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THE OPEN SOURCE ERA
EMBRACE THE FUTURE

OXFORD ECONOMICS

DO BUSINESS BETTER

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Contents

THE OPEN SOURCE ERA

An Oxford Economics Study In Collaboration with Wipro

Open source software is changing the way the world computes. A huge majority of businesses are using this collaborative, iterative, and transparent development method, which powers everything from disruptive internet companies to the design of electric cars, along with countless other projects. Also, open source has become even more important to growth and bottom-line success.

In early 2015, Oxford Economics conducted a global survey of senior business and technology executives about their use of open source software and development methods. The results of the survey, conducted in collaboration with Wipro, show clearly that open source is widely used to drive innovation, while at the same time underpinning a variety of other critical technologies.

The value of open source plays out on multiple fronts. It enables processes and systems required to capitalize on successive waves of digital technology—including Big Data, cloud, and mobile applications. It eases the task of integrating new technologies with legacy systems and packaged products by allowing a more hands-on approach to development and innovation. And it empowers users in an environment where they must constantly adapt strategies, business models, and new ways of working.

Among the key findings of the survey:

- Over three-quarters of respondents say open source software will power their company's cloud computing efforts in three years, while nearly two-thirds say open source will drive their Big Data initiatives in three years
- More than half say open source is already supporting new products and services in their company
- Nearly half say open source supports cloud (49%) and IoT (46%) infrastructure

In short, open source is fulfilling the expectations defined for it nearly two decades ago by Eric Raymond in his seminal essay "The Cathedral and the Bazaar." The intervening years have seen the maturation of global development communities, buy-in from major software vendors, and the massive popularity of open source platforms like Google's Android operating system. All that has created the critical mass necessary for open source to become a mainstream business tool. And as our survey shows, the philosophy behind it has expanded beyond software development to strongly influence other facets of innovation.

This report includes comments from major companies around the world that are using open source in a variety of consequential ways. From innovative upstarts like Twitter to established giants like Time Inc. and research powerhouses like CERN, this new approach to software is now essential to everyday operations. The open source era is well under way.

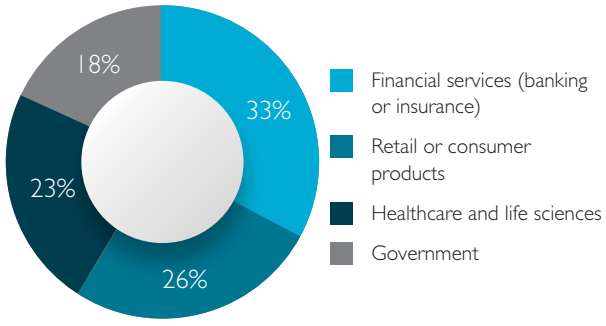
> **"Open source is mainstream today; it is robust, scalable and is being used by organizations to create competitive advantage. With a model of sharing as opposed to owning, open source has enabled better developer collaboration, faster time to market, and lower TCO across geographies."**
>
> **—Bhanumurthy B M,**
> **President and Chief Executive,**
> **Business Application Services, Wipro Ltd**

RESEARCH METHODOLOGY

In the first quarter of 2015, Oxford Economics and Wipro surveyed 100 business and IT executives with the knowledge of and responsibility for their company's open source strategies. These executives come from around the world, and represent a range of industries. The majority of respondents are from companies with annual revenues between $1 billion and $5 billion; the rest are from larger companies.

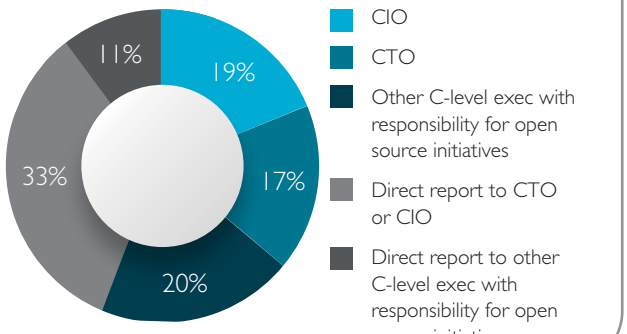
Respondents by industry

What is your firm's industry segment?



Respondents by title

What is your job title?



Interviews were conducted with executives at nine companies, providing critical qualitative support to our survey findings:

European Organization for Nuclear Research: Tim Bell, Head of Infrastructure Services

Expedia: Spokesperson

FINRA: Saman Michael Far, SVP Technology

Government Digital Service: James Stewart, Director of Technical Architecture

SciGenom Labs: Paul George, Chief Technology Officer

Twitter: Chris Aniszczyk, Head of Open Source

Time: Colin Bodell, EVP and Chief Technology Officer

Qatar Airways: Shiju Thomas, Vice President of IT

Wikimedia: Quim Gil, Engineering Community Manager

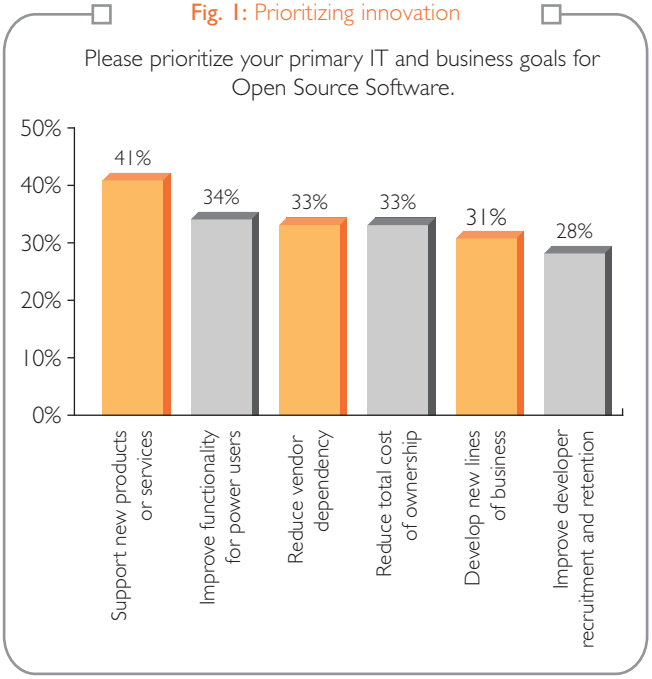
POWERING INNOVATION

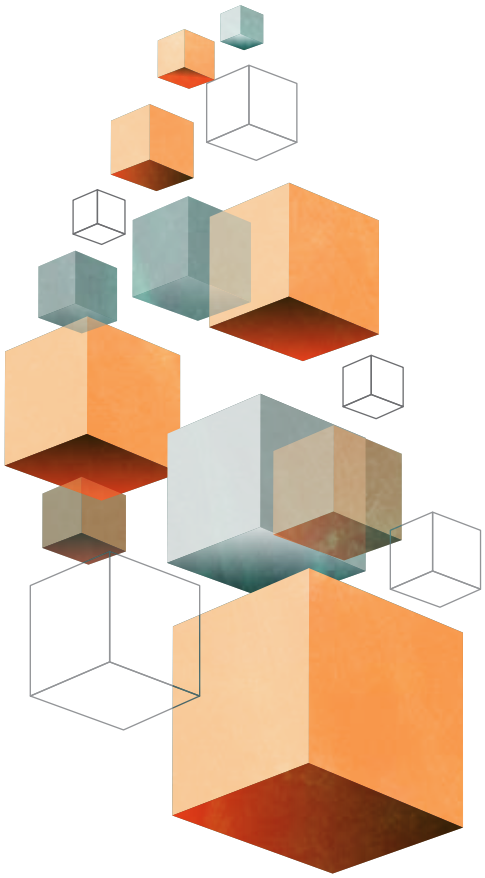
An open source approach to products and services

Open source software is a powerful platform for innovation — a critical differentiator as companies seek to roll out improvements to products and services faster than what traditional software might allow. The development method's reliance on ongoing and external contributions naturally create a strong testing and development model. "There is an old saying that innovation happens elsewhere," says Chris Aniszczyk, Head of Open Source at Twitter, referring to the famous quote from Bill Joy of Sun Microsystems. "You can only do so much as a company, but there are always going to be crazy people outside your company doing interesting things. Why not have those people contribute to your open source project and take it in interesting directions?"

While businesses have a variety of plans for open source, our survey shows the demand for supporting new products and services is especially strong. When asked to prioritize their primary IT and business goals for open source software, 41% placed support for new products or services at the top of the list, ahead of cost reduction (see Fig. 1).

Fig. 1: Prioritizing innovation





And these are not just future plans: over half of respondents say open source is already supporting product and service development, with higher quality products among the top overall business benefits realized by companies today. This is a trend that will likely strengthen as open source continues to support technologies of growing strategic influence, including cloud, the Internet of Things, and virtualization.

