are the two massive changes that are the core focus of the Test Chapter improvement approach at the moment.

As for automation around artificial intelligence, for Genesis at the moment the jury is out. Our current AI constitutes a chat bot and some Robotic Process Automation (RPA) to automatically answer emails. This may change in the future.



The key issue is that data bias can be introduced when you manipulate your data, and that bias generates an answer, or generates a calculation, or a range of calculations, that may or may not be as accurate as you want.

From a Genesis Energy perspective, we're not a long way into the process of AI. The chatbot was deployed, but we quickly

realised it wasn't doing what we wanted. So we've pulled it and we've rewritten it. The robotic process automation is in proof of concept, so my theory about automating AI tests, has yet to be proven or disproven. We've recently looked at a UI tool that captures a screenshot and creates a baseline, and every time you run an automated test, it automatically compares the current screen with the baseline screen and then highlights any differences. It is very much focused on the UI/UX. However, the focus that our business wants is to ensure the products look good, are consistent, that we capture data which is valid, and then that the data we use is relevant.

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Lessons from Automation

When I first joined Genesis, we had a team that did test automation. That team was part of the Test Chapter. These days the automation the Test Chapter does is completely across the board. It does automation for bills, deployments,

testing, automated acceptance, automated monitoring — pretty much everything in the development process — and is now moving into automated operational support functions such as the monthly server patching process. We've actually got the ability to head to a full CI/CD solution. We use open-source tools — giving advice or guidance about the best tool to use is probably a road that most people don't want to go down. The right tool is the tool that you need to do the job. Sometimes they are more UI-focused, sometimes they are more AI-focused, sometimes they are more desktop-focused. As a result, with respect to the actual tools themselves, I'm not going to go into it because I don't think it's a value-add and can often be misleading.

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One of the learnings that's become apparent with the automation of testing — though it applies equally to other automations — is that automating every test is neither an edifying nor value-added activity.

But actually, it doesn't generate any value. The great thing is that sanity appears to have overtaken the market so that now we automate what's valuable as opposed to automating



a process because it's a challenge, or because we can, or we want to, or because it looks good on a CV. The automation journey, though not complete, has reached a level of maturity where sanity prevails. So that is at least a good thing.

Product intent testing

I have been thinking that we're going to need another phase in the testing process – perhaps an acceptance process, or similar. At the moment we do component testing – we can automate that. We do functional testing – we can automate that. We do system integration testing – we can automate that. We have UAT – we can automate some of that, though obviously it requires a lot more business input.

When you have a situation where the expected results from AI tests are changing all the time, there is no hard and fast expected result. The result might get closer. As long as the function delivers the intent of the requirement, of the use case, or the story, then that's close enough. But with an automated script, that doesn't work. You can't have 'close enough'.

So I believe there's an extra step, or an extra phase, I call Product Intent Testing [PIT]. This should be applied once we've run the functional tests. What we are investigating is 'Has the intent that you were trying to achieve from a particular story, been provided'? That requires human input – decision-making, basically. That becomes your interim acceptance point where you can say, 'Yes, that's meeting the intent. Now let's move on with the system integration. Let's move on with the UAT'. Because we know, now, that as long as that result remains in this range, then that's good enough.

Whether that's how things are going to evolve or not, I do not know. But that's just my view of how we may have to handle the decision-making around signing off a system, or signing off a patch, or signing off an upgrade. To say, yes, there has been product intent acceptance as well as user acceptance.

The user acceptance remains the same – it's 'can I do my job'? The product intent acceptance says that what we're going to give the people to do their job, meets the intent of the requirement that we started out with.



Keeping the water flowing

Ian Robinson
CIO
WaterNSW

WaterNSW is the operator of large dams within New South Wales in two main areas. In the metropolitan area, the organisation feeds the Sydney Water Distribution Network and provides the large storage and major pipeline into the treatment plants. In rural areas, it manages rivers and provides bulk storage and delivery for local water utilities and irrigation companies. The majority of its 50,000 customers in the country are irrigation customers.

WaterNSW also provides groundwater licensing, and borehole monitoring, and other water monitoring services. It also runs a large hydrometric network and monitors the health of the river and the flows. This includes the Murray-Darling Basin, which is a Federally - administered policy.

Our revenue is regulated. We operate like any other utility – we are effectively a State-owned corporation. It is a highly politicised environment because of the passion stakeholders have for it. New South Wales is in severe drought and a lot of the focus is currently on both managing the water on hand and on building infrastructure to enable us to squeeze the lemon as tight as possible and get as much as possible out of it. That includes new pipelines and temporary dams. For example, Tamworth will run out of water in about nine months. It is a town of 60,000 people – you can't cart water to that. We have to respond and get immediate drought relief solutions for those people.

WaterNSW is both a long-term infrastructure, large-asset organisation, and a responsive operational organisation. Our IT is similarly two-paced. From a Quality Assurance (QA) point of view, there are two main areas of focus.

First, we have just implemented Microsoft Dynamics 365 as our Software-as-a-Service Cloud enterprise resource planning (ERP) solution. This has been a three-year project, and it went live in April. The last six months involved testing and refining the solution.



The quality assurance process not only included the testing but also development of the work instructions.

Our focus was on QA, specifically around mapping the original requirements to the final outcome. And, of course, trying to tune the solution, improve customisations and ensure the business process could work. In effect, the QA process not only included the testing but also development of the work instructions to help people run the new system, along with the training and change management associated with that.

Power of the microservices model

The other area is microservices. We are doing work in the analytics space, where we are using Azure as a data lake to store data from a myriad of systems, and then run microservices using Kubernetes containers to present that information in a way that it can be used, often in a dashboard.

An example is our dam safety program, where staff in the field take measurements at a dam. They look at pressure levels or various other on-site monitoring tools, some of



which are not telemetered. Those that are not have to be captured on our mobile application, which feeds into the data lake, and then joins up with data that is telemetered from a range of monitoring sites. We then combine that with drone information that looks at LIDAR (remote sensing) measurements of cracks in the wall to see if there's any widening of microscopic cracks that could indicate the dam is under stress.

Next, we produce a set of microservices capabilities for the dam engineers that can analyse the health of that dam, looking at various engineering components of that. The testing of that is done using an Agile model rather than as a big-bang ERP-type project. This improved our delivery to a six-weekly release cycle, including testing by the business engineers. They are involved in defining the analytical parameters on a continuous basis by checking that they have been completed, ensuring that data sources are confirmed, and validating the quality of the incoming data.

Our automated testing tool with the Dynamics 365 (D-365) solution is Azure DevOps, which comes with a scripting tool allowing us to run and capture a test manually, and then rerun it for later regression testing. Having implemented that, within a month of our first release, we then did a major upgrade of the full point version of the D-365 solution and regression-tested it automatically.

A separate testing tool, Tosca, is running tests for other applications on a case-by-case basis. We are just starting the journey of capturing the scripts for some of those other applications, for instance, our more bespoke legacy systems. When we change, we plan for large regression testing cycles. This allows the business to focus on the new functionality rather than working out what we have broken.

Why data was a massive issue

There were significant challenges around data within the implementation of Dynamics 365. In an ERP project, when you're bringing multiple best of breed solutions into one single integrated solution, data is a massive issue. For example, the asset guys wanted to completely change our asset hierarchy. So they rebuilt their entire data view and restructured the relationships between the components in our big assets. That meant we were open to all sorts of problems with reconstructing that data. It wasn't just a straight migration.



In an ERP project, when you're bringing multiple best of breed solutions into one single integrated solution, data is a massive issue.

But in finance – and this is where the data problem becomes most evident – you need to envisage up front all the different scenarios that a finance practitioner will deal with and then create synthetic data for a test environment. Alternately, you need to bring the whole data set across and then test it with all the types of transactions that are in there.

We chose the latter with the ERP project and had all sorts of problems converting the data. The way that Microsoft posted things was different from our previous finance system, and therefore the state of the transaction was very different from one system to another. And that meant all sorts of rectifications had to be done on the data in order to run a process.

We couldn't just start a greenfield environment and say, "Right, I'm just going to pretend we've never done a transaction with anyone before, then open up a new set of vendors and run our purchase orders through them. We were living with in-flight data. That allows you to ensure you think about all the functionality the data drives. Data and testing are intimately linked, so doing a good job on data means testing can flow.



For example, there are exception conditions that we had not considered when developing the system requirements. Vendors do not always give us the things we want. We don't invoice against one project, we invoice against multiple projects. Unless you are good at scenario analysis, you only learn these things when you try to convert a massive system into a new massive system. If you're building a greenfield environment it's much easier. You can do it bit by bit. You can analyse, you can build functionality. You often don't have that luxury in an ERP system.

Ultimately though, the business has to take accountability for the data. They are the only people who know it, who understand the relationships. It's a big imposition on them. The software practitioners can help with how to structure it in the new system, how to load and validate it. They can automate the comparison of previous and new data, and that can be very helpful. But, ultimately, fixing the data is hard work. I question whether a QA process that's based on synthetic data for an ERP-style system would be successful. It would probably help you get to a point, but then you need the real data to actually confirm it.

Managing quality assurance on IoT devices

Do we use Internet of Things (IoT) applications to monitor water levels? It depends on your definition of IoT. In the broadest definition, absolutely, because the sites are remote access, the telecommunications network obviously provides the data back into a telemetry system, which then puts it into a data lake or other system.

However, we have a project that aims to make those external sites and monitoring locations more lightweight and standardised by using low-cost, low-power componentry, leveraging communications networks like NB-IOT or other lighter-weight communications networks. It's a transition from a traditional telemetered heavy-cost environment,

where each monitoring station costs tens of thousands of dollars, to something that costs hundreds of dollars. That's a shift.



We would like more computing power on the edge and lightweight protocols passing data back.

We would like more computing power on the edge and lightweight protocols passing data back. A lot of the data we capture is real-time, 15-minute interval or measurement points, which come back and are put in a time-series database and then analysed. You are looking for anomalies, trends or exception points that you can map and present to an engineer.

Standing up environments for IoT is about establishing the key use cases, testing on a small sample of external devices and then standardising on the configuration and mapping, so there is a simple approach possible for each additional device that is installed and registered on the system for data capture and visualisation.

As for managing the QA on these IoT devices and on the data being generated, there is usually a downstream process from the SME that manages those devices, and which checks whether they are in calibration. There is a team that manages the calibration.

In our environment, hydrometrics is a discipline for which there are trained water-monitoring staff who take the data when it arrives at the telemetry system, analyse it, and ensure it is within valid limits. If it isn't, they go out to the site and fix the gauging station. That's a constant activity. If they find that the data is incorrect, they pull it out of the data lake and fix or remove it, and make it a non-value.

A decorative graphic on the left side of the page features several interlocking gears in shades of blue and teal. One gear prominently displays a smartphone icon with a dollar sign on its screen. The gears are set against a dark purple background. To the right of the gears, a large, abstract shape composed of many overlapping triangles in various shades of blue, teal, and red is visible. At the bottom of this graphic, a series of small, colorful dots (blue, teal, red) are arranged in a curved, dotted line.

Sector Analysis: Financial Services

Happiness, trust and compliance driving the future of quality assurance

Sudhir Pai

Chief Technology and Innovation Officer,
Capgemini Financial Services

Our day-to-day interactions with clients, partners, analysts, universities and startups highlight that we are at the cusp of a 'new wave' of transformation, driven dually by business model innovation at one end, and by technological disruption at the other. This is especially true for financial services organisations. While technology trends such as digitisation and automation of QA continue to expand, we are now witnessing coming up of several customer and employee focused themes – convergence of finance and lifestyle, building trust and happiness with customers, and new ways of working – that power these trends. Organisations are thus beginning to look at specific

technology trends in the light of the larger, more holistic shifts in customer and employee expectations.

Digitisation is right up there in the agenda of all financial services providers – irrespective of their size. However, the objective behind it is no more to merely provide a digital experience to customers. For these organisations, digitisation is a means to improve agility – a chance at simplifying their internal operations, either by hollowing out the core of by replacing it altogether. The ability for financial institutions to react quickly to market changes to launch new products and services is of paramount importance – QA

in the current age must be able to support this need. Smart QA solutions integrating end-to-end ecosystems powered by cognitive and analytical capabilities are vital – banks and insurers are flocking to service providers who can offer such comprehensive solutions.

DevOps (and now DataOps) is a key contributor to agility within organisations. Forrester called 2018 the year of Enterprise DevOps – and rightly so. It seems the trend is here to stay. Large number of financial services organisations are taking up measures to roll out DevOps to their entire enterprise. We foresee this to add to the change management challenges that these organisations currently face. Yet another challenge is the accurate measurement of progress – companies might struggle to find the right metric to determine if their efforts are bearing fruit. This is extremely important. For example, a marked improvement in deployment speed at the cost of quality cannot be considered as progress.



“There are gaps in automation that need to be addressed before it can go full scale.”

Automation levels continue to rise in the Financial Services industry – so is the use of AI (especially NLP and ML) in testing. This enables organisations to put in place an effective continuous testing environment requiring extensive collaboration between teams and ensuring immediate feedback on any threats, thus reducing business risks and providing quicker resolution of defects. While the adoption of continuous testing is increasing, there are gaps in automation that needs to be addressed before it can go full scale. Our Continuous Testing report shows that the next 2-3 years is a critical time period for continuous testing – with increased automation in test data management and use of model-based testing (MBT) for auto-generation of test cases, adoption is all set to boom.



“Financial services is a particularly difficult industry as far as quality assurance is concerned.”

Financial services is a particularly difficult industry as far as QA is concerned. The sheer complexity brought in by a multitude of customer channels combined with the need to comply with a host of regulations makes it extremely tricky to navigate. Customers expect industry players to meet the experience provided by tech giants such as Google, while regulators expect them to meet the regulatory compliance levels similar to the healthcare industry. Banks and insurers are stretching the concepts of Agile and DevOps to find solutions – one particular theme in this direction is New Ways of Working - this new trend is gaining popularity, and its beyond just Agile project delivery. Entire organisations are being restructured around new ways of working, with a focus on empowerment, speed and productivity. This envisages new engagement models working with customers, partners in squad structure demanding much greater collaboration.

Open banking has heralded a new age of QA for banks. The rapid increase in the use of open APIs has created a multitude of opportunities in testing services related to security and robustness of APIs. With regulators across the globe taking up open banking initiatives, there is a possibility for open banking QA to develop as a niche domain requiring niche skills. Industry will foresee a challenge in finding the right talent for such roles – a workforce equally skilled in integration functions and testing. With PSD2 and GDPR already in place, Europe is set to drive this trend – US and Asia are playing catch-up. This issue is even more aggravated for insurers. Testing insurance applications requires test professionals who have insurance expertise and understand the business – this has always remained a challenge.

In summary, access to vast amounts of data (internal and external), a new world of high speed connectivity and massive storage, compute power will lead to developing ecosystem led innovative offerings for customers, keeping in mind customer’s experience & happiness. Most of the traditional organisations are adopting Agile ways of working while building strong foundation for engineering skills. Quality assurance in these contexts is going to play a vital role in providing a competitive advantage for organisations through trust, agility and speed.





How regional privacy policies add complexity to QA

Nathalie Turgeon

Head of Project Delivery

AXA Shared Services Centre (Manila, Philippines)

AXA, a global insurance company headquartered in France, has been trading for more than 200 years, having been founded in 1816 as Mutuelle de L'assurance contre L'incendie (the Ancienne Mutuelle). It has about 180 global centres around the world and recorded revenues of €102.9 billion last year.

Regionalisation adds to complexity

AXA has a global footprint across 180 global centres and the Philippines is the epicentre for the Asian markets managing multiple regional applications for the region. We have a number of QA policies and procedures in place to manage data privacy. We are responsible for any customer data that resides within those regional applications so we have data privacy, and we have Quality Assurance (QA) built around that.



The added layer of complexity is that those are for regional applications. However, we have also had to learn to clearly understand and work with the different entities such as Thailand, for instance. Obviously, when it comes to customer data worldwide, most countries have some sort of data privacy legislation — some more than others.

We had to learn and understand all of those different legislations relating to customer data. We have to bring each local country's data privacy frameworks, or procedures and policies, and align those with our regional applications. It's quite complex, because we might have more stringent policies and procedures from a regional perspective than a local one might have.

It is important we have the right QA framework, but that's a framework – that's a guideline for us to use. What we then have to do is align with the different regions and, sometimes, we have to get them to all align to a certain direction in terms of customer data. That is an added layer of complexity.

When you have just one country, such as Australia, for instance, it is pretty straightforward. The customer data privacy laws are clear cut, they apply to everyone, and that is the end of the story. Everybody can apply them. We have added layers of complexity given the number of entities that we deal with.

With customer data, particularly where you have multiple layers and multiple entities, you need to have tight security measures in place, and it's not just that you need to have it from a regional perspective.



With customer data, particularly where you have multiple layers and multiple entities, you need to have tight security measures in place – it's not just that you need to have it from a regional perspective.

Obviously, we have a strong security team here from the regional application side of things. And because we also serve so many other countries, we obviously need to ensure they equally have the same level of security in place. And that's more than just the QA.

It is about having very tight controls in place. Given the speed at which things are moving now it's an ongoing challenge to obviously stay on top of that and make sure that there are no breaches. Are we 100 per cent foolproof? Maybe not. Do

we know where our gaps are? Yes. Do we have a plan, a very strong plan, to close those gaps? Yes.

Digital vs Legacy

The skills required in the quality assurance team are changing, both from a digital and legacy perspective. You need different skillsets than obviously what you would need for a framework you would use for digital, and also in the way you would apply it.

“ *Because digital is faster, it’s newer, it’s changing every day. Therefore, we probably don’t need as much. When you look at QA, that’s not the intent of QA.* ”

We tend to be heavily focused on the legacy side. What happens today is that there’s an assumption that we need more QA on the legacy side because there are a lot more issues there — the technology is older, therefore it requires a much more rigid framework and more focus. Because digital is faster, it’s newer, it’s changing every day. Therefore, we

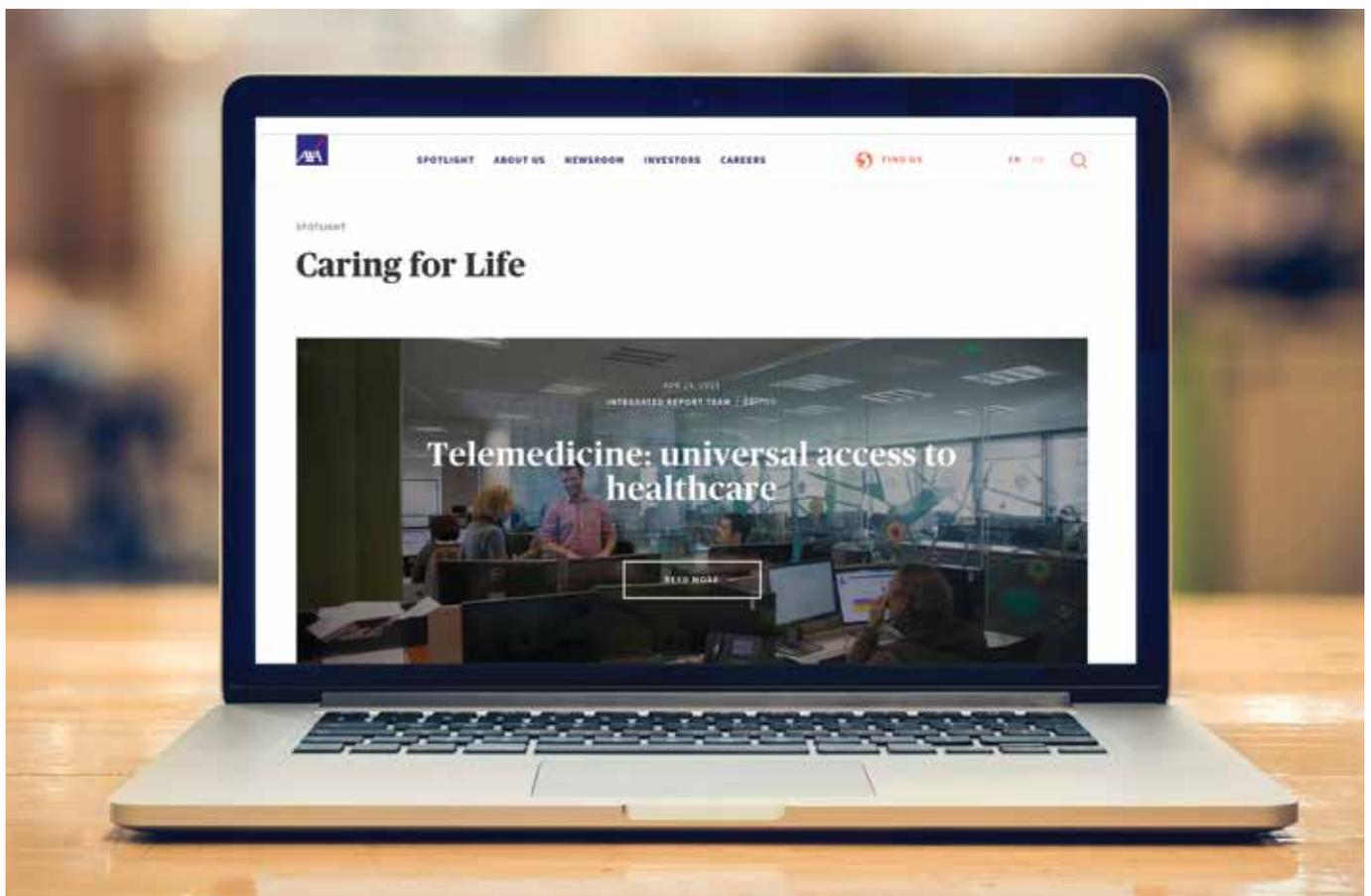
probably don’t need as much. When you look at QA, that’s not the intent of QA. It’s not there for you to assess where and how you need it. It is something that you should apply regardless of your methodology and you need to find a way to have the right skillsets and approach to apply that.

