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Software testing

Trends shaping the industry

Foreword

Emerging technologies and digital transformation are sweeping across businesses today and are transforming the way software testing is being done.

With an onslaught of the global pandemic, there were new issues for IT programmes, and software testing too faced challenges. However, with quick adoption to the changing technological landscape, some challenges were resolved, while few still need a solution.

The software testing industry has evolved and transformed itself into a more robust and inclusive function, ready to deliver businesses of the future influenced by new ways of working, hitherto considered difficult.

We intend to share in this point of view, which is in collaboration with NASSCOM, current trends that have shaped the software testing industry, since the pandemic.

The insights are based on discussions with experts from service integrators (SIs), global capability centres (GCCs) and product-based organisations on topics covering industry trends, business models, people, budget, methodologies, automation, technologies, tools and challenges.

Hope you find the insights useful.

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KPMG in India

Methodology

This point of view (PoV) is a combination of roundtable discussions, secondary research, past experiences and knowledge of KPMG in India and NASSCOM. Key takeaways from the panelist discussion conducted jointly by KPMG in India and NASSCOM are shared here.

It provides an understanding of the global and Indian trends in software testing and insights from testing professionals across a diverse set of current topics besieging the industry. It offers a view of the evolving nature of the industry.

You may access Nasscom's previous report on 'Software testing to Digital Quality Assurance - A paradigm shift' available here:

https://nasscom.in/knowledge-center/publications/software-testing-digital-quality-assurance-paradigm-shift

The round table discussion was attended by distinguished panel members from the software testing industry across services, GCCs and Product based organisations.

- 15% Round Table discussions
- 60% NASSCOM/ KPMG experience & knowledge
- 25% Secondary research
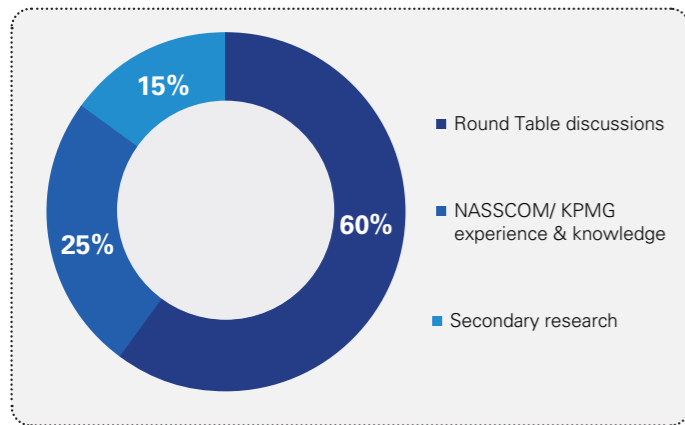
Key trends impacting software testing:

1. Industry trend: Accelerated digitalisation and impact on IT advancement and software testing

The pandemic accelerated digital transformation across organisations and those that adopted digital strategies earlier have done significantly well. While the global test market exceeded USD40 billion in 2020 and is estimated to grow between 7% to 12% CAGR until 2025, the market is estimated to add an incremental USD34.5 billion for the period 2021 - 25[1]

2. Business models: Customer preferences driving evolution and adaptation

Service-delivery models of test organisations have undergone change in preferences since the pandemic. Nonetheless, traditional staff augmentation models have seen an incredible growth in the last two years. Newer and innovative models, such as outcome-based pricing, have seen an adoption by a few clients.

3. People: Specialised strategy to manage business and demand fulfilment

Demand for software testing resources is at an all-time high. However, there is shortage of skilled resources. There has been an incredible surge in demand for software test / quality resources in line with IT advancement. With IT companies willing to hire many more, there is scarcity of resources with the right skills. The demand is more for skilled testers than tenured testers.

4. Process: DevOps and agile Becoming an integral part of testing

Continued focus to advance this methodology with tangible benefits and efficiencies being realised, which advocates a 'shift-left' approach for continuous testing. Testing while gaining importance is also seen as being more inclusive, thus reporting improvements in quality of software, productivity and time-to-market.

5. Markets: Banking continues to rule the tech space

Indian software testing vendors continue to attract most of the work due to its large available talent pool and advancement of vendor capabilities. Banking continues to be the domain ruling the tech space. Number of (BFSI) GCCs setting shop has seen a substantial increase over the last two decades

6. Test automation status: Progressively meeting expectations

Generally, organisations seemed to have achieved 50% automation levels, while a few aim to achieve levels of 80% test automation. With most automation directed towards execution, organisations need to focus on process efficiency than just execution, such as requirements automation, test design automation, etc.

7. Testing tools: The debate continues - script-less and open-source over licensed tools

With an ever-increasing demand for custom software solutions in support of digital transformation, it has sparked the emergence of testers outside of the traditional IT organisation and has influenced the rise in codeless testing tools. Such tools bridge the gap between non-technical and technical teams, and are being widely considered for adoption by many testing organisations.