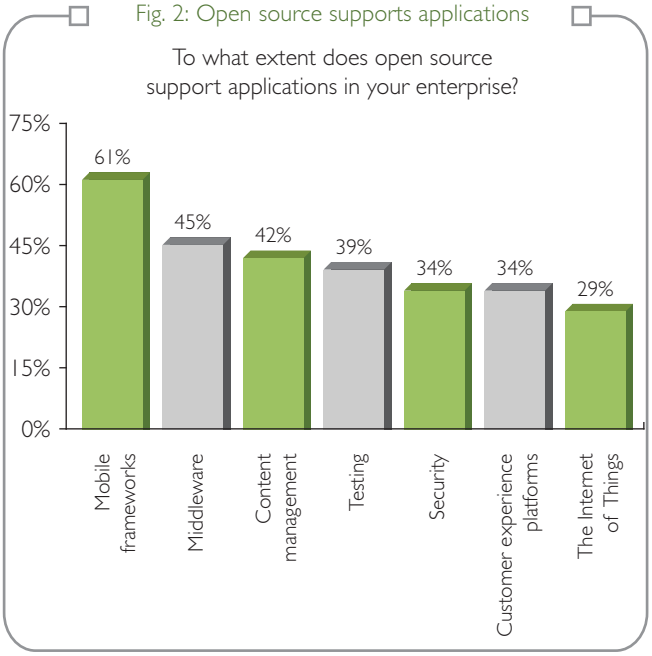
> **"There are always going to be crazy people outside your company doing interesting things. Why not have those people contribute to your open source project and take it in interesting directions?"**
>
> —Chris Aniszczyk,
> Head of Open Source, Twitter

INNOVATION FROM THE INSIDE

Innovation may often "happen elsewhere," but it matters a lot to the way things are done close to home. In addition to supporting the development of customer-facing products and services, open source software is driving performance within organizations, supporting core operations, and enabling mission-critical technologies. This kind of support for daily operation allows companies to spend more time on strategic tasks.

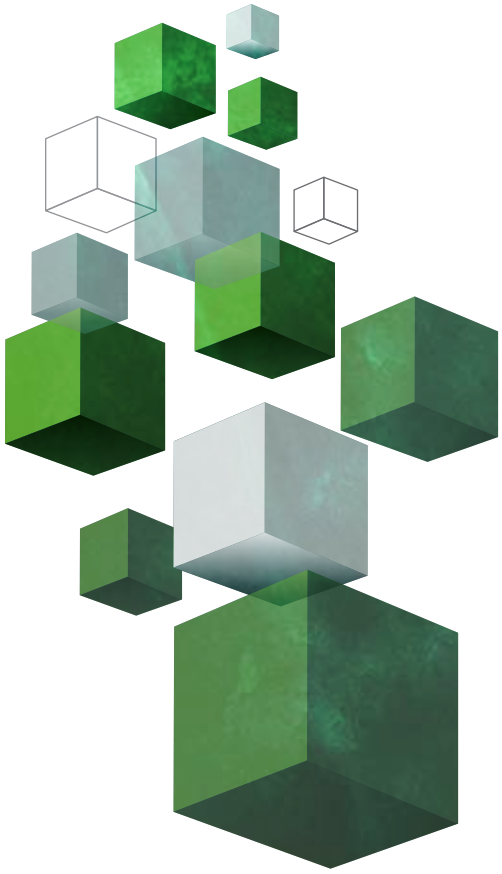
As Fig. 2 shows, open source is a critical supporter of mobility, middleware, and content management — some of the essential tools of day-to-day work. And as illustrated in Fig. 3, open source is also supporting cloud infrastructure, the largest technology trend impacting companies today, according to our respondents.

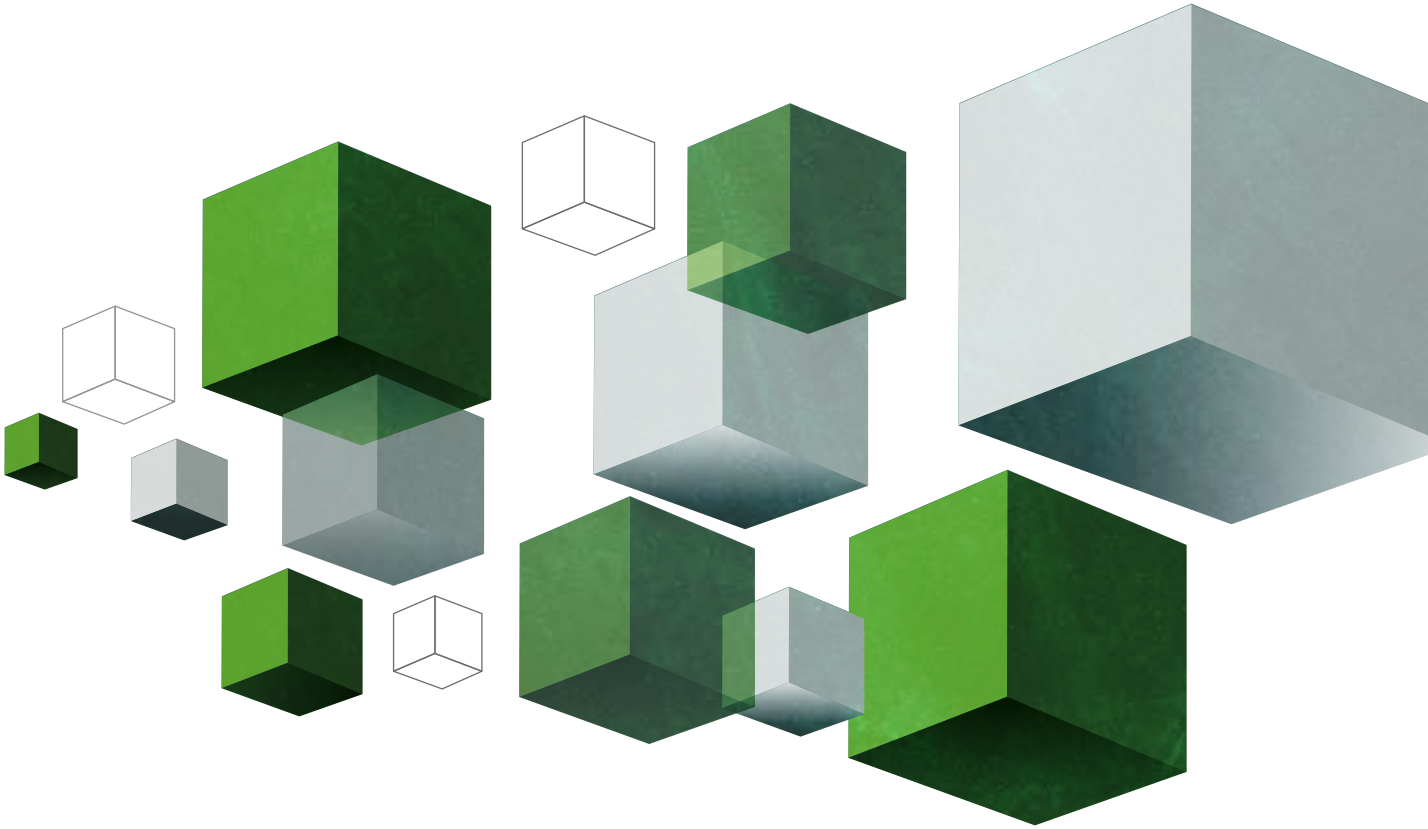
Fig. 2: Open source supports applications



At SciGenom Labs, the India-based DNA sequencing company, open source software is behind the development of bioinformatics tools that allow better management and analysis of the wealth of data created in its labs. Open source has also allowed the company to automate more processes, freeing up more time for workers to focus on strategic endeavors.

The Financial Industry Regulatory Authority (FINRA) is also using open source to power Big Data and analytics efforts. The US-based, government-authorized regulator, which processes vast amounts of financial data and alerts analysts to impending spikes and critical trends, needs a solid IT architecture to independently validate and integrate the data it feeds to analysts. "By using open source technologies,

