Gartner's 2017 application development predictions focus on lean/agile, DevOps and enterprise-scale development practices, which will have a major impact on organizations and how they build and manage systems. This research provides application leaders with insight to guide their planning processes.

Key Findings

- As application development organizations mature in their use of lean, they will replace Scrum with a methodology based on a combination of lean and agile practices.
- Testing is no longer a stage in a DevOps delivery, but quality has become an integral activity that impacts all areas.
- In application development, two main types of advanced analytics — "predictive" and "prescriptive" analytics — are gaining momentum and will continue to grow in the next three to five years.

Recommendations

Application leaders focused on modernizing application development programs should:

- Prepare for continued challenges to your development practices and cultural status quo as lean/agile values become established. Do so by gaining competency in lean/agile thinking and modeling the corresponding values and behaviors.
- Adopt a continuous testing approach that prioritizes unit test and API test automation over UI testing, and includes service virtualization, test data management and optimization, and test environment management.
- Understand the different capabilities of predictive and prescriptive analytics, as well as how and when they can be used in the application delivery pipeline.
Strategic Planning Assumptions
By 2020, 35% of application development organizations now using Scrum will use a software development methodology based on lean/agile instead.

By 2020, DevOps initiatives will cause 50% of enterprises to implement continuous testing using frameworks and open-source tools.

By 2020, 50% of IT organizations will apply advanced analytics in application development to improve application quality and speed of delivery.

Analysis
How can IT leadership successfully drive application development (AD) modernization?

The modernization of AD will not succeed without application leaders embracing lean principles and practices. Lean restructures development work toward its contribution to customer value streams. Enterprises that follow this path will:

- Move beyond Scrum as their primary development practice
- Integrate quality processes into every phase of development and operations
- Use analytics to drive refinements to DevOps processes as well as to the applications they deliver

What You Need to Know
Meeting the challenges of the digital economy requires enterprises of all sizes to increase their responsiveness to business needs. Application leaders, too, are facing increasing pressure to
improve the responsiveness of their AD organizations by incorporating new techniques and practices that can speed up development without sacrificing quality. IT organizations need to deliver new value more quickly with less risk, but IT in general and AD organizations in particular can't meet the need. Lean IT concepts and techniques are instrumental in driving improvements in the overall development life cycle and reducing risk in the process. Agile software development enables better and faster delivery of software, but, without the collaboration of infrastructure and operations (I&O), getting it into production quickly is not assured. DevOps facilitates that collaboration between development and operations. Introducing agile product management and cross-team coordination enables the scaling of development to enterprise-class (see Figure 1).

Figure 1. Minimum Building Blocks of Lean-Agile IT

Strategic Planning Assumptions

**Strategic Planning Assumption:** By 2020, 35% of application development organizations now using Scrum will use a software development methodology based on lean/agile instead.

**Analysis by:** Keith James Mann

**Key Findings:**

Scrum, the most widely used agile software development methodology, has not evolved along with other aspects of AD. Recent advances in DevOps, enterprise development frameworks and even waterfall methodologies are founded on lean principles, not agile ones. While Scrum remains at the core of software development, it is becoming the constraint in the overall process. Scrum's fixed sprint length limits deployment frequency, while its insistence on ceremonies prevents the elimination of activities that become wasteful when teams outgrow them. As AD organizations
mature in their use of lean, they will remove these constraints by replacing Scrum with a methodology based on a combination of lean and agile practices.

Awareness and adoption of DevOps and enterprise agile frameworks are growing. Gartner survey data shows that by the end of 2017, 64% of organizations will be using DevOps. Almost half (49%) are using or considering an enterprise framework, a market led by lean/agile frameworks such as Scaled Agile Framework (SAFe) and Large-Scale Scrum (LeSS).

**Market Implications:**

End-user organizations and technology service and software providers have invested heavily in supporting Scrum. While this approach has been successful, in 2018 and beyond, the growth in markets such as training, certification and tools will be in lean/agile. Some vendors are already showing strong support for lean/agile as customer adoption of such enterprise frameworks increases and as partnerships are established. End-user organizations should examine the lean/agile tools and capabilities offered by their vendors. Providers should establish product and service roadmaps now to meet customer demand.

**Recommendations:**

- **Application leaders in organizations that are using Scrum (or Scrum within DevOps) and an enterprise development framework:** Be prepared to switch to a lean/agile methodology as lean practices mature. This preparation should include assessing lean/agile practices and developing an appropriate strategy for tools and training.

- Anticipate continued challenges to your cultural status quo as lean/agile values become established. Gain competency in lean/agile thinking and model the corresponding values and behaviors.

