A Forrester Consulting Thought Leadership Paper Commissioned By IBM

Product Innovation Requires More Flexible Software Delivery

Innovators Demand More Collaboration, Transparency, And Speed

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FORRESTER®

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Executive Summary

Product development leaders are fervently seeking more innovation, and software is playing an increasingly central role in that innovation. As the pace of product innovation increases, the need for better ways to harness and integrate software innovation in the overall product development life cycle drives product development professionals to challenge traditional approaches to software delivery.

Eighty-four percent of software development professionals surveyed ranked the role of software as important or very important in their organization's ability to deliver innovation.

In September 2010, IBM commissioned Forrester Consulting to conduct a study to better understand the increasingly important role of software innovation in product development. Forrester surveyed 106 product development professionals in the US and the UK. The organizations surveyed included enterprises with 1,000 employees or more. All those surveyed said they had responsibility for software development as part of product development, with 36% developing software for support of physical products in markets including aerospace, telecommunications, or computer systems, 36% developing software for inclusion in physical products (e.g., embedded or OEM software), and 28% developing software that runs on top of physical products, such as operating systems.

Key Findings

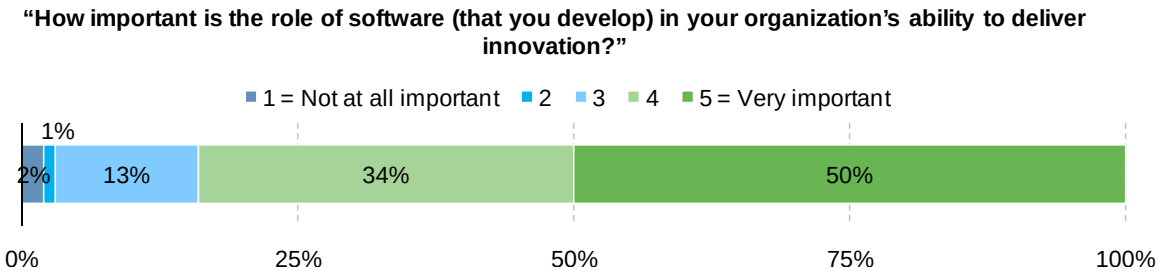
Forrester's study yielded four key findings:

- **Customer insights are not shared with the broader product development community.** While a vast majority (93%) of development decision-makers surveyed have implemented specific initiatives to better capture the voice of their customers, only 16% of product professionals surveyed worked in organizations that shared customer insights and analytics with the broader community online.
- **Innovation demands a collaborative development environment.** Fifty-nine percent of product development professionals surveyed expect their organization to take steps toward improved innovation by better connecting development teams and enabling more collaboration.
- **Innovation demands faster software delivery.** Over half of the survey respondents wanted to speed up delivery by over 50%, with 21% wanting delivery to be at least twice as fast.
- **Along with speed, software flexibility is key to overcoming barriers to innovation.** Forrester found that the biggest roadblocks to software innovation for products were that product developers were too busy solving day-to-day problems, followed by product delivery taking too long, then by existing products being very hard to change due to old technology. The innovation mandate requires product developers not only to speed software and product delivery, but also to increase software flexibility.

Slow Software Delivery Is Impeding Product Innovation

Software plays an increasingly crucial role in delivering product innovation (see Figure 1). You only have to turn on a TV to see how software is a key differentiator for TVs, autos, and even home painting. The vast majority of survey respondents spend more than 10% of their total product R&D budget on software development, with 25% spending more than half. In the past, software was not so central to the success of product companies, with most innovation being electrical or mechanical, placing the focus of many software delivery processes on planning and quality to ensure that software did not undermine important work in other areas. This led to complex development processes, limited tools, and weak connections with other groups or the end customer. Making software an effective part of innovative product development requires software delivery to be faster and more collaborative, providing rapid feedback, increased transparency, and greater flexibility.

Figure 1
Software Is Crucial To Product Innovation

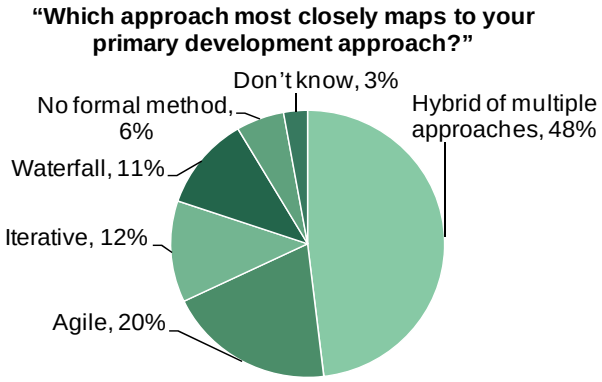


Base: 106 US and UK development decision-makers at organizations producing software on top of, included in, or embedded in products

Source: A commissioned study conducted by Forrester Consulting on behalf of IBM, September 2010

The need for more frequent software delivery has led many product companies to apply Agile processes to software development (see Figure 2). Though a hybrid of multiple approaches is the most popular process reported by our survey respondents, Agile is the most popular single development approach. Agile requires small cross-functional teams with shared goals to deliver frequently and get increased customer feedback. Agile may not speed delivery time for the whole product, but it brings more focused delivery of key high-value features, allowing earlier customer feedback, earlier integration with hardware, and more predictable execution. Agile in isolation does not increase innovation, but when the right people with access to the right stakeholders apply Agile, innovation often results.