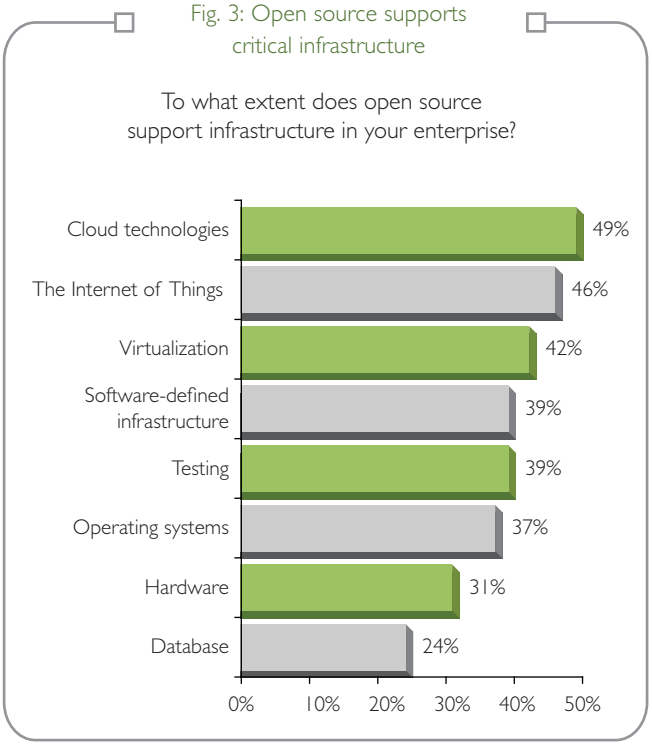


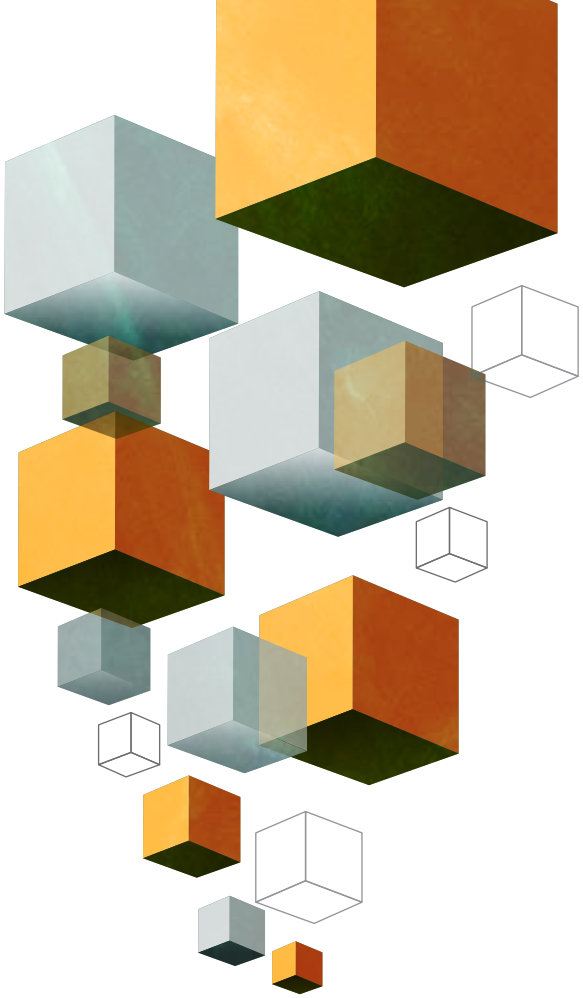


we are able to do massive data processing on commodity hardware," says Saman Michael Far, the company's SVP of Technology. "The amount of compute we can get per dollar is so much higher that we can provide much more in-depth analytics for our surveillances, and staying vendor-neutral gives us execution options in terms of adopting new technologies as they come up vs. getting locked in."

As an increasing number of the tech tools and applications companies rely on are powered by open source, and new ways of using the software methodology continue to emerge, it is likely that companies will find more new solutions to address business issues over time.

Fig. 3: Open source supports critical infrastructure





THE POWER OF FLEXIBILITY

Agility has never been more important to business performance — and even survival. Open source enables the development of new products and services by allowing companies more freedom, flexibility, and agility than they would realize from traditional software. In fact, 63% of our survey respondents say open source software will be critical to business agility in their company over the next three years.

For the Wikimedia Foundation — proprietor of Wikipedia, one of the most-visited websites in the world and one that is funded by donations from the public — the flexibility offered by independence from vendors is a core value proposition. "Our donors do not give us money to optimize costs by making compromises. They give us the money to ensure that Wikipedia will continue to exist no matter what, and that our service will be reliable," says Quim Gil, the foundation's engineering community manager. The Wikimedia Foundation develops and integrates open source software to operate successfully and to build the infrastructure its donors require without depending on proprietary software and the private organizations developing it.

Open source is not just for technology-based businesses or startups — it is also an engine of innovation for companies with more traditional business models that are looking to move to a more agile development model.

Media giant Time Inc. must constantly find new ways to repackage its editorial content in ways that work for changing methods of media consumption. Over the past few years, as apps have grown in importance, the company has had to rethink its delivery format — quickly — while striving not to sacrifice quality. "If we had to build everything from scratch," says Colin Bodell, the company's Chief Technology Officer, "it would be years before we released great applications. But because there are so many good open source frameworks and deployment packages — as well as measurements and metrics packages — everyone has gotten a boost. It has put us all on the same playing field, allowing us to focus on our unique content and differentiating technology."

> **"By using open source technologies, we are able to do massive data processing on commodity hardware."**
>
> —Saman Michael Far,
> SVP of Technology, FINRA

CASE STUDY:
Twitter measures as it innovates

A social network with more than 302 million active users needs an agile development framework that allows it to innovate quickly even as it grows in scale. According to Chris Aniszczyk, Head of Open Source at Twitter, the $1.4 billion Silicon Valley innovator, open source allows the company to do just that.

"Open source gives you a lighter ecosystem and a way to see what other companies — even those much larger or smaller than yourself are experimenting with," says Mr. Aniszczyk. "It helps us innovate more and stay on top of technological trends."

With more than 200 active open source projects today, Twitter faces its share of community-management challenges, most notably a loss of direct oversight of various projects. "You always lose a bit of control when you open source something, even if you own the trademark and have the majority of the code-base under your umbrella."

But the engineering-driven company is built to measure and analyze, and its open source projects are no different. To reclaim some control over open source project management, the company has built tools to better measure the quality of external participation and response time to community requests. Furthermore, Twitter also has a team of developer advocates dedicated to cultivating open source communities important to the company. Understanding the community contributions and responses to various open source projects allow Twitter to find development problems and solutions — faster.

Open source software is a critical enabler of Twitter's social networking service as we know it today, and a key strategic asset for its future. For that reason, the company is constantly looking for new collaborators and hires from the open source community.

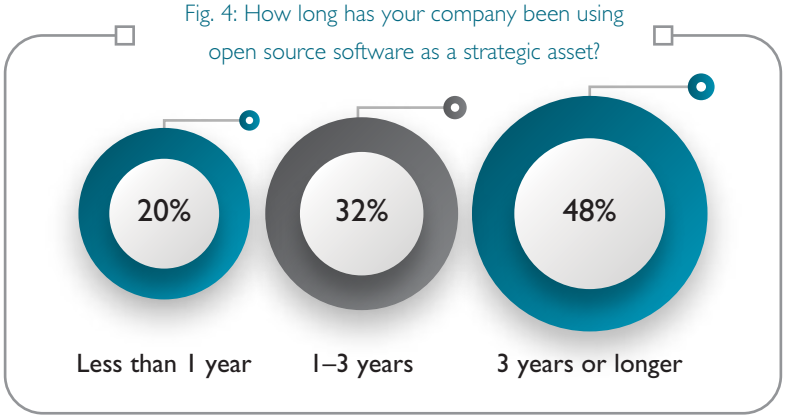
> If we had to build everything from scratch, it would be years before we released great applications. But because there are so many good open source frameworks and deployment packages — as well as measurements and metrics packages — everyone has gotten a boost.
>
> —Colin Bodell,
> Chief Technology Officer, Time Inc.

OPEN SOURCE EVERYWHERE

Built for the long haul

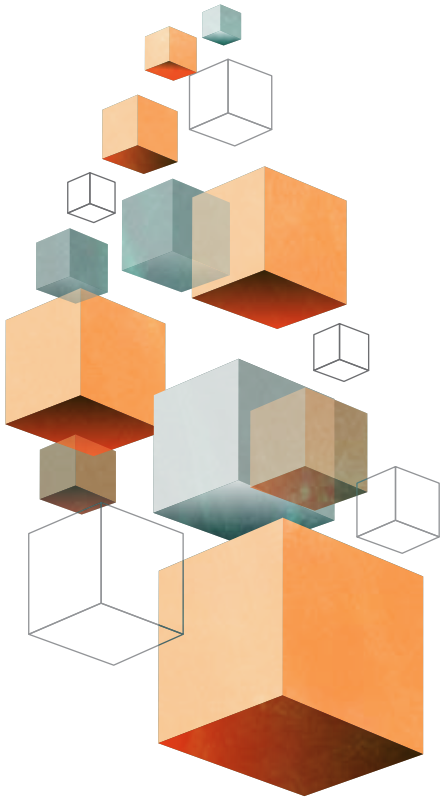
Open source software is in broad use across regions and industries. In fact, nearly half have been using it strategically for more than three years (see Fig. 4). Another 46% say open source software is in use either in a business unit or across the enterprise, while just one-fifth of respondents say they have not implemented open source software.

Fig. 4: How long has your company been using open source software as a strategic asset?



Despite its longevity in the marketplace, there is no clear agreement on the best method of implementation. Different strategies may suit different needs. Companies are roughly equally likely to say they work with a software company (38%), a systems integrator (32%), or self-manage (30%) to purchase and implement open source software. And while deployment is fairly advanced, nearly half of respondents say that over 20% of their user base is using open source enterprise-wide — there is still room for expansion.

> **One of the biggest challenges we've seen is the rate at which open source communities are evolving.**
>
> —Tim Bell,
> Head of Infrastructure Services, CERN



TRADITIONAL CHALLENGES FOR NON-TRADITIONAL SOFTWARE

Complexity of integrating with existing systems (75%) leads the list of challenges for companies using open source software — a problem only made harder by the constantly evolving open source landscape. "One of the biggest challenges we've seen is the rate at which open source communities are evolving," says Tim Bell, Head of Infrastructure Services at The European Organization for Nuclear Research (CERN). "Any community we join, we need to feel that the speed of that community is compatible with the resources we have available."

