CIOs and IT leadership teams in every industry sector face an increase in business and competitive pressures. There is increasing need to deliver innovative solutions that enable revenue growth, to reach more customers faster, and provide integrated feedback for continuous improvement. This drives the need to rethink how IT organizations operate, organize, and deliver business services and outcomes.

IDC believes that organizations’ ability to grow and compete will increasingly depend on their digital “innovation capacity,” which is tightly linked to the talent and capability of software development teams. To meet the demands of a digital economy, CIOs must move beyond focusing on just improving IT operational efficiencies to enable business innovation, and provide superior customer experience through continuous deployment and improved software practices. To achieve this, CIOs must ask themselves how they and their teams will adapt, what strategies they will use, and how they will drive their business forward and respond to these challenges.

The use of DevOps practices is one way in which IT leadership teams can start to answer some of these questions and be more responsive to business demands. DevOps is increasingly considered as the solution to the ongoing struggle between the need for developers to innovate and update applications, and IT operations’ charter to guarantee reliability, resiliency, and availability of infrastructure and applications.

In a digital world, the end goal is to create connected intelligence that drives smarter collaboration and automation to deliver exceptional results and superior customer experience. However, DevOps is a multilayered challenge, and the business must be at its heart.

DevOps is not a science but an art, and success is based on multiple factors working together. DevOps should be the goal and not the starting point – it is a transformation journey – and the path that organizations choose to take will differ for each of them. Many organizations will not be able to make this transition alone. Organizations should opt to work with external services providers that can: guide them on this journey through a structured approach; assist in enabling end to end collaboration and cultural change; and provide the cross-functional technical platform through which to deliver.

THE PATH TO DIGITAL ENTERPRISE AGILITY AND THE RISE OF DEVOPS

IDC’s recent CIO discussions highlight that many organizations continue to be faced with the divergence of old and new IT, with new investments increasingly driven by non-IT management. Thus IT organizations are being asked to support rapid growth often from a perspective that is
difficult to grasp and requires a truly agile enterprise to make possible. Showing and proving value to the business through understandable metrics is a key target, as is addressing the existing IT culture in an effort to fix the basics and overcome cultural barriers to change. A key focus is on changing the culture from "over-engineering — no mistakes tolerated" to a "fail fast — fail early" culture.

The key challenge is essentially how to enable faster delivery of better quality (and often custom) business solutions that address and meet continuously changing business and customer needs. The creation of custom agile apps is the hallmark of the digital enterprise — if organizations are to keep up, then embracing more collaborative ways of working is critical.

With this rapid shift to digital transformation, IDC finds that DevOps practices are rapidly becoming more inviting, and indeed necessary, for enterprise survival. DevOps is not so new, but is something that many organizations are currently trying to get to grips with, understand, and implement successfully. So what do we mean by DevOps? IDC defines DevOps as a methodology, or set of practices, that unifies a team consisting of business leadership, development/testing, and operations to be responsible for the creation and delivery of business capabilities.

The Forces Shaping DevOps

The pace of change today highlights the need for IT organizations to become more efficient and really embrace business and customer alignment at speed. This drives a growing debate about the need for speed, and the nuances between waterfall and agile application development methods; DevOps takes Agile practices a step further, and looks to add more of a business and customer-centric perspective to certain workloads that require faster deployment capabilities.

Increasingly, enterprises consider DevOps as the solution to the ongoing struggle between the need for developers to innovate and update applications through agile development methodologies and IT operations’ charter to guarantee reliability, resiliency, and availability of infrastructure and applications based on ITIL practices. Ultimately, DevOps practices offer IT organizations a tremendous opportunity to transform how they develop and operate IT services.

Figure 1 shows the major forces shaping DevOps today.

FIGURE 1

Forces Shaping DevOps

Source: IDC, 2016
CIOs we talk with agree on one point: this "movement" forces organizations to address how to work more effectively together to help break down the silos that still exist and inhibit change.

Without a doubt, business and IT — and increasingly the customer — must work in lockstep with each other. This requires a real change in mindset, culture, and the way we operate. As one CIO told us: "As a company, we must do a complete technology reinvention (at speed) to align with the business model, if we fail to do so, the company will also fail."