Figure 2
Agile Software Delivery Is The Most Common Single Process For Product Developers



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Source: A commissioned study conducted by Forrester Consulting on behalf of IBM, September 2010

Processes, Product Architecture, And Resource Demands Are Slowing Software Delivery

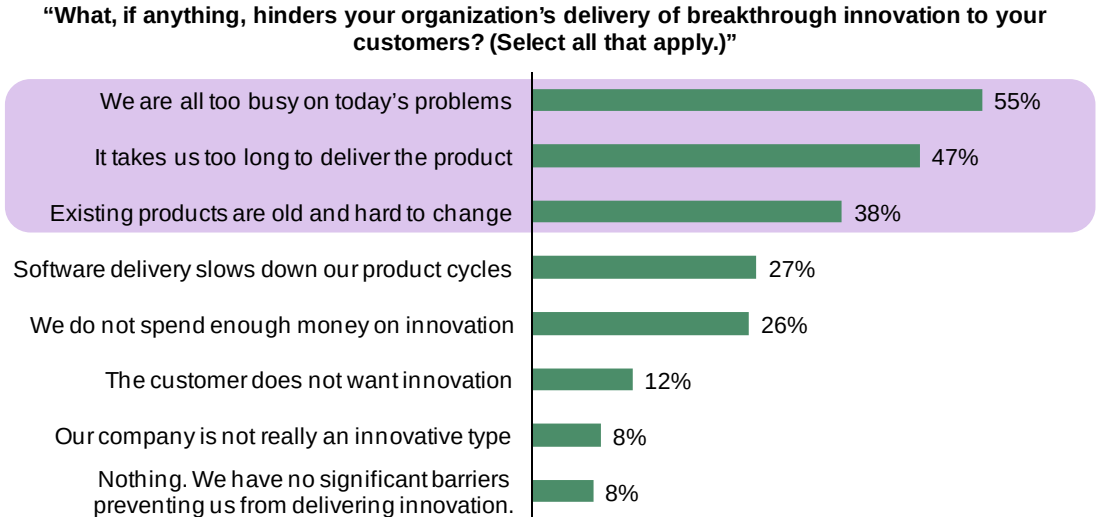
Fifty-four percent of respondents feel their organization needs software delivery to be at least 50% faster in order to get new ideas in front of customers, with 92% of respondents dissatisfied with the speed of software delivery. Respondents identified the main obstacles to breakthrough product innovation as being too busy with today's problems, taking too long to deliver, and finding existing products too hard to change (see Figure 3). Insufficient investment in innovation was a key factor for only 26% of respondents. Root causes of these obstacles include the following:

- **Today's processes are heavy, inflexible, and not delivery focused.** Changing technology, improving engineering practices, and shifting supply chains are often far easier than changing core funding, delivery, and quality processes. New practices and technology have led many organizations to add steps to their delivery processes. The result? Increased complexity and specialization, leading to more handoffs. Specialization of labor, though crucial for algorithmic work, inhibits the creative aspect of innovation as individual tasks provide little opportunity for out-of-the-box thinking. Process optimization can lead organizations into inflexible processes with little room for thought. Product companies continue striving to adopt Agile processes in response to this need.

- **Product teams are not effectively managing technical debt.** Technical debt is a metaphor for the long-term consequences of short-term solutions that suboptimize architecture or design.[1] Software becomes harder to change or improve when technical debt accumulates. Short-term fixes to meet schedule and budget constraints often lead to design tradeoffs that increase technical debt. Thirty-eight percent of respondents indicated that old and hard-to-change products are obstacles to innovation.

- **Teams are too busy with today's problems.** Fifty-five percent of respondents indicated that the biggest obstacle to delivering breakthrough innovation is that they are bogged down in the problems of today, with no time to spend on innovation. The combination of heavy role specialization, a strong focus on schedule and budget, and a project-driven approach often lead organizations away from enabling staff to deliver breakthrough innovation.

Figure 3
Breakthrough Innovation Is Impeded By . . .