Skills also present an issue — 56% of respondents rank it among the top three challenges. Qatar Airways, where open source is widely and effectively deployed, follows a conscious review process that includes skills availability, support, and fitness for use. This process limits deployment to those areas that are ready to support it. "We evaluated open source for content management, but we have not adopted it primarily because of the availability of skills," says Shiju Thomas, the company's Vice President of IT.

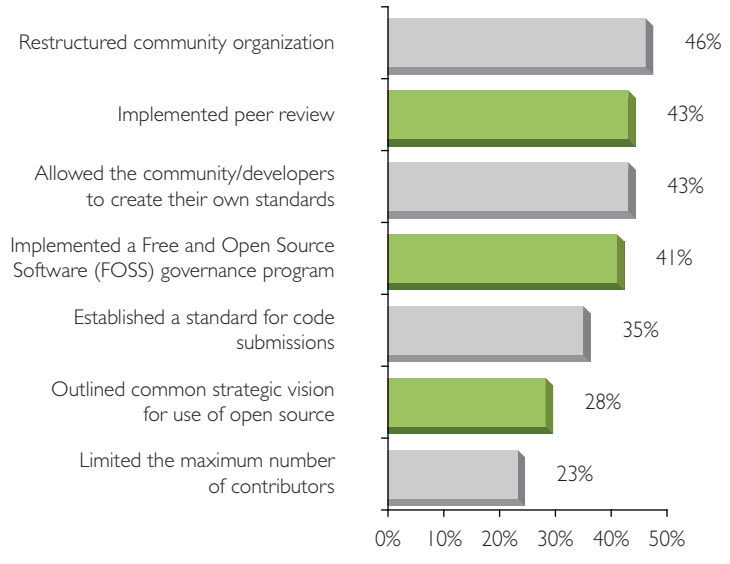
RISING TO THE OCCASION

To respond to these challenges, businesses have changed the way they develop software and solve problems related to it, with most solutions centered on the way open source communities are managed and reviewed (see Fig. 5). Adopting open source software has forced companies to alter their approaches to managing talent and overseeing development. Half say that they have made changes to the way they manage their people, and another 48% say they have changed development oversight methods.

While guidelines and policies may help counteract some of the challenges of implementation, it is also important to allow some flexibility in the approach. When travel and technology company Expedia needs to implement a new solution, it determines how best to go about it on a case-by-case basis. "We decide whether it makes more sense for us to buy support or whether we should do it ourselves," says an executive at the company. "Even when we do buy support or services, we still leverage whatever is available in the open source community, so that we have the capabilities regardless of whether we buy support from a commercial provider or not."

> **We evaluated open source for content management, but we have not adopted it primarily because of the availability of skills.**
>
> **—Shiju Thomas, Vice President of IT, Qatar Airways**

Fig. 5: What steps, if any, have you taken to offset the challenges of using open source?



CASE STUDY:
Expedia's journey to open source

Despite its travel-industry footprint, Expedia considers itself a technology company. "We are free to innovate and figure out what needs to be done; it is built into our business model to test and learn and go from there," says an executive at the $4.8 billion company.

Expedia's growth through acquisition strategy means that the company has added a new operation every 20 months — and the underlying IT network is a complex result. Over the past few years, the company transitioned to an open source platform to ease the complexity. "It is still not 100% lift and shift," says the executive. "This is not an overnight activity, but we want to have the option to use newer technology and products." Open source drives that agility.

To ease the transition to open source, the company uses a set of guidelines to determine which open source technologies it should use to adapt its processes, with the level of community participation the strongest determinant of selection. "We would evaluate our use of open source on a case-by-case basis," says the executive. "If it makes sense for us to solve a business problem with open source instead of a vendor, we are always open to it." And while the scale of its contributions back to the community varies, Expedia makes a point of submitting modifications, bug fixes, or new capabilities on a regular basis.

Expedia is energized by widespread industry support for open source and use by larger tech companies. "It can be liberating to figure out how to deliver business value faster — with open source, the infrastructure is available when I need it."

CORE TO VALUE

Great expectations

Enthusiasm for open source software is growing, and businesses are expecting major payoffs from their investments by 2018. Net positive impact from open source is expected to grow rapidly in the next three years, with many expecting open source to power competitive advantage and agility. This focus on strategic value may explain the importance of open source as a general technology trend, trailing only the much-hyped technologies like Big Data, e-commerce, and cloud.

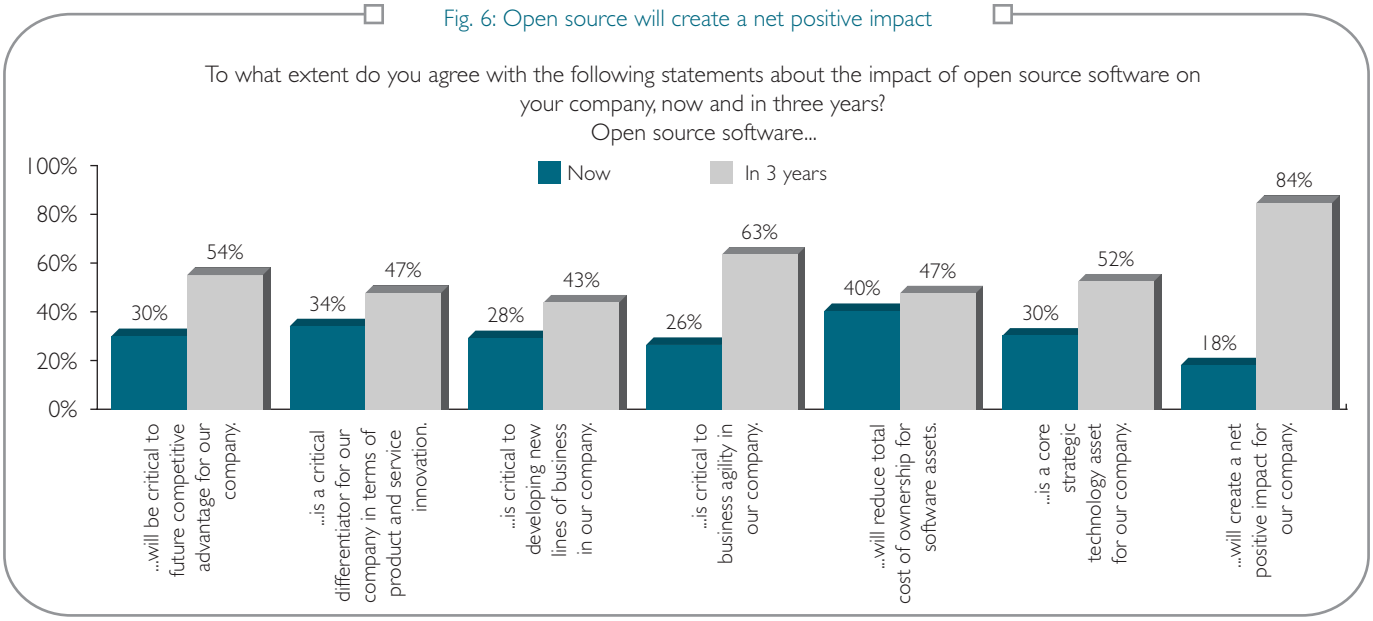
Yet a great deal of open source's value still lies below the surface. "Much of the improvement we can attribute directly to open source is not clear at this point, because the changes that include open source are also a part of business process changes — improvements to user experiences and other initiatives," says James Stewart, Director of Technical Architecture at Government Digital Service, the UK Cabinet Office's task force for transforming how government services are delivered in the digital age.

"I see elements of our use of open source and changing approach to architecture as an essential enabler of our cost savings."

For FINRA, open source is as much about flexibility and cost control as it is embracing new ideas. "If an enterprise requires custom software, it is hard to imagine a world where it is not based on open source," says Mr. Far. "Open source allows your investment dollars to go to the part of the iceberg that impacts your business, rather than the part of the iceberg that is under the ocean."

> **"I see elements of our use of open source and changing approach to architecture as an essential enabler of our cost savings."**
>
> **—James Stewart, Director of Technical Architecture, Government Digital Service, UK**

Fig. 6: Open source will create a net positive impact



VALUE BEYOND SOFTWARE

Open source is about more than just software. More and more companies are taking the open source approach — that is, collaborative, iterative, and transparent — and applying it to other areas of development and ways of working. One-fifth of respondents say they are using open source methods widely across the business, and another one-third say they are using them to a limited extent.

CERN's meritocratic, multicultural structure makes the open source approach a natural fit for the organization. "There are many countries that participate in CERN, and we are very used to that exchange of ideas," says Mr. Bell. "The same techniques that are being used outside to manage the collaborations with open source communities are being brought in-house for other projects."

Unsurprisingly, this open method of working allows closer and more effective collaboration, both internally and externally. Businesses are collaborating more with customers and business partners as a result of their use of open source methodology.

While our survey respondents are less likely to say increased internal collaboration is a primary benefit of open source methodology, there is a place for it. Time Inc. is using open source to build a collaborative environment among its editorial, design, and IT teams. Mr. Bodell attributes the launch of the company's curated video content site (thedailycut.com) to a free exchange of ideas between content managers, video production teams, and technologists. "Doing this work cut across all of the company's historic silos — the open source, rapid-iteration, collaborative, and transparent culture very much came into play."

