DevOps/Continuous Delivery Tooling

Launchpad for the Digital Enterprise Report Summary

ENTERPRISE MANAGEMENT ASSOCIATES® (EMA™) Research Report
Written by Julie Craig, Research Director, Application Management

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Overview

Throughout the past decade, Enterprise Management Associates (EMA) researchers have continued to track the growth of Agile practices, the rise of cross-functional DevOps collaborations, and the impact of Continuous Delivery on business and IT. In most modern organizations, these three areas are inextricably intertwined.

This paper presents EMA's latest findings on these topics from a research survey conducted during the spring of 2017. The intent of the survey was to highlight the current state of software delivery and related tooling in today's companies. This paper summarizes the results, tracing the DevOps and Continuous Delivery practices and tools most relevant to managing the delivery of business services in 2017.

Research on these topics is particularly critical at this point in time. EMA is actively tracking what has amounted to a revolution in business—and an accompanying revolution in software delivery—that has occurred over the past five years. Today's rapidly changing and fast-moving business climate is the prime mover for a vastly changed IT landscape. IT has evolved from being a cost center to a cost generator, as software has become the core around which modern businesses operate.

Massive changes in the way revenue is generated, combined with increasingly direct and customer-centric service delivery, have created an environment of "institutionalized change." To be successful, business must be able to implement new ideas very quickly, and IT organizations bear the brunt of the work necessary to make this happen. This "need for speed" has driven a revolution in software delivery. Agile practices enable software to be delivered more frequently, in smaller increments, and at a faster pace. Developments in technology have enabled a new generation of componentized, massively distributed applications running on technologies that are radically different from those of the past. Container-based microservices, orchestration engines, and the most powerful and sophisticated software deployment engines in history—modern Release Automation products—have all contributed to the rise of Continuous Delivery.

The cumulative result of these factors contributes to growing complexity and a pressing need to automate resource-intensive tasks. Yesterday's toolsets and support practices—in which tools relied heavily on human expertise and manual processes—are no longer viable. At the same time, designing, developing, deploying, and supporting complex modern application environments requires collaborative decision-making supported by a new level of cross-functional skills, knowledge, and judgment.

Surmounting these challenges to embrace the requirements of a new era requires changes to mindsets, skill sets, and tooling. This white paper encapsulates EMA's latest take on how this can best be done.

10 Key Takeaways

1. **Integrating and sharing metrics and data between diverse toolsets—via APIs, integration hubs, or both— are growing requirements driving tools purchases.** It is becoming increasingly apparent that both DevOps and Continuous Delivery practices require an ability to share information across the staff, tools, and processes supporting diverse lifecycle stages and functions.

2. **Top focus areas for digital business initiatives include customer satisfaction (external customers), "using technology to match competitors' digital presence," and "faster time to innovation."** There were, however, significant differences in responses among small, medium, and enterprise-sized businesses.

3. **The rise of private cloud** (18% increase in use over 2 years) **and SaaS** (5% increase in use over 2 years) **were perhaps the most notable changes in technology landscapes since EMA's last study on this topic in 2015.** Clearly cloud is the wave of the future, whether it is delivered on premises or by a third party.

4. **It is also interesting to note a percentage decrease in organizations using a company-owned data center.** On close examination, however, the overall decrease is being driven primarily by small companies (those with fewer than 1000 employees).

5. **Software change control is the least automated Continuous Delivery function, with only 47% indicating "full support" and 5% indicating "no support" in existing toolsets.** Since Continuous Delivery creates high rates of change—and because high rates of change, unmanaged, can have significant adverse production impact—this is one of the more troubling findings in this report.

6. **Although survey respondents obviously recognize the business value of Continuous Delivery processes, they report relatively low levels of automation:**
   - For 63% of respondents, less than 50% of their company's end-to-end Continuous Delivery process is automated.
   - Only 6% have automated 90–100% of the process.

7. **More than 90% of companies are utilizing DevOps teams/or processes, at least to some degree. However, these teams support production applications only about 30% of the time.** Given the complexity of modern applications, an ongoing requirement for cross-functional skills supporting troubleshooting and root-cause determination of production problems is almost a certainty. Apparently, however, the DevOps focus is primarily on pre-deployment versus production in the majority of companies, which means that much of the onus for supporting custom applications, in particular, falls on Development.