8. Managing challenges: A balancing act

With the pandemic altering ways of working (WoW), coupled with growing expectations of employees for extreme flexibility, organisations are trying to strike a balance with market trends and evolving HR practices. The challenges that most organisations face today are hiring, retention and motivation of employees; managing remote work and 'return to office' strategy.

1. Industry analysis, Software-testing-market, GMInsights
   Growth in software testing services market, Technavio, accessed April 27th 2022

1. Industry trend

Accelerated digitalisation and impact on IT advancement and software testing

The key word today is 'go-live faster'.

While 'go-live faster' might often be associated with lower quality, apart from solutions discussed as under, sticking to the fundamentals of testing is equally important.

- Focus on reduction of defects, shifting left non-functional testing activities like performance, security testing, etc. will help in faster go-live without compromising on quality

- Adoption of newer technologies, tools and innovations has not only reduced cycle time but also improved quality of testing
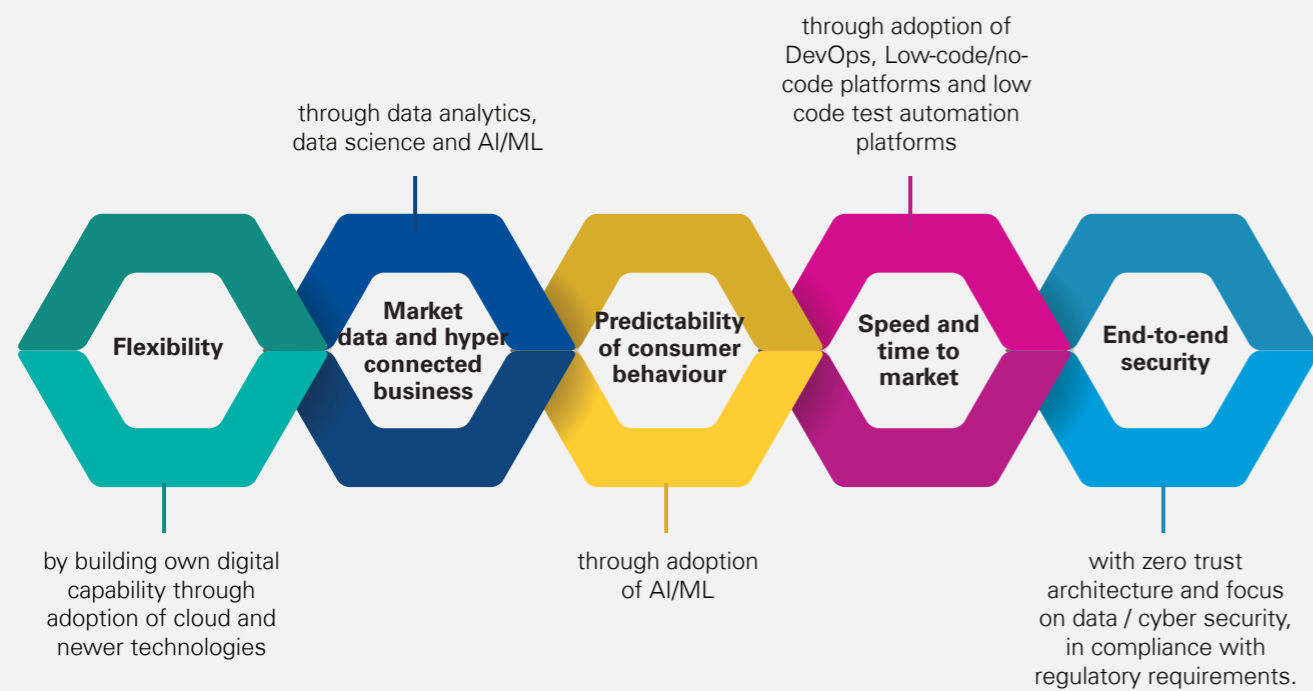
- As part of innovative solutions in testing, the focus is on preventive activities rather than activities that are more reactive. As a result, demand for Testing as a Service (TaaS) is growing.

India's technology sector is set to become a USD227 billion industry in FY'22, a growth of 15.5%, highest in over a decade according to NASSCOM[2]

While global test market exceeded USD40 billion in 2020 and estimated to grow between 7% to 12% CAGR until 2025, the market is estimated to add an incremental USD34.5 billion for the period 2021 - 25

With most businesses going online, there are five key aspects that test organisations are focusing on

through adoption of DevOps, Low-code/no-code platforms and low code test automation platforms

through data analytics, data science and AI/ML

Flexibility

Market data and hyper connected business

Predictability of consumer behaviour

Speed and time to market

End-to-end security

by building own digital capability through adoption of cloud and newer technologies

through adoption of AI/ML

with zero trust architecture and focus on data / cyber security, in compliance with regulatory requirements.