**Related Research:**

"Use Agile and DevOps to Implement Lean IT and Improve Software Delivery"

"Survey Analysis: How Agile in the Enterprise Stumbles, Evolves, Then Succeeds"

**Strategic Planning Assumption:** By 2020, DevOps initiatives will cause 50% of enterprises to implement continuous testing using frameworks and open-source tools.

**Analysis by:** Joachim Herschmann

**Key Findings:**

- As agile development practices have matured and DevOps principles have gained significant traction in enterprises, testing has become no longer a stage in a DevOps delivery, but an integral DevOps activity that exists in various forms through all areas.
IT organizations struggle to move from the tactical task of testing software as part of a distinct phase or activity to a more automated form of quality assurance that essentially requires no human intervention.

DevOps toolchains evolving without a plan and encompassing the entire DevOps process result in disparate, overlapping tools that can be difficult to integrate and automate across the different DevOps areas. Point solutions for automated testing are becoming a constraint in the overall process.

Core test automation functionality is fast becoming a commodity, and vendors are increasingly competing by adding value on top of the underlying frameworks and tools.

**Market Implications:**

End-user organizations and technology service and software providers are investing heavily in tooling for DevOps delivery. The automated execution of tests as part of a continuous delivery process is replacing the more traditional ALM-driven execution of tests. Testing is evolving to a "bring your own tools" mentality and, rather than use a monolithic tool, developers are using a variety of open-source and proprietary tools to perform each of these functions.

Many vendors are already showing strong support for popular test automation frameworks and open-source tools such as Selenium, Appium, JMeter or SoapUI, and adding support for continuous testing by enabling IT organizations to execute a set of tests specifically designed to assess the business risks associated with a release candidate. The key to successful continuous testing is to understand how to put together a best-of-breed quality solution that enables IT organizations to regularly execute tests in the context of stable, production-like test environments and invest in building the necessary skill sets.

**Recommendations:**

Application leaders in end-user organizations:

- Understand that testing will require a portfolio of tools both commercial and open source along with the use of testing services to meet the varied needs of business.
- Examine vendor capabilities for supporting different test automation frameworks and open-source quality tools, and evaluate alternative solutions.

Application leaders in IT organizations:

- Adopt a continuous quality culture that includes practices to manage technical debt and automate tests focused on unit and API testing. It should also automate test lab operations to provide access to production-like environments, and enable testing of deployment through the use of DevOps pipeline tools.
- Shift investment bias from traditional, monolithic testing platforms toward continuous automated testing solutions that can be seamlessly integrated into a DevOps toolchain pipeline.
Related Research:

"The Eight Essentials When Moving to Automated Software Testing"

"Avoid Failure by Developing a Toolchain That Enables DevOps"

"Market Guide for API Testing and Service Virtualization"

Strategic Planning Assumption: By 2020, 50% of IT organizations will apply advanced analytics in application development to improve application quality and speed of delivery.

Analysis by: Maritess Sobejana

Key Findings:

Advanced analytics is widely deployed in many areas of industry to improve business decision making. Large to midsize organizations are moving away from "gut-feel" decision making, and instead are using more-sophisticated analytics and fact-based decisions to project future trends and optimize business decisions (see "Advancing Business With Advanced Analytics" and "Hype Cycle for Business Intelligence and Analytics, 2016").

In AD, two main types of advanced analytics — predictive and prescriptive analytics (see Note 1) — are gaining momentum in the marketplace, and Gartner anticipates that this will continue in the next three to five years. Most of the ADLM, testing, quality and software analytics tools in use today from leading vendors have extended capabilities beyond basic reporting and source code analysis, into advanced analytics. They leverage current and historical data sources from AD and production, and apply machine-learning algorithms to generate predictions of the most likely outcomes. They recommend actions for avoiding problems, mitigating risks, or optimizing processes and deliverables.

Examples of insights that these capabilities can derive include:

- Visualizing heat maps or predicting emerging hotspots in the software (or code) caused by changes, and proactively guiding testing teams to focus effort on the hotspots.
- Giving "real" customer feedback and application performance analysis to influence delivery and business process, and control quality more effectively.
- Predicting defects that are likely to cause escalations in production, enabling teams to do predictive maintenance.

Other vendors have offered advanced analytics that use data about the aspects of people who create the software, and the processes by which the software is built. They provide insights on the predicted quality in use and the ability of the team to deliver on time and within budget.
Market Implications:

To keep up with the business demand to deliver applications quickly, efficiently and of high quality, IT organizations will need to accelerate the shift in focus to advanced analysis. They will need to adopt a fact-driven analytics culture that is pushed down from the CEO and executive team to effectively reduce waste and increase the velocity and quality of the application. This in turn will lead to improved customer satisfaction and significant savings in time and resources. Organizations that fail to embrace analytics will be forced through cost-optimization measures to make ad hoc cuts that may ultimately lead to catastrophic consequences.