In fact, IDC predicts that one-third of top 20 firms in industry segments will be disrupted by new competitors within five years. The need to balance speed, user experience, reliability, and quality has never been greater. It is clearly a matter of transform or perish.

Ultimately, DevOps practices offer IT organizations a tremendous opportunity to transform how they develop and operate IT services. DevOps is not easy but must become a strategy and execution tool for every CIO. Investment in DevOps involves a commitment to change, specifically changing the culture, organizational structure, training investments, and leadership goals of IT.

**Measuring and Driving DevOps Maturity**

To be able to assess overall enterprise DevOps maturity, IDC has created a model to gauge DevOps competence and sophistication through five stages of maturity: ad hoc, opportunistic, repeatable, managed, and optimized — see Figure 2.

Overall, IDC finds around a third of enterprises utilizing DevOps practices to be fairly advanced in driving and developing the right capabilities and competencies for DevOps success. However, what is clearly evident is that the majority of enterprises are — to varying degrees — just beginning to get their arms around what DevOps means, what's required, and what benefits can be delivered. An increasing number of CIOs understand the value and benefits of DevOps, but must now work to overcome barriers around skills, culture change and legacy IT process mindsets to accelerate adoption.
Recent IDC research found that 80% of large enterprises will utilize DevOps by year end 2016 to optimize the delivery of business services across both development and operations teams. DevOps looks to bring the best of both ITIL and agile to the forefront, while elevating the real reason for these investments, which is driving business value and outcomes.

IT organizations have a tremendous opportunity to collaborate across both sets of practices to accelerate and optimize business value. Tighter integration can increase process efficiencies, teamwork, collaboration, and overall business value. There is an expectation that DevOps-led projects will accelerate the delivery of capabilities to the customer by an average of 15%-20%.

**Thriving With DevOps — Critical Success Factors**

Like many other methodologies, DevOps is multi-dimensional, and success is based on a number of factors that must all work in lockstep with each other. The IDC DevOps maturity model is based on five dimensions that are necessary to drive successful DevOps implementations (*IDC MaturityScape: DevOps, IDC #249471, June 2014*). The five dimensions are: people, culture, business, technology, and process standardization.

IDC's research confirms that a growing number of IT organizations are thriving within the digital environment by leveraging DevOps disciplines. But what are these organizations doing differently? Table 1 identifies the top 5 traits of organizations thriving in the use of DevOps.
TABLE 1

Top 5 Traits of DevOps Thrivers

<table>
<thead>
<tr>
<th>Maturity Dimension</th>
<th>Traits</th>
</tr>
</thead>
<tbody>
<tr>
<td>People</td>
<td>Unified cross-functional teams encompassing development, testing/QA, operations, and business stakeholders and an integrated organizational IT and business strategy.</td>
</tr>
<tr>
<td>Culture</td>
<td>Collaborative, risk taking ethic, metrics are commonplace, as is team-wide accountability.</td>
</tr>
<tr>
<td>Business</td>
<td>DevOps practices are the foundation for delivering business value moving forward.</td>
</tr>
<tr>
<td>Technology</td>
<td>The application of newer tools and methodologies that embrace DevOps collaborative thinking and integrated security.</td>
</tr>
<tr>
<td>Process</td>
<td>Continuous delivery supported by a governance process that achieves the right balance between chaos and conformity.</td>
</tr>
</tbody>
</table>

N=250
Source: IDC's DevOps MaturityScape Benchmark survey, 2015

CIOs that understand the value of DevOps are working toward overcoming barriers around skills, culture change, and the legacy IT process mindset to accelerate DevOps adoption. However, change is hard, particularly in companies that have been doing something the same way for years. IDC finds that those excelling with DevOps are more advanced in their application of newer tools and methodologies that embrace DevOps collaborative thinking.

However, many organizations realize that they cannot make this transition alone and are opting to work with external services providers with specialist DevOps consulting, quality engineering skills, and end-to-end DevOps solutions/platforms.