Breaking the bottlenecks

It is getting harder for us. From a digital perspective we are able to implement a lot faster and in an Agile way. And we have that in place here. What that means though is that you still have predominantly a lot of legacy that sits around that. It is very difficult to manage QA effectively. And, again, in a flexible and Agile way, given the speed at which we operate on the digital side.

“ *From a digital perspective we’re able to implement a lot faster and in an Agile way. And we have that in place here.* ”

So we are often seeing that we are trying to impose, for instance, legacy processes or procedures on the digital side



of things, thinking that it's a good QA practice. But in actual fact, it doesn't fit. It's not delivering us the QA that we need because we haven't amended it to fit the Agile methodology, if you like. That's a real challenge — not just for AXA, but for a lot of organisations. So we tend to think of QA more in terms of the legacy side of things rather than how do we automate it so that we can provide the right framework to fit both. Or do you actually need two frameworks? We tend to think that we only should have one framework which will cover everything. So then the next question is, do we actually need two frameworks to help us understand and ensure the quality?

New KPIs

If I look at what we put out in terms of our digital products and applications, indirectly we're measuring the quality based on the customer experience. It's real-time. Whereas we don't, in a lot of instances, get real-time in legacy. Therefore, our KPIs are all in hindsight.



In terms of our digital products and applications, indirectly we're measuring the quality based on the customer experience. It's real-time. Whereas we don't, in a lot of instances, get real-time in legacy. Therefore, our KPIs are all in hindsight.

Currently, I wouldn't say that we've integrated, in terms of QA, for digital. It's still very much geared towards legacy. And so we're working through what does that need to be. Obviously, we are looking at the marketplace to try and find how other insurance companies have integrated that.

Then the tools come into it. And certainly from an Asian markets perspective, I would say that we're at the lower end

of the scale in terms of maturity for QA. At the moment, it's done across various areas rather than having a proper overarching QA framework. And so we're building that out and taking into account bringing legacy and digital together.

Three key partner qualities

The first thing that jumps to mind is thought leadership. If you look at our business, we're insurance people. If I get a vendor, I want some thought leadership put on the table in terms of the market and what's happening on a global perspective – not just a local perspective. That's really important.

While we have strategies and roadmaps, these sometimes can be very inward looking. I look for some thought leadership from partners with whom I work, along with skills and capability from a global perspective.

Trust is important. If I partner with somebody, it starts from a trust basis. I just assume that from the outset. The relationship has to be on an equal basis. I've worked in many companies where their vendors are not engaged on an equal footing, and the vendors tend to have a lot of global experience and exposure to the marketplace – a lot more than we would internally. And we quite often do not give them enough air time to help us with our direction and our strategy. So a partnership on equal footing is really important.

We limit ourselves in the way that we use vendors in terms of what we want them to do, for instance with a specific scope of work. What I'm saying is that, within this scope of work, we often don't get them to help us validate the direction of that scope of work. Given their experience, exposure and skills and capability, we don't often tap enough into them to ask: are we doing this the right way? Would you do it differently? For us to really maximise our vendors, we need to be a more open-minded.



Insuring an Agile future

Jarrod Sawers

Head of Enterprise Delivery
Australia & New Zealand
AIA

AIA Australia is one of Australia's leading life insurers. It is part of the AIA Group, which is the largest independent, publicly-listed, pan-Asian life insurance group. It also offers health insurance through the myOwn brand and AIA Vitality, an award-winning health and wellness proposition.

We are all about making a positive difference in people's lives. Whenever we make promises to our customers, we need to live up to and fulfil them when the moment comes. When somebody wants to buy one of our products, when they engage with us, they must get the outcome they expect. When they make a claim with us, we must have a seamless claim service and make it as easy as possible to pay out the claims that we should.

When we bring that back into what our delivery teams are responsible for, testing becomes a critical part. The ability for us to develop market-leading product or service propositions, and then be able to build them and, importantly, have them operate in the way we imagine is critical.

“ *We need to have a continuous flow from idea generation through to what the customer experiences.* ”

We need to have a continuous flow from idea generation through to what the customer experiences. As such, testing is something that needs to be considered at the start of that process and managed all the way through.

In practice, from the moment we begin determining what other products and services we need to put to market, it is a collaboration between the people generating ideas – from the marketing, product, operations, customer experience and digital areas. And they all working very closely with the technical areas of the company and particularly the test team.

We embed test managers in the process from the start of all of our delivery, so they are involved early and can design what they need to. It is integrated all the way through.

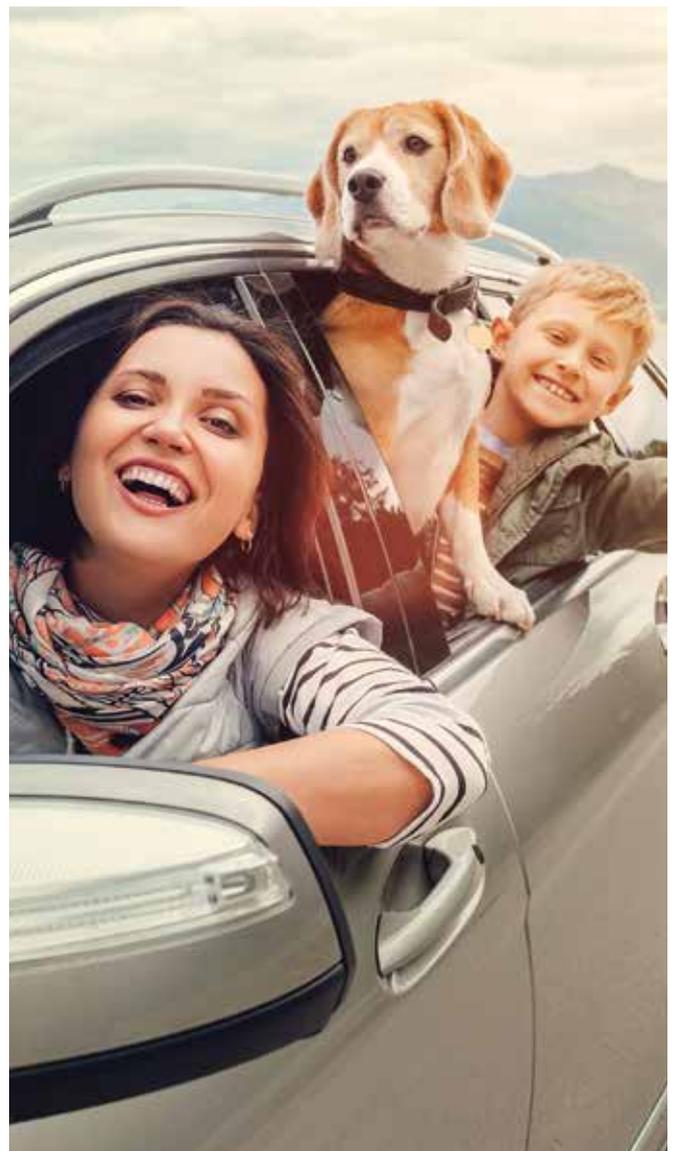
Digital transformation catalyses evolution

The role of Quality Assurance (QA) has evolved in the past five years, and there are a few different parts to that. One part is mindset. If you go back several years across the market, testing was seen as the last thing you did, and it took a long time, and was always done under pressure. Because if anything else went slow, the time to test was always challenged and, potentially, compromised. And that is the wrong idea.

It's very much a mindset shift to say, 'Well, let's think about moving to a more Agile way of working, thinking about testing and QA and assurance of that.' That is the assurance of what that outcome needs to be for the customer from the start of that process.

This, in turn, goes back to the people responsible for designing the part and telling them what they need to build, and what they need to test to prove that it works.

We have also evolved around the need to get to market faster, and to look at things like automation testing, which we committed to several years ago. It's an investment you need to make, so future delivery can be that much more effective. Essentially, you are future-proofing. You fund it at that time, so that in the future other projects reap the benefits.



Speed to market is key in the future

It is vital to recognise that we are spending money now that will benefit us in the future. Neither the need for speed-to-market, nor the focus on customer outcomes is going away. We've improved our speed-to-market and our customer-connectedness, and we've had some good experiences with both.



Speed-to-market and focus on customer outcomes are not things that are going away.

We still have Waterfall projects, some of which derive from customer expectations. This happens when we are dealing with partners that operate that way so we need to operate that way as well. Other customers are comfortable with moving to a more Agile mindset. They understand when dealing with legacy systems that you can operate and work in a more Agile way.



However, it is still about getting something developed and getting it to market, or getting it ready to go to market, and then deploying and releasing different things.

Performance testing is a perfect example. If we find that a solution isn't able to meet our speed or performance requirements, or the client or the end customer needs, then we work to develop one that does.

Developing artificial intelligence answers

We are doing a fair bit of work around artificial intelligence (AI) and automation. Some of our original use cases were more data-driven AIs – analytics and tools that are more predictive for staff. There are situations where the tool is going to supplement somebody's workload.

An example would be when an individual needs to understand a large amount of data to provide one of the first steps of a process. That takes time and it adds value, but it's not where we want the person to spend their time. We want them to spend more time with the claimant.

We've dealt with that situation by using AI to try to understand the data and do that work faster. To do this we analysed past decisions and had the AI to teach itself to come up with the result. We then compared our past decisions with what the AI came up with, and asked if it's correct. Was it what we expected it to be? Initially, that is very much a matching of two sets of data. It's very straightforward testing.

As we move into the future, we'll need to think about ways of applying a similar but faster way of doing that – because you can spend a lot of time validating the AI is operating as expected. We're working through those challenges.



A great part of the AI is around the move from doing quality assurance once to continuous QA.

A great part of the AI is around the move from doing QA once to continuous QA. Think about computing speed, and the power available now compared to just a few years ago, and the speed of these activities. Having that integrated within that decisioning process makes sense. To build it in so that you're constantly getting feedback that, yes, it's operating as expected. Yes, it's giving us the outcomes we're looking for.

The customer experience or customer outcome is much better, because no organisation without AI has one-to-one

QA for all of their operational processes. There is risk in manual processing and human decision-making.

Choosing the right tools to use

The traditional tools model is often, 'Well this is our tool and that's what we use'. One provider is unlikely to be able to provide everything because there are so many different systems and needs that you have from a tooling perspective. It's difficult to imagine one tool that does everything. Even if you just think about performance testing – different tools will give you theoretically the same result, but they may calculate it in different ways.



It's difficult to imagine one tool that does everything.

However, innovation is happening at three levels: customer, tools, and market. I don't know whether it's driven by the clients, service providers or the tool providers, but you need that dynamic tension to be driving innovation.

Ultimately, the more people you have thinking about a problem, the more solutions you get. You may have somebody come to you and say, 'Well, have you thought about doing things a completely different way, or using a tool that gives you more comfort and a better outcome?' There's a potential opportunity for them to add value and say, 'We

understand the challenges you've got, and here's how you could solve that challenge'.

Quality assurance will evolve to meet future needs

QA will continue to exist and evolve. If you go back to what testing was years ago, you can see it has already changed and evolved, and it will continue to do so.

In future, we may focus more on thinking through new risks and challenges, and trying to understand the innovation, and how to protect the outcomes. Whether they be customer, organisational, client, or market outcomes, you need people who are thinking about those new products, markets and services, and how to safeguard them.

It has to be inherently part of the organisational journey to ensure that when we have a new product entering the market, all those things we say it's going to do must actually happen. If it doesn't work, it's very damaging. So how do we know that we're going to get there? The answer needs to be, 'We know, because we have taken the correct steps through the process'.

And somebody can say, 'I know we're doing this properly, it's going to be very valuable throughout the process'. Whether that is a product owner or a test manager, it has to be somebody who can guarantee the QA and give assurance to the quality.

A portrait of Nicki Doble, a woman with shoulder-length brown hair and bangs, wearing a red turtleneck top. She is smiling and looking directly at the camera. The background is a light-colored wall with a large red and white geometric pattern on the right side. A blue curved shape is overlaid on the bottom right of the image, containing the text.

Insuring quality for customer and business

Nicki Doble
Group CIO
Cover-More

Travel insurance company, Cover-More, has been protecting Australians travelling domestically and internationally for 30 years. It provides travel and rental car excess insurance to 18 million travellers worldwide. While it has strong relationships around the world to provide global support for its policyholders, Cover-More's emergency assistance operations are based in Australia.

While historically, Cover-More has operated under different brands and different companies globally, the new strategy will see us come together as one brand and one organisation. The challenge we face over the next 18 months to three years is bringing those organisations together, both from a business perspective and from a technology perspective.

QA competitive advantage

Our travelers, clients, and partners have growing expectations around the ease of access and engagement using digital technology, and we have to meet all of those needs.

For the Quality Assurance (QA) team that means being at the forefront of the organisational and customer changes, and at the forefront of our delivery practices. The team needs to be engaged earlier to design smarter, more effective and efficient ways of building quality into our delivery practices – and ensure we can move at the right speed.

We need to move faster with confidence, and that means leveraging continuous testing and deployment practices at the same time as meeting the quality and security requirements.

This will involve automated releases, along with test-driven development and automated testing to ensure confidence is maintained.

Historically, testing has been either quite manual or it involved a huge suite of automated tests that took a lot of effort to build and maintain, but which didn't always support the value chain of the business.



We need to focus on building only the right automated testing required to instill confidence and surety into our practices.

In future, we need to focus on building only the right automated testing required to instill confidence and surety into our practices. This needs to be a mix of Test Driven

Development (TDD) undertaken by our developers but supported by the QA team, automated performance and functional testing to maintain our minimum standards and create surety. And it all needs to be paired with continuous testing running across our development branches.

The QA team need to be engaged earlier in our technology roadmap and delivery processes to ensure we can meet the demands required. All of this means we need to evolve the role of our QA team members.

Team Transformation

There will be a huge transformation in the QA space in the near- to mid-future and all of it will be driven through customer experience. With the advent of the Internet of Things (IoT) and with more automation around the sphere of customer experience, the need to assure the quality of delivery would be minimal. This is a step above where we are today. It will be driven by the business need to be seen as a differentiated partner in the travel assistance and insurance space.





There will be a huge transformation in the QA space in the near- to mid-future and all of it will be driven through customer experience.

The QA teams are increasingly becoming part of the business and digital space rather than just purely IT. In this digital era, the focus is naturally more on automation and mobile testing.

Co-creation will involve developers and QA teams sitting together without any segmentation. This team, will, in fact, drive most of the “exceptional customer experiences” and include those as deliverables in the future software development life cycles (SDLC).

The need to be responsive to the market and our clients and partners requires us to move at speed in our digital and policy systems. The need for shorter cycle times demands we automate our ability to confirm the quality of our digital builds and client-facing solutions. Without automating our approach to building quality, we would not be able to move at the pace the world and our industry requires.

KPIs

The digital era has redefined the way we expect to view and use QA services within the organisation. A few of the key KPIs within this changing environment will include:

- **Cycle Times:** The current release cycles are very traditional and will not be able to keep pace with the dynamic nature of the business as needs change. Businesses have moved from mainframe infrastructure and Waterfall processes to more Agile ways of practicing release management. Adopting the Continuous Integration and Continuous Delivery (CI/CD) life cycle is critical to being more effective. The QA team need to have input in the assurance mechanism for CI/CD.
- **Value to Business Growth /Transformation:** Capturing customer experiences and feeding this information in to enhance the next cycles is a key measure of success of the business. QA teams play a critical role during the overall application development life cycle to include customer experience improvements as part of the quality measures.
- **Innovation:** QA teams need to be adaptable and to help the organisation take advantage of innovations. We need



to be able to measure how customers are attracted to our sites, the success of product options and the level of personalisation. It is essential to ensure we have the right quality measures in place to take advantage of these innovations.

Security

QA practices also play a key role in helping safeguard our information assets within the organisation. We have a comprehensive process set up to approach application as well as security testing. For example, based on the client applications, we ensure the applications under testing have the means to protect sensitive personal data against unauthorised access. Such accesses across the application landscape are reviewed periodically as well as monitored proactively. Also, QA teams are involved in infrastructure security testing with respect to performance and functionality as part of the change management process. The QA team, systems analysts and developers work closely together to help the systems analysts gather requirements and build a robust security design within the application.

Partners

When it comes to partners we look for three things.

1. The first is a mutual understanding of the strategy and a good cultural fit. This is an essential aspect of what we look from our IT service provider. Not only is it critical that partners understand and appreciate how the overall industry works, it is even more important they understand how we work and the alignment we expect

from them. A common understanding of the framework, culture, values, and our business approach, from our service partners not only helps in aligning and achieving our business objectives in a more seamless manner, it also helps build a platform for improved delivery, sometimes exceeding the expectations held.

2. We also require credibility in delivery at all levels. As a delivery partner, we look at our service providers as an extension of our team and expect them to own the delivery commitments we have with our businesses. Quality and predictability for timelines are key components of the delivery metric we want them to deliver consistently for each and every delivery cycle.
3. And, finally, there needs to be trust on both sides. By taking on the key journey of changing the way QA is currently delivered to the business, a trusted service provider helps smooth the transition.



By taking on the key journey of changing the way QA is currently delivered to the business, a trusted service provider helps smooth the transition.

While we need to have a belief in the capabilities of the service provider, we expect them to provide upskilling based on their expertise and tools experience. The same level of trust is required when it comes to understanding our business needs and our aspirations to become the market leader in the travel assistance and insurance industry.



The transformation of Equifax and the impact on QA

Raoul Hamilton-Smith

General Manager Product Architecture & CTO NZ
Equifax

With about 1000 employees, the Australian and New Zealand (ANZ) region represents about 10 per cent of the greater Equifax business — a Data, Analytics and Technology company. The A/NZ region is part of the International division which includes the UK, Canada, LATAM, India, Russia and emerging markets. A/NZ represents about one-third of the International division.

We are in a new era at Equifax. We have a new Group CTO, Bryson Koehler who is pushing an ambitious transformation program to migrate all of our products and services to the Cloud and where there is a fit, move these onto global platforms. This will eventually lead to the closure of all our data centres. With the transformation, we will build full, secure continuous integration/continuous delivery (CI/CD) pipelines, including automated testing.

To support the transformation, we have an engineering handbook. It's a confluence site with hundreds of pages of information, with each discipline having its own chapter including Quality Assurance (QA). The handbook provides us with the guard rails to deliver applications. It details the selection of tools to use and the methods to follow including what to automate, what tools to use and so on. As with other disciplines, we have instituted a global QA guild, with our local Head of Quality Assurance being a member. At the guild, the QA practice is discussed across the regions and with representatives from the head office in Atlanta.