8. **This is the third EMA study in the past six years to show that BOTH the quality of interactions between Development and Operations AND the percentage of year-over-year (YoY) acceleration of Continuous Delivery are strongly linked to high revenue growth.** Observable over a six-year time span, those links continue to drive home the true value proposition of coordinated, well-oiled, automation-driven processes in today's competitive business environment.

9. **Companies rating their DevOps teams as "excellent" were nearly 50% more likely to see accelerated YoY growth of 25% or more than companies whose DevOps ratings ranged from "above average" to "poor".**

10. **Companies that increased the delivery frequency of their Continuous Delivery function by 25% or more YoY were more than 60% more likely to also see YoY revenue growth of 25% or more (compared to those whose delivery frequency either increased by less than 25%, remained the same, or declined YoY).**

DevOps and Continuous Delivery: People, Processes, and Technology Interacting Across the Lifecycle

This research revealed that approximately 90% of today's companies have put cross-functional teams in place to support applications at various stages across the lifecycle; this is in contrast to just 30% of companies surveyed in 2013 that had done so. These teams go by a variety of names, including "Infrastructure Services," "Application Management," and "Application Support." However, in more than 30% of overall companies (in contrast to 5% in 2013), they are now known simply as "DevOps" teams. The proliferation of such teams and the growing use of the term "DevOps" in a short time frame illustrate the advancing acceptance of DevOps practices.

While Agile development has become an essential element supporting the rise of Continuous Delivery, EMA research finds that it is DevOps that greases the wheels of software delivery, facilitating the high-speed, high-scale application delivery requirements characteristic of today's businesses. EMA surveys have consistently found tight links between accelerated frequency of code delivery and outsized revenue growth; the correlation between the quality of interactions between Development and Operations interactions and revenue growth is even stronger.

Automation Supporting DevOps and Continuous Delivery in the Digital Enterprise

EMA analysts view DevOps from ecosystem, tools, and lifecycle perspectives. In this context, DevOps encompasses skilled IT and business professionals, automated processes, and tools supporting cross-functional collaboration with ongoing, integrated insights into each relevant lifecycle stage (see **Figure 1**).

From this perspective, the relevance of DevOps is not confined to testing or deployment; it spans multiple stages, ideally the entire lifecycle. This broad view recognizes the need for ongoing collaboration across Development (Dev), Operations (Ops), and Line of Business (LOB) as software moves from stage to stage.

It's also important to note that software delivery is not a one-way street but an iterative process. Once in production, high-quality software becomes an organizational asset requiring new features, maintenance, and modification over time. As software becomes ingrained into business functions, it must evolve along with the business. Approaching DevOps and Continuous Delivery from this perspective from day one maximizes the efficiency of individuals, teams, and processes by