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Source: A commissioned study conducted by Forrester Consulting on behalf of IBM, September 2010

Product Development Processes Do Not Have Sufficient Customer Focus

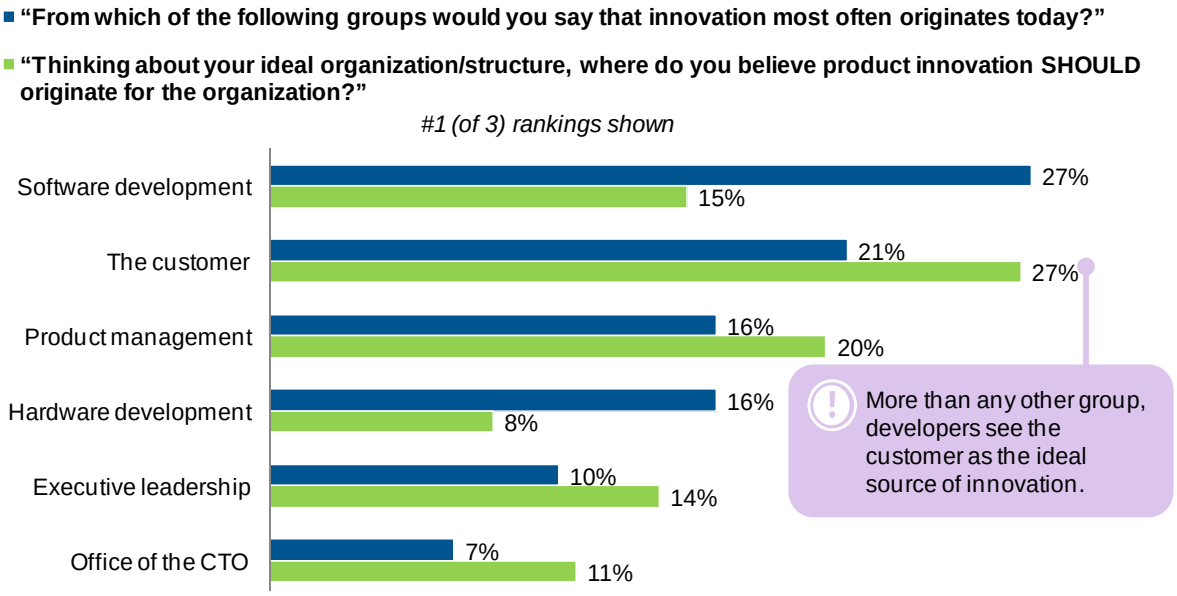
Many product development companies have established sophisticated Voice of the Customer (VoC) programs that connect customers to product development. Sixty-six percent of respondents elicit feedback from customers in multiple channels and integrate those into a single view. But only 35% of survey respondents look to customer input frequently throughout the execution of the project. Thus, the original customer idea can easily morph into something very different from what they expected. Development teams need to connect VoC programs to the development process with more frequent and more meaningful interactions, increasing the consumer's role in innovation (see Figure 3). Techniques for improving customer collaboration include:

- **Exploiting Agile to drive more customer involvement.** By delivering software to the customer more frequently, product development companies can obtain increased customer feedback. This requires not only faster delivery, but also frequent reprioritization of software features to reflect customer feedback.

- **Integrating product management, software engineering, and the customer more closely.** Although customer intimacy is very important to delivering innovation, engineering and product management also play a critical role. Organizations have a tendency to focus on one part of this triad at the cost of the other two. In some companies engineering dominates, relegating product management to documentation and release activities. In others, existing customers dominate, with product management and engineering focusing on their wishes at the expense of future vision. A balanced organization is crucial for delivering value today while also delivering the breakthrough innovation critical for long-term success. Don't forget Henry Ford's caution that if he had focused only on what his customers wanted he would have delivered faster horse carriages!

- **Connect software engineering more closely to the customer.** Only 16% of respondents have a product delivery organization that shares customer insights and analytics in an online form with all interested parties, including software engineering. By connecting the people with the problem — the customers — with the people with the solution — software engineers — VoC programs can harness innovative ideas and reduce the time it takes engineering to understand customer problems. For example, discussion forums offer an exciting new focal point between customers, engineering, and product management. Such social media provides a great mechanism to ensure everyone is working from a common understanding.

Figure 4
Software Decision-Makers Believe Customers Should Drive Innovation



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Staff Are Not Rotated, Measured, Or Rewarded For Innovation

Process, organization, and technology all help enable innovation, but without great people, they are of limited value. Hiring, managing, and retaining staff is crucial, but it's only a part of the equation. For long-term success, product development organizations develop people by rotating them through customer-facing roles, and they should also measure and reward people for innovation. Yet our study indicates that many product development organizations are not doing enough today:

- **Engineering and product management staffs are not rotating roles.** Many great ideas have come from viewing a problem from a different perspective. By rotating staff into different parts of the business, product teams expose those future innovators to fresh ideas. Yet 66% of our respondents rotate none or only a few product managers or engineers through multiple customer-facing roles (see Figure 5).