Fig. 7: Open source methods are in broad use

Are you using open source methods and techniques for non-software development?

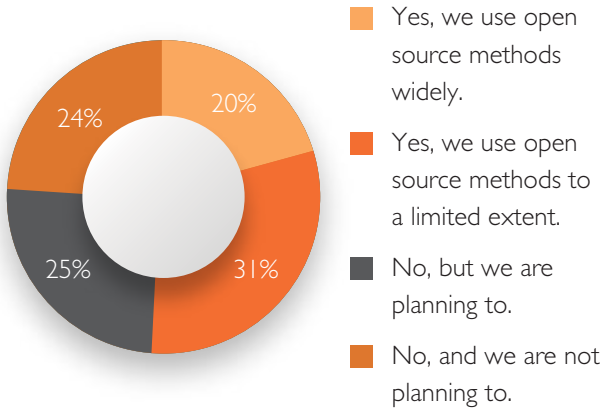
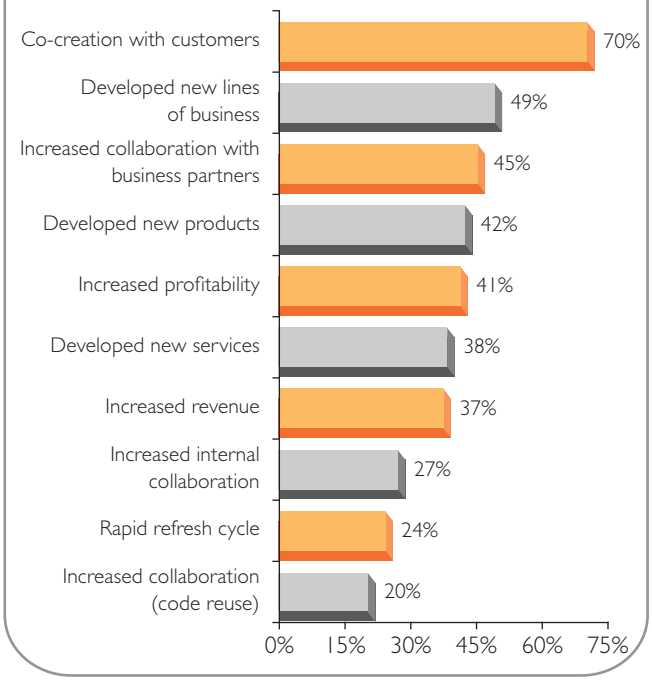


Fig. 8: Benefits of open source methodology

To what extent has your company realized the following benefits of open source development methods for non-software uses?



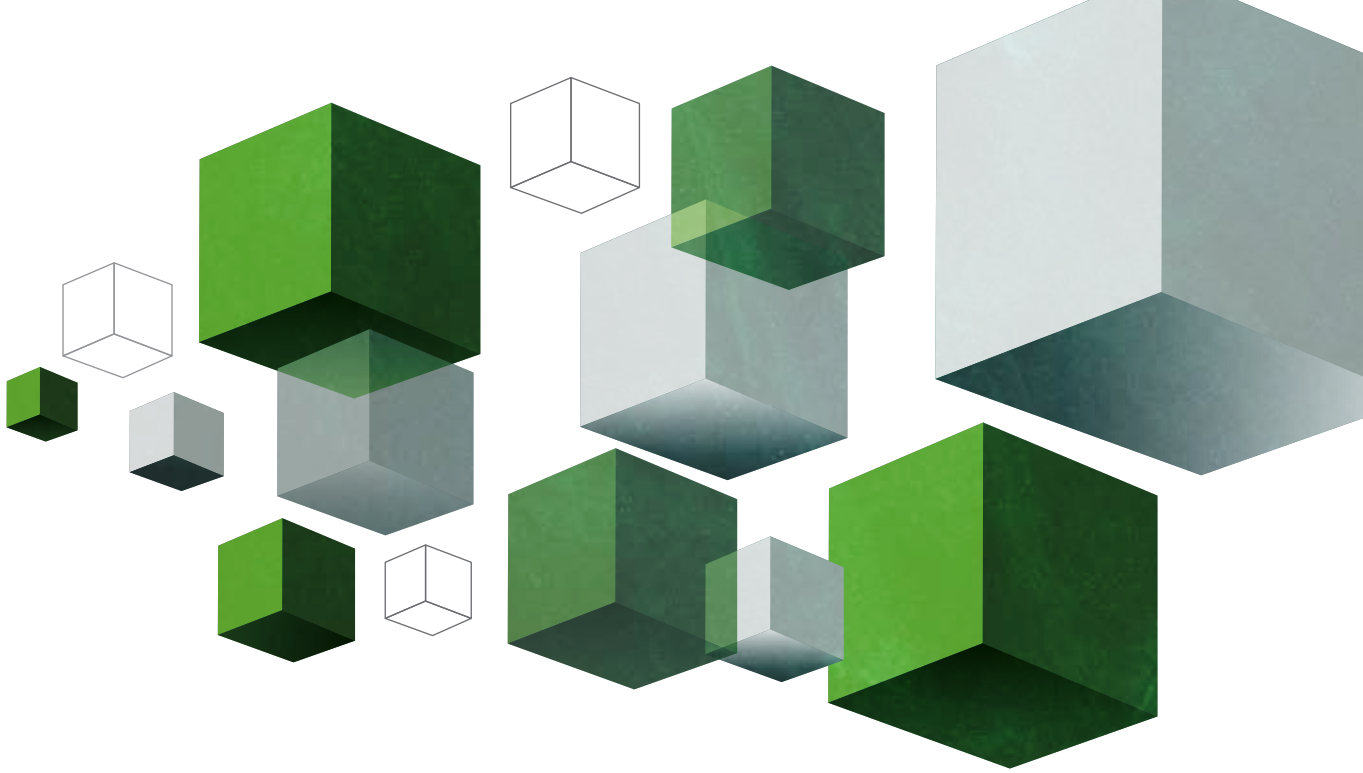
CASE STUDY:
CERN's open source acceleration

The Switzerland-based European Organization for Nuclear Research (CERN) operates the Large Hadron Collider, the world's largest particle accelerator — a particle collider that powers a wide array of scientific research. The Large Hadron Collider has exponentially increased the amount of data CERN must process, requiring a powerful new computing structure that respects the realities of public ownership.

"As a publicly funded institution, we needed to find ways to continue to do what we were doing with the same number of staff and maximum efficiency of any equipment we use," says Tim Bell, CERN's head of infrastructure services. "How do we go about reengineering the IT infrastructure and processes to be able to do this?"

For CERN, the answer is open source. "Rather than doing everything ourselves from the ground up, we looked for others trying to solve the same problem," says Mr. Bell. Results have been strong: CERN developed an environment in 18 months that previously would have taken more than eight years to build. "Open source has allowed us to get a large amount of code off the shelf," says Mr. Bell. "Then the work is to customize and integrate it rather than write it from scratch."

Mr. Bell says the organization can struggle to keep up with the rapid pace of change among open source communities, but keeps internal learning up to date by ensuring enough rotation to bring new ideas and innovation. Looking ahead, CERN will need to continue to rework its computing infrastructure to make use of the collider's data — current estimates predict 400 petabytes of data per year by 2023. Should these predictions hold true, CERN will need to continue to look for innovative, collaborative, transparent methods of development, and the solution will likely be open source.



CONCLUSION

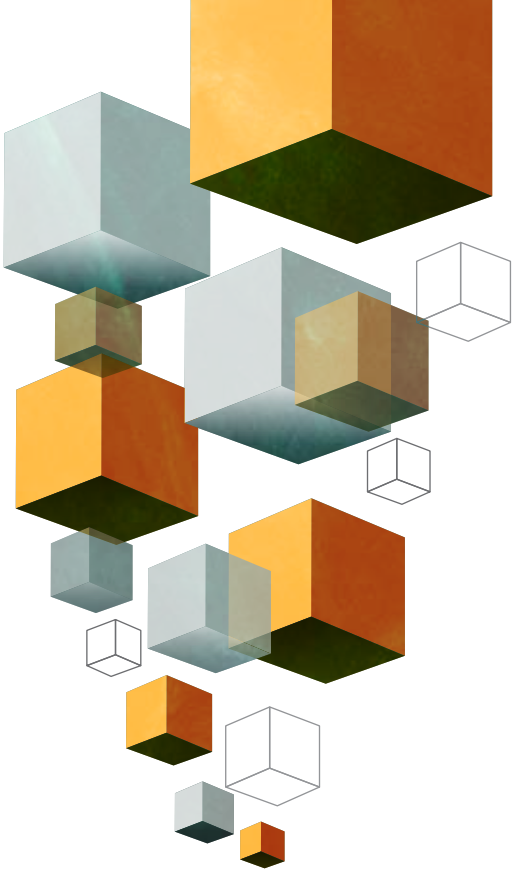
The impact of open source software and methodology on business performance and operations is broad and expected to grow strongly over the next few years. Challenges remain — dealing with complexity and putting the right recruitment and retention strategies in place are key issues, but most companies find the benefits are worth the effort.