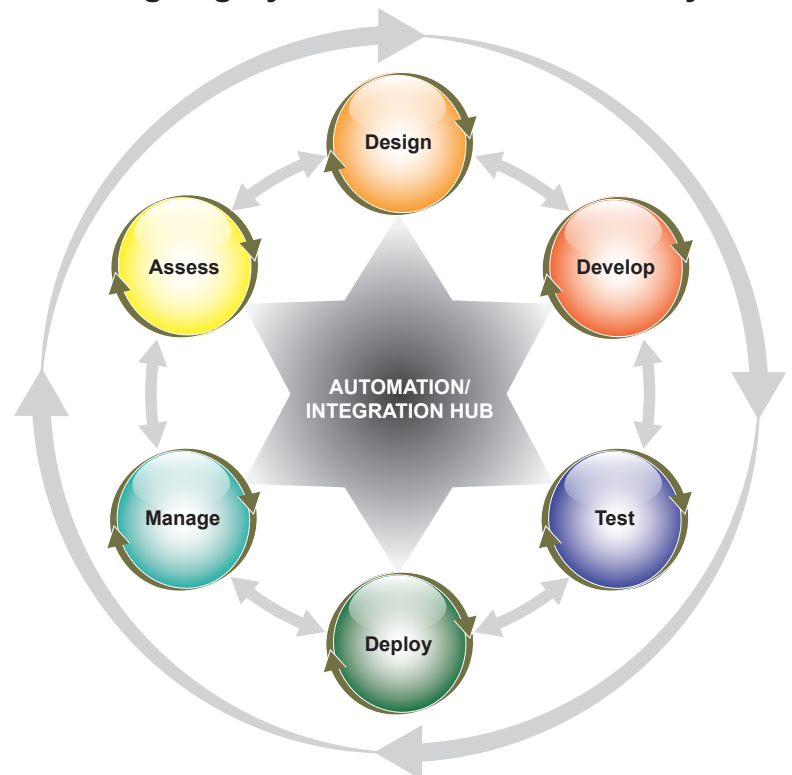**Ongoing Cycle of Continuous Delivery**

Figure 1. DevOps can be a backbone for Continuous Delivery, supported by a central integration hub.

recognizing the fact that modern applications are evolving entities that, in the average company, become part of an ongoing cycle of adaptation and change.

Both automation and integration are core functions necessary to deliver on this vision. For companies seeking to invest in tools supporting such a lifecycle approach, both should be incorporated into requirements documents and resulting tools selections.

This scenario supports iteration *within* each stage of the lifecycle as well as iteration *across* the expanded cycle supporting Continuous Delivery. It requires support for the process-related handshakes and artifact handoffs that occur as software moves from one stage to the next.

The reality is that Continuous Delivery can only be accelerated to the degree that each stage of the underlying lifecycle is accelerated and data sharing between stages is optimized. In other words, the Continuous Delivery process is only as fast as its slowest link, and data sharing is only as efficient as the integration capabilities of each tool supporting the lifecycle.

From this perspective, each stage must be appropriately instrumented and automated for the tasks specific to that stage. Ideally, the artifacts generated are shared on an as-needed basis with users, other tools, and subsequent stages of the lifecycle. For example, the requirements generated during the Assess and Design stages must be accessible in successive stages to support development, testing, and service-level measurements. Metrics gathered during production delivery (depicted in Figure 1 as the "Manage" stage) must be shared with tooling and activities supporting the "Assess" stage, which is where Service-Level Management (SLM), Capacity Management, and requests for new/additional business functions occur.

In terms of tooling and automation, this sharing process is supported by a central integration hub and associated meta-repository creating a centralized single source of information that enables information sharing across the lifecycle. Ideally, this hub supports physical integrations across the various tools supporting each stage of the lifecycle. The meta-repository stores physical or logical data creating during each stage, which can be shared on an as-needed basis for tasks performed during subsequent stages. In addition to directly storing data, the meta-repository often links to data contained in other data repositories—Git repositories, for example.

The vast majority of leading DevOps- and Continuous Delivery–related management toolsets include sophisticated integration technologies, such as APIs, to share data with other products underlying the software delivery cycle. In fact, many DevOps- and Continuous Delivery–related products resemble integration hubs as much as they do traditional function-based tooling.

Prospective tools buyers often overlook the value proposition delivered by the integration capabilities of many of today's tools. However, delivering on the vision of DevOps and Continuous Delivery depicted in Figure 1 requires integrating diverse toolsets with the central repository in some way, shape, or form. These integrations are a big part of what you pay for in purchasing tools and ongoing support, since integration modules must evolve along with the tools to which they connect.

Execution on this vision delivers a backbone of seamless efficiency supporting Continuous Delivery at scale, as well as delivery of high-quality software.

> **Both automation and integration are core functions necessary to deliver on this vision. For companies seeking to invest in tools supporting such a lifecycle approach, both should be incorporated into requirements documents and resulting tools selections.**

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Background and Methodology

The data for this report is based on a March 2017 survey of more than 200 technology professionals "on the front lines" of application delivery. The survey itself was extensive, consisting of approximately 80 questions and more than 250 data points.

Qualification questions narrowed the field of respondents to ensure that each participant was knowledgeable about the topic areas covered in the survey.