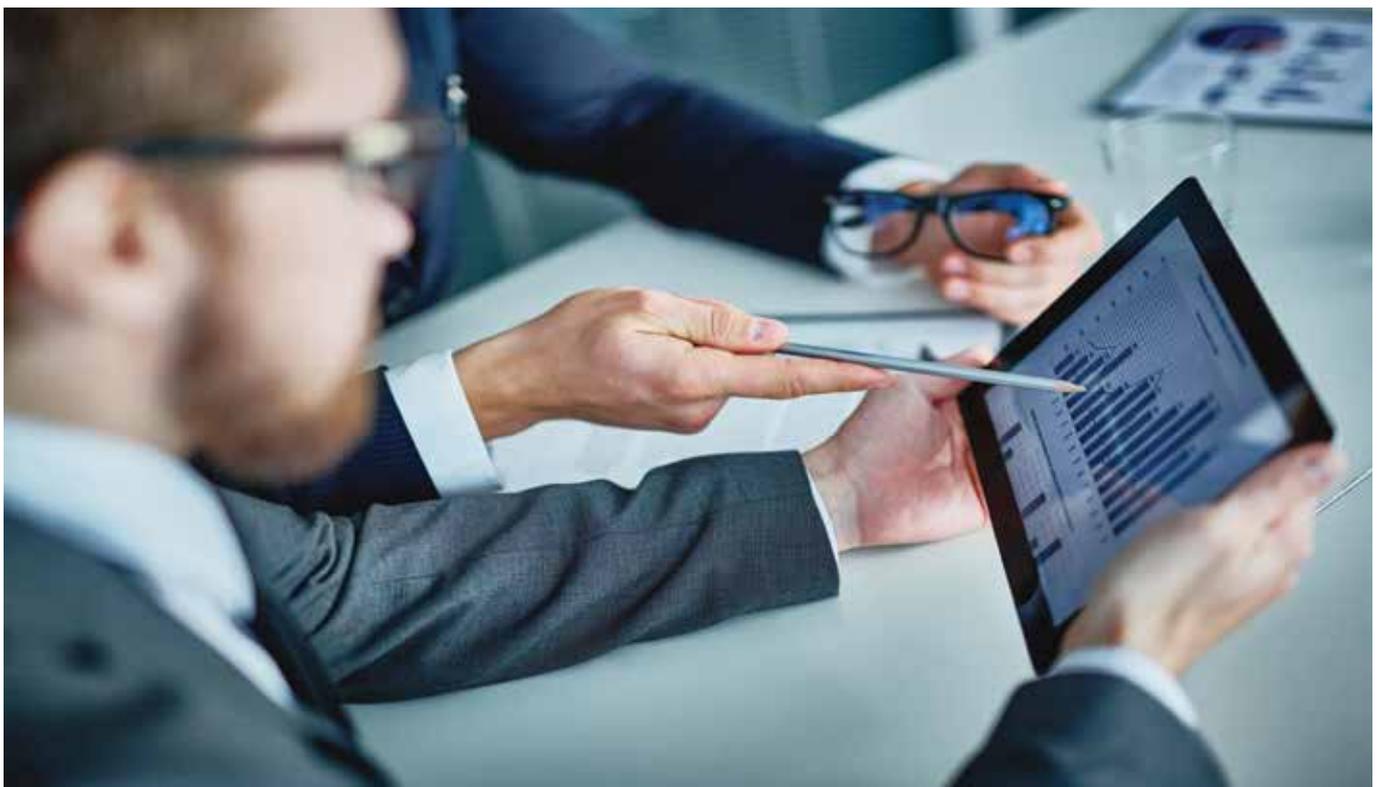
As an example of how things are changing, we had a meeting with some of our project managers who are leading various initiatives to build or enhance our systems. The question came up (as it has done for many years), 'If we build out the automation, that's going to be more expensive and take more time, isn't it?' The answer is, 'Of course, initially – but you have to as this is how we do things now'. I think the penny has finally dropped that, moving forward, every component that's built will come with a set of automated testing around it.



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Ensuring quality is very important for our customers. We need to ensure that all of our deliverables are of top quality because we're dealing with information that's used in decision-making by financial institutions and other organisations. The quality of the data that is delivered is paramount, as is the stability of our systems.

There are many things that can potentially go wrong. The major risk we face is supplying reports with incorrect or missing information. We have had situations in the past



where we have had data integrity issues. This can be very serious for us and for the financial institutions. These are the situations we must avoid.

And the way we do that is by relentless scenario testing across many thousands of permutations. It is not always a perfect solution but if artificial intelligence could help us solve that problem, we would take it with both hands.

“ *If artificial intelligence could help us solve that problem, we would take it with both hands.* ”

Always On

We aspire to provide ‘Always On’ services, which is a constant challenge. We are not perfect by any stretch but do focus much of our QA effort towards non-functional testing. When I joined the organisation around eight years ago, we had only ever performance-tested one application. Now we performance-test all our customer-facing systems. In terms



of automation at that time, there were some limited IBM robot scripts for a few test cases. The world has changed considerably since then.

“ *Now we performance-test all our customer-facing systems.* ”

Our QA organisation is in a transition stage, as it has been for a while.

We want to have all testing automated, but we’re not there yet. It’s a cultural shift as much as a technology shift to make this happen.

The challenge is to change the mindset to recognise there’s value in investing up-front in automation rather than making it an optional piece of our project delivery. What has happened as a result of the increased amount of work that we’ve put in to improving our security posture over the last 18 months, is that we’ve found ourselves releasing software much more frequently than we ever have for every application. That is a real challenge without automation.

We have found the lack of investment in automated testing upfront is now causing pain because we need to react faster than ever to any sort of vulnerability. All the applications have been through a variety of tests to bring them up to a higher standard than they were, which has entailed a significant effort to get those things tested and out the door.

Pivoting to automation

The organisation has been set up for Agile delivery for quite some time, including a move to the scaled Agile framework around 18 months ago. A standard Agile team (or squad) consists of a product owner, some application engineers, some QA analysts and a scrum master. As far as line management is concerned, there is a QA tower. However, the QA people are embedded in the Agile teams so their day-to-day leadership is via their scrum master/project manager.

What we have not been so good at is being very clear about the demand to automate testing. We probably haven’t shown all how that can be achieved, with some areas of delivery being better than others.

This is the challenge that we’re facing now – we have people who have been manually testing with automation skills that haven’t really had the opportunity to build out the automation. So right now, we are at the pivot point, whereby automation is the norm.

We call out the non-functional requirements up front when we start creating, enhancing or migrating an application. Included in those requirements are ones relating to data security and the security of the application, much of which will already be built into the framework of the Cloud offering that will be provisioned. There is an alliance in the US that is called the Infrastructure as a Service Alliance. They are building an entire secure framework within AWS, GCP and Azure. We will work within that framework to provision our new applications, so much of the work required comes 'out of the box'.

In addition to our normal functional and non-functional testing, we run our systems through penetration tests, and our code through security tests. Moreover, we are very careful with the data that is present in the Cloud. Bear in mind that we're at the beginning of this journey, not the end of it – but my understanding is that private data will be tokenised within the Cloud. We also must be especially careful around what ends up in logs and what data ends up in system-transacting type databases.

Advantages of the Cloud

Being able to utilise the full breadth of the Cloud will provide us with several advantages. A current disadvantage is on-premise environments are expensive. Let's say we have a record for every adult in Australia, which is around 18 million people. To replicate that in another environment is a big investment as we have a mainframe that sits at the core. Now with Cloud, things change.

We will have the opportunity to spin up environments and spin them back down again. Provided we can construct a clean dataset, we can preserve that and continue to reuse it into the future. Demographics and name structures, for example, are unlikely to change that much. However, the primary dataset could always be tweaked as and when things change.



Once we crack that original dataset with the power of Cloud, we'll be able to spin up environments to do things like performance testing or mass testing.

Once we crack that original dataset with the power of Cloud, we'll be able to spin up environments to do things like performance testing or mass testing, populate it with this synthetic data, run the tests, take the results out and then spin it back down again.

Moreover, we'll have the opportunity to have many different developments occurring in parallel, whereas now we only have the one environment that we share that isn't quite sized to production.

As you can see, many of the constraints we face will disappear in the future. Artificial intelligence will no doubt help us in some way, shape or form once that technology matures.



QA moves on at ME Bank

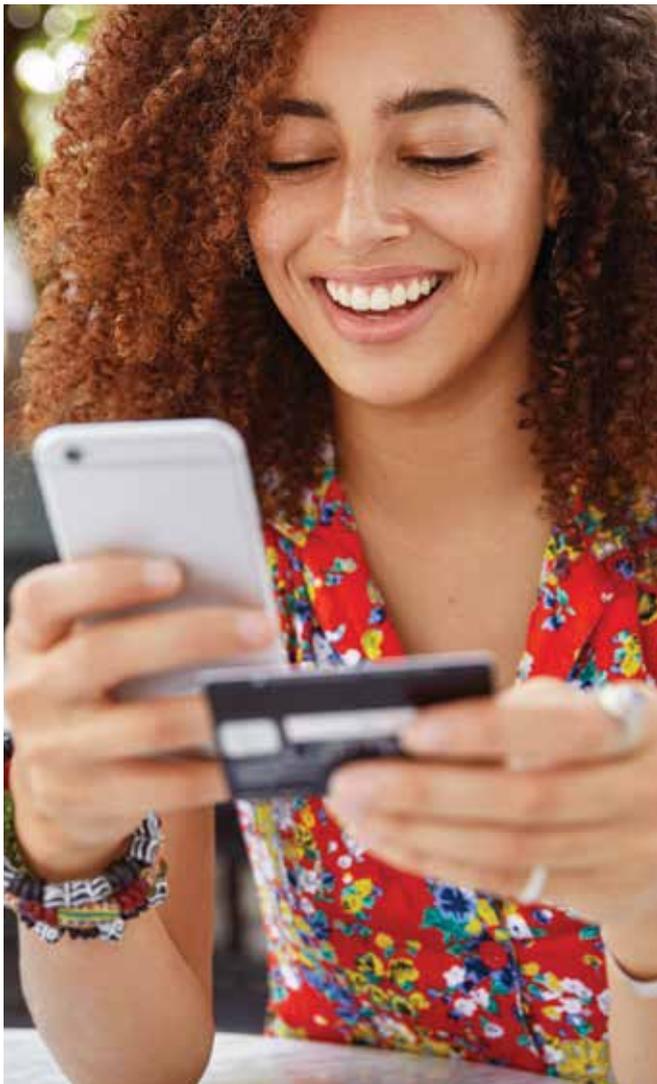
David Lochrie

General Manager, Digital and Integration
ME Bank

Melbourne-based ME Bank is a digital-only bank with over \$27 billion dollars in total assets and more than 1800 employees. The company is owned by 26 industry superannuation funds.

By Australian standards, ME Bank is a small digital bank. It is branchless, so the vast majority of customer interactions happen through digital channels. The organisation is at the end of one transformation – that of its core banking platforms and capabilities – and is now a year into what might be called its digital transformation, says General Manager, Digital and Integration, at ME Bank, David Lochrie.

“This involves focusing further up the stack on customer outcomes rather than re-mediating areas like technical debt at the core banking level and modernising core banking services. We are starting to think more about trying to funnel investment to where it will make a difference to customers.”



QA evolution and three streams of transformation

According to Lochrie, there are currently three main programs of work. The regulatory compliance stream takes in everything going on in the industry around the Royal Commission into Misconduct in the Banking, Superannuation and Financial Services Industry.

“Regulatory compliance is our ticket to play. If we get that wrong, the impact is quite high. Regulatory compliance is a big focus and there are a series of initiatives underway.”

A second program, Foundation, takes in fundamental elements such as remediation of technological debt, platform uplifts, and finishing off the core banking transformation. The business is also putting in place foundational elements that will provide a springboard for its digital transformation.

“The final category of work we call growth. These are the projects or initiatives that directly lead to improved customer performance or customer interaction — such as delivering new features via digital channels, providing better self-service, or reducing call handling time in our call centre,” he said.

From a quality assurance [QA] perspective, as a practice, Lochrie characterises the current status as being in the middle of an evolution. This involves transforming from highly manual, extremely slow, labour-intensive enterprise testing processes, and instead heading towards leveraging automation to reduce the cycle time of big, expensive, fragile and regression test suites.

“We’ve started our QA by focusing purely on automation.”

“We’ve started our QA by focusing purely on automation. The next phase QA transformation journey will be to broaden our definition of QA. Rather than just focusing on test execution, and the automation of test execution, it will focus on what other disciplines come under that banner of QA and how do we move those to the left.”

The days of QA equating to testing are gone, he says.

QA these days involves much more than the old-school tester sitting at the end of the value chain and waiting for a new feature to be thrown over the fence from a developer for testing. “Under the old model the tester knew little about the feature or its origins, or about the business need, the design, or the requirement. But those days are over.”

Putting speed and quality in focus

When it comes to speed to market, one of the biggest contributors to cycle time is the QA group's approach to testing and its environment. "The goal of any digital organisation should be to reduce cycle time – the time it takes from cutting code to having code in the hands of customers. It is a constant goal to reduce that."



"The goal of any digital organisation should be to reduce cycle time."

There are so many metrics that are positively correlated with cycle time that no matter what you do to reduce cycle time, it's probably a good idea, he suggests.

"If you do manage to do so, you're probably doing something worthwhile. Speed, and the constant focus on reducing cycle time is a great place to start."

According to Lochrie, when it comes to cycle time, a big slice of that is taken up by testing at the far end rather than QA more broadly. "A big focus for us is reducing dependencies between teams and across environments. We want to create autonomy for delivery teams so they can get their code into production without having to orchestrate large swathes of code and teams into a single release."

ME Bank is focusing on delivering autonomy to teams.

That includes delivering environmental automation, test automation, test data automation, and service virtualisation to enable teams to be independent. All of these contribute to reducing cycle time.

"Speed is a great focus for us. But obviously, speed can't come at the expense of quality. However, I don't subscribe to the old-school idea that speed and quality are negatively correlated. I believe with modern DevOps practices, the things that you do to get faster are the same things that will increase and improve quality."

Automation plays a big part in that, but shorter cycle times are highly correlated with higher quality, lower defect rates, and a faster time to recover. By focusing on cycle time, it is possible to sweep up a lot of practices and techniques that you should be using to improve quality, he says.

Security and the Royal Commission

The regulatory environment, whether due to the Royal Commission or because of other regulatory activity, hasn't changed ME Bank's internal approach to security, nor to QA.

"We have a constant focus on security. We see the external environment as a threat. There are constant threats to every financial organisation when it comes to protecting the data of our customers and the integrity of the banking system. The regulatory environment doesn't change our perception of the actual threats out there."



In Lochrie's view, it is not the regulator that banks need to worry about, it's the malicious actors that are queuing up to try to get their hands on the data of a banks customers' and to get inside its network.

ME Bank is fortunate to have a good track record when it comes to security.

"From a QA perspective, I've noticed a definite change. Security is now part of everyone's job. The days of having a separate, siloed, isolated, security team whose job was to keep everybody safe are over. And that brings us back to DevOps practices and principles. You can't rely on an external group for security," he says.

These days security is the responsibility of each team member, such as the developer, the or the tester, or the business analyst (BA), or the solution architect. The team that owns, builds and manages the solution is responsible for keeping their data and information safe.

"So it's moving security left, just like we move quality left. Security is just another dimension of quality."

Another big shift in the organisation is the cultural realisation that there is no magic team to worry about security on its behalf. "Everyone's security is everyone's job all the time."



"There is no magic team that's going to worry about security on your behalf."

Don't fall for the bad KPI

Too many KPIs for testing in the past missed the mark of what the testing function was trying to achieve, says Lochrie.

"Like all metrics, if you pick the wrong one, you will drive behaviours achieved the metric but don't necessarily achieve the business outcome. Artificial Intelligence (AI) testing, in particular, is prone to bad metrics, or the selection of bad metrics. Testing in the past, particularly around automation,

was seen through the prism of cost reduction or headcount reduction."

That perspective, he argues, is really short-sighted. "It is a terrible metric. Reduction in the investment in QA is not a good outcome of automation."



"Reduction in investment in QA is not a good outcome of automation."

For example, the value of automation is reducing cycle time and reaping the benefits that come with that. "It's not a great mark to reduce investment in QA because you need fewer people to do it. QA is absolutely fundamental. Not just testing at the end, but driving QA all the way to the start of the value chain right back to inception."

Getting QA practice right from the inception of the feature is the best thing you can do to reduce cycle time, he says.

"I'm more comfortable with metrics that are not too specific to a particular slice in the value chain and especially those that are shared metrics for the team. Trying to slice metrics up too finely can drive the wrong behaviour. If you break it down to 'What's a development metric? What's a business analysis metric? What's a testing metric?' you end up having too narrow a metric."

He argues a better approach would be to identify, for instance, cycle time as an important metric. Understanding how QA practice influences that is a much healthier way of measuring the success of a cross-functional team than trying to pick out one particular function within a team and measure it separately.

"I don't think there's a perfect metric, but I do think there are some bad ones."

By getting the right metrics in place such as reducing cycle times, and getting QA involved as early as possible, ME Bank will be able to transform the experiences of its customers.



Technology Assurance post Royal Commission and BEAR

Mark Zanetich

Head of Technology Risk Compliance and Controls for Infrastructure & Operations
Westpac

Outcomes from the Royal Commission have had a significant impact on the financial services industry. The Royal Commission comes on the back of Banking Executive Accountability Reforms (BEAR). This places more obligations on executives and holds them accountable for the actions of their organisation. Industry wide there is a lot more interest from executives on the detail of what is happening inside the organisation.

As a result, the role of Quality Assurance (QA) is about expanding its responsibility to deliver quality products to market and they are fit for purpose, but also that all of the compliance and regulatory obligations have been met. Lastly, there is a need for increased reporting to being able to demonstrate back to the executives that everything has been executed as per instructions and obligations. These new services need to be introduced into operating models which is something that we have never had to address as an industry before.

Getting it right the first time

QA in the open banking and open integration environments around financial services is another big area. When all services were all contained within your organisation, if things were not necessarily ideal you had the internal opportunity to self-rectify. In a future world, where everything is public and the data is provided by one organisation to another on behalf of the customer, if there are errors in those transactions or advertisements, it can have effects either positively or negatively towards the customer's interaction. As such, the importance of getting it right immediately is increasing with these new ecosystems.

The Royal Commission has basically directed that the obligations of organisations and executives extends into these ecosystems and there is little tolerance for getting it wrong for the customer. The expectation is you have to get it right the first time and you have to support your customers in the custody of their data and service.



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Even controls like the European legislation around data, the General Data Protection Regulation (GDPR), are focused at the individual level. Was one individual impacted as a result of something that your organisation did? And how are you assuring that those individuals are not impacted by the

changes your organisation or the ecosystem in which you participate make? Assurance over that is something that is very challenging to implement to ensure that everybody is doing the right thing.

Tools, techniques and testing in a digital transformation world

There is still a lot of manual testing and there is a challenge with the breadth of coverage that is now becoming even more critical. And, due to the complicated networking the large financial services companies have, co-interdependency of all of these things, open banking or Software-as-a-Service (SaaS), you do not always know where things are coming from. The ability to ensure things are happening at the right times in the right places means your test coverage needs to be expanding continuously. That does create a very significant challenge for people sitting with legacy technology because a lot of the modern tools do not lend themselves easily to a legacy platform.



It is a delicate balance that everybody has to run — balancing the risks you take versus the breadth you have versus the amount of money you invest into bringing up to speed your legacy technology, compared with what you need to get into market and what you are going to do when you get there. There has been some interesting rationalisation. If you look at the financial services sector, since the Royal Commission there has been a significant reduction in product offerings. Almost all of the top tier one and two financial service organisations have exited products like lending to self-managed super funds and they have tightened up on personal and property lending.

They have removed a swag of products from the market to simplify the product offering and they are trying to then get better at the ones they are offering. Some of those decisions are because they are no longer commercially viable given the new market or because of the new rules. Those products may no longer be relevant, but also it is about having to make sure that we can deliver that consistent experience on the products that we have, so they are tackling the problem in multiple ways.

Blurring the lines between security, compliance, testing and performance risk

There is definitely a desire to move faster. Every business has been crying out for that forever. It doesn't matter what industry you're in, everybody wants it happening faster. There is a certain rate of change that particular organisations or industries can run at irrespective of their desire. But it is also vital to get the decisions up the chain quickly and concisely to support rapid decision-making. As a result of the Royal Commission and BEAR, executives are being held to account for those decisions.

