Application Delivery Speed Drives Success

How Mastering DevOps Enables Speed With Quality And Low Cost

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Forrester Consulting provides independent and objective research-based consulting to help leaders succeed in their organizations. Ranging in scope from a short strategy session to custom projects, Forrester's Consulting services connect you directly with research analysts who apply expert insight to your specific business challenges. For more information, visit forrester.com/consulting.

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Executive Summary

Organizations today rely on software to provide differentiating customer experiences that help win, serve, and retain customers. Software is a key enabler of business, driving topline results, and as such must be delivered quickly, with high quality. However, many application delivery organizations find that delivering with speed and quality is not easy to achieve, and many barriers must be overcome to do so.

In March 2015, HP commissioned Forrester Consulting to evaluate challenges with application delivery pipeline cadences at organizations today. Then, to further explore this trend, Forrester developed a hypothesis that tested the assertion that challenges related to the causes of latency throughout the application delivery pipeline can be mitigated through the use of DevOps practices, but that most organizations are just beginning their DevOps journey.

To test this, Forrester conducted an in-depth online survey with 200 IT decision-makers at North American and European companies with visibility into or responsibility for their organization's app delivery pipeline. Forrester found that while companies want to move faster and deliver applications at more frequent cadences, often the delivery pipeline gets bogged down with lag between steps caused by a siloed application delivery organization. Properly implemented, DevOps can be key in overcoming these challenges and moving faster, while maintaining the high quality needed to delight customers and provide a unique and differentiated customer experience.

KEY FINDINGS

Forrester's study yielded four key findings:

› **Organizations rely on applications to deliver quality, differentiated customer experiences.** Sixty-four percent of IT decision-makers surveyed said that software was a key enabler for the business. With applications closely linked to customer satisfaction and business success, organizations need to be sure their applications provide differentiating customer experiences that are of high quality and are delivered quickly.

› **Application complexity and manual processes impede faster application delivery.** While app delivery organizations want to deliver software more frequently, a variety of factors impede faster delivery. Nearly half of respondents identify design complexity as a top technical challenge they experience when developing applications. Manual testing and environment management also create bottlenecks in the app delivery pipeline.
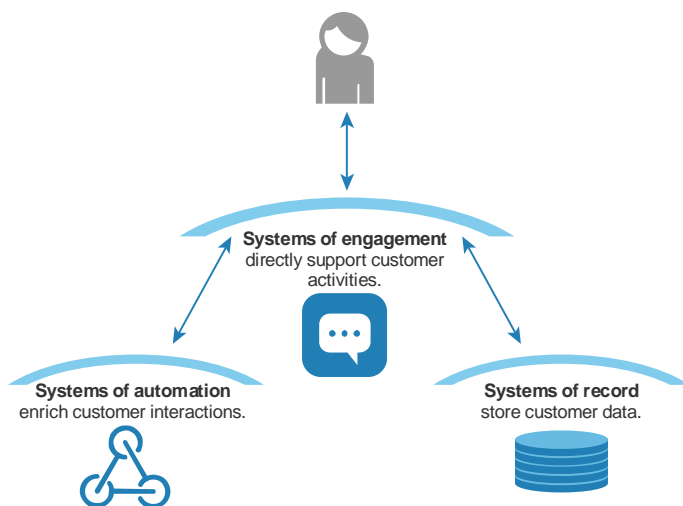
› **Lag between pipeline steps is a product of siloed delivery teams.** While the causes of lag vary depending on the step in the application delivery pipeline, respondents identified waiting for roles outside of the delivery team, or waiting on roles within the delivery team, as the No. 1 factor introducing lag in all six steps of delivery. The root of the problem lies with the way that organizations are structured into silos, with different goals and measurements that reward utilization at the expense of delivery speed and customer satisfaction.

› **DevOps practices can help ensure faster delivery without sacrificing quality, but for most, the journey has just begun.** DevOps practices can reduce wait times in the application delivery pipeline by automating tasks and eliminating human error, reducing design complexity, and enabling continuous feedback on both customer satisfaction and the health of the delivery practice itself. Many organizations in our survey indicate that they have begun to implement DevOps practices today. However, those same organizations report they are more successful at slower cadences, indicating that they are still learning how to harness the new approaches.

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Software Will Determine Your Future Success

Your business, no matter the industry, size, or business model, faces fierce competition to win the dollars of an increasingly demanding customer market. Great customer experiences attract customers, and software is increasingly your source of differentiating capabilities. Software interacts directly with customers through systems of engagement, it enriches customer interactions via systems of automation, and it serves up customer data through systems of record (see Figure 1). Delivering great customer experiences relies on your ability to deliver solutions that span all these systems, with quality, predictability, and the speed to respond to both customer sentiment and market signals.

In April 2015, Forrester conducted a survey of 200 IT decision-makers at North American and European companies with visibility into or responsibility for their organization's application delivery pipeline. Sixty-four percent of respondents in this survey claimed that software is *the* key enabler for their business and that their success depends on having high-quality applications that enable modern business models (see Figure 2). Organizations that use software as the dominant means by which they win, serve, and retain customers, which Forrester calls software-powered businesses, support customers better, are simpler
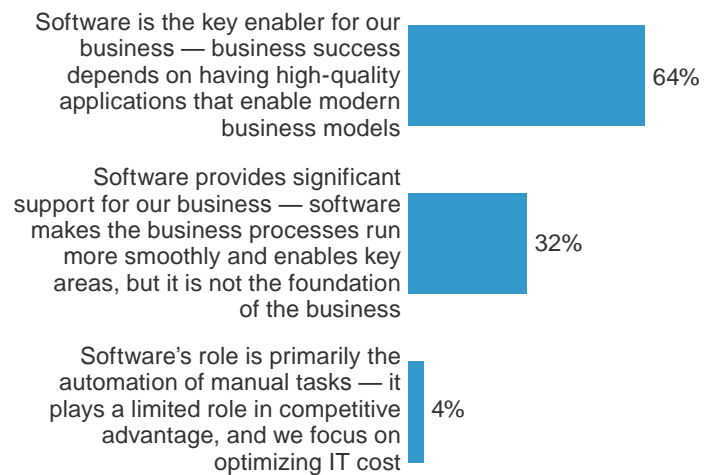
FIGURE 1

Software Enables Businesses To Be Continuously Connected, And Relevant, To Their Customers

Systems of engagement directly support customer activities.