Enterprises are increasingly looking at open source applications for end-to-end business collaboration, greater productivity, speed, efficiency, and growth. Open architectures and Internet-powered services are replacing conventional application development. The next generation of IT will address the challenges of availability at scale, moving from efficiency to effectiveness and erasing the boundaries between personal and enterprise computing.

To keep pace with the rate of change, technology organizations will need to be nimble. In order to become successful open source organizations, companies must:

- Embrace a culture of openness and move beyond familiar comfort zones and long-established practices
- Recognize the need for speed and agility in terms of development of applications, products, and services
- Rethink operations to maximize the value of open source as an enabler of next-generation technologies
- Focus on talent — recruitment, development, and retention — as a core element of the open source revolution
- Think beyond software to realize the full value of open source as a way of driving innovation and interaction

In the epilogue to "The Cathedral and the Bazaar," Eric Raymond wrote of the "tremendous explosion of interest in the open source development model" following the adoption of open source by Netscape. That was 1998. What has happened since then and continues to happen today makes even Raymond's expansive vision look cramped.



IMPACT ON IT

Our research is focused on the impact of open source software and methods on business performance, but it is impossible to ignore the changes this new regime imposes on IT. While many respondents are unsure how IT will be affected by open source, there is strong agreement that meaningful changes are on the way.

- 40% say IT will become more of a strategic advisor to the rest of the company
- 32% say IT will become more of a center of innovation
- 42% say use of open source software has reduced costs for the IT department

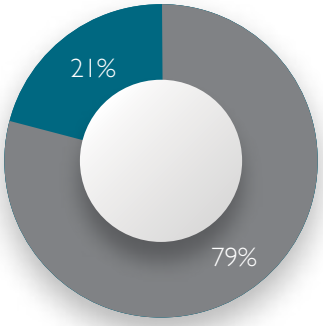
Far from reducing the role of the IT department, open source can help make it more strategic and central to business growth.

For more details pls reach out to
ask.opensource@wipro.com

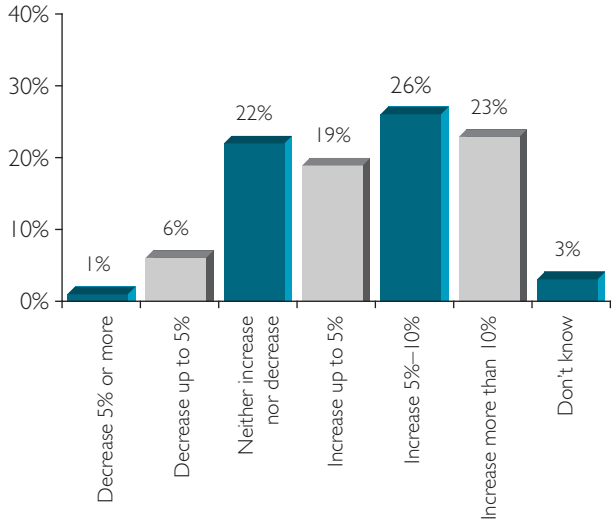
APPENDIX

Q. In which country are you based?

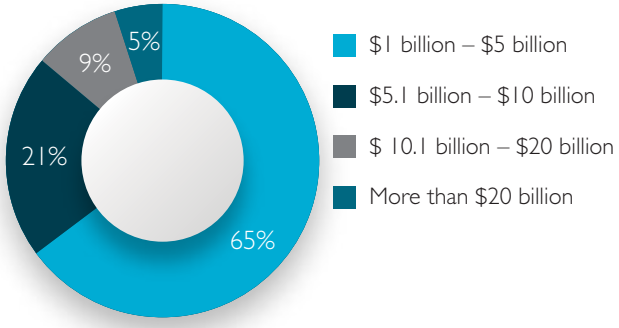
Q. Is your main software development center in a location other than your headquarters country?



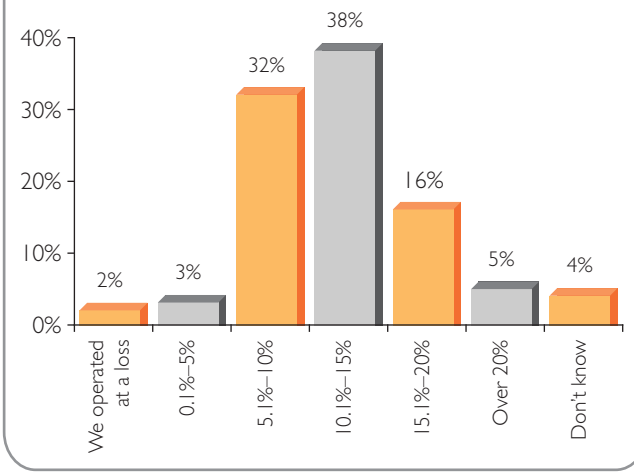
Q. What is your estimated average annual revenue growth for the next 24 months?



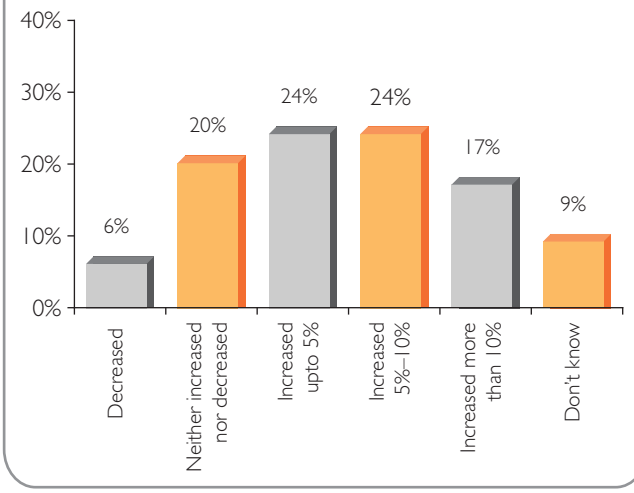
Q. What is your firm's annual revenue in US$ for the most recently completed fiscal year?



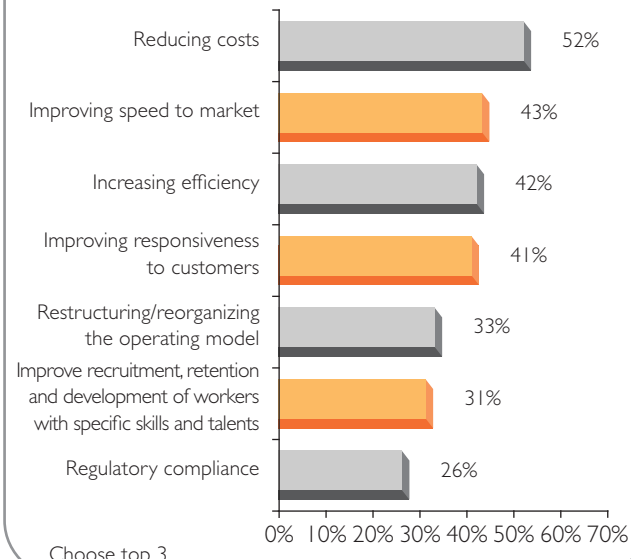
Q. What was your firm's average annual profit margin over the past two years?



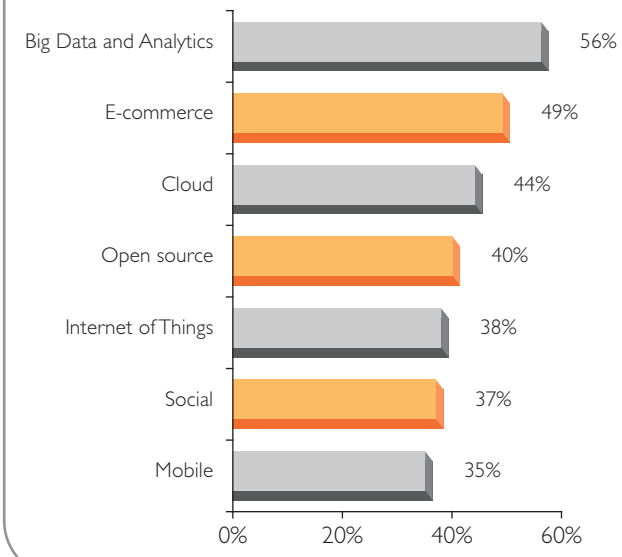
Q. How has your firm's profit margin changed over the past two years?



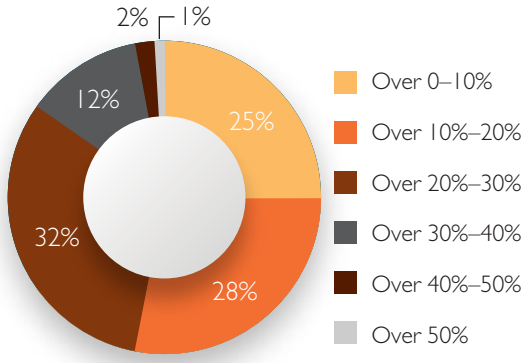
Q. Which business initiatives do you expect to have the greatest impact on your firm over the next three years?