So the ability to be able to do things faster — but get greater visibility so you can report that back — is becoming the key. It is not just about how fast we can move through our development life cycle. The problem is that, within organisations in the financial services sector, following the Royal Commission, the ability to get the executives on board and comfortable with allowing the process to move into the next phases or released to market or whatever those steps are, is becoming the limiting speed factor. The way the tools can get that information and present them in consumable format is the key.

What we see today is a lot of disparate systems — be they testing systems, automation systems, performance systems, compliance systems, risk systems, security systems with all these things. They are all happening independently. So you get a technology piece, the technology from conception through to production. You have to pass through so many gates. It's not just about writing the piece of code and making sure it does what it is supposed to do. There are a number of other pieces to that process now.



It's not just about writing the piece of code and making sure it does what it's supposed to do.

All these pieces used to be independent. So you get your reports from the security team, 'Yes, it's now compliant'. You get the functional people saying 'it does what it's supposed to do'. The performance people, the risk people, all these people are assessing this through the life cycle. They would compile these things individually and project managers would bring them to steering committees and people would read



through weighty tonnes of documents. At the end of all that some summary goes up.

That's got to happen almost in real time and must be integrated and those reports need to go up more in dashboard styles, asking, 'Can I proceed to the next phase of my sprint?' Boom, boom, boom, yes, yes, yes. That's the challenge you're facing to get things working today if you want to work fast.

How the merging of disparate skill sets will define the QA of the future

Some time ago, there were a lot of conversations about the magic that comes together when disparate skillsets meet. I believe that is definitely playing out in technology today. The days of saying 'I'm just a developer of this' or 'I'm just a tester of that' or 'I'm just a technology compliance person, I only need to understand compliance. The need to understand the life cycle and how things work in order for you to fulfill your part of the jigsaw puzzle is key.



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So what will become the skillset of a tester in the future? I think it will be very different to what it is today. It's pretty much the same as what it's going to mean for people in technology roles going forward.

And we see that changing all the time. You constantly see the reports asking, 'What's the changing role of the CIO? What's the changing role of the tester? What's the changing role of the developer?' They will morph into other things.

They will morph into other things due to all of the obligations on everybody. It used to be you would just have to be a technologist and manage an asset. Now they need to be semi-legal because they need to understand the legality around the contracts they're supporting with the people they are leveraging.

They need to understand their APRA obligations in terms of what they are supposed to be delivering from what they are held accountable for. They need to understand all of the nuances around security vulnerabilities and how they're going to maintain their assets to ensure that they meet those conditions.

And they also have to understand application development, integration testing, and performance. Everybody's world is becoming far more complicated and far more integrated as a result of where we're trending, where we're going.



Everybody's world is becoming far more complicated and far more integrated as a result of where we're trending.

QA will definitely continue to exist, but it's going to become more complicated because that team won't just be providing the assurance over the functional aspects of it. It will include the non-functional aspects and all the other dimensions that have to be accounted for. They will be looking to the assurance people and saying, 'Prove to me that we have assurance done on everything'. It's not satisfactory to say, 'Part of this is good'.

The leader of that assurance team has to account for the whole lot, and they are going to tell the team to go out there and assure that all obligations are being met — not just the traditional paths it used to assure.



Sector Analysis: Higher Education

Transforming quality assurance to enable the digital learning ecosystem

David Harper

Vice-President | Head of Public Services,
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Businesses in an increasingly digital world are facing a key challenge to transform their quality assurance practice to make sure they remain relevant and competitive. The higher education industry is no exception. With the introduction of the Tertiary Education Quality and Standards Agency (TEQSA), the federal government requires higher education providers to embed quality assurance practices within their day-to-day activities.

Non-regulatory drivers are also rapidly changing the higher education system. Remote tuition and self-paced learning have allowed students to become more flexible and self-directed in organising courses and learning. Through blended learning, competency-based degree programs, and helping

students design their own education program, universities are leveraging digital advancement to create choice for students in a digital learning ecosystem.

As a result, it is important for higher education providers to deliver quality products and services that ensure students get the most that they can from their program.

The providers are finding ways to better understand student expectations through the data available to them. Some have gone a step further and looked at how effective they are in equipping students with the right tools and knowledge to not only improve their job prospects, but also support further study in the future.

In general, they rely heavily on Big Data processing and predictive data analytics to better tailor services to students.

With a focus on generating sector-wide quantifiable results to inform performance improvement, some universities have gone beyond collecting course experience survey data and developed insights on, for example, the students' attainment of skills, their learning outcomes, and graduate satisfaction-levels. As a result, students, employers and professional bodies can get an informed view on the educational investment, when and where needed.

Australian universities use the Australian Qualifications Framework (AQF) to compare the quality of their own courses with those being offered by their peer institutions. This allows TEQSA to easily monitor and measure the performance of different tertiary courses throughout Australia. By collecting student and graduate course satisfaction metrics, and graduate employment and further study outcomes, universities compare their courses with other market offerings and find ways to better compete in the market.

Meanwhile, a US university has used predictive analytics to help students with course selection. The mathematical model takes a student's grade history, enrolment data, and curricular constraints into consideration and then predicts which courses are most suitable and, if the student was to take them, estimates the final grade he or she would receive, and how this may help them progress through their chosen program. This model has helped the university increase retention and graduation rates.

Thanks to advancements in learning and teaching technologies, higher education providers can work with third party providers to design high-quality courses and resources. Students are provided with affordable content access that is not bound by time and space and are increasingly becoming curators of their own learning. They tend to see more value in what they learn and develop increased critical thinking, collaboration and teamwork capabilities beyond the walls of traditional classrooms. Coupled with the data analytics capabilities, teaching advisors and mentors are able to leverage actionable dashboard data to provide students with targeted guidance on how to build incremental learning pathways in a transparent and trusted way.

Robotic Process Automation (RPA) is also being used in the education industry to eliminate paperwork and manual processes. Administration and customer facing roles are a major part of higher education and act as the main touchpoint between universities and their students. Through the use of RPA, repetitive tasks and processes

– such as system enrolment, timetable scheduling and answering frequent enquiries – have been automated in order to minimise error and reduce task competition time. Through the introduction of automated processes, higher education providers are better able to manage the quality of their customer facing services and ensure students can get answers and outcomes as quickly as possible.

By transforming the higher education business model, universities can better use technology to develop information flows between different ecosystem parties to create trust. They can open up learning materials and student study plans to external accreditation facilities that are backed by the industry. And enterprises and organisations can see what is being taught and work with universities to incorporate necessary industry requirements.

However, the integration of student-related data across various business systems can lead to potential data interoperability and security challenges, particularly when higher education providers choose to integrate and share data amongst institutions and across the higher education ecosystem.

Higher education providers need to clarify their role in the digital learning ecosystem, working together with the sector, external assessment agencies and third party providers to set quality benchmarks. There is the opportunity to use data and analytics to measure how effectively courses are contributing to the development of job-ready skills. In doing so, technical capability planning is essential to strategically invest in AI and automation technologies and platforms to deliver insights on-demand, guide capacity planning and help predict potential quality compromise.



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Vision without viability is wishful thinking. Like other transformation initiatives, the capacity of people and resources to manage all of them is a key constraint for many organisations. This means organisations need to plan for the capacity – under the new quality assurance model – to absorb the change, and management and employees must clearly understand their roles and responsibilities in ensuring continual quality delivery and managing cultural shift.



Enabling excellence on all levels

Vicki Connor
Enterprise Test Architect
Deakin University

At Deakin University, we aim to be Australia's premier university in driving the digital frontier – to enable globally connected education for the jobs of the future, and research that makes a difference to the communities we serve.

The University has a longstanding record for using cutting-edge technology while providing a personalised learning experience. Deakin aims to be at the forefront of digital change, enabling globally connected and innovative education and research. Advances in research have been a hallmark of Deakin's success, with significant growth in quality and impact. Deakin has internationally-recognised research excellence, particularly in computer science, technology, materials science, health and medical sciences.

At Deakin, our main goal is to be agile and responsive and deliver education to our students to prepare them for the real world of work. To do this, we are always looking forward. We have to maintain that competitive edge at all times — that's our key.

The eSolutions unit at Deakin provides the four faculties: Arts and Education, Business and Law, Health, and Science, Engineering and Built Environment with testing enablement services.

Within the eSolutions area, we have a quality practice that is ramped up when we have a program of work, compared with the tactical or small work we also do. Within the tactical and small-to-medium projects, we use the business people to help with testing. Depending on the scenario, for instance, if we're doing an application that might be coming out such as Deakin Scout, which helps you navigate the campuses, we use students to test it out and ensure it works. That gives us coverage of people using it and usability as well.

When we did a major work program — such as transforming from the old financing solutions to Workday — we used a mixture of business people and a professional testing team for the actual testing component that ran for about 12 of the 18 months that it lasted.

Essentially, we are about the future. Whilst we acknowledge the value of all testing phases, over time we have adapted to our customer needs and types of products we test. History has taught us things that we need to take on board and learn so we can apply them as we further develop and grow.

CI/CD and the centre of enablement

We provide the guidance and the principles that experts should test to — but we don't, unlike a centre of excellence, dictate that 'you must always do this'. What we are saying is, 'Regarding this best practice, you say you would go down this path. However, in this instance, we feel that you could achieve it this way'. While we expect a test strategy out of a program of work, we don't expect that out of a piece of tactical work, but the testers still have to meet certain guidelines.



We have very tight timeframes, so we're meeting technology delivery with excellence

That said, we do act like a centre of excellence, but it's more about enabling the areas to do the testing themselves. And we do bring in experts when we need them. The testing practice is very Agile. It is embedded with the developers. We have very tight timeframes, so we are meeting cutting-edge technology delivery with excellence.



Deakin was a Waterfall and only a Waterfall model. Now it is a mixture of Waterfall and Agile. For instance, the product might lend itself more to Waterfall than to Agile. The beauty about Deakin is we are able to adapt. At the moment, we are introducing CI/CD into our digital products, such as Deakin Genie, that we are commercialising and selling outside of Deakin. It is a complex setup, involving a practice manager who sets the framework across Deakin and test managers embedded in the different areas to adapt it as they go which has its own set of challenges.

The challenge of finding the right tools

At Deakin, we are not bound by our tools. We find the tool that suits the application that we are testing. With some of our applications, the biggest challenge we have had is the environment.

It can be challenging to find the right tool so we have to just try it out. The university has another area called emergent technologies that investigate emergent technologies and Artificial Intelligence (AI). At the moment they have the freedom to play with what is available and exercise it – once we develop a concept further we imbed a test team with the dev team and allow them the freedom to design the testing to suite the product however we maintain our guiding testing principles around planning, execution, reporting and maintenance. All our resources have to be flexible and capable, or timeless, and they need to operate in a centre of enablement.



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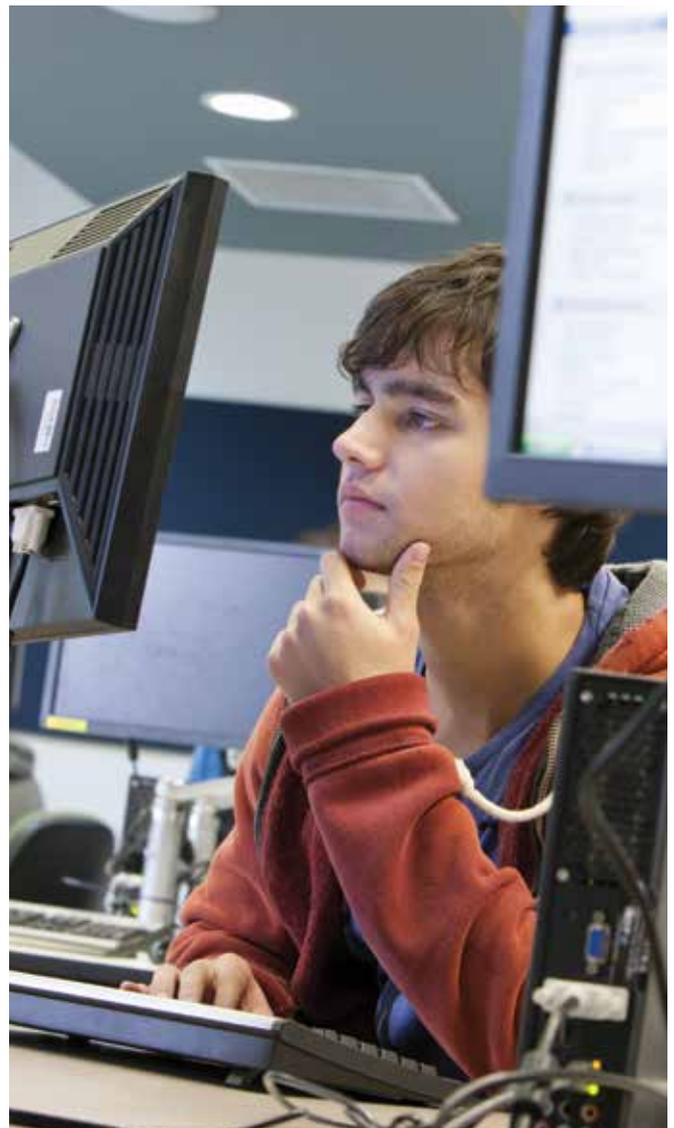
How is Quality Assurance (QA) being enabled? We embed the testers right at the start. They are there in the discovery phase. They are not just coming along down the track, they are right at the start. They sit physically with the development team, with the BAs, with the whole group. They use the product right from the start and they have guidance on what they need to achieve. We have compliance and regulation that we have to meet, but then we have the freedom of what does the client actually need?

Back in the day it used to be that you wrote a Word document with all your requirements and you delivered to that. Now those requirements can change. They no longer take the form of a Word document to capture the stories. Those stories change as the Business learn the product and what it can offer.

As far as testing applications based on AI, we are doing some exploratory testing and we are learning as we go. We are very open-minded about it. Whilst maintaining our basic principles of understanding why we are testing, what we are testing, when to test, who is best suited to test, where to conduct the testing and how to achieve the best results.

A testing hierarchy around interns, students and crowd

We did consider crowd testing for some products initially, and then we decided we needed people on campus to do it. Some of our work is campus-based, some isn't. When the need comes up we will consider it. We are not closed off to anything with our student base. We are selective with student testers to ensure we are maintaining a level of quality.



Another option we utilise is to have interns. These students we teach them how to test and then they go back into their studies and it's credited. Our customer needs are varied therefore our testing practise needs to be varied.

Adapting KPIs for QA when the customer base is non-traditional

Our customer base is challenging because our customer base are the thinkers of the future, the leaders of the future. They have high expectations that we have to meet and how we meet them is a challenge in itself. Our customers want things now and they want them to be usable and fit for purpose. Fit for purpose is critical.



Our KPIs are about showing that we're producing value to our customer

Our KPIs are about showing that we are producing value to our customer. The fundamentals of testing or of QA have not changed. The KPIs are still the same, but it's about being able to change. Improving our speed to market without compromising quality has led us to investigating increasing our the automation of our health checks and regression

suites and identifying which products can progress the functional testing into the CI/CD framework.

The KPI is more customer-centric now. We still have compliance and regulation, but everybody expects that. That is the norm. We have to go that next step: We are here to provide tangible quality and value by ensuring our products are fit for purpose, our customers understand any risks and reduce time to market.

IoT and the whole security question

When we talk about the Internet of Things (IoT), we talk about creating our own IoT-based solutions — so it's quite interesting. We are not being limited by what is in the marketplace. We look at new products and/or new ways of learning.

How do we ensure that the data being generated by such devices is used for further enhancement and improvement, and that there is the right amount of QA perspective to rule out data breaches? Obviously, we have a lot of data both from our students and those devices. Our security arm is separate to the QA team however we work closely together. They provide the specialist skills and oversight needed to keep our data safe.



How RMIT organised quality around the customer and student journeys

Dirk Vandebulcke
Director - Digital Platforms
RMIT University

RMIT is a multi-sector university with more than 91,000 students and 11,000 staff globally. With three campuses and two sites in Australia, two campuses in Vietnam and a research and industry collaboration centre in Barcelona, Spain, it is truly global. The University also offers programs through partners in Singapore, China and Indonesia, and has research and industry partnerships on every continent.

Organising around the student experience

At RMIT, teaching, research and engagement are central to achieving positive impact and creating life-changing student experiences. When it comes to creating student and staff journeys within our systems, they need to be high quality, align with our strategy and be immediately usable in support of our student experience.

The staff experience is equally important, ensuring they are supported in a way that allows them to deliver the

best possible student experience. An area of focus for the University is service culture, and that underpins our approach to providing a quality service that meets staff and student expectations.

Our digital platforms team has organised how we support the business across several digital capabilities. We have channel managers and product owners who are responsible for a set of customer journeys or student journeys.

The digital platforms team is organising itself in line with a set of these journeys. Everything we do and every improvement we make can be linked back to how a journey is impacted or changed, improved or created. Along the way we defined several pain points which we are actively looking at removing.

Quality Assurance (QA) means focusing more on end-to-end journeys instead of taking a piecemeal approach. We do that from two perspectives: development testing and deployment, and this approach has changed the way QA relates to RMIT traditional implementation and delivery of systems and solutions.

We now have multiple customer journeys coming together on our digital platforms. This can create a tunnel in the delivery of our solutions, especially when they are student-facing. It means that quality assurance is incredibly important because the knock-on effect on the different journeys can be huge, and we did face some challenges at the beginning of the year.

Streamlining our approach to QA testing, deployments, and releases is key because we are sitting with a single platform servicing a multitude of business areas.

Speed to market and the importance of automation

RMIT is currently in a monthly release cadence. By only having monthly releases, we want to ensure the quality of these releases matches what you would normally find in Waterfall circumstances.

Automation is not only a form of cost control; it is also a question of quality control to meet these timelines. If the test cycles are six weeks, there is no way you can operate on a release cadence of four weeks.

Ultimately, we would like to move to fortnightly releases for speed-to-market reason, which means our QA cycles need to be automated, improved, and sped up.

For the moment, our QA is more journey-focused. As such, we want to make sure our testing needs are optimised, and



use cases are properly tested. Potentially, that means not every single edge case will be tested every single time. When they were originally developed they were tested – but they won't be every single time we deploy.

We have started to focus on our activities around the paths and journeys our students and staff will take through an experience, rather than doing wide, unfocused tests.



Especially in a fast release cadence, you can't test every single thing, every time, or automate every single thing, so it's essential to be focused.

Especially in a fast release cadence, you can't test every single thing, every time, or automate every single thing, so it's essential to be focused.

AI and automation

Some student or customer journeys often cross multiple systems. In the past, you had to sometimes accept the limitations and stick to a certain platform, but that's

no longer the case. It is important to always test in a system integrated environment. That puts a lot of demand on integrated data sets, environment availability and consistency.

The testing scope reaches far beyond a single platform. This raises substantial challenges because if testing is automated, the data sets need to be integrated every time test sets are run. Data sets have to be refreshed to ensure the test results are consistent and the toolsets required are more sophisticated.

I am looking forward to seeing how capabilities such as machine learning can help us be smarter in this space, especially with data set management.

At RMIT we are in the early stages of building out some of these artificial intelligence capabilities. We are automating our pipelines and a fixed set of use cases and test cases. It will be interesting to see how testing works when the bots become self-learning. For instance, if your bot becomes more intelligent, and you start to increase or extend its capabilities, or your machine learning capabilities in a dynamic way, will the testing be able to follow?



Accelerated evolution

Tools are evolving faster than the way we use them, and our delivery capabilities are running behind what the toolsets can do. We need to continuously look at evolving the way we work to utilise these capabilities that enable early feedback as close to initial development as possible.



Tools are evolving faster than the way we use them, and our delivery capabilities are running behind what the toolsets can do. We need to continuously look at evolving the way we work to utilise these capabilities that enable early feedback as close to initial development as possible.

We still have some work to do to integrate our testing. We are developing full sets of test use cases that are currently used for functional testing, but still doing our performance and volume testing on a completely different set of test cases. To integrate that closely, a performance and volume test should be running multiple iterations of the same tests we did in our test cycle.

So, why don't we still have a normal integrated way of looking at that and how do we bring all these capabilities together?

We started with an almost completely manual set of steps to get something from the end of development into production based on the releases. To move to deploy ambitiously on an hourly basis would require a smooth press-of-the-button style of process, and you'd still want to do everything you did before. You don't want to stop things or drop things out. You want to go faster with improved levels of quality, not reduced levels of quality.

Challenges from the Internet of Things

As everything becomes connected, data gathering becomes a massive challenge. Companies are collecting huge amounts of data but the real challenge in future will be what we do with that data.

Ensuring we collect the right data and monitor the quality of data generation processes will be important. My expectation is that companies will find the quantities of data being generated more of a challenge than the QA processes associated with gathering it.

We are already hearing reports of companies collecting data from Internet of Things devices in homes that they shouldn't be collecting for privacy reasons, but are doing so to improve quality. Google was a recent example, and that is a good example of how dangerous the application of QA processes can be in the age of the Internet of Things.

Sector Analysis: Government

Targeting anytime, anywhere services for all Australians

David Harper

Vice President | Head of Public Services,
Capgemini Australia and New Zealand

In a surprise announcement in May 2019, the Prime Minister set out a structural change to simplify how Australians deal with federal government. The creation of Service Australia saw a renewed emphasis on service delivery under the leadership of a Minister for Government Services. This super Service Delivery Agency will build on similar initiatives at a State level to make it easier for people to access services and support from government.

While structural change puts a focus on accountability and priorities, governments will only succeed in improving access to services if they can tackle the integration of systems, multiple data sources and convoluted processes.

Many have tried to tackle the challenge. The Digital Transformation Agency (DTA), created the Digital Service

Standard as a set of best practice principles for designing and delivering government services. According to the DTA, it helps teams to build services that are simple, clear and fast. NSW government is recognised for the steps it has taken to create a stronger customer service culture and its leadership in digital service delivery.

The DTA Digital Service Standard advocates Agile and user-centric delivery. While Agile has become the norm for new service and project delivery, these projects often must navigate the complexity inherent in the legacy environment before delivering better outcomes and value.

Agile approaches do bring a sharper focus on customer outcomes and stronger alignment across organisational boundaries. They also create an environment where

there are incremental, and smaller, business and technical deployments. At a minimum, this helps manage the risk of delivery through smaller, more incremental business and technology changes.

As in many industries, the challenge of assuring quality is changing rapidly as government and customers interact through more complex digital channels and data is used with greater sophistication to improve the customer experience and compliance. Furthermore, advanced analytics, automation and the emergence of augmented or Artificial Intelligence (AI) in process optimisation creates further opportunities to improve service delivery – but, again, add complexity to the environment.

“ *The challenge of assuring quality is changing rapidly as government and customers interact through more complex digital channels.* ”

Automation in managing technology landscapes is emerging with Continuous Integration Continuous Development (CI/CD) - an area of developing interest and experience. Only a few years ago, forward thinkers listed DevOps and DataOps as key ambitions. Now there are many examples of successful projects that can claim significant progress in these areas.

Within this context of a changing customer service, data and technology development, the role of quality assurance in delivery has changed from a discrete activity at the end of a development lifecycle to an integral – and often automated – part of development and deployment. Automation in testing and deployment is also starting to find a place. In less complex environments, these technologies are maturing, while in the larger, more complex organisations, test automation is beginning to gather pace.

Data security remains a key priority, as government continues to manage the large volume of customer and sensitive data. Again, QA activities need to address the full scope of challenges around authorised access to services and appropriate use of data through to identifying and addressing errors in calculation and code.

Technology trends continue to encourage new innovative approaches of testing code and opportunities for QA with, for example, DevOps and continuous integration and continuous delivery, further enabling Agile operating environments. Most notable is the emergence of the applicability of artificial intelligence/machine learning as

it relates to driving efficiency at scale in large transaction processing environments.

While these techniques are starting to be deployed in business process, it is interesting to explore how learning algorithms will be used to improve QA activities. Such smart or advanced automation in testing will emerge once agencies have found their feet with automated testing.

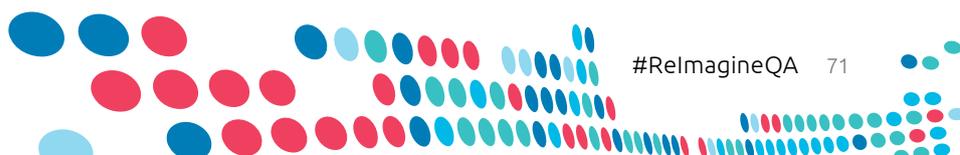
So where to next? The use of Agile as a delivery method will mature and eventually become more embedded in the culture of an organisation. To enable this will require greater maturity in government procurement processes and changes to traditional funding models.

Automation in QA will become standard practice and agencies will look at further opportunities to automate the system development lifecycle. Process automation and learning algorithms will improve both customer service, compliance and the speed at which government can drive new strategic directions.

“ *Process automation and learning algorithms will improve both customer service, compliance and the speed at which government can drive new strategic directions.* ”

Traditional organisation boundaries – which often protect a power base – will blur as agencies look to share by utilising APIs. As new services are designed around the customer, traditional boundaries will be challenged, and the new economy of agency success will be based on an ability to share. We are already seeing this new “economy” emerge as data is shared across organisations to deliver government policy. This trend will continue with a greater emphasis on end-to-end service delivery rather than complex interactions and hand-offs between disparate organisations. Of course, navigating customer service improvements in government does require an understanding and respect of the legislation and policy which defines how processes need to be implemented and data used.

That said, we hope to see these changes adopted as a strong focus on customer service and access to “anytime anywhere” services for Australians wins out against the inertia of accepted practice, organisation boundary and embedded complexity.





Transforming testing and QA capability to enhance customer experience

Srinivas Kotha
Technology Testing Services Manager
Airservices

Airservices is a government-owned organisation providing safe, secure, efficient and environmentally responsible services to the aviation industry. Each year we manage more than four million aircraft movements carrying more than 156 million passengers, and provide air navigation services across 11 per cent of the world's airspace.

The organisation has two major operating centres in Melbourne and Brisbane, and a corporate office in Canberra. We employ more than 3500 staff – including 1000 air traffic controllers who work from 29 air traffic control towers at international and regional airports – and provide the aviation industry with telecommunications, aeronautical data, navigation services and aviation rescue fire-fighting services at 26 Australian airports.

How it works

I am part of the senior leadership team of Airservices Information Management and Data Services (IM&DS) Business Group that oversees all organisation operational and corporate technology strategy, planning and execution. The IM&DS business group provides modernised, scalable, secure and agile ICT services that support Airservices' evolving business needs with customer and service-centred approach to technology services.

“ *The model we adopted three years ago – and are trying to mature – is that of broker, integrator, and orchestrator.* ”

Under our CIO leadership we have adopted, and are trying to mature, the next generation IT operating model where IM&DS group plays the role of broker, integrator and orchestrator, working closely with customers, stakeholders and partners as a collaborative information service provider, establishing and maintaining technology services that support streamlined business processes.

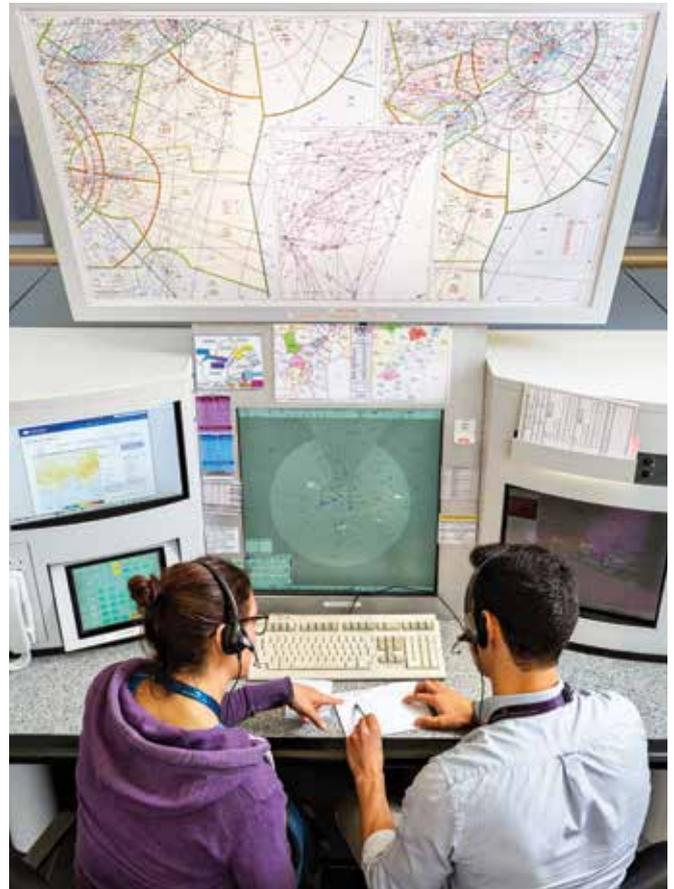
I lead the Technology Testing Services (TTS) business unit within the service design and delivery (SDD) branch of the IM&DS business group. The service, design and delivery branch is the largest in the CIO group, which is responsible for solution architecture/design, development, testing, implementation and ongoing maintenance and support of enterprise, operational, network and infrastructure services. The project delivery team is also part of the SDD branch, which manages and delivers all projects related to the IT services portfolio of Airservices.

Testing services

My team's motto is “**ensure and enable delivery of high quality IT systems and services that meets and exceeds our customer/user expectations**” through provision of mature, modern and world-class testing and quality assurance capability and services. Our team's core functions include test governance, management and delivery for IT systems and services across Airservices. We provide testing services covering end-to-end test management, delivery and assurance to projects and non-project implementations run and managed by various IM&DS service delivery teams.

My team strives to deliver the following key business outcomes:

- **Enhancing customer Satisfaction and Confidence** through fit-for-purpose, high quality and reliable systems
- **Increase business value** through higher product and process quality, early defect detection and prevention to reduce costs, faster releases.
- **Minimise risk** by reducing outages, mitigating risks and greater compliance to regulations
- **Deliver service excellence** through robust testing, test assurance, smart test platforms and analytics and use of evolving technologies.



Airservices has embarked on a major technology transformation journey to deliver on our corporate plan and priorities with several technology programs planned for delivery over the next five years. To deliver service excellence, support service innovation and enable operational agility, we started testing and quality assurance capability uplift initiative to ensure our technology programs are delivered efficiently and effectively to meet our customers' requirements and expectations.

This initiative aims to set the organisation to a future ready state to be able to deliver on more complex testing requirements and growing demand, and it initially focuses on delivering two key outcomes:

Building a **robust technology testing framework** that is integrated with related Airservices' frameworks to enable effective governance, management and delivery of testing and quality assurance functions and activities, and:

Creating a **technology testing strategy and roadmap** to enhance organisational capability of testing and QA to

effectively reduce risks and improve quality, business value and customer satisfaction of our IT systems and services.

With a consultative approach in development of the testing framework and strategy, we plan to engage with our key internal stakeholders and customers for their input and considerations. Airservices has a number of overarching organisational level frameworks & standards such as technology management, risk management, safety management, project management and change management which govern various functions and operations performed within the organisation. We intend to embed and make testing framework an integral part of all the relevant existing frameworks and standards.



I'm looking at implementing more automation and the emerging technologies around artificial intelligence (AI).



**Photos supplied by Airservices Australia*

As part of the test strategy development, I will be looking at the market trends and emerging technologies in testing and quality assurance space to be able to effectively satisfy our future needs and demands. I believe technology evolution is on the upward trend and there is lot out there in the market that we can leverage to enhance our testing and QA capability and deliver business value.

I will be keen to look at implementing more automation and use of Artificial Intelligence (AI) to scale up to increase the coverage (depth and breadth) of testing to reduce risks and time to market. We will be looking at two components within automation – basic and smart automation. We have done little bit of basic automation at the project level. However, we are not going to reuse that for ongoing testing, nor are we maintaining those scripts. There are some areas within the organisation where specific automated scripts are maintained and run for specific testing needs. We currently using a combination of market-leading and open source tools for test management and automation. Key basic automation items that are for immediate consideration are around ongoing functional, regression and performance (load and stress) testing.

Smart automation uses emerging technology such as AI. The questions we are asking are: how we can automate that for testing and data analysis for improving quality outcomes? And what testing can we do from a DevOps and CI/CD perspective, which we aim to adopt in the coming 1-2 years? In the next 6 months we will put up the framework, create the strategy and then begin implementing the initiatives in the strategy. The key potential strategy areas are around automation, test environment and data, and some of the smart test platforms/labs capability.

Improving customer/end-user experience and satisfaction

From our customer/end-user satisfaction and experience perspective, we will be focusing on improving overall quality of our IT services and products through early engagement of our system users in the quality control/testing process, and ensuring their requirements are properly captured, reviewed and tracked through to system/service delivery.

We aim to improve time-to-market through testing process efficiency gains via testing tools, automation and smart test platforms. In addition to the early engagement of the customer/users in the development phases, we want to better understand our customer/user expectations and involve them throughout the process.



We aim to improve time-to-market through testing process efficiency gains via testing tools, automation and smart test platforms.

I also want to improve the quality of our systems that are handed over to users for user acceptance testing so that users' time is efficiently utilised and mainly focused on business scenarios testing that confirms the system is fit for their use. I am also passionate about supporting and enabling our service delivery teams, stakeholders and customers/users in delivering desired business outcomes and to be a trusted service provider for testing and quality assurance services.



Working towards a safer Victoria

Philip John

QA and Testing Services Manager
WorkSafe Victoria

WorkSafe is a Victorian state government body that enforces occupational health and safety standards.

I manage the Quality Assurance (QA) and testing within the IT Shared Services team. We have an established testing services panels to support us in undertaking testing as our business demands. We are part of the governing body, where we set standards and policies to undertake QA in projects. We also manage the testing toolset to support our testing capability. We offer support to projects running on Waterfall, Agile, Scrum, DevOps, Kanban, and so on.

For us, quality is paramount, and we focus heavily on delivering the applications and software we develop with appropriate quality assurance.

WorkSafe is going through a period of fast-paced change in which we are bringing new technologies and application suites, and putting strong standards and procedures in place. We are aiming towards the continuous integration and

continuous delivery (CI/CD) approach. For WorkSafe this is an exciting time which will offer us opportunities to grow.



The evolution of new devices and technologies will be a challenge and may redefine the development and testing standards.

When it comes to testing, a partnership-based testing regime is going to be our approach in the future, with security and penetration testing the new bare minimum. The evolution of new devices and technologies will be a challenge and may redefine the development and testing standards.

Making the move from Waterfall to Agile

As an organisation, we are shifting away from a traditional Waterfall based delivery model to a more Agile based



delivery model. We have major programs in place in both organisations where we uplift the technologies into CRM or similar customer-centric platforms.

When it comes to QA resourcing, we are bringing in more Agile testers who can offer assistance in automation, with an aim to support continuous QA to underpin a CI/CD approach. We have behavioural-driven development and DevOps in our mix and are focusing our delivery model into shift-left testing.

The organisation is also using more Agile/SAFe Agile delivery models.

We use a range of tools, depending on the need. Tools include ALM, QTP, Selenium, JIRA, Test Rail, Confluence, ConnectALL, SoapUI, Cucumber, and API connect. Toolsets are selected on the basis of business and technology needs.

Micro Focus (previously HP) Suite is being used to a larger extent in our environment. We have ALM, UFT and Load Runner Suites for the majority of our testing. To support the Agile delivery model, we have established a ConnectALL bridge between JIRA and ALM. Having said that, in one of our major programs, we are also checking new testing tools to support Agile delivery such as Test Rail, Selenium, Jmeter etc. The Agile delivery approach provided us the opportunity to see many new tools in action to expedite the QA delivery and governance.

Developing the customer experience

We have a strong focus on customer experience and are implementing a Cloud-based CRM to help streamline our interactions with employers, workers and the public.

An important factor in everything we do is cost and speed. At times, external factors may alter the way we deliver projects and impact on funding. Open-source tools will definitely help the software community to save on costs down the track. However, before we consider any alternative in our tool-space, we ensure that the quality of the deliverables are not compromised.

Traditional test management tools come with a cost, and I'm open to identifying alternate tool sets to reduce the cost impact to BAU. We also need to be mindful of any additional resource overheads that may come with the new toolset.



Traditional test management tools come with a cost, and I'm open to identifying alternate tools to reduce the cost impact to BAU.

The Agile delivery model is certainly assisting us to deliver the releases quickly and more efficiently. In one of our BAU programs, we were previously delivering one release in every



six months or so. Now, we are delivering one release every month by using the Agile delivery approach. It was a great outcome for the business to schedule application releases in a speedy manner that aligns with the business strategy.

How key performance indicators (KPIs) will transition as QA evolves

KPIs will transition to adopt more multi-skills into the mix. There will be a need for more governance and IP management in a partnership-based delivery model. When it comes to contract resourcing, there are potential risks for organisations to manage and maintain the IP. We have resources coming from different backgrounds and with different skill sets that undertake our testing. As a governing body, we ensure the IP is centrally managed and maintained and that is one of our KPIs. It is our responsibility to transition the IP to the new resources as appropriate.



KPIs will transition to adopt more multi-skills into the mix.

In future, I believe there will be more KPIs added. The process optimisation is continuously evolving day by day. When it

comes to different technologies, project managers would want to experiment and try different things. We need to ensure they are aligning with QA standards and our processes are consistently optimised and evolved with market trends.

We suggest QA and testing baseline standards and recommendations to teams, including business and IT, to adhere appropriate QA. For example, a reasonable QA and testing coverage has to be established and documentation has to be updated, reviewed and approved.

During post-process optimisation, we review our processes and continuously make adjustments to support the delivery.

From our perspective, we set the standards and policies in Testing and QA. We encourage them to adopt our standards and policies. However, we continuously work with them in partnership mode to achieve the organisational goals without compromising quality.

From the KPI perspective, the number of KPIs in the testing and QA space is only going to grow, rather than diminish. We expect that there will be a tactical shift in the definition of some KPIs. In any case, We will need to have a reasonable level of KPIs established to ensure the adherence of testing and quality standards.

Key trends in Quality Assurance

DevOps changes the game



Modern testing approaches for a DevOps world



The status of performance testing in Agile and DevOps

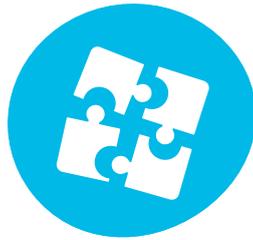


Digital Transformation and Artificial Intelligence

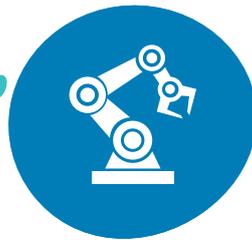




Unlocking the value
of QA teams



Connected ecosystem
for effective and efficient QA



RPA and what
we can learn from
test automation



Data democratisation for
competitive advantage



Key Trends in Quality Assurance

DevOps changes the game



Thomas Hadorn
Managing Director APAC
Tricentis

Dominik Weissboeck
Managing Director APAC

Scaled agile and DevOps are changing the game for software testing. It is not just a matter of accelerating testing — it is also about fundamentally altering the way quality is measured. For Agile, we need to test faster and earlier. But DevOps demands a more deep-seated shift.

The test outcomes required to drive a fully-automated release pipeline are dramatically different than the ones that most teams measure today. Even if you are very good at testing in a siloed manner isolated to an Agile team, this might not help with a DevOps process where an overarching assessment of business risk is imperative for a release decision.

In the past, when software testing was a timeboxed activity at the end of the cycle, the focus was on answering the question, 'Are we done testing?' When this was the primary question, "counting" metrics associated with the number of tests run, incomplete tests, passed tests and failed tests, drove the process and influenced the release decision. These metrics are highly ineffective in understanding the actual quality of a release. Today, the question to answer is: 'Does the release have an acceptable level of risk?'

To provide the DevOps community with an objective perspective on the quality metrics most critical to answering this question, Tricentis commissioned Forrester to research the topic. The goal was to analyse how DevOps leaders

measured and valued 75 quality metrics (selected by Forrester), then identify which metrics matter most for DevOps success.

Here's a look at the process:

1. Survey 603 global enterprise leaders responsible for their firms' DevOps strategies.
2. From that sample, identify the firms with mature and successful DevOps adoptions (157 met Forrester's criteria for this distinction).
3. Learn what quality metrics those experts actually measure, and how valuable they rate each metric that they regularly measure.
4. Use those findings to rate and rank each metric's usage (how often experts use the metric) and value (how highly experts value the metric).
5. Compare the DevOps experts' quality metric usage vs that of DevOps laggards. If there was a significant discrepancy, the metric is considered a DevOps differentiator.

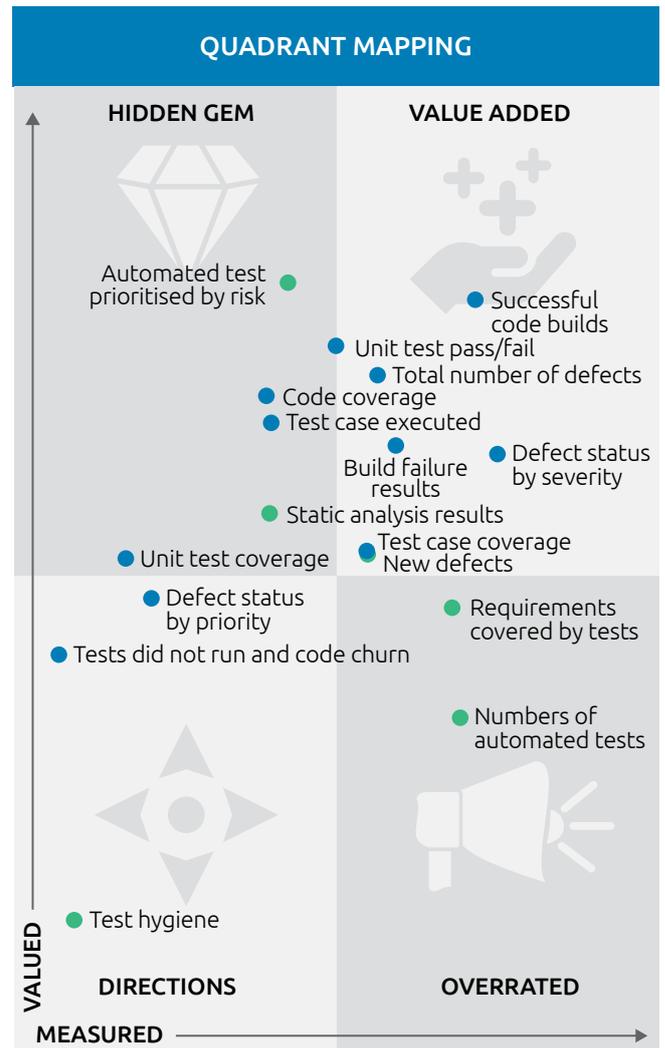
Ranking Heat Map		
Metric	Usage Rank	Value Rank
Automated tests prioritised by risk	13	1
Successful code builds	1	2
Unit test pass / fail rate	9	3
Total number of defects	5	4
Code coverage	10	5
Test cases executed	12	6
Build failure rate	6	7
Defect status by severity	1	8
Static analysis results	10	9
New defects	7	10
Test case coverage	7	10
Unit test coverage	14	12
Requirements covered by tests	4	13
Defect status by priority	15	14
Code churn	17	15
Tests did not run	18	16
Number of automated tests	3	17
Test hygiene metrics	16	18

● DevOps Differentiator

For each category of quality metrics, a heat map was produced showing usage vs value rankings. For example, here is the heat map for the Build category metrics.

The data for each metric was also plotted into a quadrant with four sections:

- **Value added:** Metrics used frequently by DevOps experts and consistently rated as valuable by the organisations that measure them.
- **Hidden gem:** Metrics that are not used frequently by DevOps experts, but are consistently rated as valuable by the organisations that measure them.
- **Overrated:** Metrics used frequently by DevOps experts, but not rated as valuable by the organisations that measure them.
- **Distraction:** Metrics that are not used frequently by DevOps experts, and not rated as valuable by the organisations that measure them.



For example, here is the quadrant for Build category metrics:

Some of the key findings specific to the Asia Pacific region are outlined below.

End-to-end testing metrics are valued—and measured—more than in the global average

Although Asia-Pacific respondents measured fewer Build and Functional Validation metrics than the global average, they measured (and valued) end-to-end testing metrics much more than their peers around the world. For example, percent of automated end-to-end tests was measured by

47% of the respondents (36% globally) and highly-valued by 84% (70% globally). Risk coverage measurement was measured by 49% (34% globally) and highly-valued by 71% (59% globally). This underscores to the region’s focus on digital transformation and commitment to delivering exceptional user experiences.

API testing metrics were also valued—and measured—more than in the global average

Asia-Pacific respondents also measured and valued API testing quality metrics more than the global average. Overall, API quality metrics were measured by 16% more

Top 20 DevOps Quality Metrics that Matter to Asia Pacific DevOps Experts

 BUILD	 FUNCTIONAL VALIDATION	 INTEGRATION TESTING	 END TO END REGRESSION TESTING
Successful code builds	Critical defects	Risk coverage	Percent of automated end-to-end test cases
Total number of defects	Pass / fail rate	Test coverage	Risk coverage
Build failure rate	Requirement covered by tests	New defects	Total # of defects
New defects	Defect density	Requirements covered by tests	Percent of test cases passed
Defect status by severity	New defects	Pass / fail rate	Requirements covered by tests

Source : Forrester Research on DevOps Metrics that Matter (<https://www.tricentis.com/resources/forrester-research-on-devops-quality-metrics/>)

organisations in this region than globally. The highest valued API quality metrics were API Test Coverage (63% vs 39% globally) and API risk coverage (79% vs 62% globally). This prioritisation of API testing is probably a side effect of the regional trend towards API-driven open banking (the vast majority of respondents indicated they were in the Financial Services and Insurance sector).

There is a greater leader/laggard quality metrics measurement gap

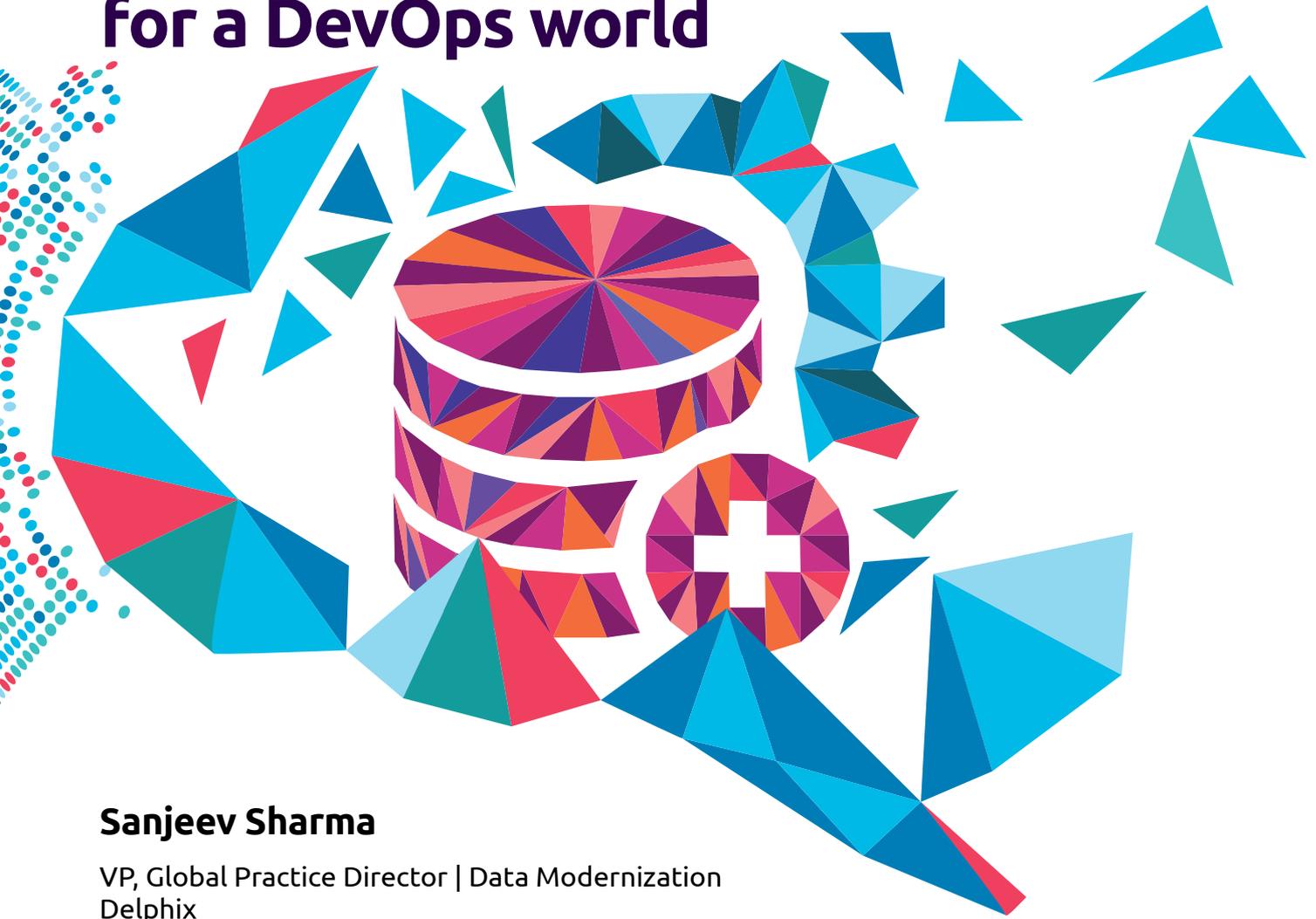
Part of the study involved classifying the respondents as either DevOps leaders or DevOps laggards, based on their responses to various questions about the maturity of their processes. Although the percentage of DevOps leaders in the region was lower than the global average (18% vs 26%), the DevOps leaders from Asia-Pacific generally measured quality metrics at a comparable rate to their global peers. However, the DevOps laggards in Asia-Pacific generally measured quality metrics at a much lower rate than their global peers. This suggests that the select set of firms that have truly prioritised DevOps initiatives have made great strides—and the laggards have a lot of catching up to do in order to remain competitive.

Accelerating Testing for DevOps

The Quality Assurance (QA) team of a leading developer of banking software decided to transform testing so the organisation could continue its commitment to exceptional quality while accelerating time to market. With a highly-complex, specialised system and a library of 100,000+ test cases, it was imperative that negative impacts to connected systems be identified and mitigated before each release. The team began to identify and measure the risk associated with each release and integrated the use of risk-based testing to eliminate redundant tests that were not adding value – a metric identified as the most valuable in the DevOps quality metrics report.

The QA team also recognised it needed to start testing earlier, complete testing faster, keep tests in sync with rapid application changes, and deliver the near-instant continuous quality feedback that the Agile development teams now expected. The result: By prioritising automated tests by risk, it delivered 30% more features per release, achieved a 50% reduction in production defects, reduced their testing cycle time by 60% and emerged as a true DevOps leader.

Modern testing approaches for a DevOps world



Sanjeev Sharma

VP, Global Practice Director | Data Modernization
Delphix

Agile and DevOps are two software development methodologies that have become the standard for building continuously deployed systems at speed with quality. As large enterprises with complex interconnected systems look to scale their DevOps adoption, there is growing pressure on test and QA teams to streamline their processes, tools, and organisational structures to support the rapidly accelerating need for Continuous Testing. The complexity is further exacerbated by the 'hybrid' nature of the technology stacks in most enterprises from mainframes that run both modern container-hosted applications and legacy COBOL-based monolithic applications, to distributed systems with myriad technology stacks, workloads distributed across

multiple public and private Clouds, and SaaS properties scattered across multiple vendors—each with their own proprietary ecosystems.

Although it was promulgated by startups that were early adopters of DevOps, "the notion of Move Fast and Break Things" is passé today. It was a Silicon Valley thing, and that era no longer exists. Enterprises require both speed and high quality, and the need to deliver products and services faster, while maintaining the high expectations of quality and performance are challenges modern day testing and QA teams must address.

Shift left test

One of the common approaches leveraged by test and QA teams to scale their capabilities is shift-left testing. Shift-Left, a core tenet of DevOps, is the ability to execute earlier (left) in the application delivery pipeline. In the area of testing, this means enabling the developer to self-serve tests – including unit tests, functional tests, integration tests, and even performance tests – and allowing developers to run them early and often. Testers still maintain, and in fact, enhance their core competencies, in addition to focusing on designing and running tests that leverage techniques such as test-driven development (TDD).

Democratising test data

A prerequisite to shift-left of test and QA capabilities is the democratisation of test data. In order for developers to run tests on demand, they need access to the right test data on demand. To enable this requires completely transforming how test data management (TDM) is done.

So how does test data management fit in with DevOps? DevOps requires developers and testers to deploy applications on a continuous basis in order to validate their integrations, functionality, and performance. This implies fresh sets of test data are needed each time developers deploy a new version of the application, but providing good sets of test data is inherently challenging. To automate and scale test data management, it is necessary to eliminate the need to manually create, clone, provision, and maintain test data. In addition, the ability to execute these actions in an automated fashion must be available via APIs to developers, who can then integrate them into their DevOps toolchains.

The following are ways to help modernise test data management for DevOps:

- Automate the creation of production-like test data. Organisations are typically creating test data by manually cloning their entire production system or creating synthetic data, rather than leveraging data virtualisation technologies. In fact, nearly half (47%) of global enterprises say it takes four to five days to provision a new data environment, according to a global research and advisory firm. By leveraging data virtualisation, automated test data

provisioning can allow for rapid creation of test datasets for various types of testing on demand.

- Mask sensitive information for compliance and protection. Protecting data privacy is no longer optional—it is the law. Organisations must have procedures in place to de-identify data across non-production environments to comply with data privacy regulations and avoid data breaches. Data masking provides development teams with meaningful test data without exposing sensitive private information, such as personally identifiable information (PII) and protected health information (PHI), by replacing the original value with a fictitious but realistic equivalent
- Refresh test data for continuous delivery. To enable continuous delivery, testers and developers need access to test data continuously, so teams can run tests each time a new version of the application is delivered and repeatedly run them for the next iteration. For that reason, organisations need to streamline test data delivery by enabling testers and developers with automated tools and processes to refresh data without involving DBAs.

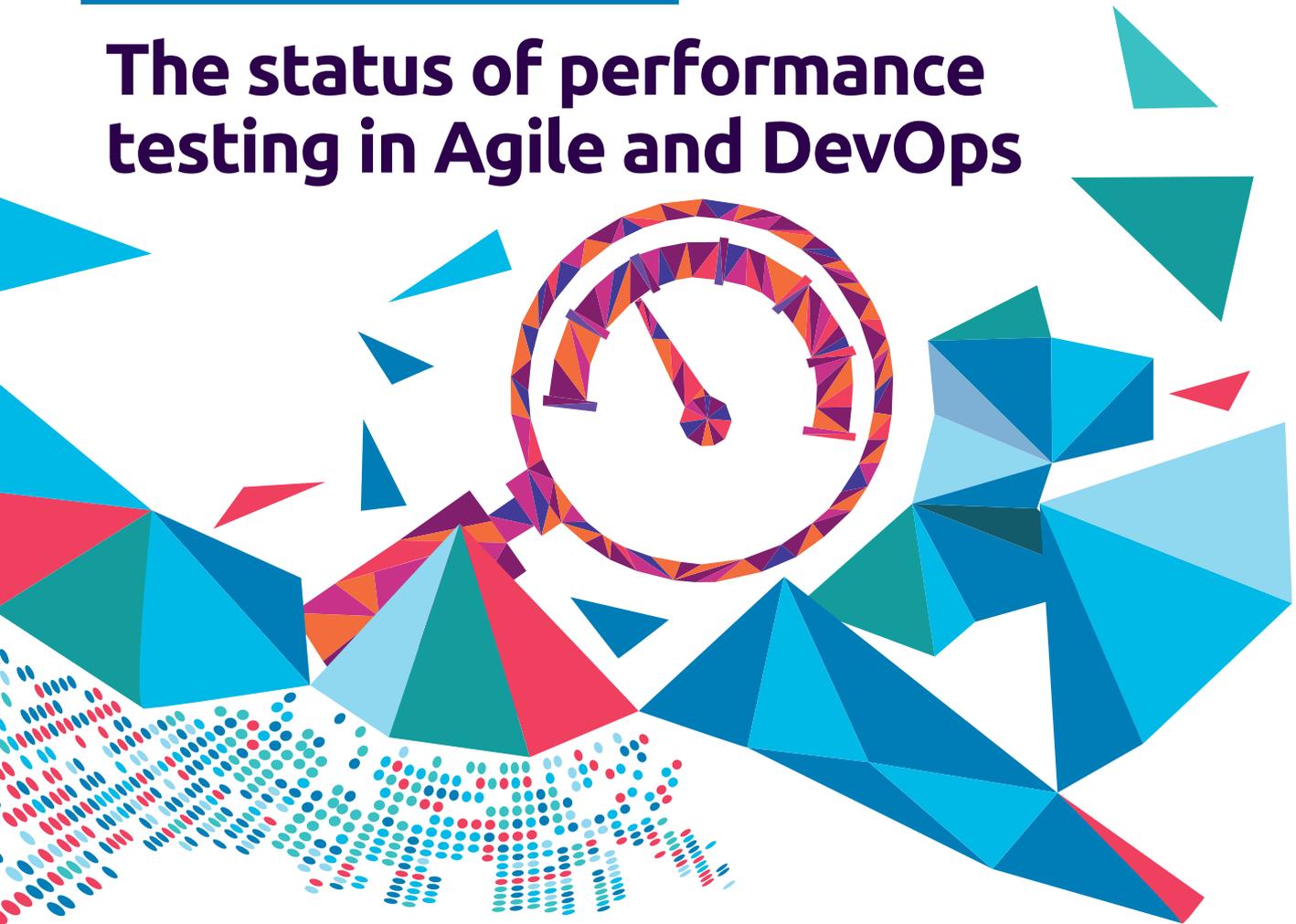
Leveraging AI in automated testing

The next evolution in the area of automated testing for DevOps will be around leveraging Artificial Intelligence (AI) and Machine Learning (ML). As organisations make the move to containerised microservices, the frequency of deployments will increase exponentially, driving up the need for more testing. Microservices-based architectures also require testing to be performed more intelligently by driving synthetic transactions through sets of services that are orchestrated together to deliver the business functions needed to execute the transaction.

In parallel, new approaches, such as chaos engineering (which is based on the premise that servers in production will go down), will go mainstream. It suggests that things will go wrong, but the services being delivered should not go down. The goal of such techniques is to ensure that the services being deployed are resilient in a chaotic, real-world environment. All of these efforts will drive the need for AI and ML-driven testing, meaning testing and QA are guided by learning from the data generated by the tests being run, by the performance of systems in production, and by introducing randomness — chaos — into systems under test.



The status of performance testing in Agile and DevOps



Henrik Rexed

Performance Engineer
Neotys

Load and performance testing is about simulating users, third-party systems, and batches and queries that interact with a system. Those simulations let you collect metrics to validate the ability of the system to handle specific situations, and each simulated situation should reflect a technical risk. For example, how would your application handle the load created by users logging into the system? And can your system handle the daily activity, along with spikes related to the opening of a new branch in a new geography?

Performance engineers analyse the results of these simulations to identify potential bottlenecks in order to improve the system.

In Agile and DevOps environments, most test engineers implement continuous testing by testing the main components of their applications early in the development cycle. The objective of testing earlier is to quickly detect performance regression during the development phase.

In order to trigger a test after each build, performance tests are not launched manually but through a CI/CD system. Performance testing is part of the quality gates of our build process.

The main problem we are currently facing is related to the status of a test. We obviously need to define a status: PASS/FAIL in order to be able to block our pipeline. Most of the

performance testing solutions define the status through a list of requirements rules usually labelled as a service level agreement (SLA). Performance testing solutions handle all the requirements at the same level making it impossible to define one requirement that is more important than another. Our performance tests will fail if any of our requirements fail – which does not make any sense. We have business transactions that are more important. And, moreover, what about the behaviour of our architecture?

The testing industry has labelled requirements SLAs. But, technically, an SLA is a legal agreement. We can easily have a legal agreement on the behaviour of our application in our production environment. For example, my application needs to be 99 per cent available.

But what about performance testing? Can we really define 'x' number of SLAs?

We need to align the principle of performance requirements to the logic that a traditional performance engineer is taking while manually analysing a test result: That person will look at the behaviour of response time, network, hardware consumption – they never limit themselves to a single metric but use a combination of metrics. Some books on performance site reliability engineering make clear distinctions between SLA, service level objective (SLO) and service level indicator (SLI).