- **Innovative people are not being allocated effectively.** Getting the right people with the right skills employed on the right projects is fundamental to effective product innovation. Knowing which people are most innovative is key, but these resources are often not available, so product delivery organizations must get creative in finding the right staff and using their time effectively.
- **Product teams often do not measure or reward innovation.** Forty-three percent of respondents do not measure innovation today. A further 25% do not tie any incentives to innovation (see Figure 6). If an organization does not measure innovation effectively, it is very hard for them to improve it. Once measures are in place it's possible to include innovation as a key management measurement, rewarding teams or individuals for their contribution to innovation outcomes like product revenue or market share growth. Many innovative organizations provide prizes or recognition programs for both small- and large-scale innovations. The reverse may also be true, with teams that do not deliver innovative ideas being treated accordingly by management.

Figure 5
Staff Are Not Given Sufficient Rotation

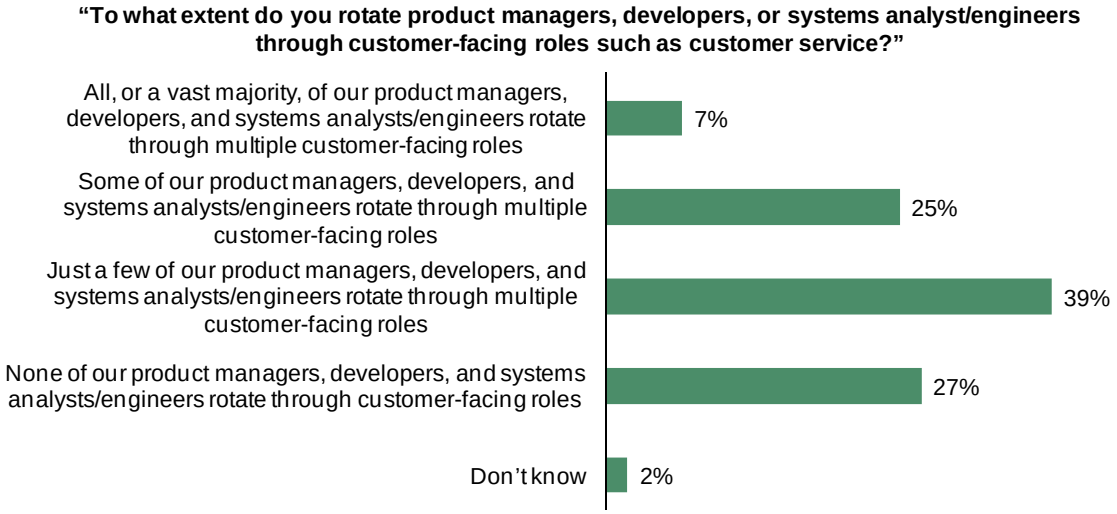

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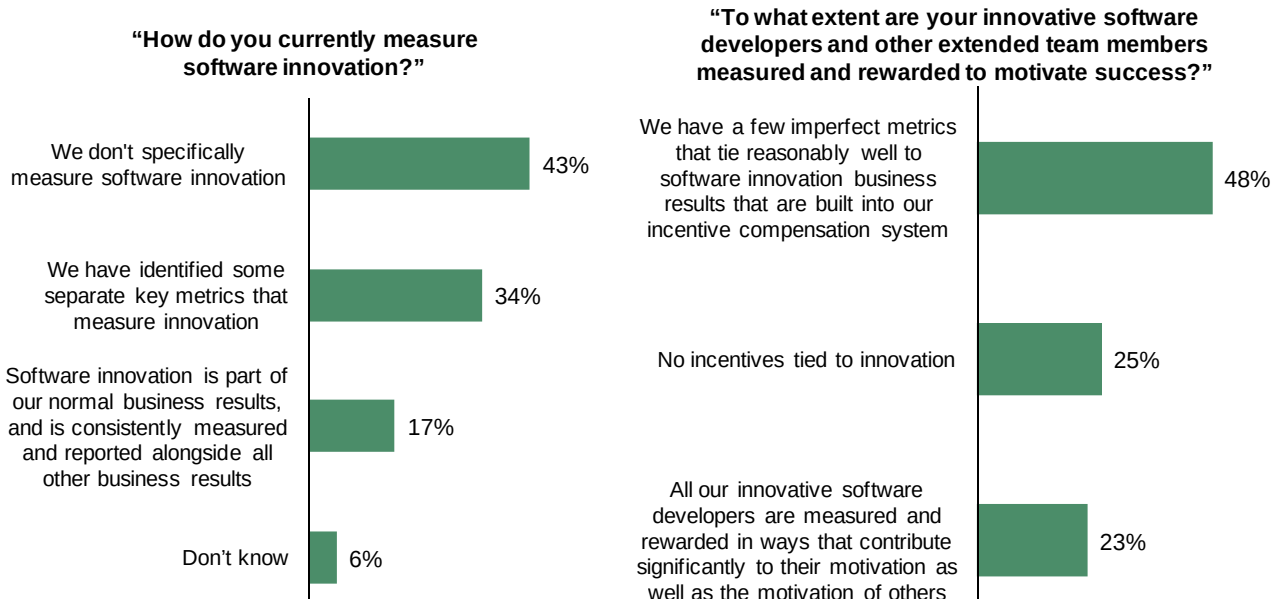
Figure 6
Innovation Is Poorly Measured and Rewarded