Advanced analytics tools in AD are already becoming more accessible, with built-in algorithms that process huge amounts of data that is not humanly possible to analyze. In order to remain competitive in the market, service and product vendors will need to shift focus away from basic and traditional reporting into more innovative areas of advanced analytics. Within the next three to five years, we expect technology to be readily available and leveraged for all areas in AD decisions.

Recommendations:

- Use a combination of analytics capabilities at different stages of the delivery pipeline to allow you to address a wider array of problems in your organization more effectively, and create a culture of data-driven decision making.
- Prepare data by identifying the problems to solve and exploring the existing data you need from various sources to determine what might be important for advanced analytics.
- Experiment with and invest in analytics tools that employ algorithms to mine existing data that can be used for current and future projects.

Related Research:

"Magic Quadrant for Software Test Automation"
"Magic Quadrant for Application Development Life Cycle Management"
"Extend Your Portfolio of Analytics Capabilities"
"How to Take a First Step to Advanced Analytics"
"Extend Your Portfolio of Analytics Capabilities"
"How to Take a First Step to Advanced Analytics"

Replay Prediction

The replay prediction is a prediction from a previously published report that is so significant that it is being republished here.
**Strategic Planning Assumption:** By 2018, the transition to agile, DevOps and web-scale IT practices will become as disruptive to IT as the adoption of lean was to manufacturing during the 1980s.

**Analysis by:** Nathan Wilson

**Key Findings:**

In the early 1980s, manufacturing was in big trouble. Most of the world’s assembly plants were based on a high-volume, large-batch mass-production model. This model required extensive planning so that the production of all of the constituent parts of a product could be produced months in advance. Large-material resource planning systems were being deployed to calculate these plans. The recession of the early 1980s resulted in massive overstock of materials as demand dropped suddenly.

A few companies led by Toyota were taking a different approach. They manufactured products in the smallest batch possible and minimized the amount of inventory on hand. Known as "lean" and "just-in-time manufacturing," this system broke the conventional mass-production "bigger is better" mindset.

In 1984, a novella called "The Goal" by Dr. E. M. Goldratt was published. This book explained the concepts of lean manufacturing and introduced the "theory of constraints" to the world. This theory states that any flow-based system's maximum throughput is limited by the capacity of the slowest step in the process — the constraint or bottleneck.

The combination of the recession and Goldratt's book resulted in a revolution in manufacturing worldwide, and a complete change in conventional wisdom in manufacturing. Thirty years later, IT is in a state similar to that of manufacturing in the 1980s. There is a crisis, brought on not by recession, but by digital business revolution and the Nexus of Forces. The rapid change in business needs is making the large software release unworkable. A few companies have pioneered the use of small projects that can be delivered quickly. There is even a book, "The Phoenix Project" by G. Kim, K. Behr and G. Spafford, which is patterned on "The Goal" and explains how the lean principles can be applied to IT.

**Market Implications:**

The transition to lean IT is showing every sign of being just as disruptive to IT departments as lean was to manufacturing during the 1980s. Most existing IT positions will be redefined or eliminated, and a new set of roles, skills and practices will be established and necessary. The following practices will become the primary mode for IT departments:

- User-experience-driven requirements
- Agile development
- DevOps
- Private and public platform as a service
Justification:

We republish this prediction from 2015 to emphasize the transformational impacts of lean on IT.

Recommendations:

- Use a bimodal approach to learn and adapt lean IT practices.
- Redefine roles to meet the needs of a lean IT department.
- Focus on the lean goals of smaller batch sizes and shorter cycle times.

Related Research:

"Maverick* Research: Fire Two-Thirds of Your IT Organization"

"Enable Corporate Agility by Using Web-Scale Development Practices"

A Look Back

In response to your requests, we are taking a look back at some key predictions from previous years. We have intentionally selected predictions from opposite ends of the scale — one where we were wholly or largely on target, as well as one we missed.

On Target: 2014 Prediction — By 2017, JavaScript will be the most in-demand language skill in AD.

Analysis by: Mike West and Mark Driver

While few would dispute how essential JavaScript has become to web developers since its introduction, the term "in-demand" in the SPA above is certainly open to discussion and debate. Perhaps "most widely used" would be a more precise term. Job boards indicate that Go is in extremely high demand currently. JavaScript, however, is used widely, and web-based surveys of developers (Stack Overflow, GitHub — see Evidence section) show JavaScript as the most popular language for development.

Missed: 2012 Prediction — By 2016, 40% of AD organizations will have joint initiatives with operations in support of continuous delivery and simplified release management.

Analysis by: Mike West

This is a near miss that appeared so likely in 2015 (see "Survey Analysis: DevOps Adoption Survey Results") that it was presented last year as a Replay Prediction. However, the most recent Gartner DevOps survey, conducted in the spring of 2016, found that the number of AD organizations with DevOps in either pilot or operational mode was only 38%, and half of those were pilots.