From a testing perspective, more demand can be expected in areas like cloud testing, data analytics, big data, AI/ML, user experience and accessibility testing, test data management and security testing.

To increase speed and minimise risks, organisations are focusing more on buy vs build.

There is also increased interest across organisations to use Low-code/no-code automation platforms, especially for automating packaged applications which undergo frequent upgrades.

Testing has become more of an inclusive function now than before.

While the quantum of testing for testing teams has not changed much, with DevOps practices being implemented across organisations, the boundaries between development, testing and operations teams are blurring.

However, most of the organisations are experiencing a shortage of skilled resources. Hence training and upskilling internal resources on newer technologies and skills is the need of the hour, and should be done along with recruitment of new talent.

2. India set for the rising techade as industry revenues soars past dollar 200 billion, NASSCOM, 15th Feb, 2022

2. Business models

Customer preferences driving evolution and adaptation

Disruption is everywhere and is seen venturing into software testing pricing models to meet changing expectations. The move towards work-from-anywhere is only intensifying new service-delivery models for

organisations seeking agile, scalable business services.

In the coming years, pricing will be based on available skilled digital talent from anywhere with no boundaries.

An influx of demand from parent organisations to global capability centres (GCCs) and other outsourcing firms is driving the tremendous resource requirement. This immediate fulfillment is tried and being achieved
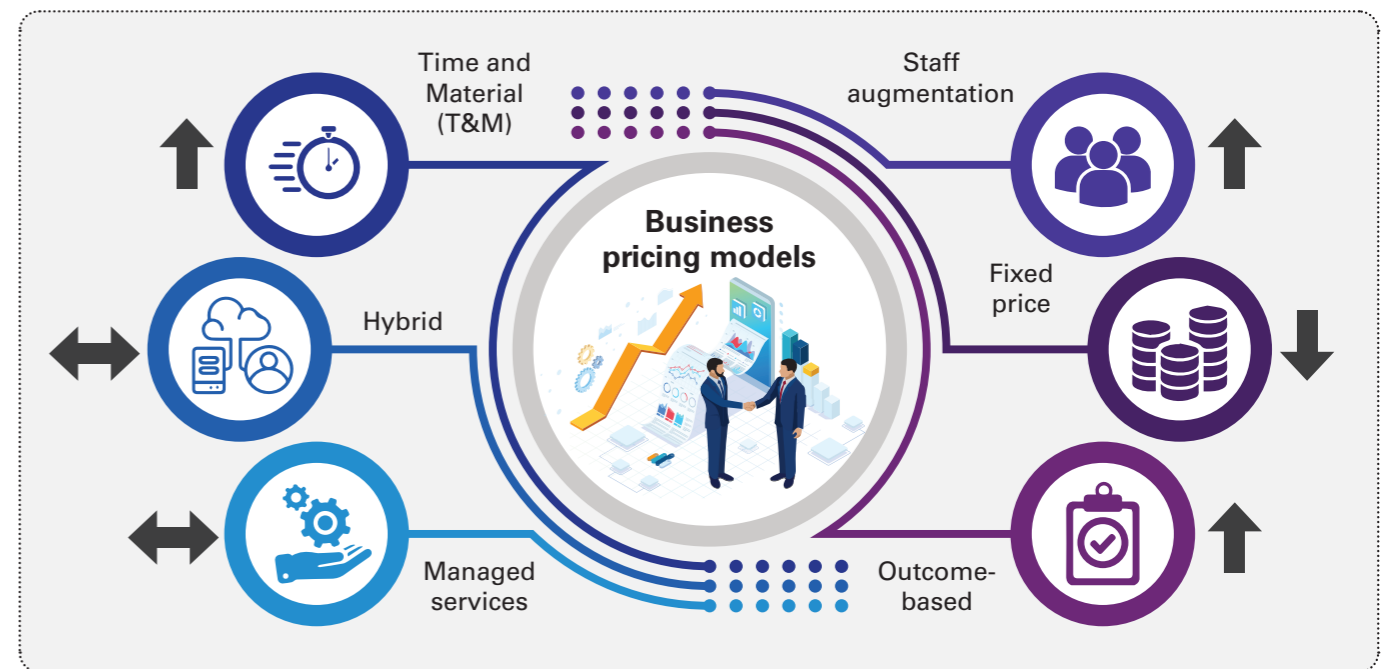
through the staff augmentation model. Traditional staff augmentation models have seen an incredible growth in the last two years, with managerial roles retained by clients.

With the growing demand for digital talent, business models vary with traditional services and new age services, with the latter being more resilient. Pricing discussions and negotiations are also dependent on tenure of client relationships.