Systems of automation enrich customer interactions.

Systems of record store customer data.

Source: October 20, 2014 "The Software-Powered Business" Forrester report

FIGURE 2

A Majority Of Firms Correlate Business Success With Having High-Quality Applications

"Which of the following statements best expresses your firm's attitudes toward software development and delivery?"

Software is the key enabler for our business — business success depends on having high-quality applications that enable modern business models — 64%

Software provides significant support for our business — software makes the business processes run more smoothly and enables key areas, but it is not the foundation of the business — 32%

Software's role is primarily the automation of manual tasks — it plays a limited role in competitive advantage, and we focus on optimizing IT cost — 4%

Base: 200 IT decision-makers at North American and European companies with visibility into or responsibility for their organization's application delivery pipeline

Source: A commissioned study conducted by Forrester Consulting on behalf of HP, April 2015

to manage, generate more profit, and scale better.[1] Customers may not be able to see how you develop and deliver software, but they feel the improvements in their experiences that faster delivery cycles provide. Accordingly, the most competitive industries, ruled by empowered customers with low costs of switching, are leading the charge in modernizing their approach to application delivery.[2] By offering a personalized, easy-to-use digital experience, powered by data and a continuous stream of new features, software-powered businesses are shaking up the competitive landscape in every industry.

With software tied so closely to business success, business leaders have high expectations of their application developer and operations colleagues, including:

› **Higher quality applications and customer experiences.** Seventy-eight percent of survey respondents claimed improved quality was a chief demand of business groups, while the next most-common response was improving customer satisfaction through software (76%) (see Figure 3). Effective, high-quality
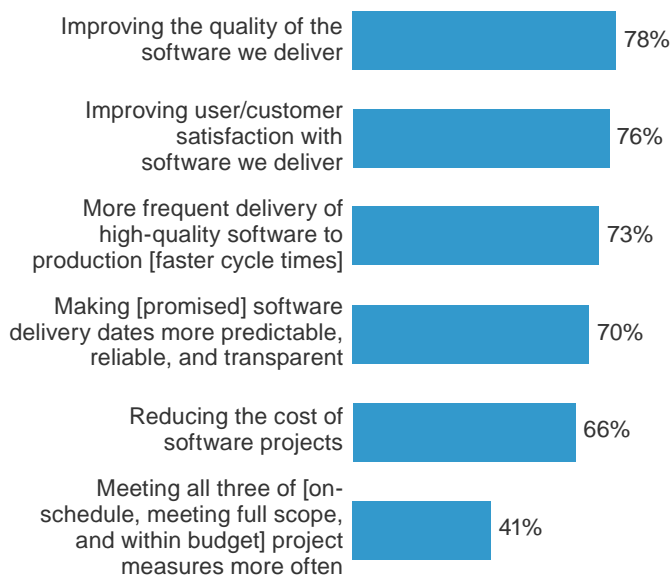
systems of engagement form the entry point for your customer's experience. Customers want software-powered channels that create value for them across all their devices, in a consistent and adaptive way. If they don't receive this quality of experience from engaging with your software, chances are they will find what they are looking for from your competitors. On the flipside, exceed their expectations and you will cultivate a loyal user group that will advocate for your brand.

› **More-frequent delivery.** Customer expectations in competitive markets rise in response to attractive alternatives. Organizations in these markets are scrambling to keep pace. Seventy-three percent of IT decision-makers surveyed said that business leaders demand more-frequent delivery.

› **Reduction of project budgets.** Increasing competition is also putting pressure on profit margins as competitors who can't innovate seek advantages through lower prices.

FIGURE 3

Quality And Customer Satisfaction Are The Top Demands Of The Business, With More-Frequent Delivery Not Far Behind

"What are the chief demands placed on your app development group by business leaders?"
Select all that apply

Improving the quality of the software we deliver	78%
Improving user/customer satisfaction with software we deliver	76%
More frequent delivery of high-quality software to production [faster cycle times]	73%
Making [promised] software delivery dates more predictable, reliable, and transparent	70%
Reducing the cost of software projects	66%
Meeting all three of [on-schedule, meeting full scope, and within budget] project measures more often	41%

Base: 200 IT decision-makers at North American and European companies with visibility into or responsibility for their organization's application development lifecycle

Source: A commissioned study conducted by Forrester Consulting on behalf of HP, April 2015

The resulting pressure on margins for everyone means that while faster delivery is important, reducing cost *is* important, too.

Organizations' drive for higher quality *and* faster delivery *and* lower cost underscores the critical importance of dramatically improving delivery processes and the organizational structures and tools that support them.

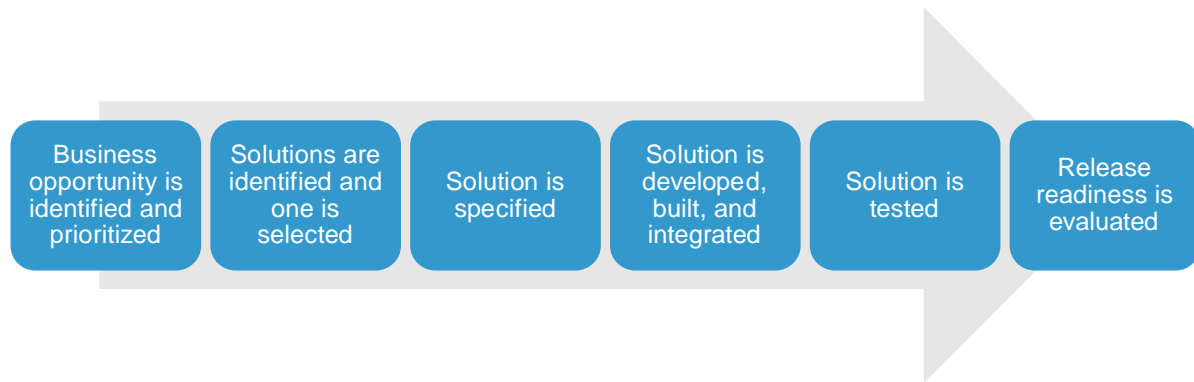## Rapid Application Delivery Is A Desirable, Yet Elusive, Goal