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Reward, Connect, And Enable Teams To Deliver Innovation Quickly

As software plays an increasingly important role in innovation, building an environment that fosters that innovation is crucial. Just as the Parisian coffee houses fostered an environment for thinking, discourse, and debate during the Age of Enlightenment, product development companies must adopt strategies that enable innovation. These strategies need to include a mixture of people, process, and technology with a strong emphasis on flexibility and transparency. The result is not just lots more ideas at the macro level, but also a more focused delivery process on the requirements that matter, allowing product companies to avoid the collection of random yet interesting features which can plague a product.

Innovation Starts With The Right People

When discussing where good ideas come from, author Steven Johnson describes great ideas coming not from eureka moments, but instead from a collection of hunches that build incrementally over time into a great, innovative idea.[2] In a product company, these hunches and mini-ideas will come from many different people in a variety of different positions. It is therefore important to make innovation a part of your HR strategy. Elements of the strategy should include:

- **Circulating people to give them a broader perspective.** Circulation provides individuals with broader perspectives, brings down organizational barriers, and encourages ideas to grow. However, moving people out of

jobs that they are good at is often anathema to most managers. Only 7% of people surveyed described a broad circulation policy, with more than half only circulating a few key resources or none. By making circulation an HR requirement, it is more likely to be undertaken.

- **Introducing community and making it thrive.** Internal communities can be cultivated by HR with a view to talent development, education, and support, but they ultimately rely on their members to sustain valuable activity. Communities not only connect the right people, they also provide a transparent document of the skills of those people. Seeing who is involved in certain discussions enables management to appreciate who has an interest in an area or has some great insight. By rewarding and encouraging participation, it is possible to build a considerable knowledge base within the company that is transparent and open to all.

- **Managing people as a precious resource.** The allocation of the right people to the right projects is problematic for a majority of organizations surveyed (see Figure 7). This will continue to be the case unless leaders do talent management systematically. Reward and promotion models must deem innovation as a key objective. Managers should include innovation in development objectives; core to a person's growth rather than an afterthought.

Figure 7
Teams Are Not Succeeding At Allocating Innovative Talent

Base: 106 US and UK development decision-makers at organizations producing software on top of, included in, or embedded in products
(percentages may not total 100 because of rounding)

Source: A commissioned study conducted by Forrester Consulting on behalf of IBM, September 2010

Today's World Demands A Broader And Deeper Innovation Network

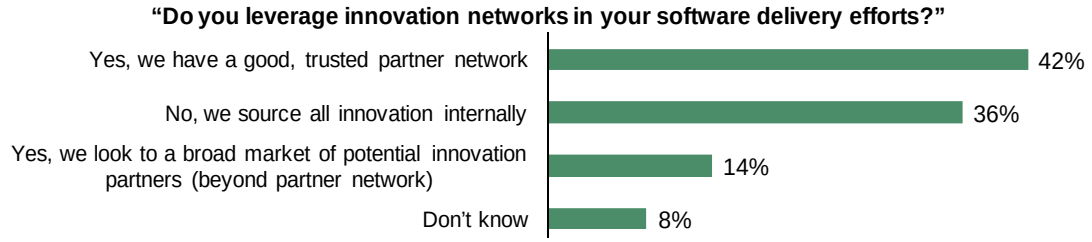
The majority of product development companies have complex partner and supplier networks. These organizations contribute materials or even assemble the product. Their knowledge of the product or the subsystem is often greater than that of the product company. Forty-two percent of respondents look to those partners as part of a broader innovation network, encouraging them to contribute to software delivery efforts (see Figure 8). Modern software is increasingly being influenced by a broader market, with open source and free software driving many of the leading innovations. Yet only 14% of respondents look to the broad market to support their innovation and exploit this large group. Product development professionals should look to the following strategies to expand their partner network:

- **Exploit the open source community.** One of the largest markets for potential partners is the open source community. By connecting to this group, product organizations can take advantage of the resource it provides;

for example, contributing parts of their software, allowing a broader community to maintain and support them. This also allows additional development around these assets, driving market-based development practices.

- **Include geographically distributed partners.** If the product will target a world market, then encouraging contributions from different geographies can better enable companies to leverage innovations from any region. This is different from traditional geography-sourcing strategies that optimize price over innovation.