- Test organisations need to look at optimising the pyramid structure and look at different pricing and operating models to keep costs low

- Another option to improve project margins, especially in managed services or fixed price models, is to focus on continuous improvement and innovation. Focusing on innovative solutions will help organisations to deliver outcomes at lower cost, thus improving project margins across testing engagements

- Newer and innovative models with outcome-based pricing like variable fees depending on the defect slippage have also been adopted by a few clients

- Because of operating models, customers are not inclined to change vendors and explore other options

- Time and Material (T&M) seems to be the preferred way compared to fixed bid or other models for newer initiatives, with less interaction possible because of remote working.

The below representation illustrates business models that have seen an increase, decrease (or) no change as compared to pre-Covid preferences.

Time and Material (T&M)

Staff augmentation

Business pricing models

Hybrid

Fixed price

Managed services

Outcome-based

3. People

Specialised strategy to manage business and demand fulfilment

IT budgets are expected to grow at the fastest rate in over 10 years with an average growth of 3.6 per cent in the overall IT budget for 2022[3]. Similar trends are also being observed in testing across organisations. Hence, the demand for testing, along with other IT services, is on the rise especially for skills across new tools, technologies and solutions.

One of the notable outcomes of remote working during the pandemic is that organisations across geographies are now more interested in outsourcing the work to remote locations. Organisations are willing to negotiate on a hybrid working model and billing rates with outsourcing partners who are well-equipped with right skilled talent.

With the spike in demand, hybrid paradox and great reshuffle, most of the organisations are experiencing skill gaps in their staff based on technology trends in the market.

The demand is more for skilled testers than tenured testers. Cross skilling and upskilling the existing team to make them future ready might help manage the demand as well as keep the costs low. However, this might also pose high attrition risk. But it can be a strategy to consider if it is worth the investment, and retention strategies can be put in place for high performing team members.

A Nasscom Futureskills report stated that digital tech talent is growing 5x faster than core tech talent (estimated to be 3.8M in FY2021), accounting for 30-32% of tech talent. The demand-supply gap for digital tech talent is expected to increase by more than 3.5x by 2026[4].

Despite employers implementing various hiring strategies, the percentage of offer reneges have gone up significantly during this period and can be expected to continue in 2022-23 as well. While focusing on minimising dropout percentages might help in expediting demand fulfillment, analysing the trend and improving the quality of profiles sourced might help organisations to meet the demand on time.
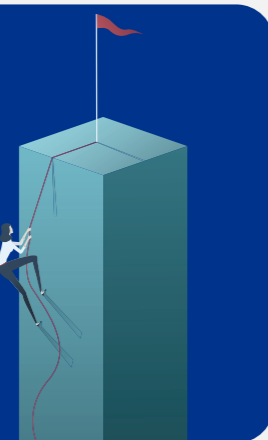
Salary trends in testing are on an upward spree.

Case Example:

Challenges

A global services company observed a surge in demand for performance testers (PT) for both web and mobile app based.

With attention to more test automation, the challenge was to address the PT skills gap.

Solution

While the demand was thought-provoking at the time, emphasis was placed on reskilling/upskilling the existing workforce under the guidance of experienced resources.

Tie-ups with online and offline learning centres with choice-based learning opportunities were provided to all employees, which encouraged continuous learning.

Hence testers with skills in test automation/functional and PT form the talent pool here now.
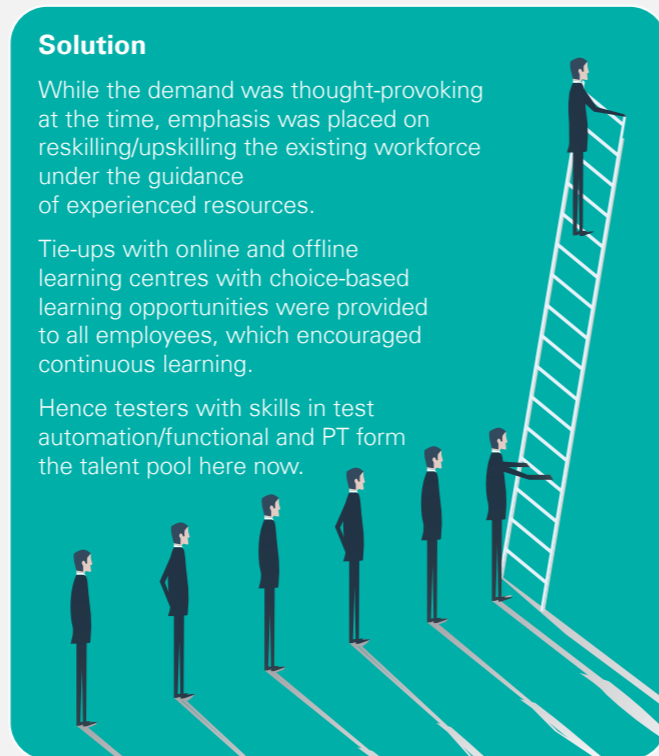
A majority of the panelists stated that their testing spend has increased in the last two years.