The mounting importance of software to achieving business goals shines the spotlight on the application delivery pipeline. Increasing the speed and quality of application delivery means considering the pipeline holistically — from the simple beginnings of someone's idea for how the customer's experience can be made better all the way to when that customer starts benefiting from the improvement (see Figure 4).

Organizations want to improve their delivery capabilities, but old habits die hard. When asked which of the project measures (on-schedule, meeting full scope, and within budget) is most often compromised, the top answer among survey respondents was speed (37%), while a mere 5% would sacrifice scope (see Figure 5). Whether due to failure to meet project deadlines, onerous scope of releases, or other obstacles, slow cadences are endemic. Respondents in our survey say they most often deliver work at a year or longer cadence (52%).

Faster cadences are less common; only 28% of respondents say they deliver most work multiple times a week.[3] Furthermore, projects delivered at cycle times of 12 months or greater are rated to be the most successful projects, with 67% of respondents claiming these projects are more successful at meeting their business colleagues' demands. And the data is trending in the wrong direction — as cycle times shorten, project success drops. While respondents want to go faster, they are not yet very good at it, and in order to do so, project quality suffers. Only 45% of cycle times of one week or more often are deemed more successful. This indicates that most organizations struggle with delivering faster even when they know that their future success depends upon it.

Organizations have many reasons for why they can't deliver faster, including application complexity, inability to provision development and testing environments quickly, continuous integration barriers, cultural barriers, siloed teams, testing bottlenecks, and deployment bottlenecks.[4] These barriers

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FIGURE 4

The Application Development Life Cycle

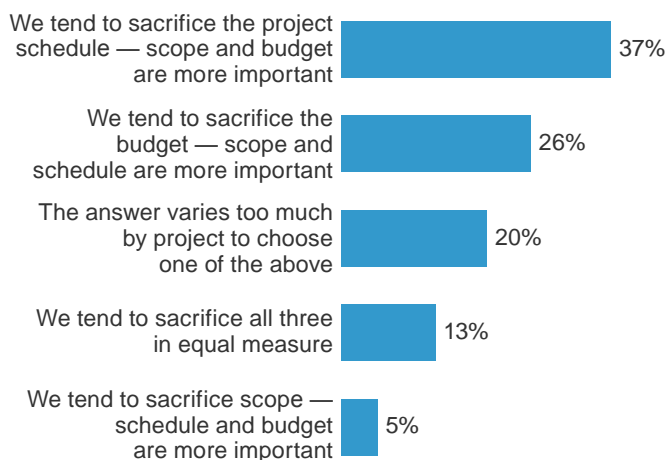| Business opportunity is identified and prioritized | Solutions are identified and one is selected | Solution is specified | Solution is developed, built, and integrated | Solution is tested | Release readiness is evaluated |

Source: A commissioned study conducted by Forrester Consulting on behalf of HP, April 2015

deprive them of valuable feedback that would help them improve their products and the experiences of the customers that use them. This leads to a negative feedback loop — as comparative experiences suffer, customers choose other alternatives. Lost customers mean reduced resources for improvement and an inevitable death-spiral.

FIGURE 5

Application Delivery Speed Is Most Often Sacrificed to Deliver Scope And Remain Within Budget

"When you have to compromise on one of the measures (on schedule, meeting full scope, within budget), which of the following apply?"

We tend to sacrifice the project schedule — scope and budget are more important   37%

We tend to sacrifice the budget — scope and schedule are more important   26%

The answer varies too much by project to choose one of the above   20%

We tend to sacrifice all three in equal measure   13%

We tend to sacrifice scope — schedule and budget are more important   5%

Base: 82 IT decision-makers at North American and European companies with visibility into or responsibility for their organization's application development life cycle that say the business demands speed, quality, and cost equally

Source: A commissioned study conducted by Forrester Consulting on behalf of HP, April 2015

In comparison, faster delivery cycles means faster customer feedback and faster response with new or changed capabilities in a timely manner to keep customers happy. Faster delivery cycles turn customers into active participants in shaping the future of your products and services. And contrary to some beliefs, speed doesn't necessarily come at the expense of quality. In fact, the opposite should be true. As the scope and complexity of releases drops, the business gains control and agility, so the risk of investment lessens.

Lag Between Steps, Complexity, And Lack Of Feedback Plague Application Delivery

Delivering applications faster with higher quality requires optimizing the activities in the delivery process, eliminating activities that deliver no value, improving the activities that do, and eliminating unnecessary wait-time between activities. DevOps provides a set of practices and cultural changes — supported by the right tools — that streamlines and automates the software delivery pipeline, enabling faster delivery, higher quality, lower risk, and lower cost.[5] It requires an obsessive focus on eliminating all sources of lag between steps of the pipeline and simplification of those steps to include only the core people, tools, and processes necessary for completion. Our survey reveals that organizations have opportunities to improve their capabilities, and given the gap between their current performance and where they would like to be, great incentive to improve.

LAG TIME BETWEEN STEPS CAUSES BLOATED DELIVERY CYCLES

Thirty-nine percent of respondents say long lag time in between delivery phases is a challenge. The days, weeks, and months of inactivity between phases of the pipeline add up to be the primary impediment to efficient delivery. According to our survey respondents, certain steps are more prone to lag. Thirty percent reported waiting weeks or months between specifying the solution and developing, building, and integrating it. Another 36% reported waiting weeks or months for the application to be tested.