THE ROLE OF TECH MAHINDRA

Solving the Business Conundrum of How to Balance Enterprise Agility and Stability

Tech Mahindra helps organizations address the dual challenge of enabling both enterprise agility and stability, as it believes that both stability and agility will be the core for succeeding and sustaining in the digital age. IDC agrees; the need for organizations to find a balance between speed, quality, security, and experience has never been greater. Essentially, the CIO must focus on making IT more agile to drive innovation, scale, speed, and stability and collaboration across cross-functional teams in a complex IT landscape that is both secure and compliant.
Through its services portfolio and offerings, Tech Mahindra looks to marry these two themes and provide organizations with a solid core that is agile and reactive. The focus is on allowing organizations to achieve the following:

- Improved business and IT alignment
- Improved product, service, and process stability
- Accelerated time to market
- Improved availability of business-critical systems
- Optimized IT costs and reduced TCO
- Higher customer satisfaction and retention
- Improved risk management

For Tech Mahindra, a key component of agility is the ability to enable teams to collaborate with each other, ensuring they learn how to move forward together at speed. This requires organizational reengineering to instill and allow a fail fast/fail early culture to thrive.

**Tech Mahindra’s DevOps DNA**

DevOps is not something that is new to Tech Mahindra, it is something that is embedded in its DNA. The company's DevOps practice was born out of a response to client and market demands as well as a realization that its own experience could provide clients with valuable insights and learnings.

DevOps was a natural progression for the company to bring together its capabilities in transformational consulting, testing, and development as well as operational management. A global DevOps practice has been established that is supported from the top and reports directly into the COO organization. The practice has more than 100 experts — DevOps consultants, engineers, and architects — working across multiple engagements globally that leverage DevOps frameworks and maturity assessments to provide clients with ROI and benefits analysis.

The focus areas for the practice cut across continuous planning, continuous integration, continuous testing, continuous deployment, continuous monitoring, and feedback. The DevOps practice has developed the following offerings:

- **ADOPT** — End-to-DevOps platform supporting people, process and tools transformation, real-time governance, measurement, reporting and traceability, standardization of process and tooling / automation
- **Advisory services** — DevOps maturity assessment and roadmap, business case identification and solution approach, tool selection and recommendations
- **Implementation services** — Process model, solution map, integration, migration and rollout strategy, DevOps use cases, integrated tooling for E2E solution
- **Support services** — DevOps platform administration and support, on-boarding projects and roll out, training, 24x7 support, patches and upgrades
- **DevOps as a service** — Providing ADOPT as a Service, hosting, platform administration and support, usage reporting, enhancement
- **Point Solutions** — Solutions such as continuous integration, continuous deployment, environment automation, release automation, service virtualization, and virtualized mainframe testing, enabling the DevOps journey
- **Organizational change management (OCM)** — Providing OCM impact analysis, stakeholder analysis, communications strategy, adoption and training, and enabling the organizations to use the best practices to succeed in business
Tech Mahindra's DevOps practice in collaboration with key tool vendors (CA, IBM, HP, Microsoft, Atlassian, Red Hat, and CollabNet) has invested in building assets and capabilities that allow it to address organizational DevOps challenges in a systematic way. This approach focuses on resolving enterprise-level issues by redefining the culture, people, process, and automation required to collaborate.

FIGURE 3

Tech Mahindra’s DevOps Approach: Assets and Capabilities

Within this framework, there are two fundamental components that bring together its offerings and capabilities: firstly, the 5C framework which forms the foundation to all engagements through the provision of a baseline maturity assessment and a recommended roadmap for continuous delivery; secondly, the ADOPT platform providing end-to-end orchestration and automation cross-functions.

It firmly believes that the agility of an organization is not just down to its tools and processes; rather it is the successful culmination of process, people, and culture. Even the best set up processes and tools do not do much until you really understand what is limiting the people. So for Tech Mahindra it is people first, process next, followed by tools – this is where its entire DevOps framework comes into play. Within this framework, ADOPT, Tech Mahindra's application delivery optimization platform, plays a central role in enabling enterprise agility in a DevOps world.
**The 5C Framework: Towards DevOps Maturity**

This framework focuses on:

1. **Continuous Planning:** The focus is on bringing all stakeholders (developers, business analysts, testers, and operations) onto one common platform in the preparation for an integrated release plan, allowing better control of what gets released, better integration, enhanced traceability and ultimately better resource allocation and budgeting.

2. **Continuous Integration:** This addresses the developer community in the DevOps lifecycle. Here the main focus is to have seamless, error-free builds with best practice standards and version controls with a key focus on code quality.

3. **Continuous Testing:** Emphasis on automating all the types and phases of testing.

4. **Continuous Delivery and continuous deployment is the core of DevOps – the bridge from IT to operations:** This area focuses on automating as many areas as possible – release, deployment and environment provisioning being the chief among them.

5. **Continuous Deployment and Monitoring:** Implementation issues center around automated sensing and alerts. Secondary issues are around completing the monitoring loop from a tools perspective.

Within each of these areas the company has identified multiple processes against which it assesses its customers; in total there are approximately 50 capabilities against which an organization is assessed. Figure 4 illustrates the 5C framework.

**FIGURE 4**

TechM's 5C Framework — Understanding DevOps Maturity

Source: IDC, 2016
Based on this assessment, Tech Mahindra identifies concrete changes required to drive DevOps maturity, with the end goal focused on enhanced collaboration and driving greater business value through continuous delivery. It does this by identifying:

- Current strengths and areas of improvement
- Organizational readiness to adopt the DevOps journey
- Areas of immediate focus to enable continuous integration and delivery
- Recommendations for organizational changes and lifecycle improvements
- Complete time-bound roadmap to enable continuous delivery

The framework developed is flexible, taking into account the fact that one solution does not fit all. For instance, an organization's current IT strategy may be committed to a mixed set of tools for implementing solutions. Or it might be that organizations have a preference for best-in-class solutions in every aspect of DevOps implementations over the simplicity of a homogenous DevOps toolset. This framework essentially allows Tech Mahindra to target each and every area individually or simultaneously. Within this 5C framework, ADOPT, Tech Mahindra's application delivery optimization platform, plays a central role in enabling and delivering enterprise agility.

**ADOPT: Tech Mahindra's DevOps Point of View**

The ADOPT platform is an end-to-end DevOps solution that integrates multiple tools underneath a common platform, including: portfolio/project management; configuration management; and testing tools used in the software development lifecycle (SDLC) to enable continuous delivery. ADOPT is focused on shortening the overall delivery cycle, and is designed to address agile and DevOps adoption challenges for companies to deliver applications and services.

The platform was designed with several things in mind, but one of the primary considerations was that ADOPT would be used “cross-function” by developers, testers, business users, and the IT organization. This required a sharp focus on standardized, integrated and automated processes. DevOps is a way of breaking down silos – not putting more up. In this regard, ADOPT becomes a single truth repository for the entire organization for which it is implemented.

**Key Features of ADOPT:**

- Single truth repository across development, test, operations, and the business
- Dashboards, reporting and automatic traceability of changes, providing transparent governance and audit trails
- Standardized and reusable templates across projects and programs
- Leverage of existing tool investments, considering licenses, people, and process
- Enables cross-function collaboration and governance, in addition to built-in wiki and discussion
- Quality gates and approval workflow with role-based access (including fine-grained security controls and authentication mechanisms)
- The platform is technology-independent and vendor-agnostic, supporting a wide range of tools (from IBM, HP, CA, Microsoft, CollabNet, Atlassian, and Open Source) across the lifecycle.
Figure 5 illustrates the reference architecture for ADOPT.

**FIGURE 5**

**ADOPT Reference Architecture**

Within the architecture there is integrated application lifecycle management (ALM), which is the lynchpin that integrates with various elements, naturally creating the capability for software configuration management, requirements capability, code reviews, and so on. This is the control center for build pipelines, deployment pipelines, and delivery pipelines.

The platform spans a number of areas, starting from continuous planning, to continuous integration and build management, to continuous testing and service virtualization, to release and deployment automation, to continuous monitoring and feedback. Essentially this maps into Tech Mahindra's 5C framework and offers the following at each phase:

- **Continuous Planning** – The platform has specific solutions that address the implementation of continuous planning tools and processes. Tech Mahindra has deep technical understanding of tools from HP, IBM, CA, or CollabNet. Coupled with organizational relationships with the respective tool vendors, this translates into an ability to integrate best-in-class planning solutions with different downstream providers for other phases, such as continuous integration.

- **Continuous Integration** – Multiple vendors and the open source community have developed tools for various aspects of this function, for instance build automation, code quality assurance, and artifacts repositories. The challenge for organizations here is selecting the right tool set that works for individual organizational requirements. And once selected, ensuring that the selected tools work seamlessly with each other and with the other solutions upstream and downstream, ADOPT integrates various combinations of tools in a cost effective manner. For example, it has created solutions in which open source products such as Jenkins, SonarQube, and Nexus have been integrated with COTS solutions from TeamForge, Microsoft, HP, or IBM.
Continuous Testing – Like integration, this area is also characterized by a plethora of tools and solutions. Tech Mahindra can ensure that the downtime delays and stoppages in development and testing are minimized by using its service virtualization expertise. It has customized, integrated and deployed the COTS products in multiple domains. Paired with its own IP, capabilities, and frameworks in test automation it ensures that the automation strategy is optimized. These individual components can also be deployed quickly under the ADOPT platform. Test automation and service virtualization are all pre-defined plug-and-play components under most common scenarios.

Continuous deployment — CA, HP, and IBM all have solutions in this area. There are also open source solutions such as Chef and Puppet that are best-in-class for specific applications like infrastructure-as-code. The main issue is the interworking of chosen solutions. This requires an implementation partner that can identify the right tool sets and integrate these efficiently and seamlessly. Tech Mahindra has built up a vast expertise in continuous deployment. Ultimately deployment is the key reason that drives the implementation of DevOps. The ADOPT platform enables deployment automation as an out-of-the-box solution.

The ADOPT platform is currently deployed in an on-premise model, but a cloud platform will be readily available in the next few months; design of this platform is in place and the billing modules are being prepared, at which point ADOPT will be fully available in a SaaS model.

The Key Benefits and Opportunities of Using ADOPT

The company has delivered more than 50 complex rollouts using DevOps across multiple domains. It specializes in implementations handling high transaction volumes and, for example, has completed telecom rollouts in Africa, retail implementations in the UK, and insurance solutions in the US. The benefits customers described as being most significant in solving core problems included the following:

- Project predictability and accuracy, while achieving faster time to market. Certain customers have reduced downtime related to deployment by 80% to 90%, and seen an increase in release volumes of 30% to 35%. While others have seen deployment failure rates reduced to less than ~10% and cycle time improved by 60%.
- Real-time governance, measurement and traceability. Some users have seen enhancements in approval workflows through lean processes, while others have improved visibility into build and release process. Essentially the ADOPT platform allows organizations to get higher predictability and accuracy, together with real-time governance, and automatic traceability rather than people going in and creating project traceability in a manual way in some kind of spreadsheet.
- Continuous delivery. The industrialization of software development and delivery. Organizations have typically seen faster time to delivery with increased automation.
- Better collaboration between teams (e.g., hand offs between development and operations) and across disparate global locations.
- Retaining and reusing knowledge and assets across multiple projects and computing platforms. Many benefits have been seen through the reusable template-driven approach, including reduced rework and faster time to delivery.
- Portability of skills from project to project. Improvement in team productivity through code analysis tools.
- Lowering the management bandwidth and resourcing. Improved visibility and better utilization of resources.
- Standardization of process and tooling/automation, thereby reducing license and training costs.
• Seamless end-to-end integration of process and tools from requirements through to deployment; including service virtualization, environment provisioning and release automation.

IDC finds through its research that IT organizations that have tried to custom adjust current tools to meet DevOps practices have a failure rate of 80%, thus making tool replacement and/or addition a critical requirement. An integrated DevOps platform like ADOPT can help reorganize an IT organization, set new goals, and establish deeper business relationships and transparency.

**Continuous Investment – Scaling DevOps**

DevOps is a core focus for Tech Mahindra, and it is working to set up the right framework from which to support this.

• Business development: Dedicated sales and marketing team for North America, Europe, and Asia Pacific and business development managers to support delivery, sales, and client teams.
• DevOps consulting: Experienced DevOps consultants and architects, and the DevOps value assessment.
• DevOps Academy – training and enablement: This academy is charged with pushing knowledge and training on DevOps at a corporate level. There is an established series of specific training focused on establishing DevOps excellence – either tools-specific, process, or cultural/collaboration training. It also arms its employees with internal certifications as well as partnerships with HP and CA on external certifications. The current goal is to train more than 200 resources across core vertical markets.
• DevOps lab and solutions: DevOps lab out of India, where together with its partners (CA, IBM, HP, CollabNet, Red Hat, Atlassian, Microsoft) it works to create differentiated offerings.
• DevOps team: 100+ experts delivering engagements globally.

**The Challenges**

One of the key challenges for Tech Mahindra is convincing organizations about the benefits of implementing an integrated DevOps platform and moving away from a siloed IT delivery approach. Part of the issue in this context is that there will be potential conflicts of interest as many organizations will be working with different vendors across development, test and operations, and the big question driving discussions would be who should drive optimization. Moreover, in this scenario of development and operations working more closely together, there will be a reduction in effort of the handover and so on. This means vendors will see revenues decrease.

Additionally, while providing a tool that gives visibility into both the development process and the IT operations, process helps create a common understanding of success and failure, bottlenecks, and challenges. The key issue will be getting developers on board. Developers are notorious for always jumping on the latest tools and not using them for a long time; to standardize on one tool is going to be a challenge. We also find through our research that the speed with which organizations make the transition to the digital world (integrating 3rd Platform technologies) is another barrier, and we believe this hampers the transition to the latter stages of DevOps maturity.

Tech Mahindra’s offshore-centric model can be a barrier to adoption for enterprise deployment decisions. But the initial adoption, strategic partnerships, and well-developed IP and implementation framework provides solid proof points for those organizations looking to adopt.
CONCLUSION

Digital transformation is forcing rapid changes in the market, as the business puts pressure on IT departments to help them develop the capabilities to enable them to adapt the business much more quickly. This in turn is putting pressure on IT development and operations to stay ahead of the curve and be able to provide the value and innovation their users are seeking.

The stark realization that accelerated change is an absolute requirement across people, processes, and technologies in IT is sometimes hard for certain leadership teams to accept. Even worse, those same leadership teams don't know what to change, how to change it, and what the changes lead to. DevOps practices are one strategy that CIOs can adopt to accelerate change across every key IT area of people, process, and technology.

Change is hard, particularly in companies that have been doing something the same way for years. DevOps projects often require new automation, management, and analytic tools that collect, manage, correlate, and analyze common data sets that can be visualized and used to identify and resolve cross-silo problems.

The end goal is to create connected intelligence that drives smarter collaboration and automation to enable enterprise agility and deliver exceptional results through DevOps practices. IDC believes that IT and business leaders must rethink how projects are completed and take advantage of DevOps practices and procedures.

DevOps should be the goal and not the starting point; it is a transformation journey, and the path that organizations choose to take will differ for each of them. We suggest starting at a point where you feel most comfortable and where you can gain quick wins and benefits that can be used to seed the values and the practices across the wider organization. This is a journey that many cannot make alone, and seeking external expertise will be critical; seek to work with partners that can support the cultural and people aspects of DevOps as well as bring the tools and platforms that will be required for cross-functional collaboration and success.
About IDC

International Data Corporation (IDC) is the premier global provider of market intelligence, advisory services, and events for the information technology, telecommunications and consumer technology markets. IDC helps IT professionals, business executives, and the investment community make fact-based decisions on technology purchases and business strategy. More than 1,100 IDC analysts provide global, regional, and local expertise on technology and industry opportunities and trends in over 110 countries worldwide. For 50 years, IDC has provided strategic insights to help our clients achieve their key business objectives. IDC is a subsidiary of IDG, the world's leading technology media, research, and events company.

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