Digital Business in 2017

Today, virtually every company is a "digital business," at least to some extent. This research study bears this out.

- 93% of the respondents surveyed said their companies were "actively engaged in digital business."
- 93% said their company's enterprise software applications were either "essential" or "very important" to day-to-day business operations.
  - 56% rated these applications as "essential."
- In terms of their company differentiating itself from competitors, 92% said their company's enterprise software applications were either "essential" or "very important" to such differentiation.
  - 52% rated these applications as "essential."
- 96% believed that the custom applications created by their development organization provide their companies with a competitive advantage over others.
  - Of those who did *not* believe Dev provided a competitive edge, the primary reason—by a large margin—was "poor requirements gathering" (67%).
    - Other reasons included:
      - Not in a competitive business/industry (33%)
      - Development team can't keep pace with business requests (33%)
      - QA/Test can't keep up with the volume of code and/or code changes generated by Development (33%)

Clearly, business is becoming increasingly dependent on IT—and specifically on IT's ability to deliver code supporting custom and customized applications. Top focus areas for digital business initiatives include customer satisfaction (external customers), "using technology to match competitors' digital presence", and "faster time to innovation."

There were, however, some significant differences in responses among small, midsized, and enterprise-sized businesses. They are summarized in Table 1.

	SMALL BUSINESSES (250 – 999 EMPLOYEES)	MIDSIZED BUSINESSES (1,000 – 9,999 EMPLOYEES)	ENTERPRISE-SIZED BUSINESSES (10,000+ EMPLOYEES)
#1 response	• Using technology to exceed competitors' digital presence	• Faster "time to innovation" (i.e., time required to transform ideas into full-blown processes or products)	• Customer satisfaction (external customers)
#2 response(s) (tied)	• Expansion of products and/or services being offered • Acquisition of new customers • Customer satisfaction (external customers)	• Using technology to match competitors' digital presence • Customer satisfaction (external customers)	• Using technology to match competitors' digital presence

Table 1. Focus areas for digital business (by company size)

The key technology-related objectives supporting the Digital Business, all geared towards efficiency, include the following:

- Automation supporting more efficient Continuous Delivery
- Processes/tools enabling IT to work more efficiently
- Efficient use of APIs delivered by other entities

As businesses evolve, and as more services become customer-facing (whether these "customers" are internal or external to the business), quality of service becomes particularly important. In the digital business in particular, the software application becomes a key differentiator for that business and, in some cases, the only customer-facing product. This is particularly true for online businesses, software-as-a -service (SaaS) providers, and online storefronts. For this reason, platform selection has become a key aspect of digital service delivery.

According to this study, four delivery platforms predominate as being "most important": private cloud, data center, the internet, and SaaS. These platforms are covered in more detail in the following section ("Technology Landscapes").

Technology Landscapes

This year, private cloud has risen to the top of the list, up 2 slots from 2015. The top three included:

- Private cloud (62%)
- SaaS/data center (tied for 2nd) (50%)
- The Internet (45%)

In contrast, the top three technologies in 2015 were:

- Data center (57%)
- SaaS (45%)
- Private cloud (44%).

The rise of private cloud (18% increase in use over 2 years) and SaaS (5% increase in use over 2 years) were perhaps the most notable changes in technology landscapes since EMA's last study on this topic in 2015. Clearly cloud is the wave of the future, whether it is delivered on premises or by a third party. But it is also interesting to note the general decrease in number of organizations using a company-owned data center, the mainstay of application delivery for many years.

This is where it is quite revealing to analyze statistically significant differences in technology usage by company size.

- 65% of enterprise-sized companies report use of company-owned data centers versus 44% and 47% of small and midsized businesses, respectively.

- 65% of small companies are using SaaS versus only 46% of midsized companies and 37% of enterprise-sized companies.

There is clearly no one-size-fits-all approach to cloud usage. In fact, use of SaaS in particular is far more prevalent in small and midsized businesses (SMBs) versus enterprise-sized companies, and the smaller the company the greater likelihood that company will use SaaS to deliver at least one production service.