While the causes of lag vary, two factors consistently rise to the top (see Figure 6). Respondents of the survey identified waiting for roles outside of the delivery team, or waiting for roles *within* the delivery team to complete tasks, as the No. 1 factor introducing lag in all six steps of delivery. The root

of the problem lies with the way that organizations are structured into silos that optimize utilization at the expense of speed of delivery. By keeping everyone as busy as possible, they are not available when and where they are needed most, causing delays. Modern application delivery demands a collaborative approach, but cross-role and cross-team engagement is a rarity. The traditional application delivery organization is organized along functional lines (see Figure 7).

FIGURE 6
Collaboration Bottlenecks Are The Largest Source Of Application Delivery Delays

"What challenges prevent you from moving faster [e.g., introduce lag] in tasks associated with the application development life cycle?"

T = Top challenge   **M** = Moderate challenge   **S** = Slight challenge   **N** = No challenge

	Business opportunity is identified and prioritized	Solutions are identified, and one is selected	Solution is specified	Solution is developed, built, and integrated	Solution is tested	Release readiness is evaluated
Waiting for other roles in application development team to complete tasks	T	T	T	T	S	M
Waiting for other roles outside of application development team to complete tasks	T	M	T	T	T	T
Lack of skills/expertise	M	M	S	S	M	M
Lack of communication	S	S	S	S	S	M
Lack of supporting tools	S	S	N	N	S	S
Lack of budget	S	S	S	S	S	S
Staffing resource constraints	M	T	M	M	M	T
Complexity of the application and/or technology ecosystem	M	T	M	M	T	T
Timing dependent on other ongoing project[s]	N	M	S	S	M	S
Inflexible job roles	N	N	N	N	N	N

Base: Variable IT decision-makers at North American and European companies with visibility into or responsibility for their organization's application delivery life cycle

Source: A commissioned study conducted by Forrester Consulting on behalf of HP, April 2015

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FIGURE 7

Traditional Application Delivery Organizations Reinforce Silos And Smother Collaboration
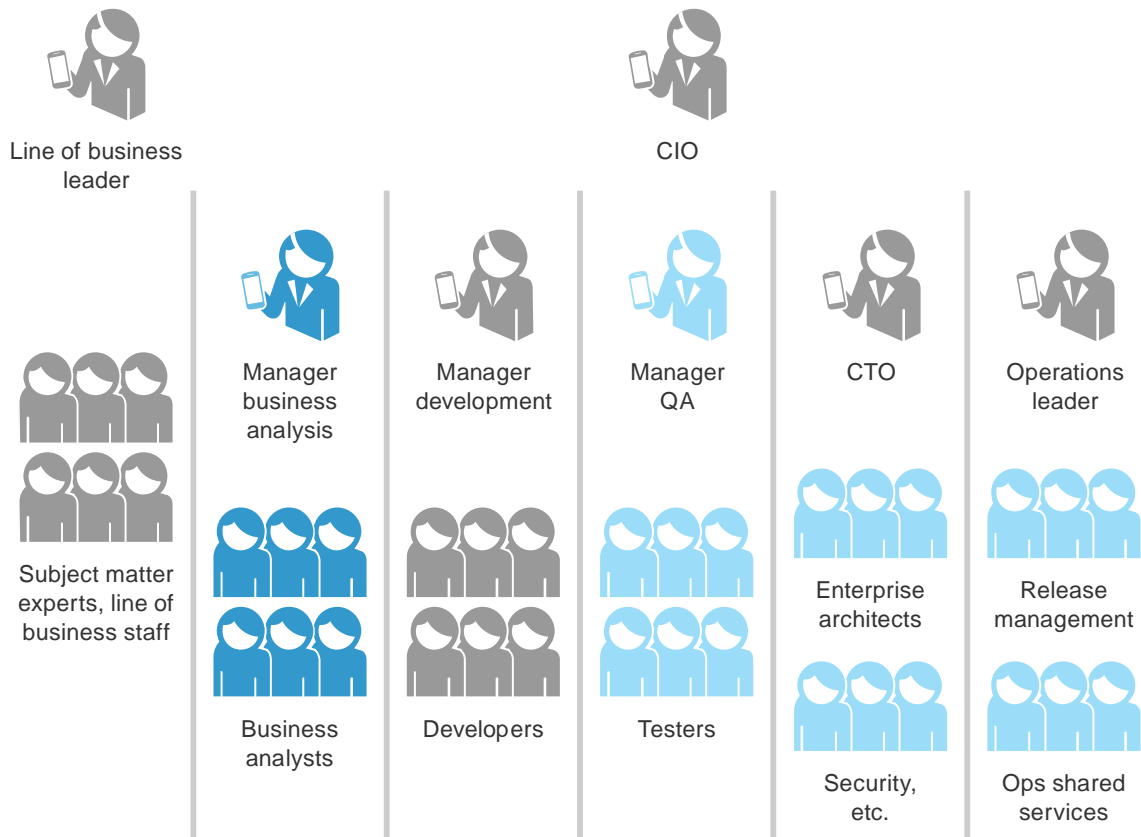
Source: "Modern Application Delivery Demands A Modern Organization" Forrester Report. June 27, 2014.

Managers of these organizational silos are often rewarded based on the size of their organization, and individuals are rewarded for expertise in a particular discipline and for maximizing their utilization.[6] When the entire organization is comprised of highly specialized contributors who are involved in multiple projects to maximize their utilization, the result is delays and bottlenecks — everyone is waiting for someone else to complete a dedicated task that often only they can complete.[7] Worse yet, managers treat their functional groups like a fiefdom and defend any disruption to the status quo, regardless of its detriment to delivery speed.