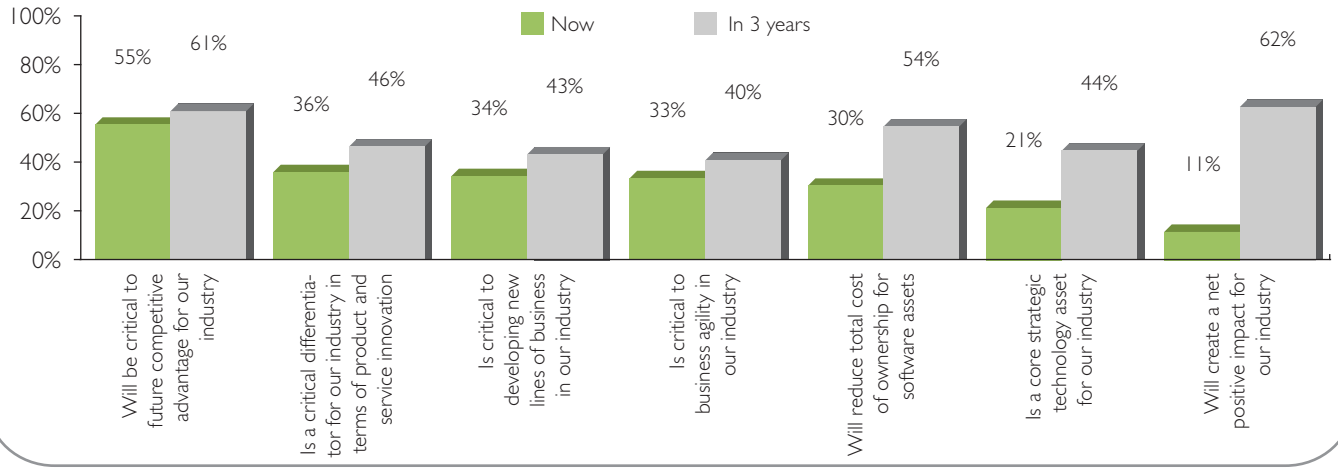
Q. How important are the following trends to your company's strategy?



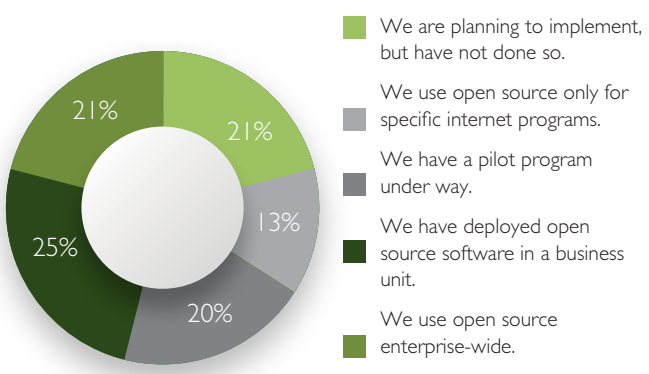
Q. Please estimate the percentage of your user base that is using open source software for strategic-level or enterprise-wide projects.



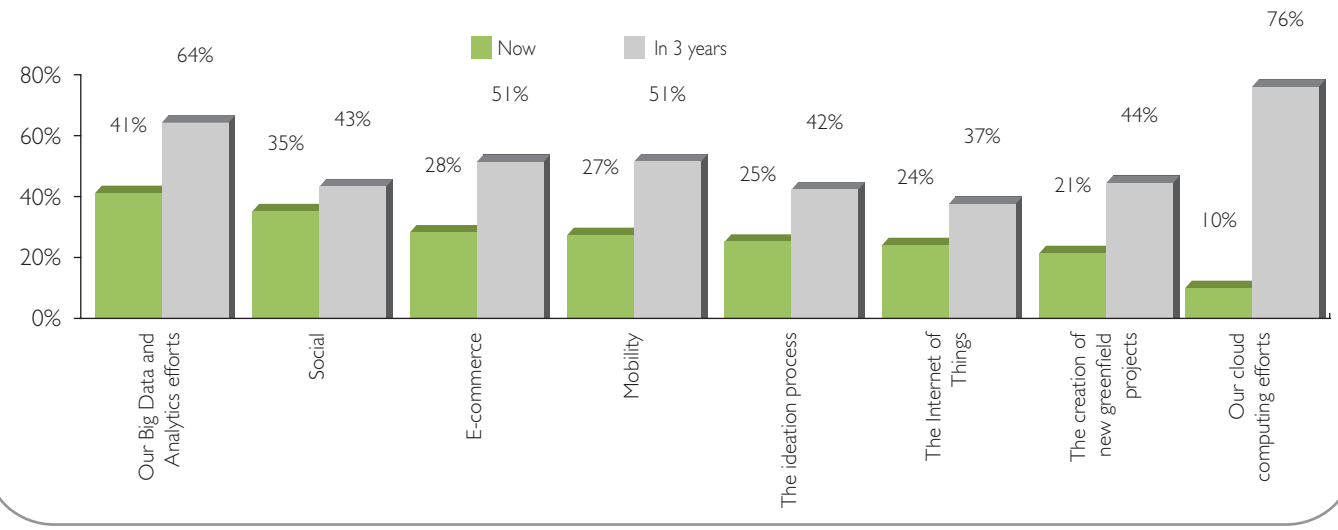
Q. To what extent do you agree with the following statements about the impact of open source software on your industry, now and in three years?
"Open source software"



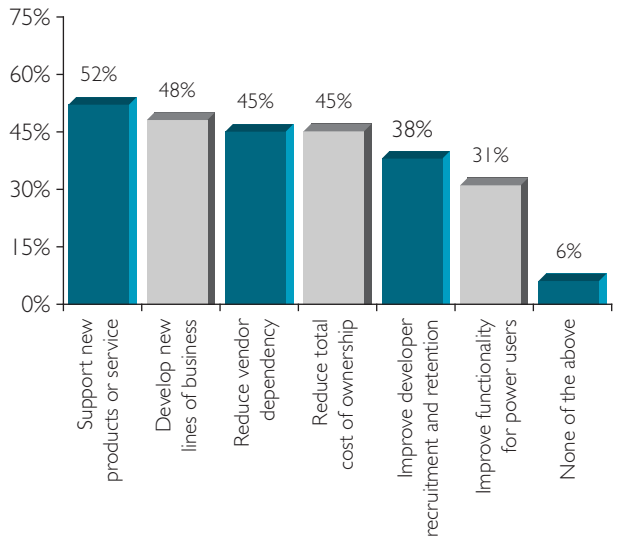
Q. At what stage is your implementation of open source software?



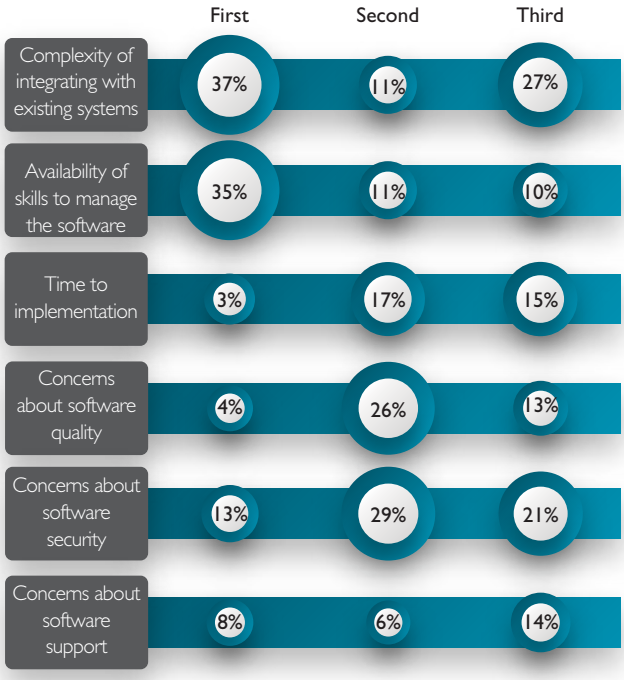
Q. To what extent do you agree with the following statements about your organization today? In 3 years? Open Source software enables...



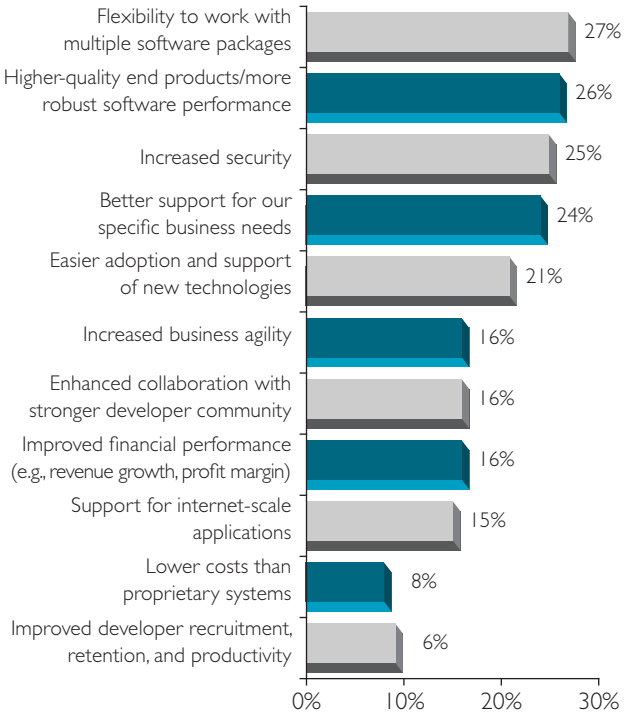
Q. What IT and business goals have you already achieved using open source software?