Figure 8
Innovation Networks Are Not Fully Exploited Today



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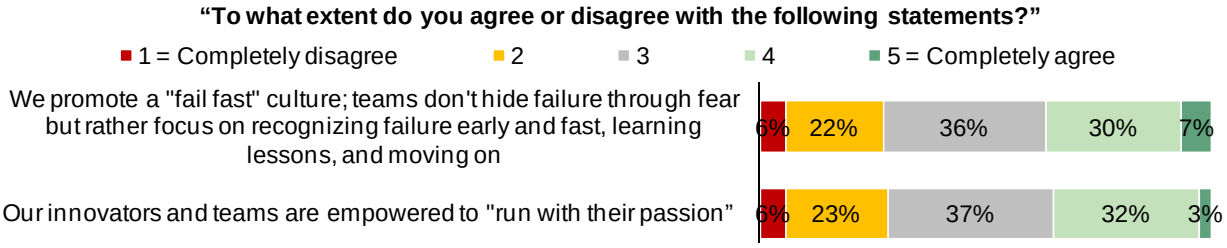
Provide Tools And Processes That Speed Delivery And Maximize Flow

Rapid release and feedback are a cornerstone of any product innovation strategy. However, only 37% of respondents report such a "fail fast" culture (see Figure 9). It's crucial that product development professionals establish an environment that allows rapid delivery and collaboration. This type of environment requires a combination of flexible processes and tools for collaborative development and integrated project management. Ideally, this approach increases the transparency and visibility of work being undertaken while ensuring that the right amount of control is in place.

Figure 9
"Fail Fast" Culture And Passion For Innovation Are Not Widespread Today



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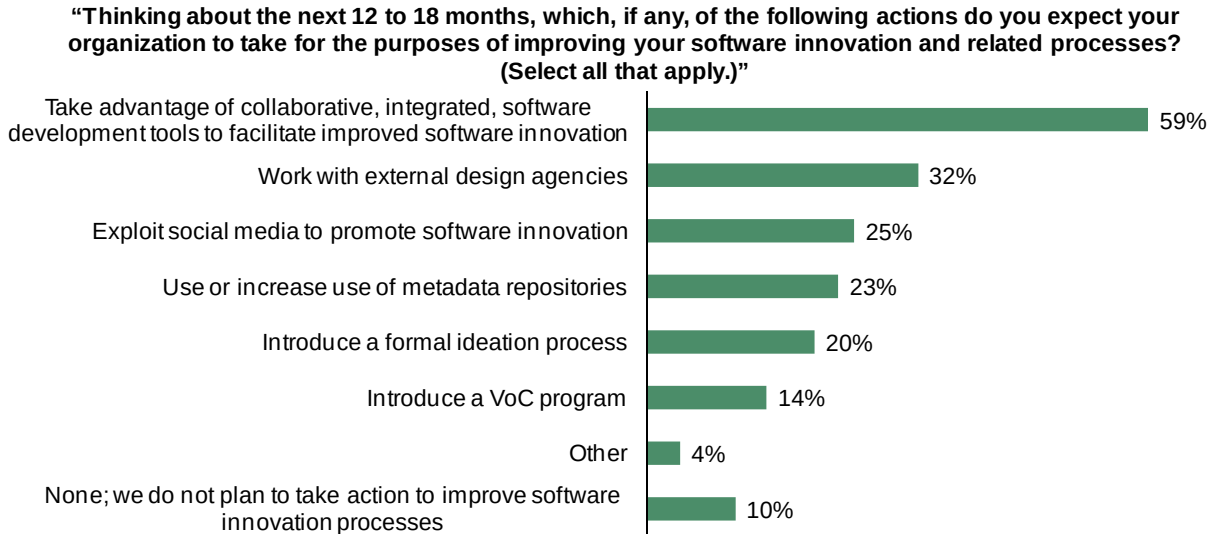
A rapid delivery environment requires product development professionals to:

- **Take advantage of Agile methods.** Twenty percent of respondents were using some form of Agile method, but instead of focusing on the method, the principles of Agility must drive the overall process, including a focus on visibility, collaboration, and incremental delivery. These principles will encourage teams to adopt practices such as introducing integration testing prior to unit-level testing, leading to increased feedback and visibility. By including VoC in the Agile approach, teams will be challenged to deliver features that are desired by the customers first.

- **Introduce a collaborative development environment.** Fifty-nine percent of respondents predict that their organization will take advantage of collaborative, integrated software development tools to improve their ability to innovate (see Figure 10). This is driven by the spread of talent and teams across many locations and by the fact that work is not linear. To support this situation while maintaining visibility and control requires development teams to adopt a platform that enables development to be a collaborative endeavor. Virtual and cloud-based infrastructure also has a role to play, ensuring that everyone has access to project information and assets.

- **Integrate project management with development to ensure transparency.** Innovation comes from information and insight. Project management has historically focused on delivering control via artifacts and plans. By integrating project management into the development environment and reporting on the progress of atomic project artifacts such as code, builds, and tests, project management presents a clear picture of project status. Making this information available to the extended team, including the partner network, supports opportunities for tighter collaboration and problem solving.

Figure 10
Collaborative, Integrated Software Development Tools Expected To Bring Innovation



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Measure And Reward Teams For Innovation

Despite the key role innovation plays in driving long-term growth and development, 43% of respondents do not specifically measure innovation, and only 17% make innovation a key measurement reported alongside other business results. For product development professionals to make effective decisions and solve problems, they need better visibility into the success or failure of work as it relates to innovation. Metrics which show how features are linked to innovation themes, or tests that measure the wow factor of a new capability must be reported on, measured, and appropriately rewarded based on these accomplishments. Holding product development teams accountable for long-term product success is important, but it is only effective if they can see how those long-term measures can be affected by their work today. Product development professionals should:

- **Connect team-based measures to innovation results.** Innovation is a team-based sport, and rewards and measures should not be tied solely to the individual, but instead to the team. Connecting teams to the measures that highlight innovation, such as brand equity or customer Net Promoter Scores, allows those teams to decide how they wish to work to deliver on those objectives. Product development leaders should also measure contributions to community discussions, rewarding active participation.

- **Involve the customer in creating real measures.** The measures that count tend not to be project management measures; but rather measures around how the market receives the product. Those measures are hard to determine and introduce. By talking to customers and tracing how their desires can manifest themselves in work undertaken by the team, it is possible to determine a scorecard that makes sense. Not all measures can be directly linked to the customer, but over time causal relationships between interim measures such as progress and technical debt and customer measures such as sales and growth can be determined.

- **Build dashboards to provide visibility.** Taking the measures is only one step; sharing them with the extended team in a form they can understand and take action on is the goal. Too many scorecards and reports show product measures that individuals do not trust or understand how to affect. Product development professionals must develop dashboards that communicate both status and intent, describing not only what is happening but also what the implications of this status are.

KEY RECOMMENDATIONS

At any moment, product development professionals can only guess as to what the next big thing will be for their product. Software is very likely to be a fundamental part of that innovation. By better connecting the software development practice to the overall innovation flow, product organizations can better take advantage of innovation opportunities and build an environment that fosters ideas. Modern software delivery environments must transition from only supporting quality and predictability to adding support for innovation and flexibility. To better integrate innovation into their software delivery environment product development professionals should:

- **Challenge the environment to deliver software more frequently.** The idea that people sit in ivory towers creating the next magic product is wrong. The majority of innovative products come from frequent release and inspection processes. The key is ensuring that the feedback is being effectively gathered and acted upon and that too much precious time or money is not spent getting that feedback. When a company puts in place a process and tools that allow for frequent releases, not only is the product more likely to fulfill its objective, but quality will also increase as processes of release are tested more and more frequently.
- **Put in place a collaborative development environment.** Historically, software development focused on individuals, optimizing their working practices through tools and process. To deliver more innovative products requires software development teams to work more effectively as teams. That requires tools to enable practitioners to work better together, sharing assets and knowing what the others are doing.
- **Be more strategic in staff development for innovation.** The biggest asset that a product company has in delivering innovation is its staff. Those assets need to be carefully developed. By rotating those staff into different areas or providing them time to undertake innovative work, product development organizations will continue to grow these assets.
- **Build open, fail-fast, passionate teams and enable them with open communication.** Software delivery is a team sport and requires that team to be cross functional in nature and passionate by desire. It is true that you cannot create these teams; instead, product development professionals need to create an environment that allows these teams to flourish.
- **Extend to broader innovation networks.** Include partners and organizations that you have never worked with before. Software innovation is in fact an evolution of many software assets whose whole is increasingly worth more than the sum of the parts. These complex software architectures will benefit from not only internal, but also external contributions. Product development professionals should consider the open source community as part of the broader development community and work with this group.
- **Introduce measures for innovation.** If innovation is important for a product then the ability to innovate and the current status of innovation should be measured and reported. Map end-point-oriented measures such as revenue and customer happiness with interim measures such as number of defects and technical debt. Put in place dashboards that clearly show both the status and intent of these measures.

Appendix A: Methodology

In this study, Forrester conducted an online survey of 106 organizations in the US and UK to evaluate current trends and practices in software development and product innovation. Survey participants included decision-makers in software development at organizations producing noncommercial software-oriented products. Questions provided to the participants asked about the role of software in innovation, current practices and barriers to software innovation, implementation of "Voice of the Customer" programs, use of partners and innovation networks, as well as plans for the future to increase innovation. The study began in and was completed in September 2010.

Appendix B: Supplemental Material

Related Forrester Research

"The Time Is Right For ALM 2.0+," Forrester Research, Inc., October 19, 2010

Appendix C: Respondent Demographics

Figure C1
Organizational Demographics

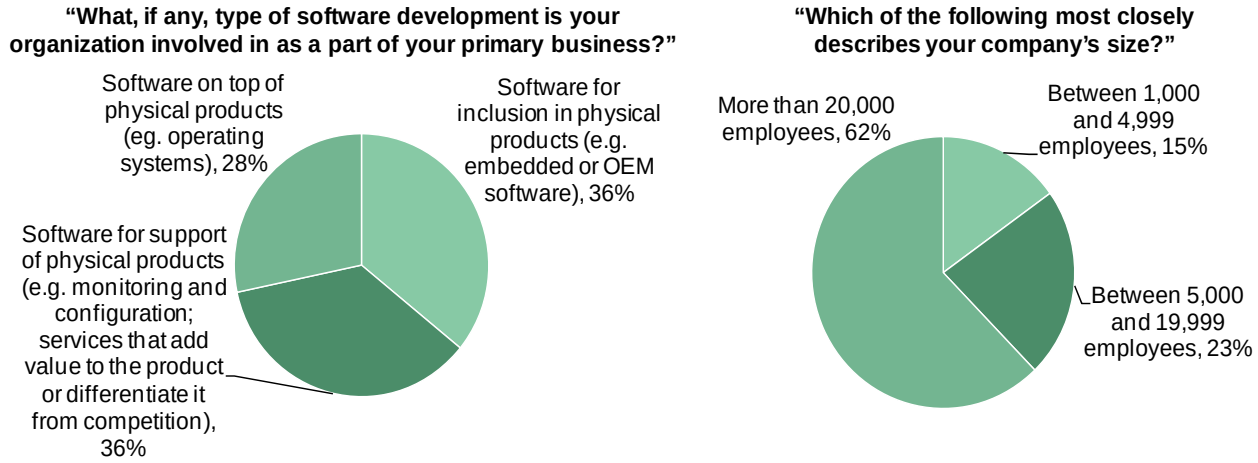

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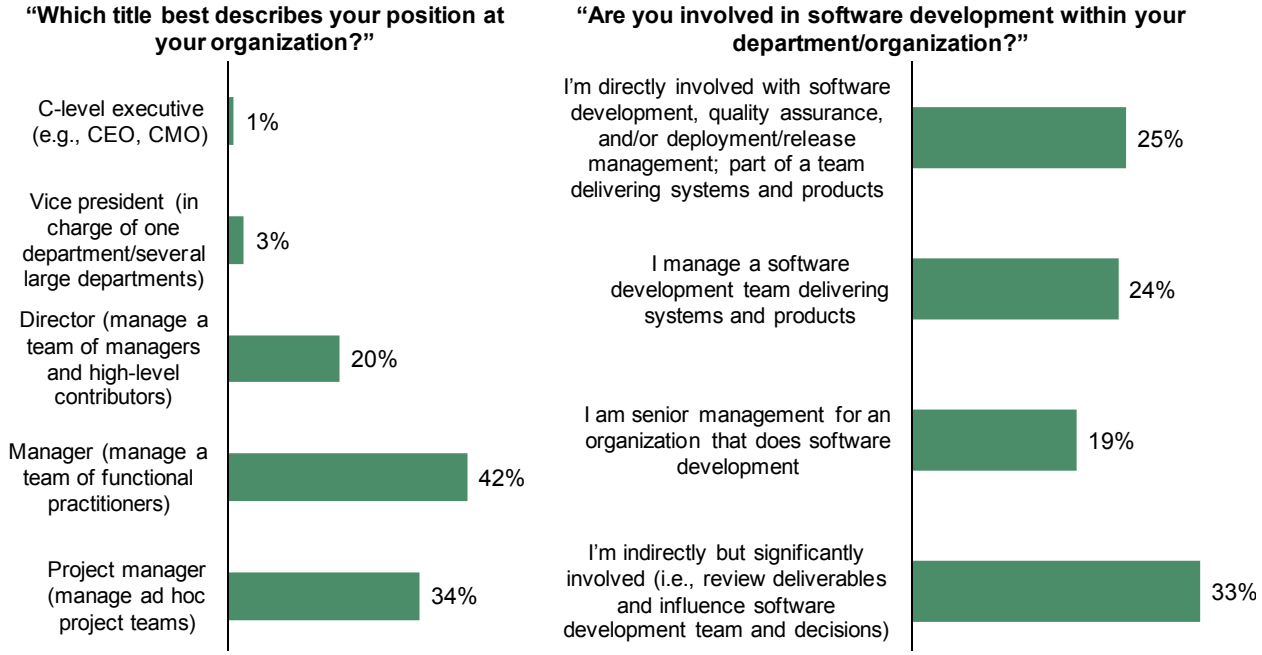
Figure C2
Respondent Roles



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Appendix D: Endnotes

[1] Technical debt was a term coined by Ward Cunningham to describe how software gets harder to change over time. Thus technical debt, like financial debt, incurs interest payments over time as it costs more time and effort to fix problems. For a great description of technical debt, watch http://www.youtube.com/WardCunningham#p/a/E95B31B1A940296B/2/pqeJFYwnkjE.

[2] Steven Johnson, in his book *Where Good Ideas Come From: The Natural History of Innovation,* describes the natural selection of ideas and how ideas themselves do not just appear out of nowhere. A great video of an overview of his thinking can be found at http://www.youtube.com/watch?v=NugRZGDbPFU.