The performance testing solution is naturally measuring metrics – indicators. Then the SLI within our test can be easily defined. Each metric can have a specific goal and depending on this objective a certain number of points could be derived.

For example, if the response time of my business transaction 'Buy products' is less than one second, I will get 20 points. If the response time is between one and three seconds I could get five points.

The concept of points is the solution to allow us to calculate a precise status to our performance tests. With this concept, our objectives can be precisely described based on metrics related to the infrastructure or pure response time.

At the end of our test, we can collect a certain number of points and that is where we could define the SLA of our test: my test is a PASS if the score is above 90.

This mechanism has been simply inspired again by a well-known American multinational technology company that specialises in Internet-related services and products and an American media-services provider through a project aiming to handle blue/green deployment based on a score.

With all the modern architecture, it becomes important to define the level of performance of our system based on response time but also on the usage of our infrastructure. We cannot deploy an application that is responsive but requires three times more infrastructure. We need to control the overall cost of deploying or release on a Cloud environment.

All the projects and studies published then motivated one of our strategic technology partners, providing application performance management, to build an open-source framework that would manage any pipeline. The objective is to make continuous delivery in operation in a modern Cloud native environment and avoid building a complex pipeline that requires technical resources to maintain it.

Within this open-source framework, one of the services that would evaluate the quality of a release is based precisely on this concept where you would be able to define your objectives and the expected points for each of your objectives and you will define an SLA that would pass or fail a build. Neotys is one of the first external contributors to build a service in this partner's framework to run load test and data source to evaluate the score of a test. This is the first brick in the world of continuous automation and smart decisions.

Conclusion

Due to the way in which performance testing tools are currently calculating the status of tests, projects are forced to request manual analysis of test results to approve the deployment of their application for production.

Many projects are even building their own custom 'analysis' solution collecting metrics from several sources to be able to provide a more realistic status of tests. This means teams are investing in resources and time to provide a more efficient status.

That is why the most popular unicorn companies have invested in a framework that would allow them to automatically build, test, and deploy their releases to production with minimal human interaction.

Every organisation moving to Agile or DevOps will add continuous testing to their release management. Without implementing the performance scoring mechanism, they would quickly be blocked and will start to move performance testing to major releases only.

We are taking major risks by removing performance testing of our pipeline. Let's be smart and provide a more efficient performance status.



Digital Transformation and Artificial Intelligence



Shyam Narayan

Director | Head of Managed Services
Capgemini Australia and New Zealand

Digital disruption is forcing enterprises to innovate at lightning speed. DevOps, the use of Internet of Things (IoT) technologies, advancement in Cloud technologies and the introduction of Artificial Intelligence (AI) in platform, are all impacting on the digital transformation journeys of enterprises.

Applications or solutions built using AI are not designed for an explicit solution of a distinct problem. The machines can and will learn, and they use data to do so. The problems

enterprises solve using AI are not deterministic in nature. And the solutions to problems enterprises are trying to solve with AI change as data grows in the applications. This means that from a Quality Assurance (QA) perspective the reference point is moving. As such, there is no absolutely right or wrong answer. The outcome is correct based on the tolerance set by an organisation.

AI interactions with the system multiply the results normally obtained by manual testing. A test automation script can be

designed to interact with the system, but it can't distinguish between the correct and incorrect outcomes for applications.

The end goal of leveraging AI in testing is to primarily reduce the testing lifecycle, making it shorter, smarter, and capable of augmenting the jobs of testers by equipping them with technology. AI is directly applicable to all aspects of testing including performance, exploratory and functional regression testing, identifying and resolving test failures, and performing usability testing.

Enterprises have implemented simple use cases of applications built on AI platforms. However, an organisation's ability to harness the power of AI platforms is restricted due to the limitations of AI in QA tools but the industry is moving in the right direction when it comes to autonomous testing. That said, enterprise scale usage of AI platforms for complex use cases will only be possible with maturity in the application of AI in software testing tools.

Applications of AI include:

Testing of UI interfaces: Machine learning algorithms are being used for UI testing. AI is being used to help identify image patterns by breaking down the user interface to pixel level.

Self-healing automation testing: AI/ML testing provides the capability for test scripts to automatically adjust to any changes making the tests more maintainable and reliable.

Visual validation automation testing: Pattern recognition or visual validation capability is used to identify visual bugs in the software.

Writing test cases using AI: AI Spidering is used to write test cases for the application by crawling through it and collecting data.

API testing: ML-based algorithms are used for back-end API testing.

AI is also used to actively test some of the most prestigious apps on the market:

- eBay uses convolutional neural nets to detect GUI defects across multiple operating systems, devices, screen resolutions, and browser versions.
- Facebook has implemented a predictive test selection to estimate the probability of each test failing for a newly proposed code change.

- Netflix is using reinforcement learning for test case prioritisation and selection.

Challenges in quality assurance of AI applications

Some of the challenges are:

- Applications built on AI platform require QA tools based on AI.
- The large number of data sets required for testing AI models. Training and testing datasets is prone to human bias which in turn impacts on AI model test scenarios.
- It's difficult to isolate and fix a defect in AI systems.
- Testing AI applications is a continuous process as the model evolves with the growth of datasets.
- Testing end-to-end integrated AI-based applications.

AI impacting QA skills

Agile and DevOps-era organisations are seeking software development engineers in test (SDET) – technical software testers. But with AI-based applications the requirement will change from SDET to SDET plus data science/statistical modelling – software development artificial intelligence in test (SDAIET). This means that QA experts will need knowledge and training not only in development but also in data science and statistical modelling.

Conclusion

Exponential growth in computing capacity, the availability of massive amounts of generated data to train AI algorithms, and a breakthrough in deep learning and machine-learning techniques is driving uptake of AI-based applications.

AI promises considerable benefits for businesses and economies through its contributions to productivity growth and innovation. AI's impact on organisations will be profound. Enterprises will leverage AI to create competitive advantage.

From a QA perspective, the successful use cases of digital transformation using AI-based applications is limited due to the maturity of QA tools, methodology and frameworks.

AI will lift productivity and economic growth, but millions of people worldwide may need to switch occupations or upgrade skills.



Key trends in Quality Assurance

Unlocking the value of QA teams



Remco Oostelaar

Director
Capgemini Australia and New Zealand

In the last 10 years, business has imported concepts and solutions from Agile, Lean and Kanban into industries such as retail, travel, healthcare, government, and financial services. In the past five years, this has accelerated with the introduction of Scaled Agile framework for enterprises (SAFe) that delivers a set of organisation and workflow patterns intended as a guide to scaling Lean and Agile practices.

Organisations in many of the above mentioned industries have used the framework to deliver more value, faster to their

customers after deploying it to simultaneously unlock essential improvements across many areas including productivity improvement, and customer and work experience.

For many test organisations, the transformation has been a great experience delivering a stronger, more resilient and responsive culture. On the flipside, organisations have struggled with the new way of working, expectations and have been unable to keep up with the demand from the business.



For many test organisations, the transformation has been a great experience delivering a stronger, more resilient and responsive culture. On the flipside, organisations have struggled with the new way of working, expectations and have been unable to keep up with the demand from the business.

In some cases, the test organisation has not adapted to the new methods of Agile, Lean, Kanban that are integrated into the model. Instead it is still structurally based on the Waterfall model with the same processes and tools. At best these test organisations can deliver some short-term value, but not the breakthrough performance that enables the organisation to change the way it competes.

Test organisations that embraced the new world used this opportunity to consider how their organisation would look in the next 5 to 10 years. For example, what is the need for a daily test status report if the test organisation can perform multiple deployments a day.

So how do you deliver the future test organisation that aligns with company goals? Here are some areas to consider:

Changing role of leadership and the team

Due to the Agile structure, the leader of the testing team has less direct control over resources that are part of scrum/squads, however, this doesn't mean their role is less important. He or she needs to act as a virtual leader who delivers vision, boundaries and direction to the team. The role can cross multiple business units and projects and must bring the teams together to drive quality in the deliverables.

The team members will become part of the value stream and need to act as the pride owners of a new house. They are the seasoned players that understand the system, business processes and culture of the organisation. They will continuously learn, improve and share knowledge to ensure

they can deliver a high-performance output. The test analyst will be recognised by the organisation and crucial for the success of the new test organisation.

The delivery model

Lean focuses on the waste in the process, and traditional test management processes are full of it. A perfect example is the creation of test strategy and test plans. Why write pages full of standard information that is copied from another document when you can change the test strategy in a set of layered guidelines that cover the activities from build to delivery. Centralise the control and reporting across the QA and Test activities to monitor and adjust the delivery. Use dashboards stakeholders can access as needed. This removes the stress of having to send out a report at the end of the day that is outdated by the time the stakeholder reads it.

It is also important to consider how to transform low-value activities into a high-value outcome. An example is the build of manual test scenarios to automation that can be integrated as part of the continuous integration and continuous delivery (CI/CD) model. Other examples are: automatic code quality checks, continuous testing for unit tests, the application performance interface (API), and monitoring performance and security.

When an organisation has a CI/CD model, it should be managed as an enterprise system like enterprise resource planning (ERP). Assign a product owner and monitor the performance. This is important because it is the nerve system of the IT development cycle. The same applies to any automation model and setup.

The measurement

Implementing SAFe is not about cost reduction; it is about delivering better and faster. Companies gain a competitive edge and improved customer relationship. The focus is on the velocity, throughput, efficiency improvement and quality of the delivery stream. For example, some organisations use the feedback from the support portal to measure the squad as a group and not as individuals.

Key trends in Quality Assurance

Connected ecosystem for effective and efficient QA



Ajay Walgude

Vice President
Capgemini Financial Services

To adopt to new ways of working – such as Agile, bi-modal or uni-modal, many organisations have moved away from a horizontal, centralised testing function to a vertical model, aligned to business units, tribes or transaction cycles.

This new world order is either fully decentralised and aligned to verticals or to a hybrid, federated structure, where part of the QA/QE organisation acts as a quality centre of excellence (QCoE) responsible for quality control, governance, best practices and tooling management. As well as a QA Guild for specialised testing such as performance engineering,

automation framework and security testing, there are pros and cons for each of these approaches.

There has been a change in the way testing is organised and performed, the skills required for testing, the tools used, and what is expected from QA as a function. This impacts on when testing gets engaged and the techniques being used to carry it out. The biggest difference has been the behavioral change upstream to enable that, the change in buying pattern for the services from service providers as well as the skills and tools change.

Everything seems to be in place or getting in order, but we still have lower defect removal efficiency (DRE), high cost of quality especially the cost on non-conformance based on interactions with various customers. While the World Quality Report (WQR) acknowledges these changes and comments on the budgets for QA being stable or reduced, there is no credible source that can comment on metrics such as cost of quality, and DRE across phases, and type of defects (the percentage of coding defects versus environment defects).

The above alignment of QA teams was associated with achieving quicker time-to-market by means of frequent and incremental feature release cycles, building quality in the product by shifting left and eliminating defect at source. To make sure it works and deliver the results as designed, it needs a fully connected ecosystem for QA. Dev and QA assets – such as requirements, code, build and deploy kits, test cases, automation scripts for continuous testing, for purpose test environment and test data provisioning – should be seamlessly integrated in the ecosystem.

These ecosystem elements are leveraged and managed by multiple parties including product owners, BA, dev, test, and infrastructure release management teams. Everybody plays their part in ensuring they are available when needed but they may not be always in sync or fit for purpose. For example, some elements in the environments may be wrongly configured, integration pieces may be missing, or the environment may not have all the data required – especially for new features being introduced. The QA team may also be unaware of what has changed, the code itself, the business logic or the configuration parameters.

A successful ecosystem isn't just about communication where the teams exchange information with other stakeholders on what is being changed or required to effectively test. The key factors in building a successful connected eco system include:

- **Every team member must be willing to learn the entire system.** This includes architectural details, use cases, code base, configuration requirements, dependencies, and the business domain. Team members do not need to be experts in all of these areas, but they should have a basic knowledge that allows them to communicate with stakeholders.
- **Updated documentation and mapping of various entities.** It may sound like a lot of unnecessary work because of the segregation of duties where everybody focuses on their part of their work and are co-located mostly in a pod structure, but this establishes the base before the smart assets are built.
- **Building smart assets** that will understand the connection between the entities described above and

provide actionable insights. For instance, a change in the application configurations parameters might trigger a note to the environment engineer indicating changes that are needed in the environments. Another example would be specific changes in a code base automatically selecting the right test cases to be executed by focusing on targeted and affected areas. Simply put, this is an automated workflow of release notes that triggers a sequence of action items based on the change and notifies the corresponding stakeholders.

So far, we have discussed the impact of the left of the software development life cycle (SDLC) but even the right part – such as production behavior and patterns – can influence and determine the testing strategies or data and environmental decisions and code changes.

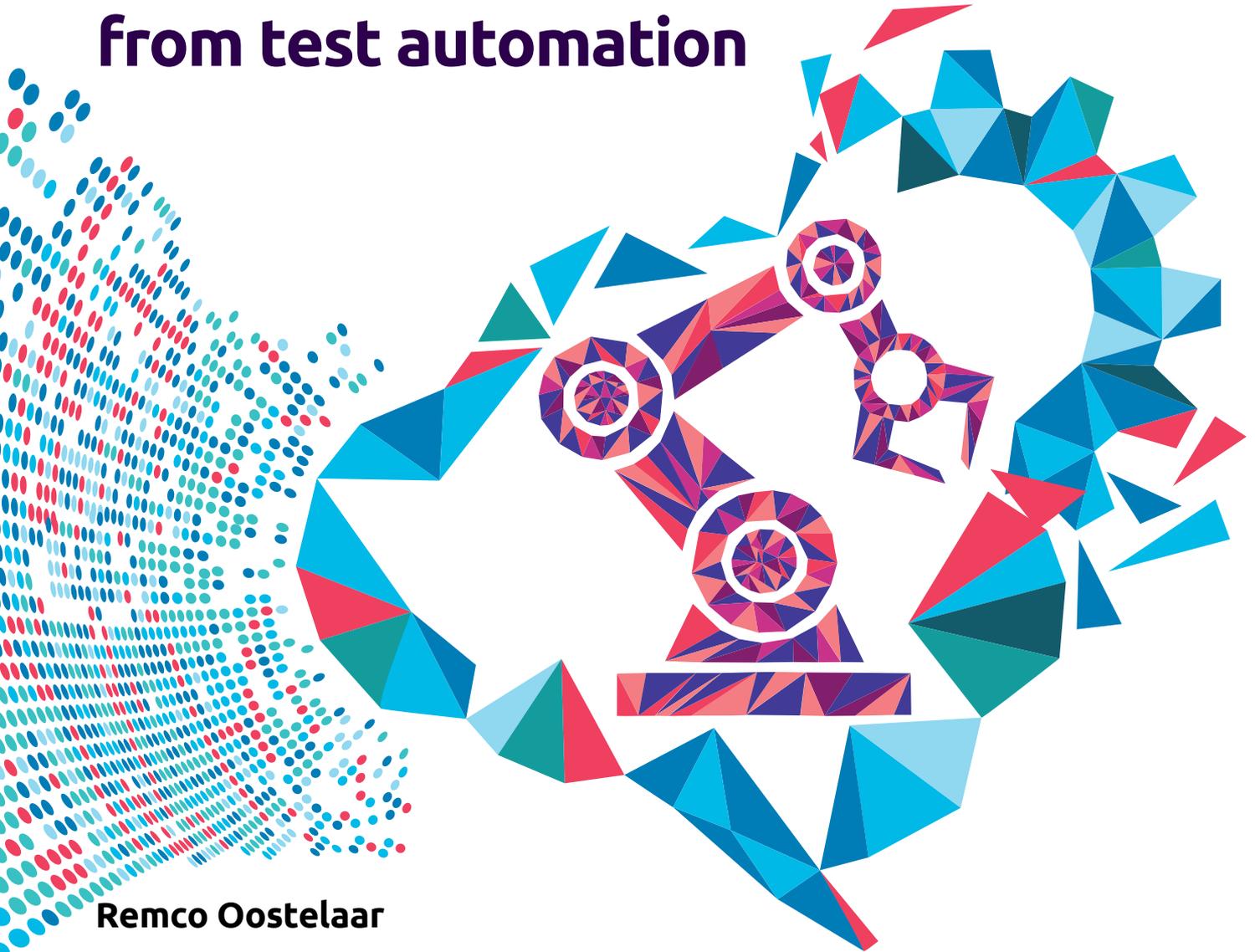
- Build bots that can take action unattended and in a predictive manner. If we build what I call Actionable Architecture which maps all of its entities even a small piece code to larger programs and its dependencies. If this is implemented right, it is possible to build code scraper bots and feedback bots to understand or predict changes, relational bots to determine the impact and next best action because of the change, and action bots to execute these programs.

Effective and efficient QA relates to testing the right things in the right way. Effectiveness can be determined in terms of defect and coverage metrics such as defect removal efficiency, defect arrival rate, code coverage, test coverage and efficiency that can be measured in terms of the percentage automated (designed and executed), cost of quality and testing cycle timeframe. The connected eco system not only has a bearing on the QA metrics – cost of appraisal and prevention can go down significantly – but also on the cost of failure.

The aim of squads, tribes, pods and scrum teams is to bring everybody together and drive towards the common goal of building the minimum viable product (MVP) that is release worthy. While the focus is on building the product, sufficient time should be spent on building this connected eco system that will significantly reduce the time and effort needed to achieve that goal and, in doing so, addressing the effective and efficient QA.

Conclusion: While businesses automate testing activities and apply artificial intelligence other solutions for efficiency and effectiveness of testing, a connected eco system made up of smart assets, that is self-aware and can steer itself to be fit for purpose, is required to realise the potential of these initiatives.

RPA and what we can learn from test automation



Remco Oostelaar

Director
Capgemini Australia and New Zealand

Robotic Process Automation (RPA) is the automation of repetitive business tasks and it replaces the human aspect of retrieving or entering data from or into a system, such as entering invoices or creating user accounts across multiple systems. The goal is to make the process faster, more reliable, and cost-effective.

Low-cost tasks with the no risks in high error areas can be fully automated. With the introduction of Artificial

Intelligence (AI) and machine learning (ML), other options became available including customer support functions such as chatbots and voice bots answering IT support and customer support desk questions.

Many companies have begun researching these opportunities and have invested in new tools and resources to automate business processes. The first RPA projects delivered significant success in reducing double-digit employee

headcount by automating the main critical processes. However, the second wave of automation brought with it complications. Organisations started to understand that scaling RPA involves a lot of organisation, planning, and maintenance.

Key issues are:

- The second wave of automation often includes more complex scenarios with multiple permutations of data that needs to be handled manually
- Setting up a network of automated bots means the organisation has to rethink its architecture layer and include it in the IT organisation (often RPA starts first at the business side with no formal oversight).
- Changes in upstream and downstream applications need to be validated against the scope of the bots deployed into production. They will become an official checkpoint for delivery into production (or part of the CI/CD model)
- Bots such as test upgrades and internal and external security need to be maintained and supported.

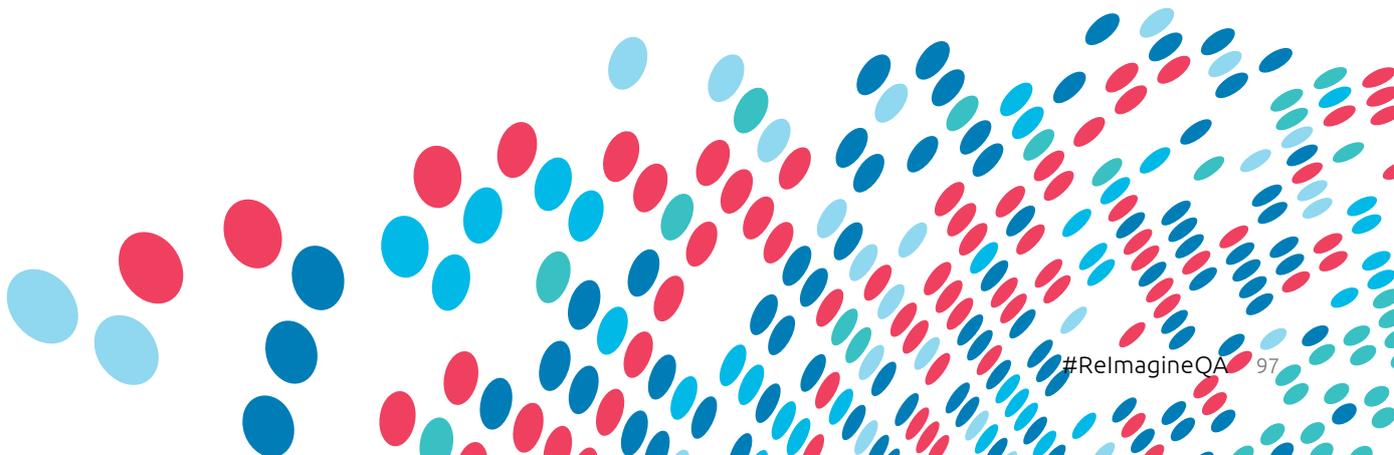
As a result, the implementation of RPA is slower or on-hold in many companies until issues on RPA-at-scale have been addressed.

What can be learned from test automation?

If you validate RPA issues with those the test organisation overcame to make its test automation work, you will find a lot of common elements. In both cases, when building the first automation the test was not the issue; however, delivering test automation at scale means having to rethink your automation approach and delivery model. Listed below are a number of similarities in the challenges associated with the set up of RPA and test automation. See if your automation lead can help you improve the level of RPA within your organisation.

- Start with a plan and blueprint the architectural implications before installing RPA within your organisation. As in test automation, the team that is going to set up the automation will create a network of integration with systems and possibly will set up new roles and responsibilities that need to be maintained. Running something autonomously means you need a high level of trust in the automation. Building test automation scripts has the same complexity, and you need to work with the business.
- Within the test organisation, there are automation experts who are fully dedicated to the automation framework and enablement. Their focus is to ensure the lifecycle of the automation is maintained, that new changes can be seamlessly integrated, and that changes in the systems are managed and incorporated to ensure test automation will continue to work. In the case of RPA, you need a product owner that works with the team to drive the same level of consistency.
- Make RPA part of your test and QA processes, and include them as part of the continuous testing model. This will ensure the deployment of RPA will continue to run, and the business will not be impacted by downtime.
- As testers understand, people are best-suited to solving complex problems while an automated bot can execute a repeatable process better than a human. So rethink how, where, and for which tasks you want to introduce automation.
- Understand that you are implementing a new tool, not a solution. In some cases, there are better ways to solve the issues you are trying to automate.

In the future, RPA and test automation will merge into one area, as both have the same customer drivers—cost, speed and quality—and the skillsets are exchangeable. Tool providers are crossing-over to each other's areas and, with machine learning and AI, this will only accelerate.



Key trends in Quality Assurance

Data democratisation for competitive advantage



Malliga Krishnan

Director | Head of Insights and Data
Capgemini Australia and New Zealand

The conventional value chain of organisations is being challenged by today's data driven business transformations. This paradigm shift to data and insights based decision making, means that value is no longer delivered in vertical silos but through a horizontally integrated operating model anchoring on customer centricity and interconnectivity of service offerings. As the age of data democratisation fast approaches, the leaders will be those whose enterprise business model enables a value chain comprising data and

analytics as the foundation, and where quality and integrity of data are intrinsic in the organisational culture.

The ever-expanding variety, volume and velocity of machine generated data through digital channels, sensors and network devices, coupled with the falling price of storage and smarter infrastructure, has seen a rise in investment spend on data centric platforms. Without robust data governance however, there is a risk of creating a deluge of

unusable data and a lost opportunity to create a source of competitive advantage.

Case in point are the challenges in the data and architectural landscape in the banking sector, driven by open banking's public sharing of data through APIs. There has traditionally been a disconnect between core banking and other systems, with legacy structures embedded with custom fixes. Today, siloed ecosystems are still prevalent and limited integration between these systems results in an absence of a single point of truth for business users. Duplicate, obsolete and incomplete data leads to onerous reconciliation exercises. At the other extreme, is a proliferation of data governance initiatives that address a specific need (project or organisational) without co-ordination and alignment. Ownership of data becomes critical, as it defines who has accountability for managing data quality, reliability, risk and ultimately its value. Best practice dictates that the business sponsor should be the owner of data. It is a person who understands the data entities and is able to act as a decision maker, influencer and enforcer.

Regardless of technological maturity, a business cannot be truly digitally reliant unless every operation is fundamentally data centric. In such a culture, data quality becomes the focal point of the business value chain and warrants attention at all levels of the organisation. A board's corporate governance responsibility should extend to the recognition of data as an enterprise asset. Only then will data related risks be comprehensively captured and managed through the risk management framework and reported to the board.

When data is perceived as a high value asset, risks that relate to profitability, security, regulation and compliance also become an imperative of the Chief Risk Officer. Again, we can see this in the banking sector challenged by regulator scrutiny, plateauing revenues due to low interest income and high structural costs. Banks are moving to data product innovation, creating new value through the analysis and availability of product, client and market segment data.

There are many aspects to sound data governance. Some key activities include:

1. Assessing, understanding and creating an inventory (cataloguing) of key data sources.
2. Centralising the management of data lineage (data origins and its transformation over time), profiling (analysing source data) and master data (common point of data reference).

3. Establishing KPIs for assessing data quality, a formal process and tools to support the achievement of the KPIs.
4. Defining and filling data governance roles such as data owners, stewards, architects, modellers.

Data management is less effective if done in isolation. Data management as a practice requires partnership with the business. For example, data cataloguing should not solely identify business-critical and ancillary data sources. Mapping against current and future business requirements creates a clear connection between the business and data strategy. Similarly, empowering citizen data scientists to leverage a self-service model means IT teams are no longer required to push data and insights to the business. User friendly platforms and the advent of enterprise search capabilities also puts the business in the driving seat. Simple queries can be created by a business or executive user in a contextual sense, with AI/ML driven search algorithms translating, drawing and aggregating data from various business areas to render powerful (and predictive) visualisations.

Technology advancements will enable better quality of data at its source. Higher quality devices naturally result in better data and a better outcome. The evolution of biometric technologies with sophisticated cameras as an example, ensures more accurate identification and authentication. With innovation however comes responsibility. The subject of ethical use of data is a contentious topic and an increasing focus in public policy and regulation. This is partly driven by the fact that AI-based decision making lacks accountability and could have unintended detrimental consequences. If an autonomous vehicle makes a decision that results in an accident, who should be held liable – the manufacturer, the passenger or the owner?

Advancements in Cloud platforms offering a scalable view of data, ingesting real time and applications that intelligently automate batch and streaming datasets have supported a rise of augmented data management. Data quality checks and remediation can be automated with ML and AI. Algorithmic engines drive business rule management, self-cleansing procedures and automate once manually intensive tasks. Performance is monitored in machine not human hours.

The democratisation of data is inevitable. Data exchange platforms and APIs provide a unique opportunity to generate new revenue streams through data monetisation, but only if it is reliable. This is a true testament to the existence of Datanatomy—data as the anatomy of an organisation.



The transformative impact of Cloud

David Fodor

Business Development - Financial Services
Amazon Web Services, Australia & New Zealand

Amazon Web Services (AWS) has been operating within Australia and New Zealand since 2012, supporting every industry with every type of business including startups and— from startups to the largest enterprises. It provides a platform of 160-plus services to its customers across areas such as infrastructure or applications or adoption of artificial intelligence and machine learning. Globally, AWS is the Cloud services giant, generating \$US25.6 billion in revenue and returning profits of \$US 7.2 billion to parent Amazon Inc.

Customer obsession

At AWS we talk about customers being wonderfully dissatisfied. What we offer them will excite them today, but tomorrow will be expected as the new normal. And that is just the nature of consumption in a world where technology is evolving so quickly.



Organisations remain keen to understand how they leverage the bleeding edge of technology, as it enters the market in a paradigm where they're traditionally challenged by legacy infrastructure.

Customers don't expect to be able to recreate or reinvent their organisations overnight, but it's about how to blend new technology into the stack that they've built over decades.

That's the challenge. And that's the expectation that we strive to meet every day. I focus on the financial services industry em rule – looking after banking, insurance, superannuation and a lot of start-up customers. We provide the platform of services to help them either move away from their legacy environments and the technical debt that builds up in that space over time, or we'll help them to reinvent from scratch. There is a lot of activity, particularly in the start-up banking space, at the moment.



In financial services the pace of new entrants to the market is accelerating month by month. It's amazing.

Cloud-driven transformation

We help customers create the ability to experiment. The adoption of Cloud means you can more rapidly establish infrastructure that will support an environment to try new things without investing too much upfront. It allows you to fail faster and more inexpensively when you're pursuing digital innovation to improve the customer experience.

It's about how quickly and easily you can establish infrastructure and – importantly – decommission infrastructure when you don't need it. You don't have to worry about infrastructure costing you money when it's not being utilised. So customer experience enabled by a culture of experimentation is one area that we see customers heavily invested in today.

Security assurance

The evolution of the understanding about how you can secure your data in a Cloud construct, versus a traditional on-premises environment, is very interesting. We provide a range of services that offer assurance both to the



organisation itself and to the overseeing regulator that any sensitive information is transferred and held securely in a Cloud construct.

So we have architectures, backed by services, that provide encryption of the data – both when the data is being transmitted and when it is sitting at rest. It's so fundamental it has become just a hygiene factor when it comes to Cloud use. We have seen in recent times in the financial services industry, a move to what we call continuous assurance.

“ *Our customers have the ability to move the balance from preventative to detective controls where they can get minute-by-minute assurance that the data held in their Cloud is being held securely. Any malicious activity on that platform becomes clear in real time.*

There is also a growing awareness of that capability by the

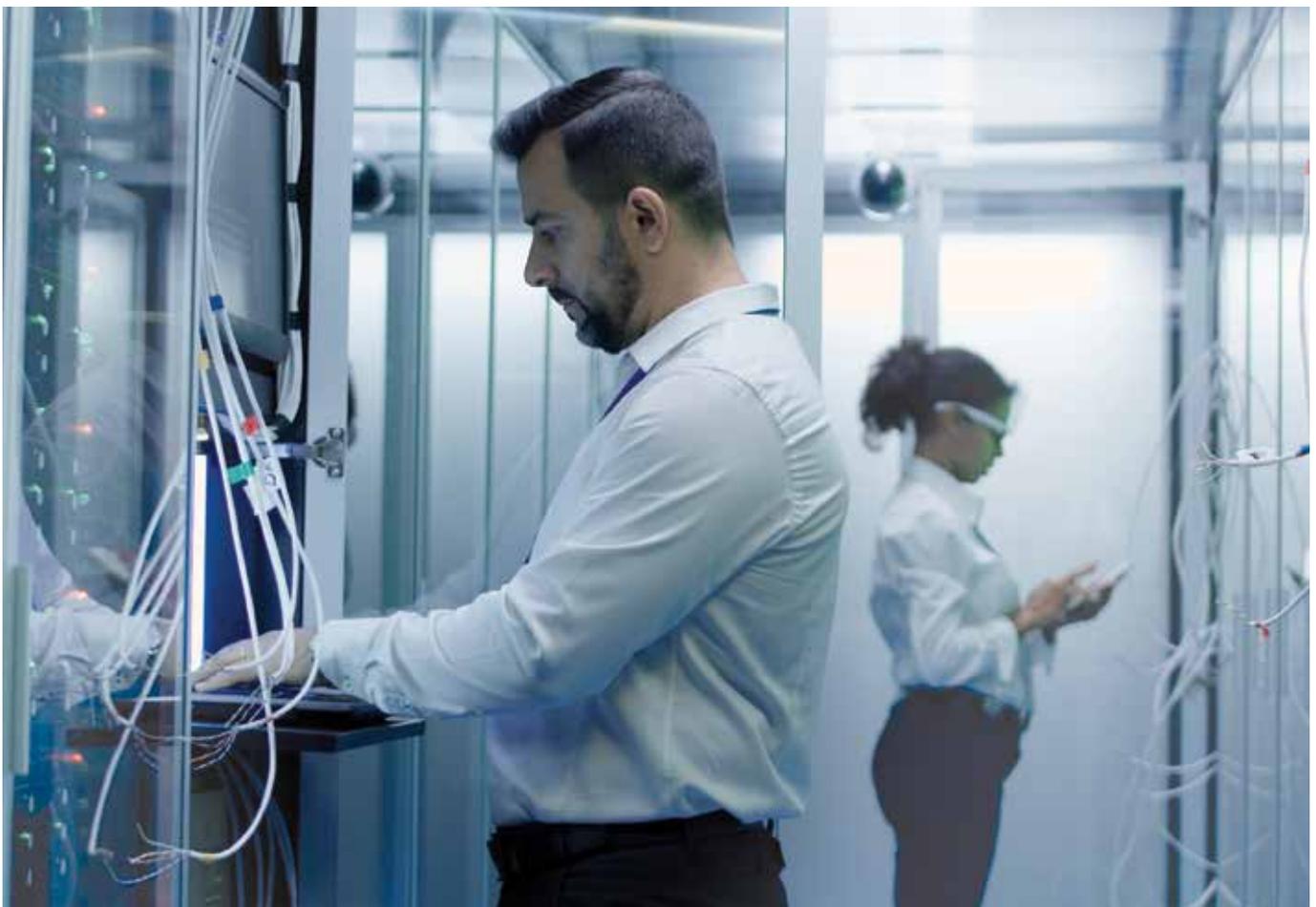
regulators in the market. Our platform has been developed for the most demanding organisations in the world. We provide security services to many government departments globally. All need to be backed by the relevant certifications that they have for protected data. As those services are developed, Cloud computing democratises access to those services for everyone. That's a different paradigm to what individual organisations can do on their own.

We've seen a material shift in the regulators' posture regarding Cloud-based security services. Thus our customers are starting to invest in the Cloud constructs that enable the most sensitive data that they have to be migrated to – and kept safely in – Cloud.

AI and the Cloud

Artificial intelligence and machine learning as a subtopic within Cloud, have become very popular in recent times.

A lot of the techniques that we employ to support machine learning are not new. The difference is that there is so much more data available to build and train models. Likewise,



the compute power to support that development process and the inference process that's required to support machine learning has grown exponentially.

So if I wind back the clock to my experience 20 years ago, in the early stages of developing models to support risk management use cases in banking, nothing fundamentally has changed from a development perspective. What has changed is just the sheer scale of data that you can use through that cycle and how you can then employ those models in production.

We're seeing a huge appetite for experimentation with artificial intelligence and machine learning. But more importantly, we're seeing the need for organisations to get their data to a point where any utilisation within an AI construct is going to be efficient.

The model will only ever be as good as the quality of the data that you provide to it. Organisations recognise they have a lot of work to do to improve the quality of their data. That's true both in terms of the way they hold it, but also in just understanding how that data came to be and how it has been manipulated over time.

Behind that, marketing use cases around next best offer have always been prevalent and now being re-explored. One of the things that we see as a real trend in this market in recent times, has been that the appetite for customers to reinvent the customer experience through their telephony channels.

When it comes to quality assurance, it's very early days. I haven't seen significant investment in use cases that employ AI for assurance processes yet, but I'm sure as organisations redevelop their code deployment and delivery constructs, evolve their DevOps operating models and get competent at managing CI/CD and blue/green deployments, they will look at the value they can get from AI techniques to further automate this process back up the value chain.

Building accountabilities

Traditionally, there was a clear delineation between developers and testers. Now developers are much more accountable – and will increasingly be accountable – for doing a significant part of the assurance process themselves. And, as a result, organisations will want to automate that as much as possible. We should expect to see the balance of metrics – or what success looks like for a development cycle – to evolve very much to cycle time over and above pure defect rate. As techniques such as blue/green and canary deployments evolve even further, and as microservices architectures evolve further, the impacts of defects in production will become localised to the extent where you can afford to bias speed over failure.



Traditionally, there was a clear delineation between developers and testers. Now developers are much more accountable – and will increasingly be accountable – for doing a significant part of the assurance process themselves.

The more you bias to speed, the more cycles that you can produce, the better you get and the lower your failure rates become. There is a growing bias to optimise for speed over perfection within an environment of effective roll-back capabilities, particularly in a blue/green environment construct. The blast radius in a microservices architecture means that point failures don't bring down your whole application. It might bring down one service within a broader stack. That's definitely the future that we see. We see organisations who would rather perform more deployments with small failure rates, than have protracted Waterfall cycle development timelines with monolithic failure risk.

10 Key takeaways for the future of Quality Assurance

1



Digital transformation

Digital transformation initiatives need to be of high velocity to create competitive advantage for organisations. Transformative QA practices will need to consider risk exposure, organisation culture and reduction in time to market to drive successful digital transformations.

2



Shift-Left or Right-Shift

Organisations will adopt DevOps and continuous testing practices which will enable shift-left and continuous quality monitoring. It will also help create timely and accurate feedback loops that will enable quick adaptation to changes.

3



Automation

Automation will become part of the QA DNA and will reach significant level of adoption. It will also become simpler with codeless and self-healing test automation. Organisations will also use a combination of AI and RPA for test automation and automating reporting and analysis.

4



Redefined KPIs

Organisations will measure the user experience across end-to-end business transactions and QA teams will have the same KPIs as other team members. Organisations will also adopt integrated KPIs which will further foster innovation and collaboration.

5



Evolution of QA Tools

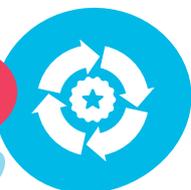
Tools for QA will be based on AI/ML which will enable UI, pattern and visual validation. It will also have the ability to self-heal and self-script test cases.

QA Operating Model

Organisations will have a myriad of options in structuring their QA operating model for the best outcomes. It is suggested that QA centre of excellence models and the QA CoE team should include both QA experts and business teams:

- **Centralised:** Where QA centre of excellence will be centralised and will focus on centralising best practices, tool strategy, frameworks and processes. The execution of QA, however, will be decentralised.
- **Hybrid:** In this model, QA CoE will be divided between central and squads/PI teams. The responsibilities for best practices, tool strategy, frameworks and processes will be decentralised to some extent in addition to execution of QA.
- **Decentralised:** This will be applicable for small organisations where governance and implementation are devolved to specific business units/programs.

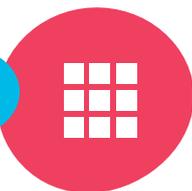
6



QA framework and strategy

Enterprises QA tool strategy will not be limited to commercial off-the-shelf tools but will also include open source tools. As such, one tool will not meet all the needs and organisations will use a combination of COTS and open source QA tools as their strategy.

7



Focus on capability uplift

With AI-based digital applications coming up in the future, the capability requirement will change from SDET's to SDET plus data science/statistical modelling. For example, software development artificial intelligence engineer in test (SDAIET). This means that QA experts will have to gain knowledge and training not only in development but also in data science and statistical modelling.

8



9



Role of industry bodies

Industry bodies around the world will evolve to certify expertise not only in QA, DevOps/Agile but also AI-based QA and test frameworks.

10



Role of system integrators

The role of system integrators will transform into an innovation enabler due to flux of technologies and requirement to bring best practices from its experiences across the world.

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With the industry's #1 Continuous Testing platform, Tricentis is recognized for reinventing software testing for DevOps. Through agile test management and advanced test automation optimized to support 150+ technologies, we provide automated insight into the business risks of your software releases—transforming testing from a roadblock to a catalyst for innovation. The result is accelerated software delivery speed, improved cost efficiency, and reduced business risk. Tricentis has a global presence in Austria, Australia, Belgium, Denmark, Germany, India, Netherlands, Singapore, Switzerland, Poland, United States and the UK.

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Delphix's mission is to empower businesses to accelerate innovation through data. In a world where every company is becoming a data company, the Delphix Dynamic Data Platform gives teams self-service access to secure, personal data environments to fuel application development, analytics, and AI while also minimising data risk.

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Neotys develops NeoLoad, the most automated performance testing platform for enterprise organizations continuously testing from APIs to applications. NeoLoad provides testers and developers automatic test design and maintenance, the most realistic simulation of user behavior, fast root cause analysis and built-in integrations with the entire SDLC toolchain. NeoLoad lets you reuse and share test assets and results from functional testing tools to analytics and metrics from APM tools. And as a load testing platform, NeoLoad supports the full range of mobile, web and packaged applications, like SAP, to cover all testing needs. Continuously schedule, manage and share test resources and results across the organization to ensure application performance.

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