DESIGN COMPLEXITY BOGS DOWN THE APPLICATION DELIVERY PIPELINE

Nearly half of respondents identify design complexity as a top technical challenge they experience when developing applications (see Figure 8). Design complexity often arises from tight coupling of applications. Modern applications are assembled from loosely coupled components and services that are easy to modify and deploy independently. Older applications are often so brittle that small changes introduce great instabilities.[8] Unfortunately, decoupling monolithic application designs into loosely coupled components is a substantial and complex task.

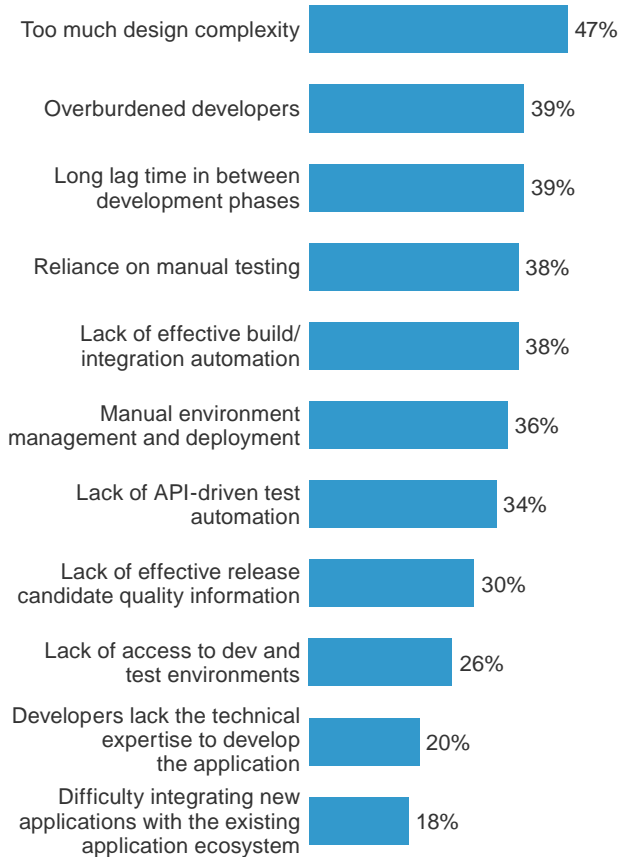### LACK OF STANDARD, AUTOMATED ENVIRONMENTS DELAYS DELIVERY

Manually building development, testing, and production environments creates delays in the application delivery pipeline. Developers wait for their dev and test environments to be uniquely built and configured, and testers wait for clean and appropriately configured testing environments. In addition, manually building and configuring environments creates opportunities for inconsistencies, making it difficult to control and audit changes. Our survey shows that 36% of respondents find manual environment

management and deployment to be a technical challenge in developing applications. Automating the building and configuring of development and test environments not only reduces delay, but allows for control over configurations and makes any changes repeatable and auditable.

> **FIGURE 8**
> **Complexity And Lack Of Automation Are Challenges**

"Which of the following technical challenges are you experiencing in developing applications today?"
Select all that apply

Too much design complexity	47%
Overburdened developers	39%
Long lag time in between development phases	39%
Reliance on manual testing	38%
Lack of effective build/ integration automation	38%
Manual environment management and deployment	36%
Lack of API-driven test automation	34%
Lack of effective release candidate quality information	30%
Lack of access to dev and test environments	26%
Developers lack the technical expertise to develop the application	20%
Difficulty integrating new applications with the existing application ecosystem	18%

Base: 200 IT decision-makers at North American and European companies with visibility into or responsibility for their organization's application development life cycle

Source: A commissioned study conducted by Forrester Consulting on behalf of HP, April 2015

MANUAL TESTING CREATES BOTTLENECKS

Reliance on manual testing continues to be a problem for respondents, with 38% indicating it is a challenge in developing applications today. Manual testing simply is too

time-consuming and inefficient for organizations that want to deliver at faster cadences. Automating unit, integration, and regression testing through APIs can be a costly investment upfront but will save time and increase the quality of releases. Thirty-four percent of respondents are challenged by a lack of API-driven test automation.

LACK OF RELEASE AUTOMATION LEADS TO ERRORS, INCONSISTENCIES

Manual deployments are often prone to human error, which must be discovered, evaluated, and resolved. This all takes time and creates yet another bottleneck downstream in the app delivery pipeline. Automating software releases can help to eliminate manual errors, increase speed and reliability, and reduce costs. Release automation also provides better audit trails by recording what was done to release the application and better recovery from failed deployment by providing automated roll-back.

EFFECTIVE AVENUES OF CUSTOMER INSIGHTS ARE A MUST FOR APP DELIVERY SUCCESS

Application delivery uninformed by customer feedback is like driving blind, yet a large number of organizations indicate they aren't using customer insights to guide their delivery initiatives. This comes to bear in the survey, where 43% of respondents claim they experience difficulty prioritizing features of application initiatives and 31% say they lack effective customer insight. Improving the frequency and quality of customer feedback gives organizations the essential information they need to deliver capabilities that delight existing customers and win new ones.

Implement DevOps To Achieve Software Success

Implementing DevOps practices is an important way for organizations to deliver more frequently with higher quality. Many respondents report they are following DevOps practices today, including 67% reporting they currently use continuous testing and half that automate the delivery pipeline. While this is encouraging, the long cycle times they report say that they have only just started on their journey toward faster delivery.

As firms seek to deliver more rapidly in order to remain relevant to their demanding customers, more work is needed. The path ahead is not easy, but it promises many benefits:

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> **More collaboration, less time waiting on others.** The challenge of faster delivery is greater than any single team working on its own can solve. An organizational focus is needed. DevOps requires cross-functional product/service teams that are directly responsible for delivering value to customers (see Figure 9). Cross-functional teams eliminate time spent waiting for resources working on other efforts.

> **Elimination of the other major causes of lag.** Lack of skills, staffing restraints, and complexity of the application/technology ecosystem all ranked highly as causes of lag. Automation, especially test automation, can help speed up the delivery pipeline, free up resources, and reduce

error. A DevOps-empowered business embraces automation-repetitive and error-prone manual tasks, while eliminating activities that add no value.[9] This enables organizations to test earlier in the application delivery pipeline, as soon as code is built.

> **Overcoming design complexity.** Adopting loosely coupled architectures reduces design complexity and enables different parts of the organization to move at different speeds. Removing these dependencies also eliminates risk by preventing change from inadvertently affecting large parts of applications. It also opens opportunities for alternative sourcing of components and services.

FIGURE 9

The Modern Application Delivery Organization Encourages Collaboration
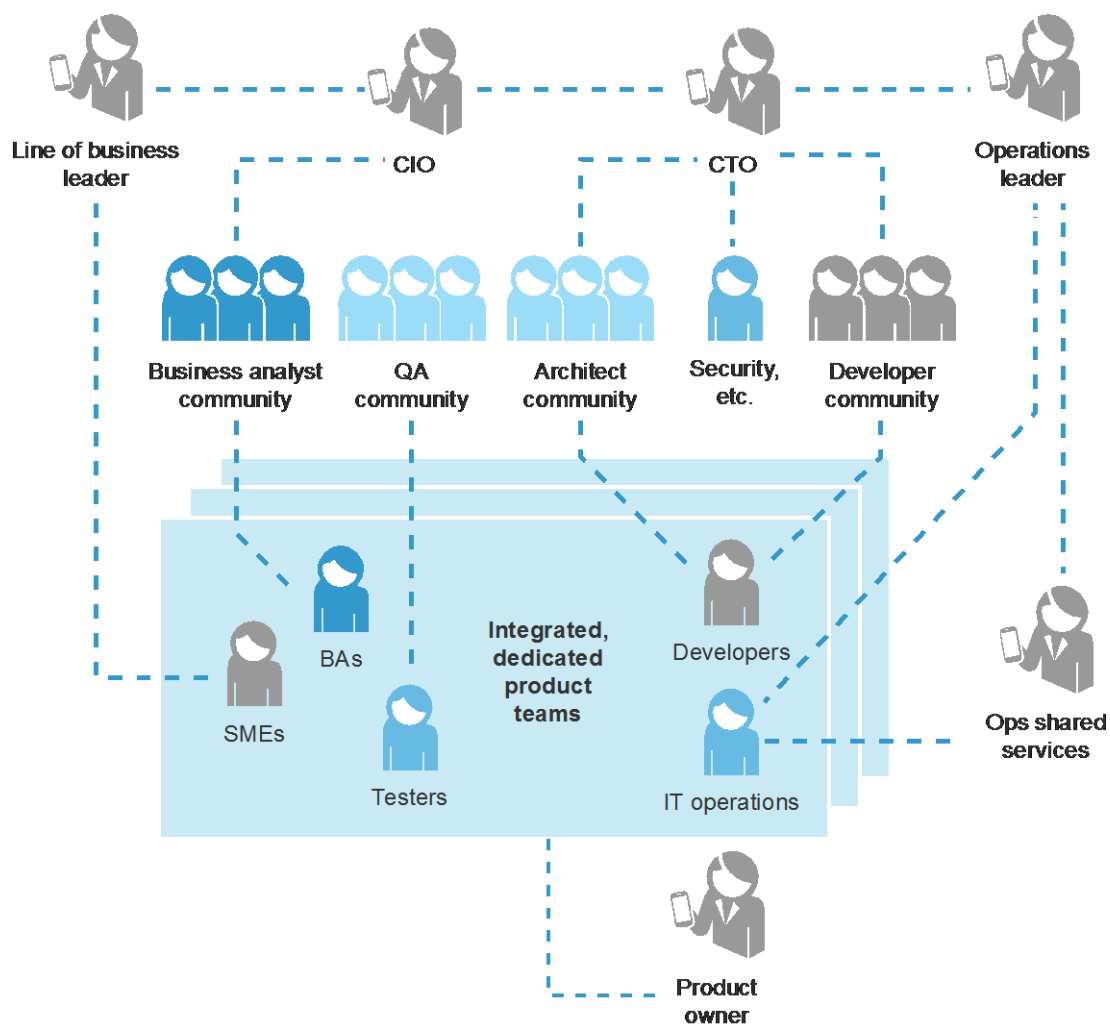
Source: "Modern Application Delivery Demands A Modern Organization" Forrester Report. June 27, 2014

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› **Agile response to customer feedback.** A great benefit of shorter application delivery cycles is that they enable organizations to gather and react to customer feedback more swiftly. The result is that customers get more of what they want and need, making them happier and more loyal. In addition, organizations reduce cost by building less of what customers don't want.

Having the ability to act earlier on customer feedback enables organizations to increase their application delivery speed, increase application quality, and reduce the cost of repair. Delivering solutions faster lets them experiment, gather feedback, and act on that feedback in very fast innovation cycles, trying out new ideas with subsets of customers before they expand to reach their broader customer base.

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Key Recommendations

Organizations embrace DevOps techniques to deliver applications faster and more reliably, which leads to happier customers, less waste, lower costs, and higher profits. Adopting DevOps practices means that organizations must streamline their application delivery and business processes to improve the way they deliver value to customers. The improvements mean changing in multiple dimensions, but the good news is that benefits are realized at every step. To start down the road to DevOps, you need to:

› **Get Dev and Ops on the same page**. In most organizations, Dev and Ops don't really understand what the other does, and what they don't understand, they can't respect. Your first step as a leader is to broker some "relationship counseling." Agree on the common goal: The success of the business in delivering value rapidly, reliably, and repeatedly, and put goals in place that measure and reward achievement.[x] But prepare yourself for resistance: Old Dev and Ops habits are hard to change. [xi] Continuous delivery practices make possible continuous experimentation and continuous feedback, leading to better, higher-quality solutions.

› **Diagnose your application delivery bottlenecks using Value Stream Mapping.** Identify the things that hold you back, removing the largest barriers first, and repeat, continuously improving delivery speed and quality over time. Making improvements using a Culture, Automation, Lean, Management and measurement, Sharing, and Sourcing (CALMSS) framework will help you to make sure your improvements address the most important aspects of the transformation.[xii]

› **Improve Ops automation to increase speed and improve quality.** Standardizing environment configuration and automating environment provisioning eliminates configuration errors that cause costly production incidents, and it improves delivery speed by ensuring developers and testers can get clean and correctly configured environments whenever they need them. Automating application release processes also increases delivery speed and reduces costly production incidents.

› **Simplify and automate the delivery pipeline to reduce time-to-feedback and improve quality.** Continuous Integration (CI), building and testing software whenever code is delivered into the source repository, increases delivery speed, eliminates manual build effort and errors, and provides developers with immediate feedback on the quality of their work. Static code analysis tools from the CI tool provide developers and architects with even deeper information about code quality. Automated testing tools from the CI tool provide very high levels of test coverage very early in the delivery cycle. Combining all of these gives organizations deep and transparent insight into code quality and overall status without creating status reporting overhead.

› **Accelerate adoption of automated testing including API-based continuous testing.** Continuous testing practices shift testing activities to earlier in the delivery cycle, providing developers with quality feedback at a time when they can fix the issues most easily. Continuous testing also reduces manual testing expense through automation while increasing testing accuracy.

› **Form cross-functional, self-reliant delivery teams**. Siloed organizations focus on maximizing utilization, not throughput, but this usually means everyone is waiting on someone else. Minimize wait time and handoffs by staffing self-contained cross-functional teams with dedicated resources. Make sure that they have access to shared resources whenever they need them, even if this means that the shared resources are underutilized. Over time, cross-train people to broaden and deepen their skills.[xiii]

› **Use application analytics to improve customer experiences.** Having deep insight into what customers need and how satisfied they are with their experiences enables organizations to optimize their investments, improve customer experiences, and deliver better business results. DevOps practices enable organizations to take action on this information more quickly while improving the quality of the customer's experience.

Appendix A: Methodology

In this study, Forrester conducted an online survey of 200 organizations in North America and Europe to evaluate the current state of the application delivery pipeline and DevOps practices today. Survey participants included IT decision-makers with visibility into or responsibility for their organization's application delivery pipeline. Questions provided to the participants asked about application delivery goals and challenges, time to complete individual steps of the app dev pipeline, and use of DevOps practices today. The study began in March 2015 and was completed in April 2015.

Appendix B: Supplemental Material

RELATED FORRESTER RESEARCH

"Brief: Break Your Bad DevOps Habits," Forrester Research, Inc., March 25, 2015.

"Brief: DevOps — Where's The Heat?" Forrester Research, Inc., March 12, 2015.

"What Makes Modern Service Delivery Modern?" Forrester Research, Inc., December 3, 2014.

"The Software-Powered Business," Forrester Research, Inc., October 20, 2014.

"The Seven Habits Of Highly Effective DevOps," Forrester Research, Inc., October 2, 2014.

"Modern Application Delivery Demands A Modern Organization," Forrester Research, Inc., June 27, 2014.
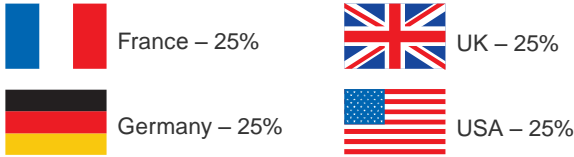
"Brief: Software Innovation Requires A Loosely-Coupled Application Architecture," Forrester Research, Inc., June 23, 2014.

"Instill A Systems Engineering Culture Across Dev And Ops," Forrester Research, Inc., November 4, 2013.
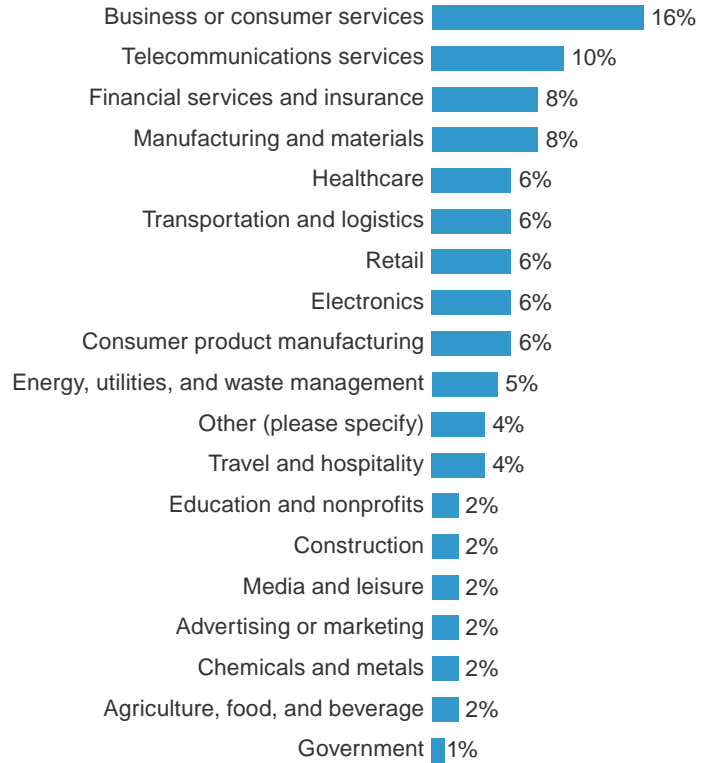
Appendix C: Demographics/Data

FIGURE 10
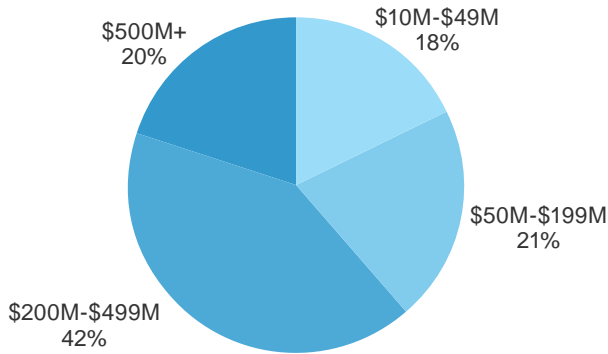**Survey Demographics: Country, Industry, IT Budget**

"In which country is your organization headquartered?"

France – 25%   UK – 25%

Germany – 25%   USA – 25%

"Approximately what is the size of your annual IT budget in US dollars?"

- $500M+ 20%
- $10M-$49M 18%
- $50M-$199M 21%
- $200M-$499M 42%

"Which of the following best describes the industry to which your company belongs?"

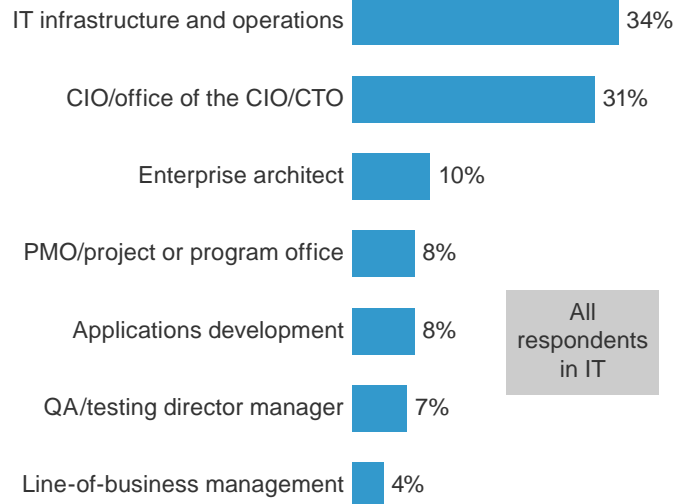| Industry	Percentage
Business or consumer services	16%
Telecommunications services	10%
Financial services and insurance	8%
Manufacturing and materials	8%
Healthcare	6%
Transportation and logistics	6%
Retail	6%
Electronics	6%
Consumer product manufacturing	6%
Energy, utilities, and waste management	5%
Other (please specify)	4%
Travel and hospitality	4%
Education and nonprofits	2%
Construction	2%
Media and leisure	2%
Advertising or marketing	2%
Chemicals and metals	2%
Agriculture, food, and beverage	2%
Government	1%

Base: 200 IT decision-makers at North American and European companies with visibility into or responsibility for their organization's application delivery pipeline
Source: A commissioned study conducted by Forrester Consulting on behalf of HP, April 2015

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FIGURE 11
Survey Demographics: Title And Job Function

"Which title best describes your position at your organization?"

- Full-time practitioner 4%
- VP 24%
- Project manager 14%
- Manager 28%
- Director 29%
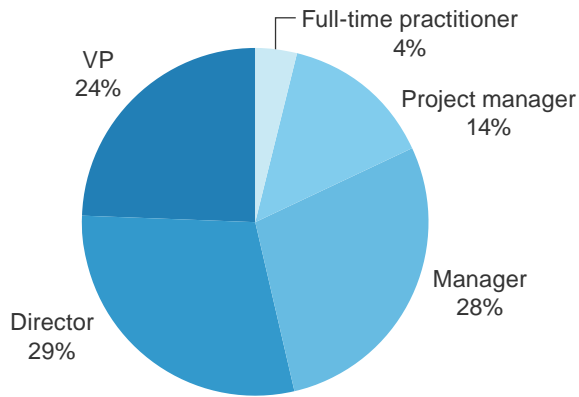
"Which of the following most closely describes your job function in IT?"

Job function	
IT infrastructure and operations	34%
CIO/office of the CIO/CTO	31%
Enterprise architect	10%
PMO/project or program office	8%
Applications development	8%
QA/testing director manager	7%
Line-of-business management	4%

All respondents in IT

Base: 200 IT decision-makers at North American and European companies with visibility into or responsibility for their organization's application development life cycle

Source: A commissioned study conducted by Forrester Consulting on behalf of HP, April 2015

Appendix D: Endnotes

[1] Source: "The Software-Powered Business," Forrester Research, Inc., October 20, 2014.

[2] Source: "Brief: DevOps — Where's The Heat?" Forrester Research, Inc., March 12, 2015.

[3] Source: A commissioned study conducted by Forrester Consulting on behalf of HP, April 2015

[4] Source: "Better Outcomes, Faster Results," A Forrester Consulting Thought Leadership Paper Commissioned by HP, December 2013.

[5] Source: "Brief: DevOps — Where's The Heat?" Forrester Research, Inc., March 12, 2015.

[6] Source: "Modern Application Delivery Demands A Modern Organization," Forrester Research, Inc., July 27, 2014.

[7] Specialization can have a sinister side: If only one or very few people have the expertise to accomplish an integral task, those people become a bottleneck to any project that requires the task. It is one way in which individual contributors can become irreplaceable to the delivery cycle, at the expense of the organization's ability to execute efficiently. Source: "Instill A Systems Engineering Culture Across Dev And Ops," Forrester Research, Inc., November 4, 2013.

[8] Source: "Brief: Software Innovation Requires A Loosely-Coupled Application Architecture," Forrester Research, Inc., June 23, 2014.

[9] Source: "Modern Application Delivery Demands A Modern Organization," Forrester Research, Inc., June 27, 2014.

[x] Source: "The Seven Habits Of Highly Effective DevOps," Forrester Research, Inc., October 2, 2014.

[xi] Source: "Brief: Break Your Bad DevOps Habits," Forrester Research, Inc., March 25, 2015.

[xii] Source: "What Makes Modern Service Delivery Modern?" Forrester Research, Inc., December 3, 2014.

[xiii] Source: "Modern Application Delivery Demands A Modern Organization," Forrester Research, Inc., June 27, 2014.

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