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3. IT budgets are growing heres where the moneys going, Gartner, accessed on 10th Mar, 2022

4. India's Tech Industry talent – Demand Supply analysis, NASSCOM, Feb 2022

4. Process: DevOps and Agile

Becoming an integral part of testing

While the past decade was about shifting from Waterfall to Agile or DevOps methodologies, the next decade will be about taking the 'Agile + DevOps' approach along with continuous testing for building superior quality into the delivered products and services.

Agile and DevOps driving automation in software development and testing was stated in our last report. Looking back on the progress since, adoption of Agile and DevOps in testing is continuing and now more so with the pandemic, there seems to be more focus to advance this methodology with tangible benefits and efficiencies being realised, which advocates a 'shift-left' approach for continuous testing.

Agile or DevOps or both? Just as a collective approach was required during the pandemic to find solutions, so does this question too. A recent Forrester survey results[5] showed a clear agreement with this collaborative approach instead of an independent approach.

The Forrester survey showed that large majorities of those doing Agile + DevOps joint programme enjoy more benefits than those who adopt them separately, such as, advantages of faster solution delivery (84%), more frequent releases (88%) and faster business value (88%).

An interesting observation from the discussion among senior stakeholders from the testing industry also seemed to suggest blurring boundaries between software development and testing, thus leading to the demise of roles such as 'test engineer'. Testing is becoming an inclusive piece in the overall delivery ecosystem including budgeting, where hitherto testing had its own budget, it is now changing. With these changes, the onus of quality lies with everyone involved in the project, which is a true shift left focused approach.

Undoubtedly, test automation with DevOps is ensuring collaboration with all departments of Dev and Ops. Test automation tools continue to enunciate this shift left approach.

Case Example:

Background
A large organisation in its efforts to consider end-to-end automation in software development and delivery attempted to change with introduction of Agile and DevOps in development and testing lifecycle.

Solution
The DevOps approach of continuous testing benefited the software being developed. Having considered Jenkins CI build pipeline to run automated tests for every build and verify code quality. More prominent was the impact of DevOps on STLC, with testing moving to development phase, with more automation and quality gates moved to the left.
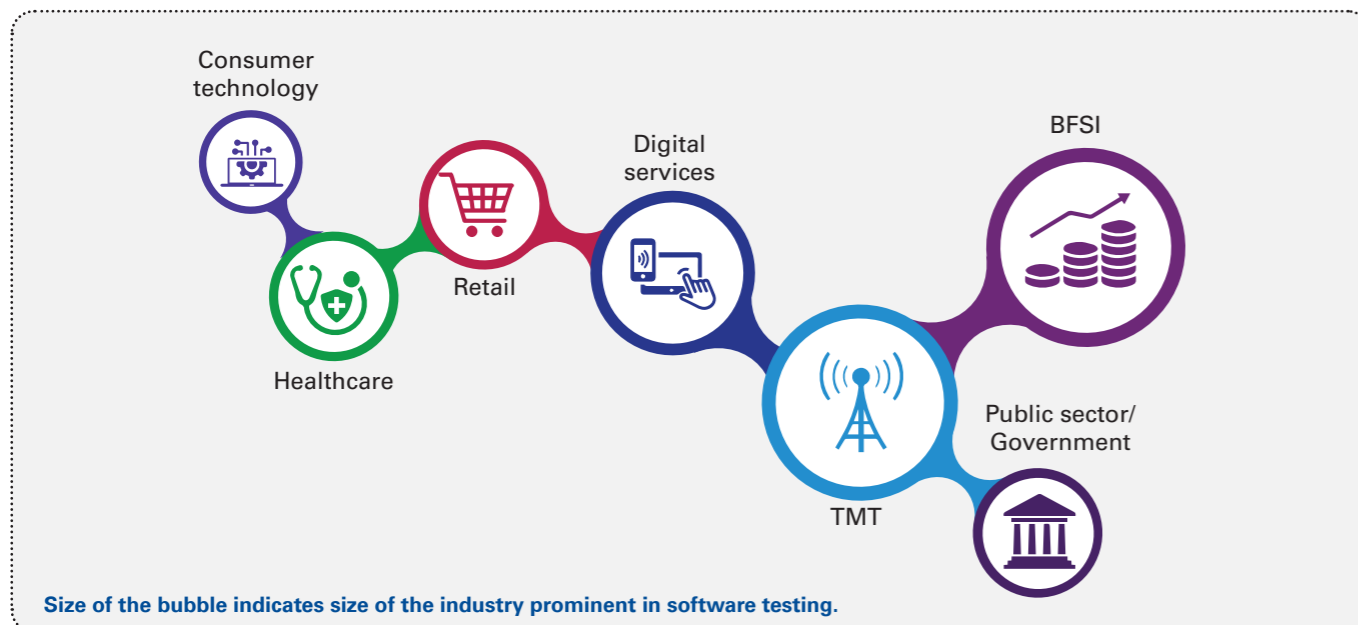
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5. Agile, DevOps & Covid-19, Forrester, Mar 2020

5. Markets

Banking continues to rule the tech space

Of the many accolades that India was noted in managing the pandemic, the Indian technology industry was no less behind in its management of continuing delivery to its global clientele during this period of work from home (WFH).

India continues to be a leader in the choice of many global clientele. Indian software testing vendors continue to attract most of the work due to its large available talent pool.

Consumer technology

Retail

Digital services

BFSI

Healthcare

TMT

Public sector/ Government

Size of the bubble indicates size of the industry prominent in software testing.

Banking continues to be the domain ruling the tech space. The number of (BFSI) GCCs setting shop in India has seen a substantial increase over the last two decades. India continues to be an attractive destination with factors supporting its growth among other nations such as access to a conducive ecosystem, english speaking talent pool, growing innovation trajectory and technological preparedness[6].

Collaboration with fintech/technology partners in digital lending, payments, utilities, risk surveillance, etc. has seen an increase in demand for specialised skillsets. Consumer technology, media and healthcare verticals also continue to see growth.

The roundtable discussion among senior stakeholders from testing industry echoed in unison of the potential business and ample growth opportunities in servicing core platforms. It needs to tread carefully and continue to upskill/cross-skill its resource to maintain its advantage. However, the need is for us to develop core platforms and aim at the next level.

Certain infrastructure shortcomings, and rising popularity of nearshore centres may be considered as worrisome for GCCs in India, though this does not seem to disrupt growth of the industry for at least another decade.

Some of the nearshore locations gaining traction are from regions of Eastern Europe and South America, with specific language support for Spanish/Portuguese populace.

In a LinkedIn survey, 40 per cent of respondents rated India to be technology leader in the next 10 years due to its large tech adoption[7]. India now has the experience and expertise to consistently deliver to the world and the well managed WFH scenario only adds to its achievements.

A large global services company had to increase the testing team size by more than 50% to cater to an increase in volume of testing projects from the US and the UK.

6. BFSI GCCs: The Road Ahead – A NASSCOM KPMG in India Initiative, Jan 2022

7. Excerpt from the round table discussion jointly conducted by NASSCOM & KPMG

6. Test automation

Progressively meeting expectations

Delivering on time, without compromising on product quality is the minimum expected in every project. Business expectation is that automation gets testing done quickly. Test automation has already penetrated the industry in testing repetitive tasks quickly and efficiently with proven benefits.

The discussion on automation, deliberated on automation making great strides in testing, however not ruling out manual/functional testing completely yet.

Though test automation solutions are commonly promoted with the promise of ease of use and efficiency, its common that majority of testing is still done manually. Domain expertise to test packaged applications continues to be driven mainly by functional testers with domain expertise and will remain to be so at least in the near future.

With the evolution of GCCs, test automation is focused on exploring more of it to automate processes and increase efficiency.

The writing on the wall is clear – with advancing technology and faster quality application deliveries expected by clients, an early automation to complement the Agile-DevOps methodology and an automation approach across all QA activities is a must.

Generally organisations seemed to have achieved 50 per cent, while 1 in 8 aiming to achieve levels of 80 per cent test automation. Sixty-one per cent of those surveyed employs less than 50 per cent automation.

More companies are implementing cloud computing solutions and as they do, technical teams unlock new capabilities in productivity and speed to market as part of their test automation journey. As a result, during this pandemic, an organisation's business strategy and technology strategy were no longer separate entities.

Companies today are investing in technology decisions including test automation that are key to sustaining a long-lasting competitive edge in the future.

Areas such as cybersecurity, data science, IT operations and software development are leaning towards automation, particularly script-less automation tools/process automation to enable key decision making with respect to their organisation's business priorities or client priorities.

With most automation directed towards execution, organisations need to focus on process efficiency rather than just execution, such as requirements automation, test design automation, etc.

From the discussion, over 60 per cent have achieved about 50 per cent automation of their testing process.

Aim to achieve 50% automation

40%

~ 50% test automation achieved

60%
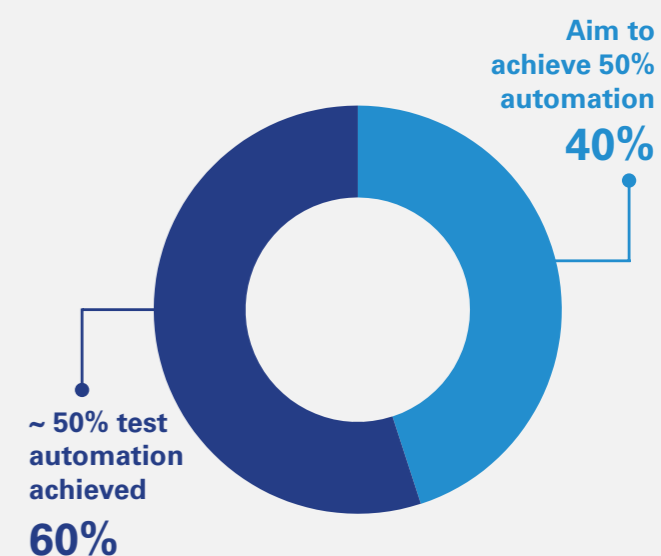
Source: Roundtable conference by NASSCOM & KPMG in India

7. Testing tools

The debate continues - script-less and open-source tools over licensed tools

Digitalisation picked pace over the last few years and the pandemic accelerated this process among enterprises. The testing industry came under pressure for faster and quality software delivery due to this acceleration.

Given a large variety of test automation tool choices, with their own unique strengths and drawbacks, teams are always trying to identify and use the right set of test automation tools. There is no one-size-fits-all test automation tool. Thus, while a mix of licensed and open source tools are in use, the choice of a tool is dependent on the domain, technology, security, etc.

With an ever-increasing demand for custom software solutions in support of digital transformation, it has sparked the emergence of testers outside the traditional IT organisation, which, in turn has influenced the rise in low-code.
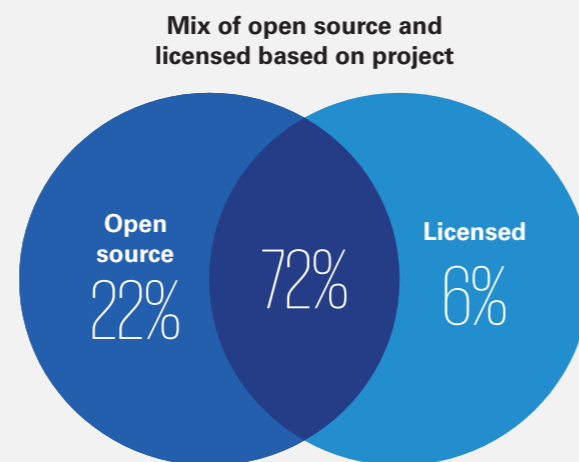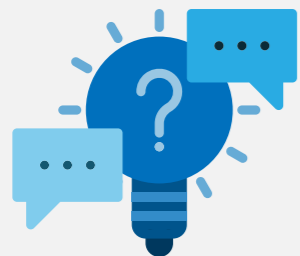
> The worldwide low-code development technologies market is projected to total USD13.8 billion in 2021, an increase of 22.6 per cent from 2020, according to the latest forecast by Gartner, Inc.

> India's Low-code no-code (LCNC) market revenues crossed USD400 million in FY 2021, growing at a CAGR of 15%, largely driven by exports. India has the potential to become a USD4 billion LCNC market with a higher global market share by 2025. BFSI, retail, SaaS are leading adopters of LCNC solutions[8]

The surge in remote development during the COVID-19 pandemic will continue to boost low- code adoption, despite ongoing cost optimisation efforts.[9]

Scriptless or codeless testing is a method to automate tests using tools instead of writing test scripts. The tools are generally based on test automation frameworks like Selenium. Such tools bridge the gap between non-technical and technical teams, and are being widely considered for adoption by many testing organisations. This approach will help organisations deliver testing projects efficiently with minimum need for manual coding and increased reusability.

One of the most widely anticipated and growing trends in test automation is the use of AI. AI will play a significant role, and will enable the non-technology and business users to adopt automation in the use of their custom applications. It will pave the way for an efficient test and asset management, easing the progression of teams to automate the testing process, enabled by AI and associated machine learning capabilities. AI-based test automation suites with built-in traceability will ensure high test coverage and low maintenance.

> Test automation tools powered by AI technology are garnering acceptance by organisations since they seem to provide an end-to-end software testing platform across all testing types.

Integrated agile project management tools are gaining traction for end-to-end test management and bug tracking over individual standalone tools.

Open source tools are gaining increasing importance when it comes to testing web applications that can operate across different browsers and operating systems.

Mix of open source and licensed based on project

Open source 22%

72%

Licensed 6%

Source: Roundtable conference by NASSCOM & KPMG in India

8. Managing challenges

A balancing act

With the pandemic changing ways of working (WoW) coupled with growing expectations of employees for flexibility, organisations are trying to strike a balance with market trends. The top three challenges most of the organisations face today are:

- Hiring, retention and motivation of employees
- Managing remote work and
- 'Return to office' strategy

Hiring is taking longer than it did before the pandemic, as the entire process is happening virtually. Some of the test organisations are already adopting AI/ML solutions to expedite hiring and minimise human intervention/judgement during the evaluation process, while others are leveraging social media and professional networks to expand profile search options. Organisations focusing on minimising lead times for various internal steps in hiring process, analysing the trends of new hires vs number of dropouts, and identifying the right source of profiles with the highest conversion rate, employee referrals, etc. are able to recruit more talent than others.

Even though hiring strategies are strong, they are being offset by high attrition rates in most organisations. This raises questions on whether the management is staying connected with the employees enough to keep them motivated to stay with the organisation.

There are several communication and collaboration tools that are widely used across organisations, but leaders are still finding it difficult to establish rapport with team members who joined virtually. They have never met other colleagues in person, and are feeling more siloed in the new WoW. Also, the number of meetings and amount of time being spent on collaboration tools have gone up due to remote work leading to extended work hours and less focus time for day-to-day deliverables. Several organisations are implementing focused hours for their teams with no meetings during those hours, but it is only helping productivity gains partially. Some of the best practices being adopted by organisations include:

Proactive delivery risk management - to address scope creep due to changes in requirements, poor quality of input code, delays induced by other teams, etc. This helps in better workload planning to minimise extra hours required from the testing team

Proactive communication - to keep the team informed about the timelines

Effective use of collaboration tools - to stay connected.

A hybrid model works well for employees to thrive, where some employees work from office while others work remotely.

Return to office plans are being implemented on a trial basis by most of the organisations. The hybrid workplace will be the new normal. Though the outcomes are a mixed bag, it is giving an opportunity to organisations to address new challenges in hybrid model before making it mandatory for employees to work from office at least 2 to 3 days a week. Organisations need to come up with revised policies in a hybrid model and focus on minimising communication and collaboration challenges. Project and team managers need to be trained regarding cultural changes in a hybrid WoW, and show no bias between people working from office versus people working remotely.

There is a significant demand for upskilling and reskilling of existing roles with an increasing demand for technology skills with an equally increasing demand for mid-level management professionals to manage this change.

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8. DRAUP Nasscom India Technology Skills Demand Supply Analysis, NASSCOM, accessed on 27th April, 2022

9. Gartner forecasts worldwide low code development technologies market to grow 23-percent in 2021, Gartner, Feb 2021

Way forward:

Skilling of workforce and evolving new ways of working

In spite of the new challenges that the industry has come to terms with, fear of the pandemic leading to an uncertain business environment proved wide off the mark and demand surged. Demand is expected to witness further growth as per the panelists and research conducted. The industry seems confident in its growth across trends in DevOps, test automation, newer technologies of AI/ML, etc. However, while skills and intellectual property are being developed to keep pace with the trend, most of the organisations are experiencing shortage of skilled resources. Hence, training and upskilling resources on newer technologies is the need of the hour, and should be done along with recruiting new talent, including fresh talent groomed to take on projects.

Developing new skills is important coupled with tools to facilitate testing. A tool across STLC provides for an opportunity to build a feedback loop between development and testing teams.

From a test practitioner's view, one must be keen to upskill/cross-skill and be available to opportunities across technologies with skillsets in demand from clients.

Businesses keen to become a hybrid company considering both advantages and challenges can hire glocal talent (locally and across the globe). Such a talent pool can help build a team with exceptional skills and be future ready.

As mentioned in our last report, and which still holds good, is that alliances and partnerships are important. The shift towards consultative partnerships with companies looking for a vendor who can partner with them in their IT transformation journeys and be there for the long haul, than just doing everything in-house.

Acknowledgements:

We sincerely thank all the leaders who invested their valuable time to give us inputs and contribute to this PoV. Our special thanks to all the NASSCOM Council Members for their valuable inputs during report finalisation.

We thank all the KPMG in India Partners, Directors and colleagues who provided inputs and continuous support from conceptualisation to launch of the report. We acknowledge the efforts put in by the following team members for publication of this report.

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About KPMG in India

KPMG entities in India are professional services firm(s). These Indian member firms are affiliated with KPMG International Limited. KPMG was established in India in August 1993. Our professionals leverage the global network of firms, and are conversant with local laws, regulations, markets and competition. KPMG has offices across India in Ahmedabad, Bengaluru, Chandigarh, Chennai, Gurugram, Hyderabad, Jaipur, Kochi, Kolkata, Mumbai, Noida, Pune, Vadodara and Vijayawada.

KPMG entities in India offer services to national and international clients in India across sectors. We strive to provide rapid, performance-based, industry-focussed and technology-enabled services, which reflect a shared knowledge of global and local industries and our experience of the Indian business environment.

About NASSCOM

NASSCOM is the industry association for the technology sector in India. A not-for-profit organization funded by the industry, its objective is to build a growth led and sustainable technology and business services sector in the country with over 3,000 members. NASSCOM Insights is the in-house research and analytics arm of NASSCOM generating insights and driving thought leadership for today's business leaders and entrepreneurs to strengthen India's position as a hub for digital technologies and innovation.

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