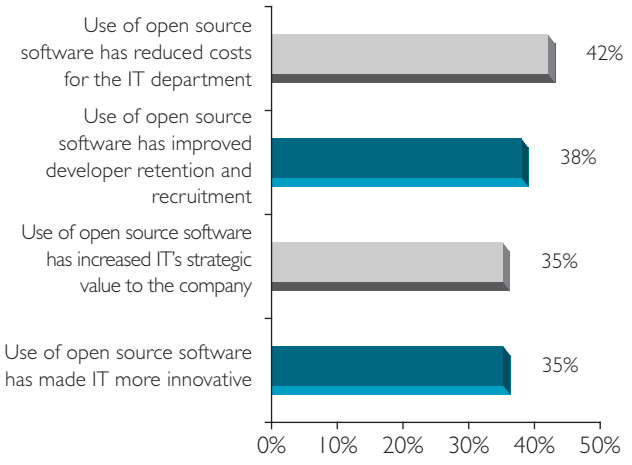
Q. What are the biggest challenges associated with open source software?



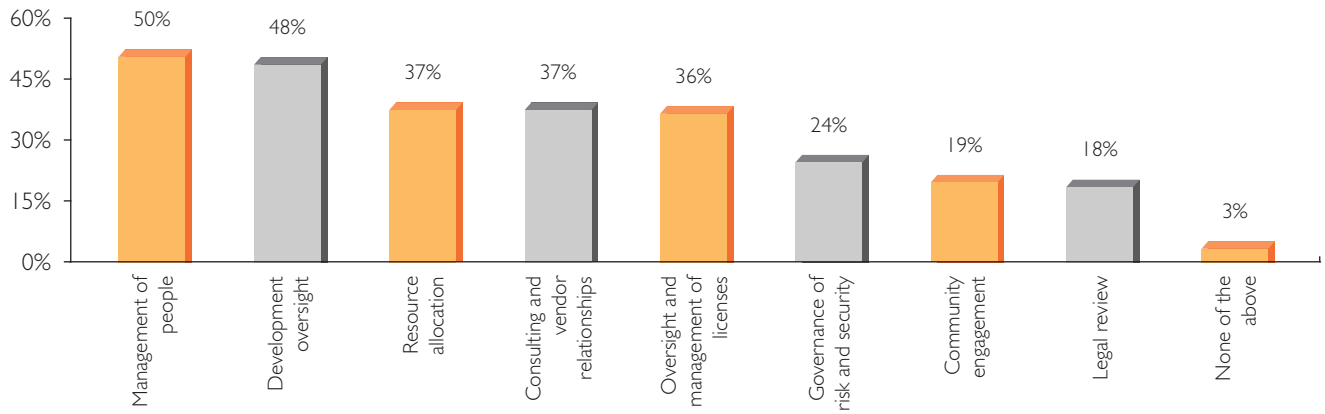
Q. What are the biggest benefits to your business from open source software?



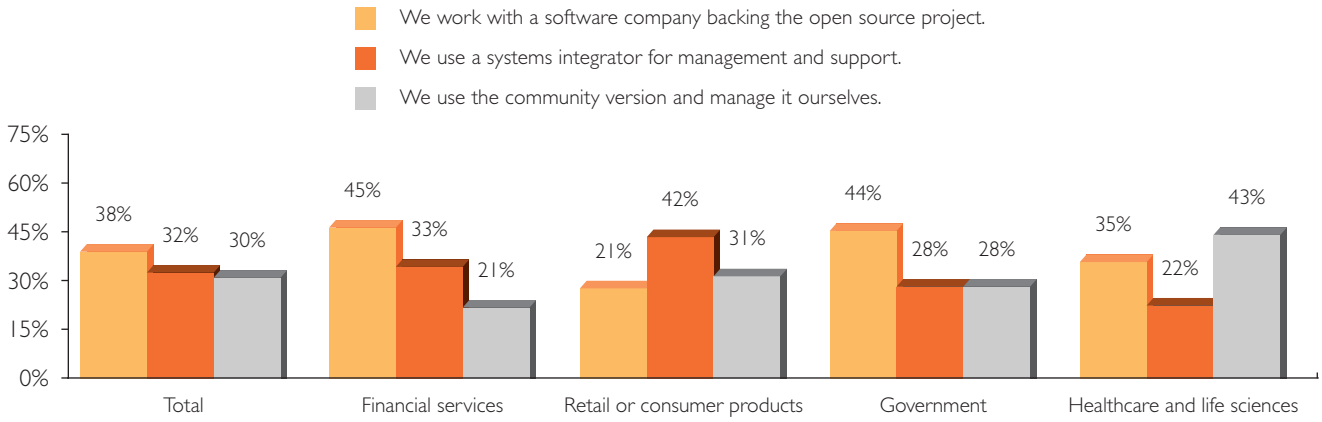
Q. What is the impact on your IT department of increased use of open source software?



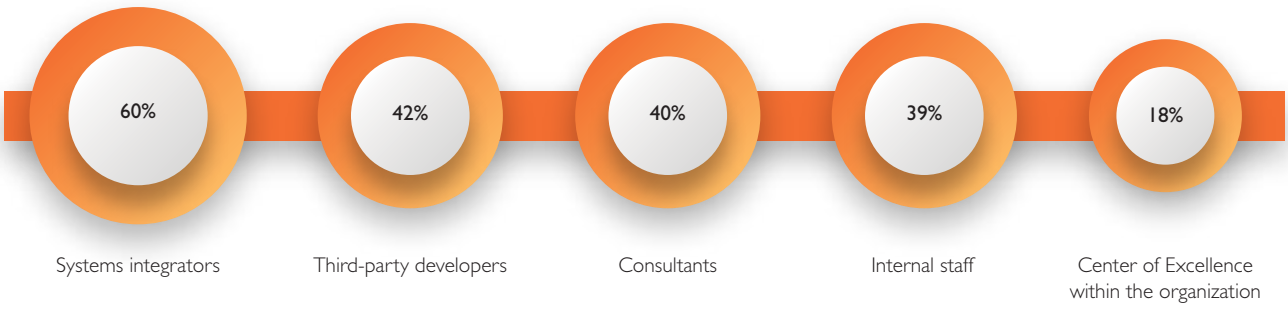
Q. What cultural or process changes have you been required to make in adopting open source software?



Q. How is your company purchasing and implementing open source software?



Q. What resources are you using to drive your conversion to open source software?



Q. How will adoption of the open source methodology across the organization change IT's role?

IT will become more of a strategic advisor to the rest of the company

40%

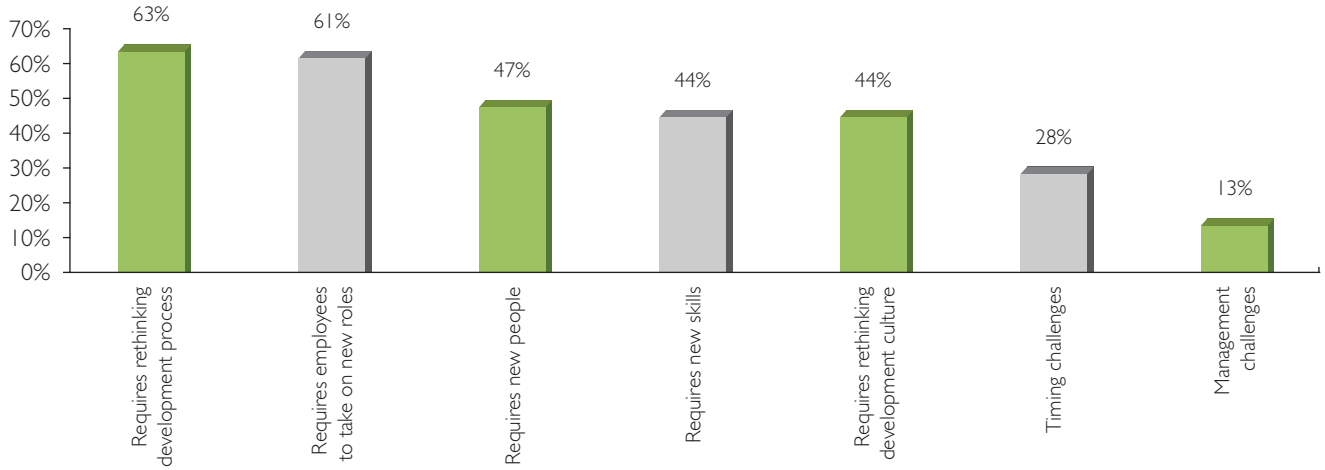
The role of IT will not be changed by the adoption of the open source methodology across the enterprise

38%

IT will become more of a center of innovation

32%

Q. What are the major challenges associated with this type of development framework?



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IND/BRD/JUL 2015-SEP 2016