In fact, enterprise-sized companies in general lag behind smaller companies in terms of adoption of any cloud flavor, including private cloud. So for cloud providers, marketing to SMBs will likely produce more bang for the buck than marketing to very large companies.

It is also interesting to note the inclusion, for the first time in an EMA study of this nature, of "the internet" as a platform category. As a greater number of companies run distributed and/or component-based applications spanning multiple locations, the internet is increasingly becoming a part of the execution stream. At the same time, more sophisticated tools are now coming to market which have some degree of visibility into internet performance and bottlenecks. Extremely valuable for troubleshooting and root cause analysis of public cloud-based services—particularly IaaS and SaaS—this new tooling category makes "the internet" a worthy inclusion into EMA's list of platforms.

Automation and Tooling for the Digital Business

There are a wide variety of tools classifications in the marketplace, and the process of comparing and contrasting tools, even those in the same product family, can be frustrating. Vendors and analysts alike tend to lump together tools with similar features, but these groups may or may not fit the actual data and metrics delivered by the tool in question.

Application performance management (APM) tools are an excellent example. Originally aimed at products delivering comprehensive, multidimensional visibility into *all* the technology elements underlying a given application, the APM designation is now used by vendors delivering application visibility from the network, end-user, infrastructure, and storage perspectives, among others. And from product descriptions, it can be difficult for prospective buyers to determine which products best fit the specific applications, platforms, and deployment architectures utilized within their own companies.

In a similar manner, virtually every software vendor is now looking to jump on the DevOps and Continuous Delivery bandwagons. Particularly as these segments of the marketplace heat up, both have become targets for vendors seeking to link products to the DevOps and Continuous Delivery stars, regardless of the actual functionality of the tool in question.

For this reason, it is often more useful to define management products by function instead of by a top-line grouping. In assessing tools usage in the DevOps and Continuous Delivery spaces, this particular survey did just that. Specifically, it assessed the automation-readiness of the IT organizations surveyed in terms of a wide variety of tools categories in terms of their support for the following three areas: software lifecycle, DevOps, and Continuous Delivery.

Figure 2 shows organizational readiness in terms of tools supporting the software lifecycle. Tools supporting Requirements Management are the best supported, with 64% of the respondents reporting "full support" for this function and 0% reporting "no support."

However, it is interesting to compare this finding with one from a related question asked in the "Digital Business" section of the survey (see "Digital Business 2017" section). Although 96% of respondents reported that their custom applications *do* provide competitive advantage, of the 4% of respondents stating their custom applications do *not* provide competitive advantage, "poor requirements gathering" was the most common cause. So whether the fault lies in the tools being utilized or in the processes within the organizations using the tool, it appears that the Requirements Management process could use improvement in at least some of the companies surveyed.

It is also interesting to note that "production root-cause analysis" products are shown as being least supported, with only 41% reporting "full support" of this process and 4% reporting "no support." Identified in prior EMA research as the primary gating factor inhibiting Continuous Delivery at scale, production troubleshooting still consumes a significant portion of available bandwidth for both Dev and Ops teams. Although APM tooling is not often mentioned as providing value in the context of DevOps and Continuous Delivery, the research shows that this is a critical component for accelerating delivery and for re-allocating work via automation, in effect freeing up Dev and Ops from time-intensive production troubleshooting.

TOOLS FUNCTIONS	FULLY SUPPORT	NO SUPPORT
Requirements management/assessment	64%	0%
Production application monitoring	55%	2%
Service Level Management (SLM)	53%	3%
Development efficiency metrics	51%	5%
Software Development	49%	1%
End User activity monitoring	49%	3%
QA testing	48%	3%
API Monitoring	48%	5%
End User experience monitoring	48%	4%
Software synchronization across development teams	47%	2%
Integration testing	45%	5%
Unit testing	41%	5%
Production root cause analysis	41%	4%

Figure 2. Tools support for software lifecycle-related activities

Figure 3 shows the support levels for DevOps-related activities. Cross-team collaboration was reported as well supported by 61% of the respondents, while configuration tracking, log analysis, and rollback were the least supported.

TOOLS FUNCTIONS	FULLY SUPPORT	NO SUPPORT
Cross team collaboration	61%	1%
API development	58%	1%
Software deployment	57%	4%
Information sharing across stages of the development/delivery lifecycle	52%	3%
Change control tracking/reporting	50%	1%
API Testing	49%	3%
Visibility into the systems and processes underlying DevOps	46%	0%
Artifact sharing (i.e. requirements, etc.) across stages of the development/delivery	45%	6%
DevOps efficiency metrics and measurements	45%	5%
Configuration tracking to ensure configuration consistency across lifecycle	44%	2%
Log-based tracking/analysis	42%	3%
Rollback of failed releases	41%	5%

Figure 3. Tools support for DevOps-related activities

Figure 4 shows the results of a similar assessment for tools and features supporting Continuous Delivery. Respondents seem to have a fairly high level of confidence that they have good visibility into the Continuous Delivery pipeline—67% said their tools "fully support" the pipeline and 0% reported "no support."

Software change control is the least supported automation function, with only 47% indicating "full support" and 5% indicating "no support." Since Continuous Delivery creates high rates of change—and because high rates of change, unmanaged, can have significant adverse production impact—this is one of the more troubling findings in this report.

TOOLS FUNCTIONS	FULLY SUPPORT	NO SUPPORT
Visibility into status of each step of the Continuous Delivery pipeline	67%	0%
Deployment/release automation	55%	2%
Visibility to Agile development pipeline	52%	5%
Self-provisioning of dev/test environments	51%	1%
Continuous Delivery metrics/measurements	49%	5%
Software change control tracking/reporting	47%	5%

Figure 4. Tools support for Continuous Delivery–related activities

Software change control is the least supported automation function, with only 47% indicating "full support" and 5% indicating "no support." Since Continuous Delivery creates high rates of change—and because high rates of change, unmanaged, can have significant adverse production impact—this is one of the more troubling findings in this report.

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Continuous Delivery

Later in this report, the impacts of accelerated Continuous Delivery and high-quality interactions between Dev and Ops are shown to be key predictors of outsized revenue growth (25% or more YoY). This section of the survey assessed Continuous Delivery practices in the context of business drivers, automation, and outcomes.

- Top drivers for Continuous Delivery include:
  - ◦ LOB demands to better compete in marketplace
  - ◦ Customer satisfaction
  - ◦ Customer demands for better application quality
  - ◦ Business revenue growth
  - ◦ Customer demands for new products/services

Although these respondents apparently recognize the business value of Continuous Delivery processes, they report relatively low levels of automation.

- In 63% of responding companies, less than 50% of the end-to-end Continuous Delivery process is automated
- Only 6% of companies have automated 90–100% of the process.

In the past two years, the number of companies deploying new code to production daily or multiple times per day increased from 31% to 42%. More specifically,

- The percentage of companies deploying software multiple times daily increased from 15% to 23%.
- The number of companies deploying software **daily** increased from 16% to 19%.

The study also found that the percentage of companies deploying software weekly, monthly, or multiple times per month all decreased. So in essence, the rate at which software is being delivered is increasing for business in general, while companies delivering at a pace slower than "weekly" are now in the minority.

By developing strong DevOps and Continuous Delivery practices—and supporting them with automation—over the past two years, high-performing companies have significantly accelerated the rate at which software is delivered. As the revenue numbers later in this report show, this can lead to outsized revenue growth. Clearly, investments in these practices yield high returns; companies seeking better growth numbers should take notice.

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Cross-Domain and DevOps Functions

Along with Continuous Delivery, DevOps interactions have emerged as critical practices supporting high-growth companies. The research findings demonstrate how today's businesses are implementing and utilizing DevOps practices and teams.

- **Application-related functions are, for the most part, subject to executive oversight**. The responsibility for oversight of development and delivery of the application portfolio is increasingly in the hands of high-ranking executives.

  ◦ In 22% of companies, this responsibility lies in the hands of C-level LOB management, such as the CEO.

  ◦ In 45% of companies, such oversight is in the hands of C-level IT management, such as the CIO or CTO.

  ◦ It is in the hands of "other" C-level, VP-level, or director-level executives at 21% of companies.

  ◦ Finally, in only 11% of companies, executives at the manager level are responsible for such oversight.

- **DevOps functions are increasingly widespread.** While this survey only included participants reporting a "DevOps function, spanning multiple IT silos and typically performed by a group of IT specialists with cross-functional development- and operations-related skill sets" at their organizations, data gathered in the survey qualification process suggests the number of companies using DevOps functions is quite high overall. Of all potential survey participants (including those respondents who did not meet the survey qualifications), 93% reported their companies were using such teams.

  ◦ Of the respondents completing the survey, 65% have dedicated DevOps groups in place. The remaining 35% of organizations form teams in an ad hoc manner only when problems arise.

- **These cross-functional teams go by a variety of names**. Most commonly, they are called "DevOps" teams (33%), "Application Management/Support" (21%), or "Infrastructure Services" (11%). Other common names include "Service Level Management," "Centers of Excellence," "Architecture Group," or "System Reliability."

- **Most often, these teams are funded cross-functionally by "multiple departments within IT"** (34%). The CIO office funds 22%, while Ops funds 16%. And 28% of the time they are funded by Dev (10%) or LOB (18%).

Revenue Impacts of DevOps and Continuous Delivery

This report has detailed technology-related requirements for the digital business and the opportunities presented by automation. The technology-related requirements center on the hardware and software prerequisites to delivering digital business services. Automated tools facilitate the process by eliminating repetitive manual tasks which are time consuming and error prone, and by standardizing processes over time to produce optimal, predictable results.

However DevOps and Continuous Delivery have also been central topics of this study, and readers may wonder whether their value proposition is, in fact, worth the resource investments—in terms of both skills and budget—required to make them viable.

An examination of the revenue impacts of high quality DevOps processes and Continuous Delivery practices helps separate hype from reality, truth from fiction. Such an examination also brings the rest of the research into focus. For the digital business, software is the star of the show and everything else within the sphere of IT plays a supporting role. People, processes, and technology come together to deliver the foundation of the digital business, and concepts such as DevOps and Continuous Delivery facilitate business goals.

This is the third EMA study in the past six years to show that both the quality of interactions between Dev and Ops and the speed at which Continuous Delivery can accelerate the software creation process are strongly linked to high revenue growth. Observable over a six-year time span, those links continue to drive home the true value proposition of a coordinated, well-oiled, and highly skilled IT organization in today's competitive business environment.

> This is the third EMA study in the past six years to show that both the quality of interactions between Dev and Ops and the speed at which Continuous Delivery can accelerate the software creation process are strongly linked to high revenue growth. Observable over a six-year time span, those links continue to drive home the true value proposition of a coordinated, well-oiled, and highly skilled IT organization in today's competitive business environment.

Figure 5 compares revenue growth for companies rating their DevOps teams as "excellent" to companies whose ratings range from "above average" to "poor." As the graphic shows, companies in the former category are nearly 50% more likely to see accelerated YoY growth of 25% or more. These percentages are consistent with prior findings and highlight the true value proposition of investments in personnel and tools supporting cross-functional collaboration.

Figure 6 shows the survey respondents into two groups: (1) those from companies that increased the output of the Continuous Delivery function by 25% or more and (2) those from companies whose delivery frequency increased by less than 25%, remained the same, or declined YoY. It shows the revenue growth for both groups. These results are even more notable than those uncovered in the DevOps example above. Revenue growth was strongly correlated with increase in delivery frequency: Those in the accelerated frequency category were significantly more likely to also see YoY revenue growth of 25% or more than those in the lower frequency companies.

Seeing similar findings from DevOps and Continuous Delivery research year after year makes it difficult to doubt the payoff of investments in these two areas. For companies in highly competitive markets in particular, these findings should provide food for thought.
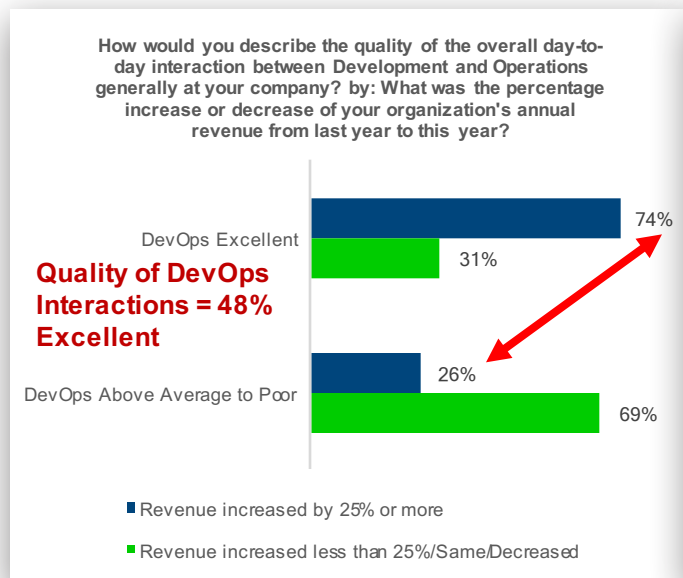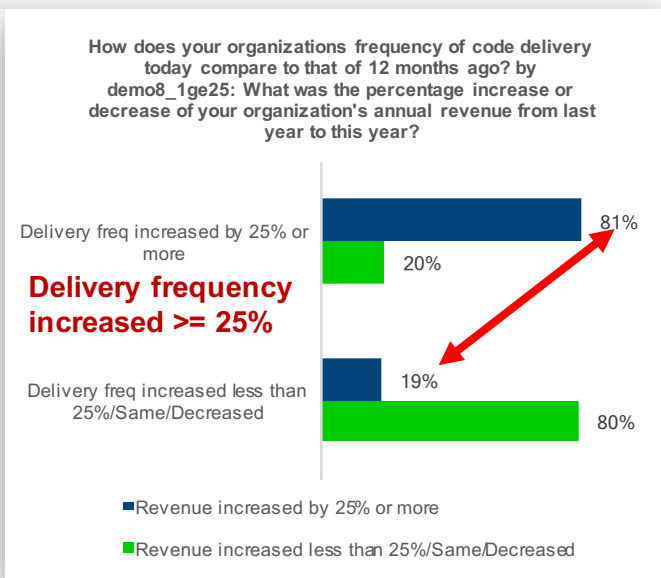
Figure 5. Revenue impacts of DevOps

Figure 6. Revenue impacts of Continuous Delivery

Summary

IT experts—from CIOs to hands-on practitioners—are finding that traditional concepts, tools, and processes no longer work in today's volatile, dynamic, and massively distributed IT environments. Monthly releases, manual change tracking, reliance on silo tools, and heavily manual processes are artifacts of past eras. Many of today's IT organizations release software multiple times per day, rely on real-time scanning and discovery techniques to detect change, and have automated manual practices with modern tools geared toward eliminating as many manual processes as possible to facilitate software delivery at scale. Increasingly, such companies are formidable adversaries in fiercely competitive industries.

For business at large, however, this study shows that there is a lot of room for improvement in terms of tooling and automation. In general, IT organizations are under-investing in functions such as APM and change control—both of which are well supported by currently available management solutions. And in an era where revenue growth can be predicted, in part, by accelerated Continuous Delivery, more than 60% of companies have automated less than 50% of the Continuous Delivery process. Likewise, for companies engaged in DevOps practices, more than 55% have automated less than 50% of the DevOps process.

Tooling vendors are rapidly evolving their products to support ever-higher levels of automation with decreases in the level of expertise and amount of time required to "manage the management tools." In other words, we as an industry are rapidly approaching scenarios in which autonomic capabilities—self-learning, self-managing tooling systems—are evolving from fiction to fact. Given the new technologies appearing on the horizon, and increasing reliance of digital businesses on technological innovation, labor requirements in the average company are already starting to outstrip availability of skilled, seasoned technical personnel. From this perspective, automation is evolving from a luxury to a core requirement for doing business—and vendors supporting both DevOps and Continuous Delivery are positioned to fill this gap.