At the same time, interest in DevOps is accelerating, largely due to the recent uptake trend in large enterprise for both digital innovations and core business solutions. The results of another recent
Gartner survey found a similar penetration through 2015 (37%), but also an intent to implement DevOps by an additional 27% through 2017 (see "Survey Analysis: How Agile in the Enterprise Stumbles, Evolves, Then Succeeds").

Acronym Key and Glossary Terms

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<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
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<tbody>
<tr>
<td>DevOps</td>
<td>A change in IT culture, focusing on rapid IT service delivery through the adoption of agile, lean practices in the context of a system-oriented approach. DevOps emphasizes people (and culture) and seeks to improve collaboration between operations and development teams. DevOps implementations utilize technology — especially automation tools that can leverage an increasingly programmable and dynamic infrastructure from a life cycle perspective.</td>
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<tr>
<td>Lean/agile</td>
<td>A deliberate synthesis of the principles of lean manufacturing with those of agile software development. Practically, this synthesis is applied to define a software development methodology.</td>
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<tr>
<td>Predictive analytics</td>
<td>Predictive analytics involves extracting an analytical model from multiple sources of data to predict future behavior or outcomes.</td>
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<tr>
<td>Prescriptive analytics</td>
<td>A set of analytical capabilities that specify a preferred course of action. The most common examples are optimization methods, such as linear programming; decision analysis methods, such as influence diagrams; and predictive analytics working in combination with rules. Prescriptive analytics differs from descriptive, diagnostic and predictive analytics in that its output is a decision.</td>
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Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

"Modernizing Application Development Primer for 2016"

"Flattening the Application Organization — Everyone Must Be Part of the Agile Value Stream"

"Cut Costs by Getting IT Lean in Lean Times"

"Principles and Practices of DevOps"

"Seven Steps to Start Your DevOps Initiative"

"Three Lean Principles for I&O Leaders to Support DevOps Adoption"

"Solution Path for Achieving Continuous Delivery With Agile and DevOps"

"Hype Cycle for DevOps, 2016"

"Making Sense of the Agile Methodology Wars"

"Market Guide for Enterprise Agile Frameworks"
Evidence

1 Gartner analysts handled more inquiries about lean or lean/agile through August 2016 than they did in 2014 and 2015 combined.

2 To date Gartner has had more than 3,500 client interactions (inquiries, best-practice calls and conference one-on-one meetings) discussing DevOps awareness, initiatives, successes and failures.

3 In a Gartner vendor survey, elements of the development of advanced analytics are evident: 62% of vendor respondents are saying either they have advanced analytics embedded as part of their current overall offerings or as part of their innovation initiatives planned in the next 12 months.

4 Gartner analysts have attended more than 300 vendor briefings between October 2015 and September 2016 from product and service vendors in the areas of AD (including life cycle management), testing and quality. Advanced analytics is noted to be one of the key capabilities offered by most of the vendors.

5 Capgemini, Hewlett Packard Enterprise and Sogeti, "World Quality Report, 2016-17," 8th Edition. According to this report, predictive analytics is the most used approach to testing in an agile/DevOps environment (45% of the respondents).

6 Seerene and Semmle are examples of such vendors.

External Data Sources

PYPL Popularity of Programming Language — This is created by analyzing how often language tutorials are searched for on Google. The raw data comes from Google Trends.
The TIOBE Index — A long-standing and popular programming language ranking, built by counting hits of the most popular search engines. This index is particular interesting because it provides a long-running historical rating for a variety of languages.

Reddit — A popular crowdsourced web news and community forum. Reddit is also the home of one of the most active developer communities on the web. Some languages have their own specific subreddit communities (for example, Python).

GitHub — An online hosting site for projects using the Git source code version control system. The site is free to use for open-source projects and provides paid support for private code repositories. It publishes a graph that shows language popularity trends on GitHub.

Programming Language Popularity Chart — This maps GitHub ranking against Stack Overflow rankings.

GitHubU — A convenient data visualization of GitHub language usage.

Stack Overflow — A popular community discussion site that focuses on questions and answers related to a wide range of programming topics.

Powell’s — We also considered trends in published book metrics. We examined the number of published reference books with a language in the title on the Powell’s under the Programming Languages section.

Dice — We examined job postings registered here in 2016.

Black Duck Open Hub — (formerly Ohloh.net) A comprehensive source of information for many open-source projects. This site tracks many metrics related to open-source projects.

IEEE Spectrum, "The 2016 Top Programming Languages" — This IEEE report ranks the popularity of several dozen languages and their typical use cases.

Debian, "The Computer Language Benchmarks Game" — This lists a wide range of benchmark comparisons for many different programming languages.

More on This Topic
This is part of an in-depth collection of research. See the collection:
