Columbia Business School
Center on Global Brand Leadership

SAP

Business Models for the Internet of Things: 5 Strategic Questions

Matthew Quint and David Rogers, Columbia Business School
Madhur Aggarwal, SAP

May 2016

Research sponsors

Columbia Business School
Center on Global Brand Leadership

Columbia Business School's Center on Global Brand Leadership creates, gathers, and shares insights on how to build and manage strong brands.

Research designed, conducted, analyzed, and reported by the CGBL

www.gsb.columbia.edu/globalbrands

As the market leader in enterprise software, SAP turns businesses into intelligent enterprises. Our applications and services enable customers to operate profitably and adapt continuously. With a global network of customers, partners, and employees, SAP helps the world run better and improve people's lives.

Research was sponsored and made possible through the support of SAP

www.sap.com

Table of Contents

Who and What We Studied

How Will the Internet of Things Take Off?

Just around the time that the Internet was forming in the early 1980s, the first non-computer device was connected to it – a Coca-Cola machine in the computer science department at Carnegie Mellon University.

The students who hacked the machine did it for many of the same reasons that will eventually drive 50 billion devices [Source: CISCO] or more to be connected to the Internet – they wanted to gather data remotely and use it for better functionality and service.

There are estimates that the Internet of Things (IoT), and the various subdivisions of it like smart homes and smart cities, will generate trillions of dollars of added value to the global economy [Source: BI, McKinsey, IDC, Accenture, etc.].

In the press, much of the hype has surrounded the consumer implications of IoT. Wearable devices, smart appliances, and smart cars, dominate much of ink in the general media environment. But equally, if not more, influential to IoT's growth will be its applications in the industrial and infrastructure sectors of the economy.

This report is developed from an online survey fielded to international executives as well as qualitative interviews with executives helping lead IoT initiatives from a wide range of companies.

Our aim in conducting this research was to uncover how companies are investing in IoT initiatives, what strategies they employ to manage the IoT technology stack, what opportunities they hope to achieve with such efforts, and what barriers and challenges worry them as they moved forward with their IoT planning.

We found that for most companies, their top financial goal was to drive cost savings. So the sellers of IoT solutions will gain revenue, but the deeper value to the global economy is likely to come from how companies buying IoT products and services can gain greater efficiencies in operations, personnel, and spending.

Critical questions we set out to explore

What is the financial case for developing IoT?

What amount of spending are they projecting? Are they looking for cost savings and efficiencies or revenue?

What will the future of IoT look like?

Do firms even know yet the offerings they will bring to market? Will it be mostly solutions built for consumers in their homes? Businesses in their operations? Or something else?

What are the biggest opportunities driving IoT investment?

What are the biggest risks and barriers hindering it?

Critical questions we set out to explore

Who is leading IoT initiatives inside firms?

Who are they partnering with outside?

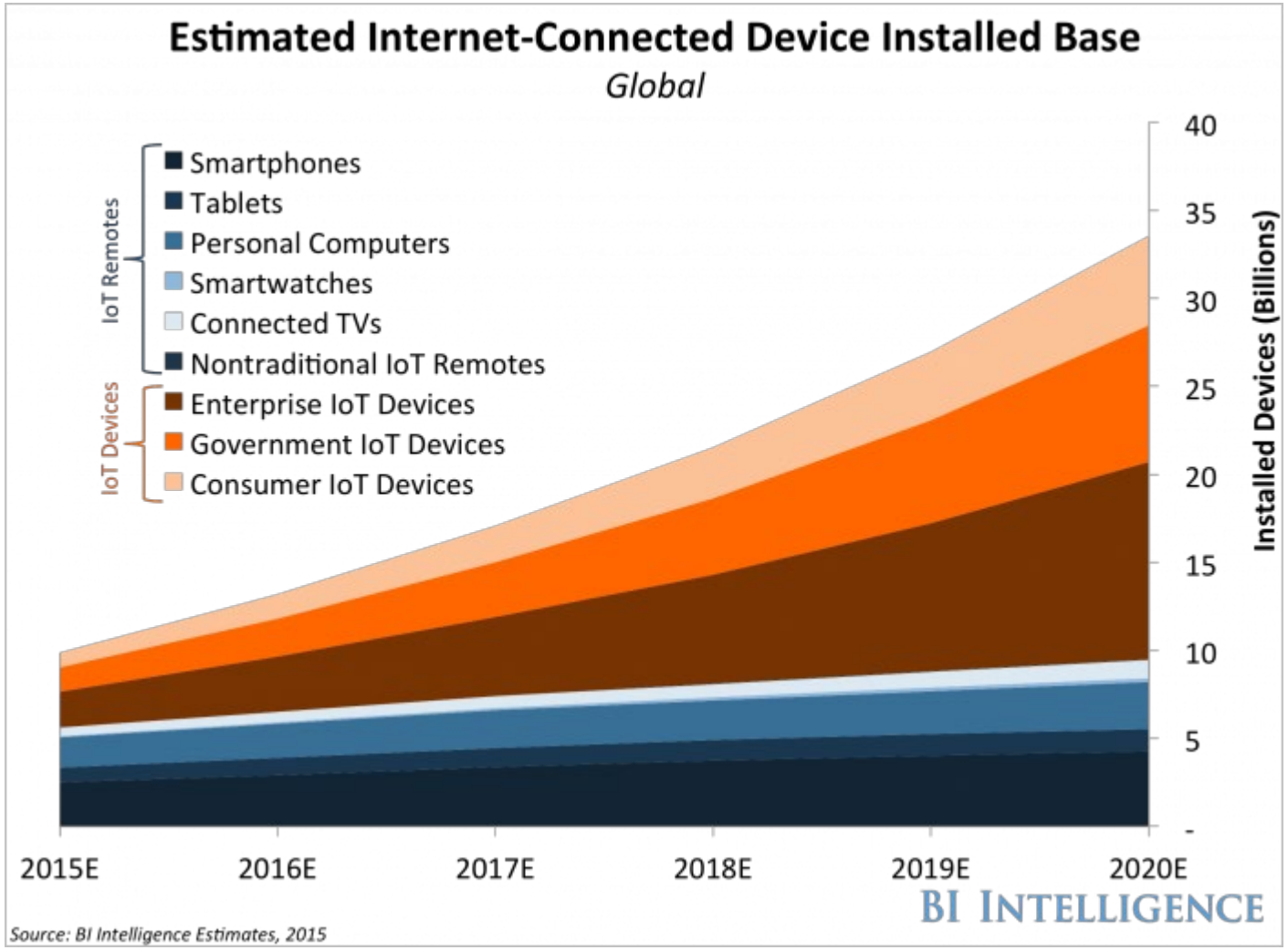
What role do public vs. private networks play in IoT?

What drives firms to decide on connecting their IoT effort in a fully public networks vs. a private network or a hybrid of these choices?

What is the business case for IoT investments?

What form of financial return do firms expect? Are they looking for cost savings and efficiencies or revenue? Do firms even know yet the offerings they will bring to market?

The Internet of Things is on the cusp of exploding



http://www.businessinsider.com/bi-intelligence-34-billion-connected-devices-2020-2015-11

Input came from diverse executives working directly on Internet of Things ("IoT") initiatives

All survey respondents were part of the decision-making team for an IoT initiative at their firm, buying products or services to support that initiative

345

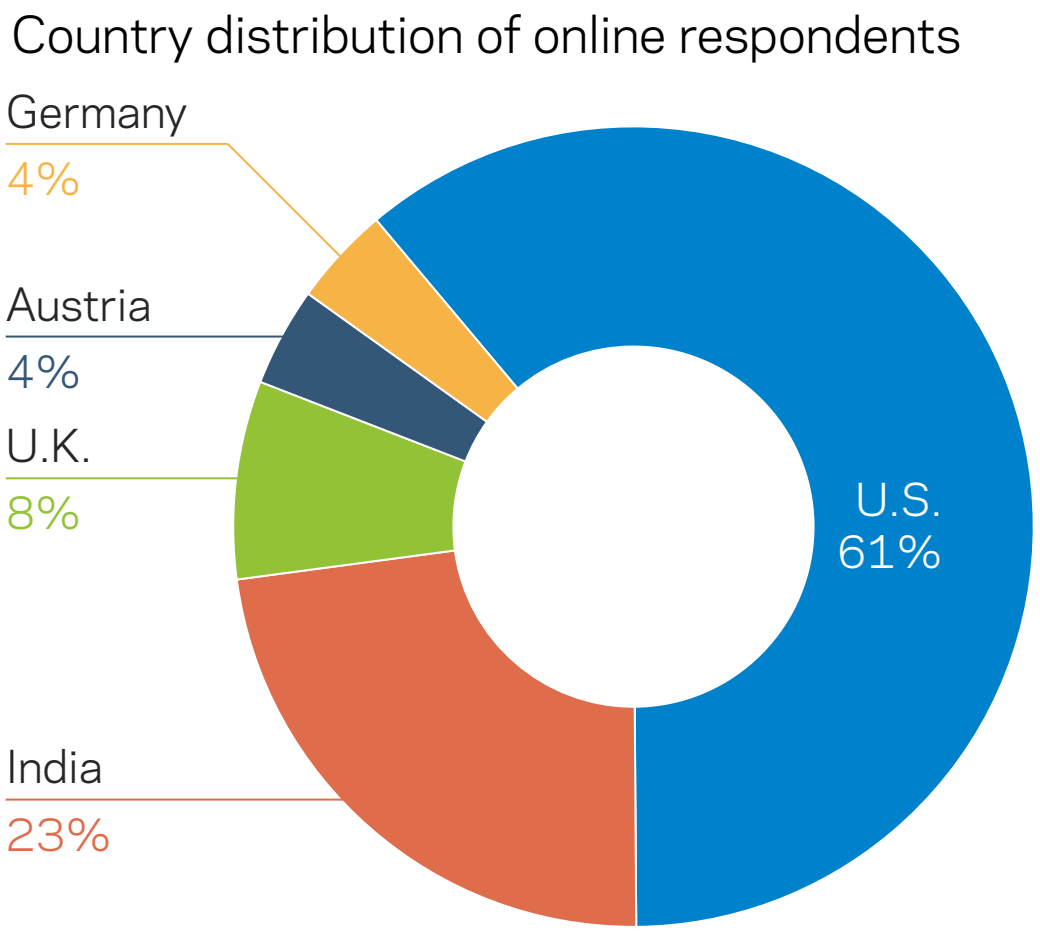
online survey respondents

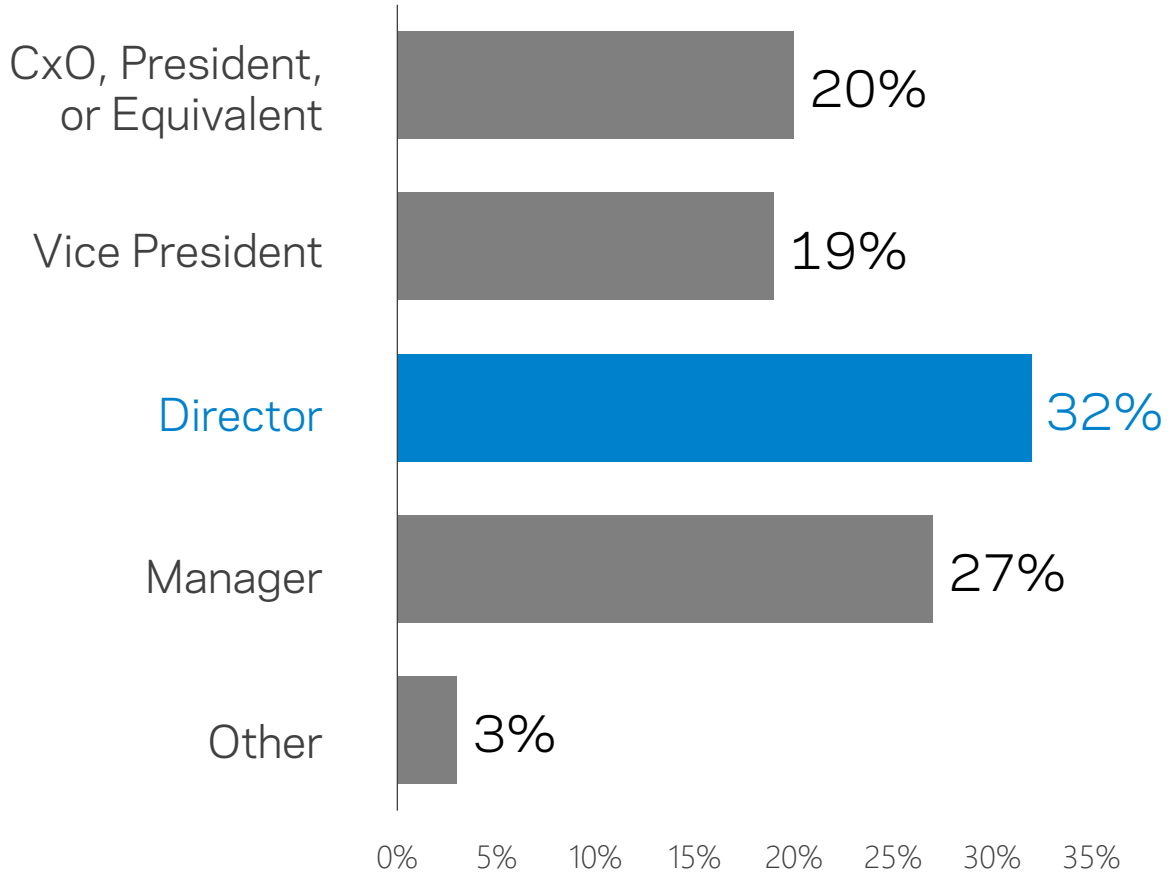
20

in-depth interviews with selected industry experts

All were developing IoT initiatives for revenue generation

Respondents came from five countries and had a diverse array of roles

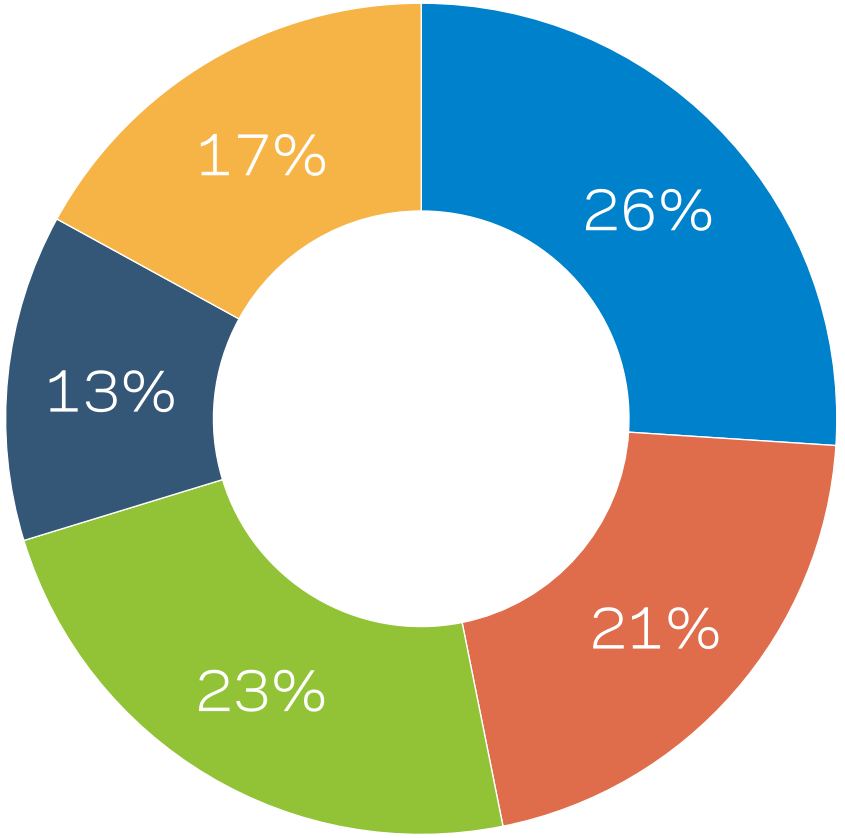




There was a balanced mix of small and large firms

53%

of firms have annual revenues over $1 billion



Columbia Business School
Center on Global Brand Leadership

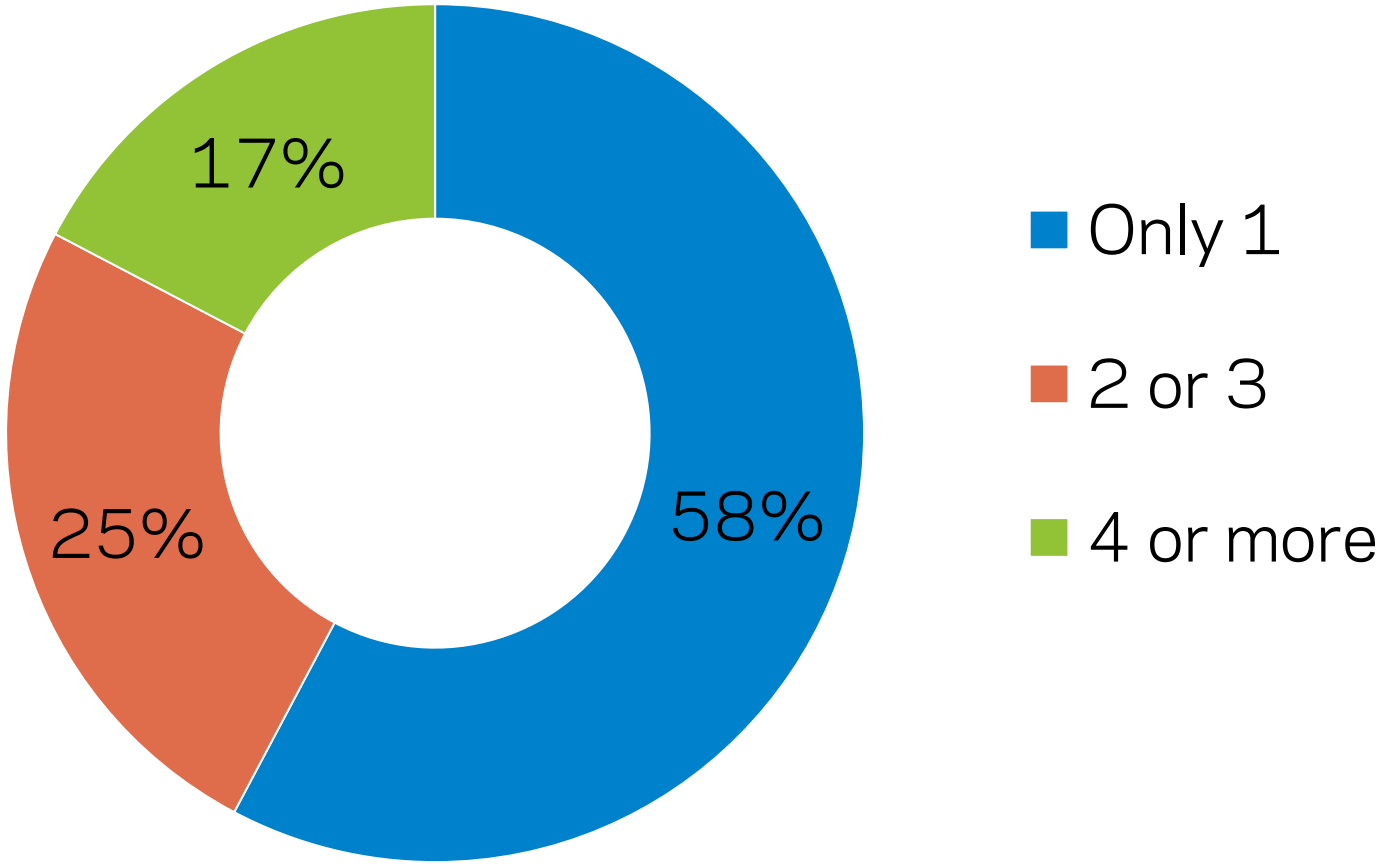
IoT initiatives were reported from a wide range of industries

NOTE: Software/IT responses not included due to the prevalence of its involvement in most IoT efforts

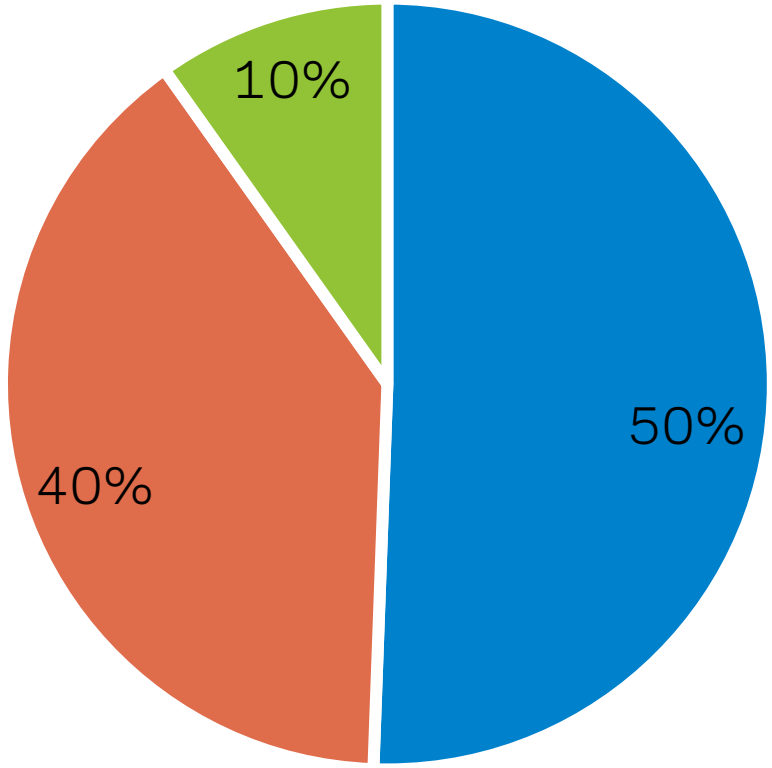
Columbia Business School
Center on Global Brand Leadership

SAP

Some firms also plan to apply their IoT initiative to more than one industry



There were a variety of planning stages for respondents IoT initiatives

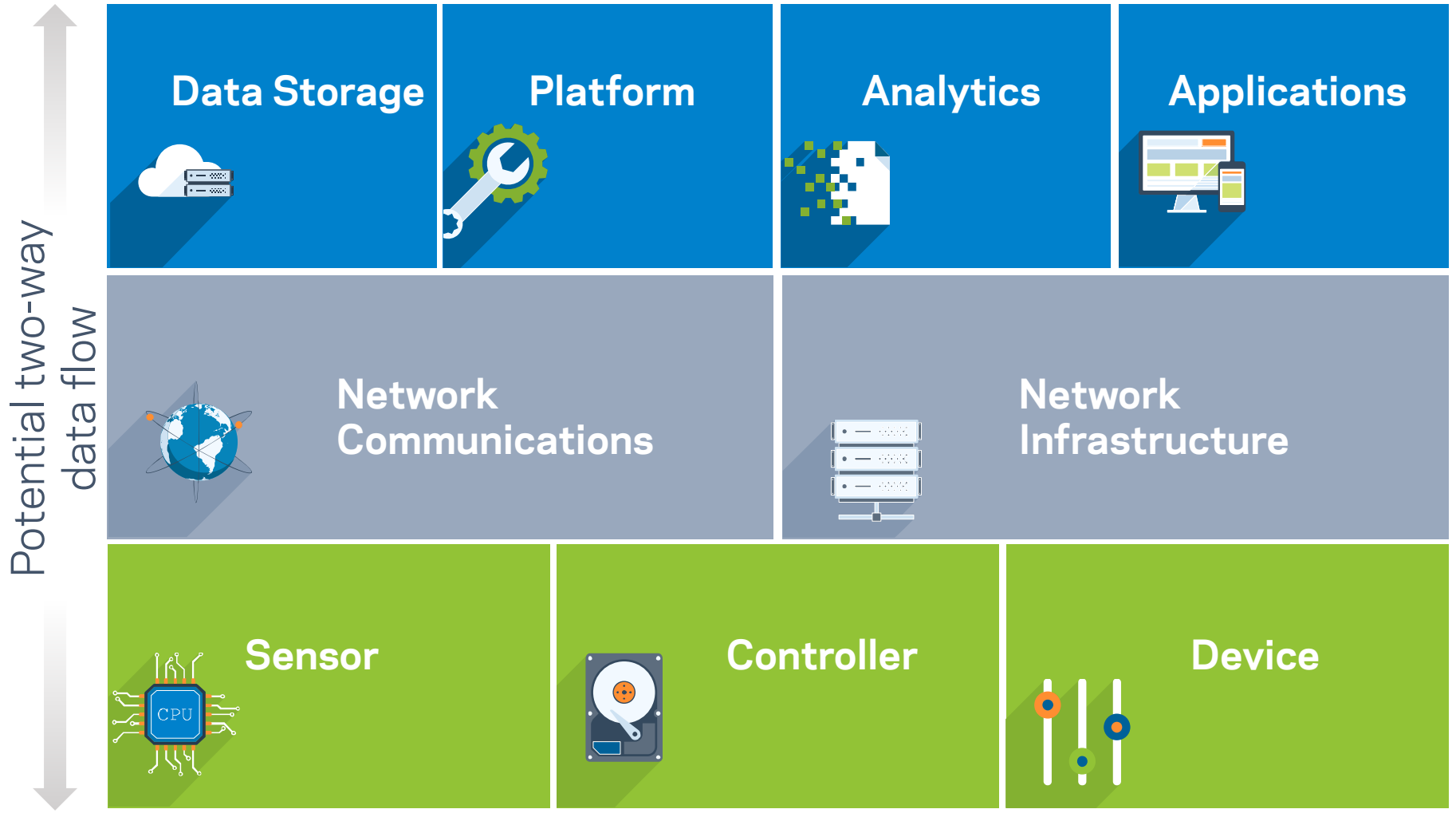


- Currently working on an IoT initiative
- Will develop one in the next 12 months
- Planning to develop one in the next 1-2 years

S1. Is your firm considering or already working on an initiative within the Internet of Things?

All these IoT initiatives build and integrate some or all of these components (aka "The Stack")

- Sensors
  (e.g. GPS chip, RFID chip, heat sensor)
- Controllers
  (e.g. chips that can control elements of a device)
- Devices
  (integrated hardware, e.g. Fitbit, Nest thermostat)
- Network carrier
  (e.g. 4G network, broadband, Wifi)
- Network infrastructure
  (Routers, switches, network software)
- Data storage
  (e.g. on-site servers, cloud storage)
- Analytics
  (e.g. database structure and processing software)
- Platform
  (e.g. middleware, development tools, open source components)
- Applications
  (e.g. mobile app, dashboard, alert notification system)



IoT initiatives are part of a large vendor and partner ecosystem

"The Stack"	Build	Partner and Buy
Applications	38%	60%
Platform	28%	69%
Analytics	35%	62%
Data storage	25%	73%
Network infrastructure	20%	77%
Network carrier	15%	83%
Devices	16%	80%
Controllers	18%	79%
Sensors	22%	75%

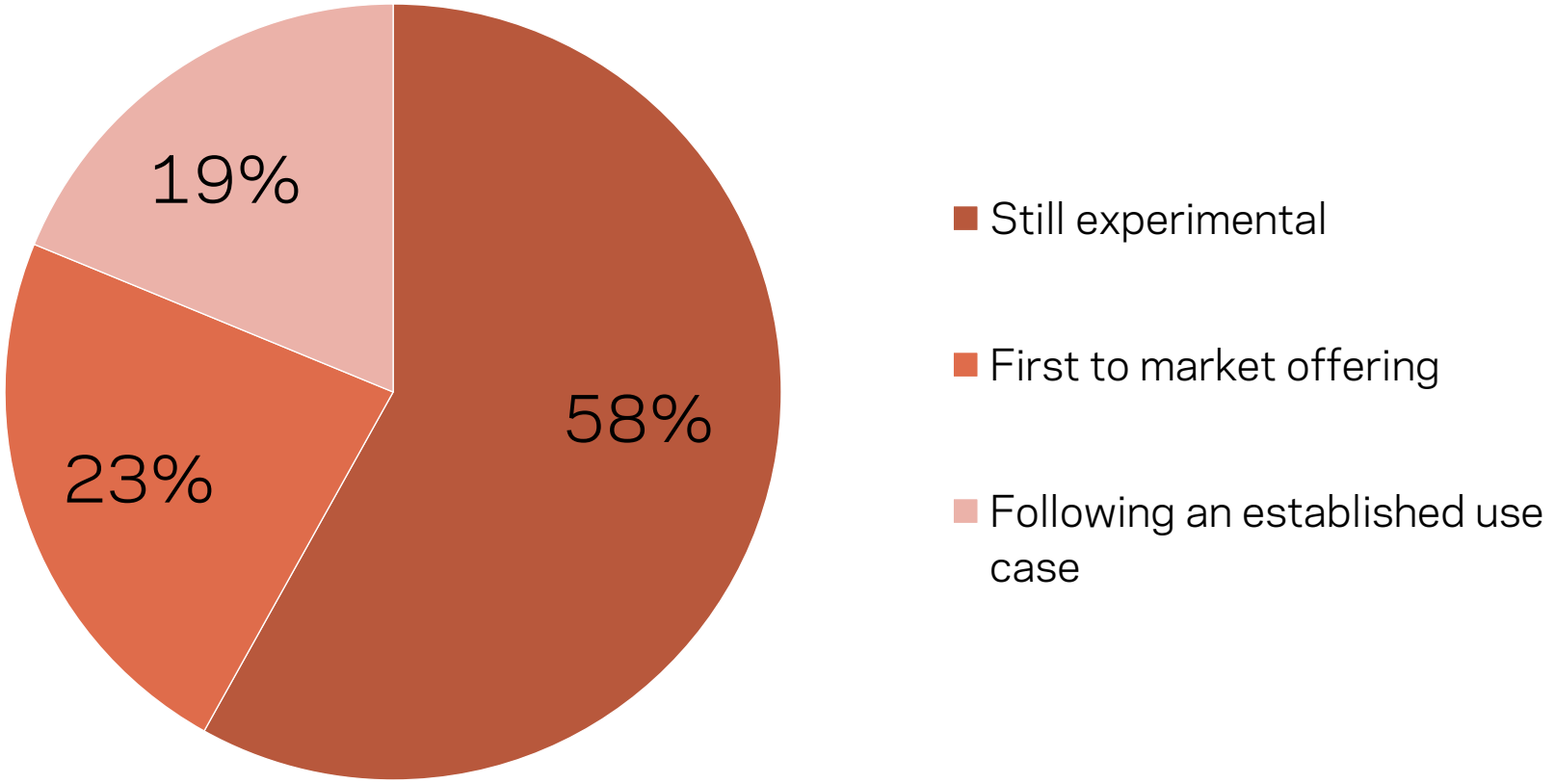
Please indicate the primary way in which your organization is implementing each of the elements shown below in regard to your Internet of Things initiative: 1) "Build" (manufacture, design, or deploy on your own), 2) "Partner" (do so jointly with others), 3) "Buy" (from a vendor), or 4) Don't know

The financial case

An array of financial and market considerations are made by a firm when committing to an IoT initiative:

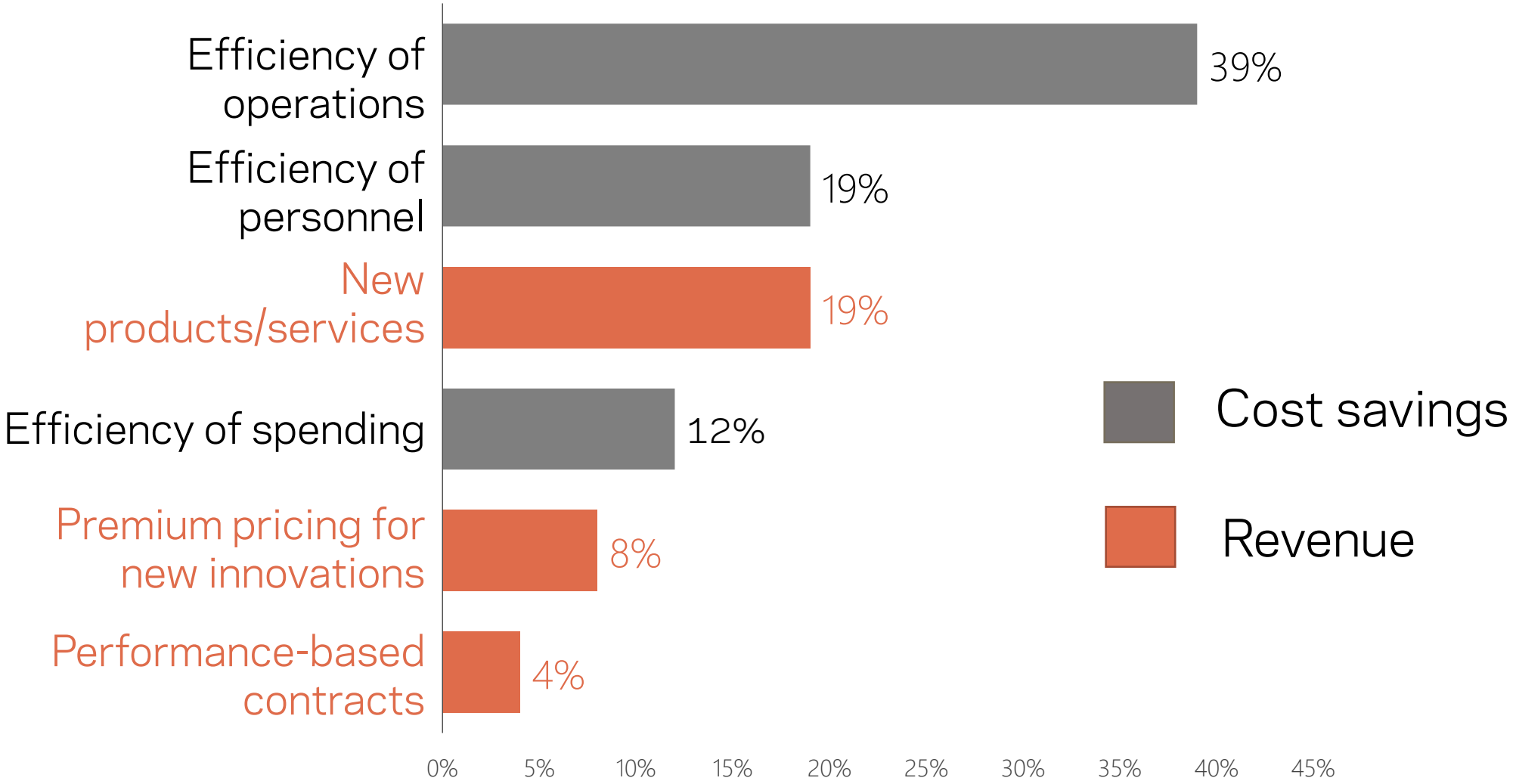
- Is the effort **experimental** or market-ready?
- Is the financial goal one of **cost savings** or **revenue**?
- What **spending** is committed now and for the future?
- When does the firm expect to get a **return on investment** from the initiative?

Firms are mixed in their developmental plans for IoT initiatives

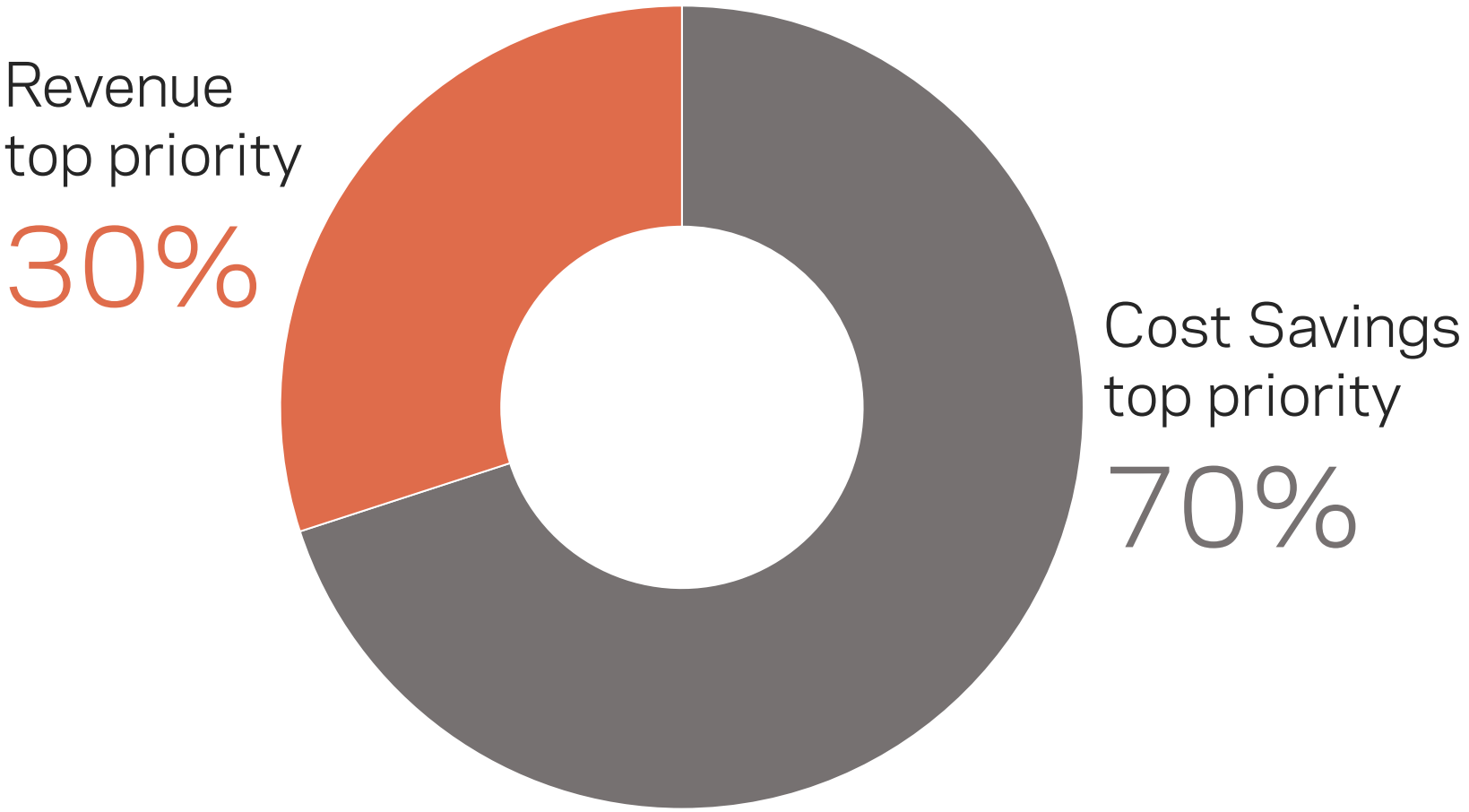


How would you describe your Internet of Things initiative relative to other efforts being developed in your industry?

Firms prioritize a range of financial goals…



…but most are focused on cost savings



Split of top financial priority among three cost savings options (241 respondents) and top financial priority among three revenue options (103 respondents)

But firms are looking at both cost savings and revenue goals to make a financial case

Respondents were asked to check all that applied among the six financial goals, and then to note their top financial priority

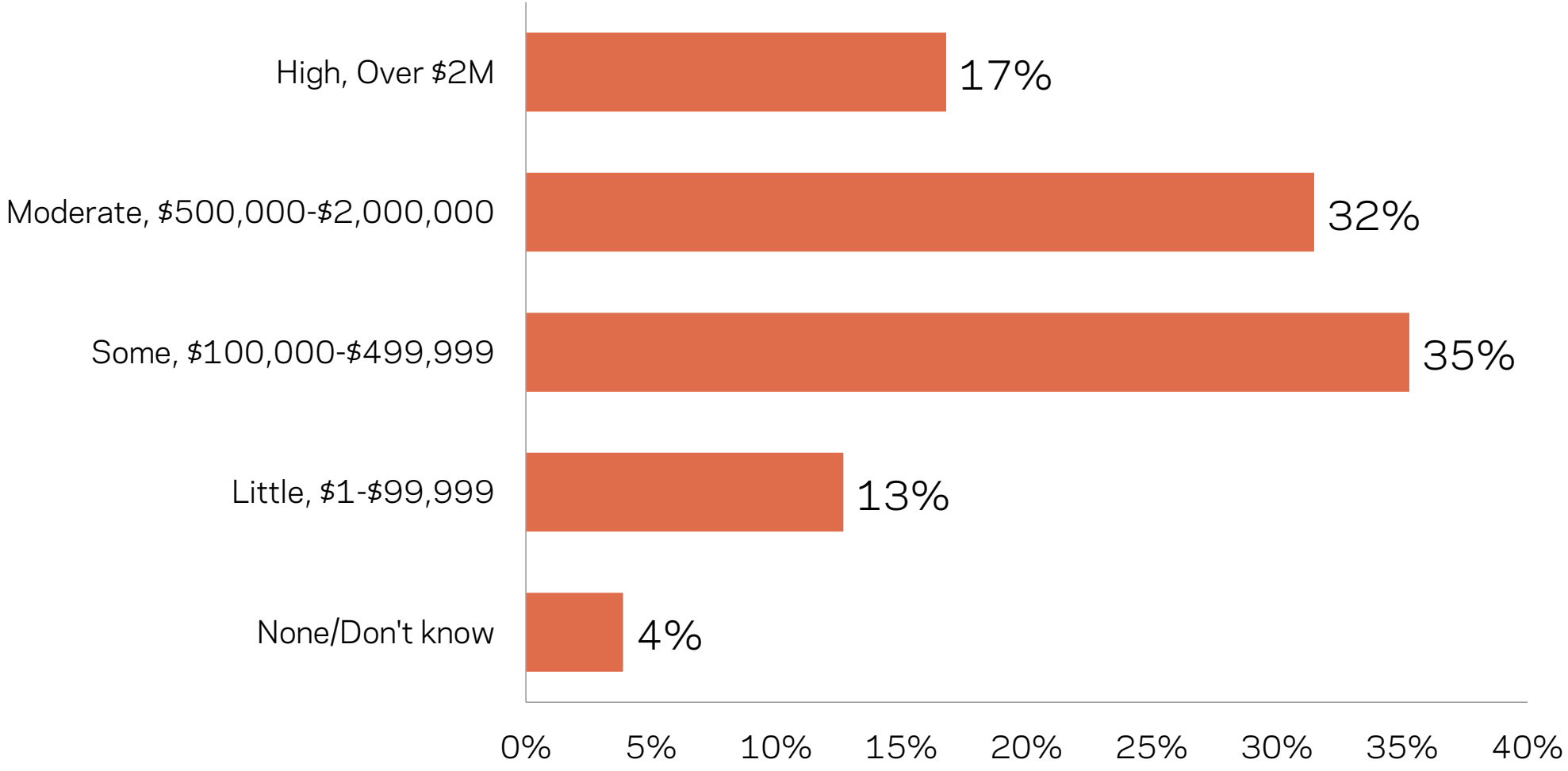
59%

of respondents with cost savings as a top priority also checked at least one revenue goal

70%

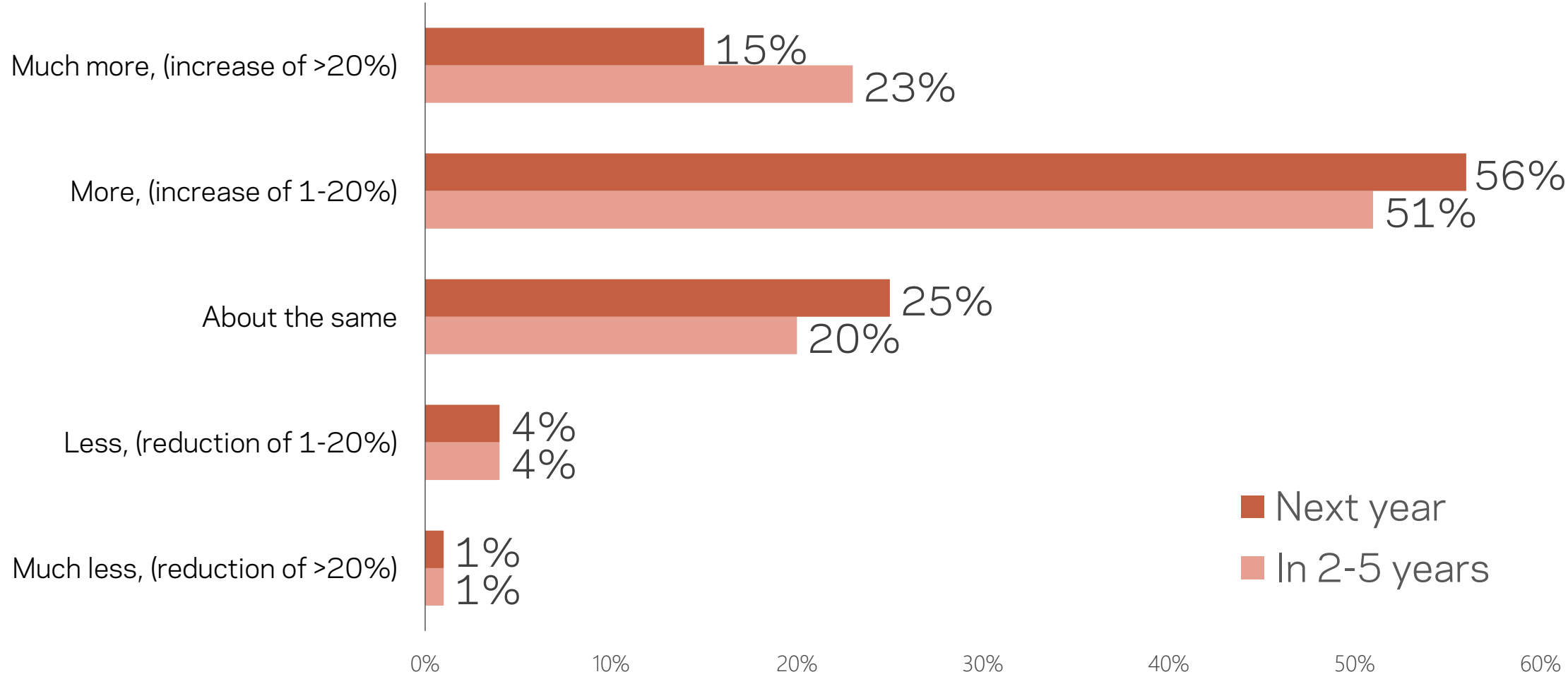
of respondents with revenue as a top priority also checked at least one cost savings goal

Firms had not yet committed vast amounts of spending on IoT initiatives…



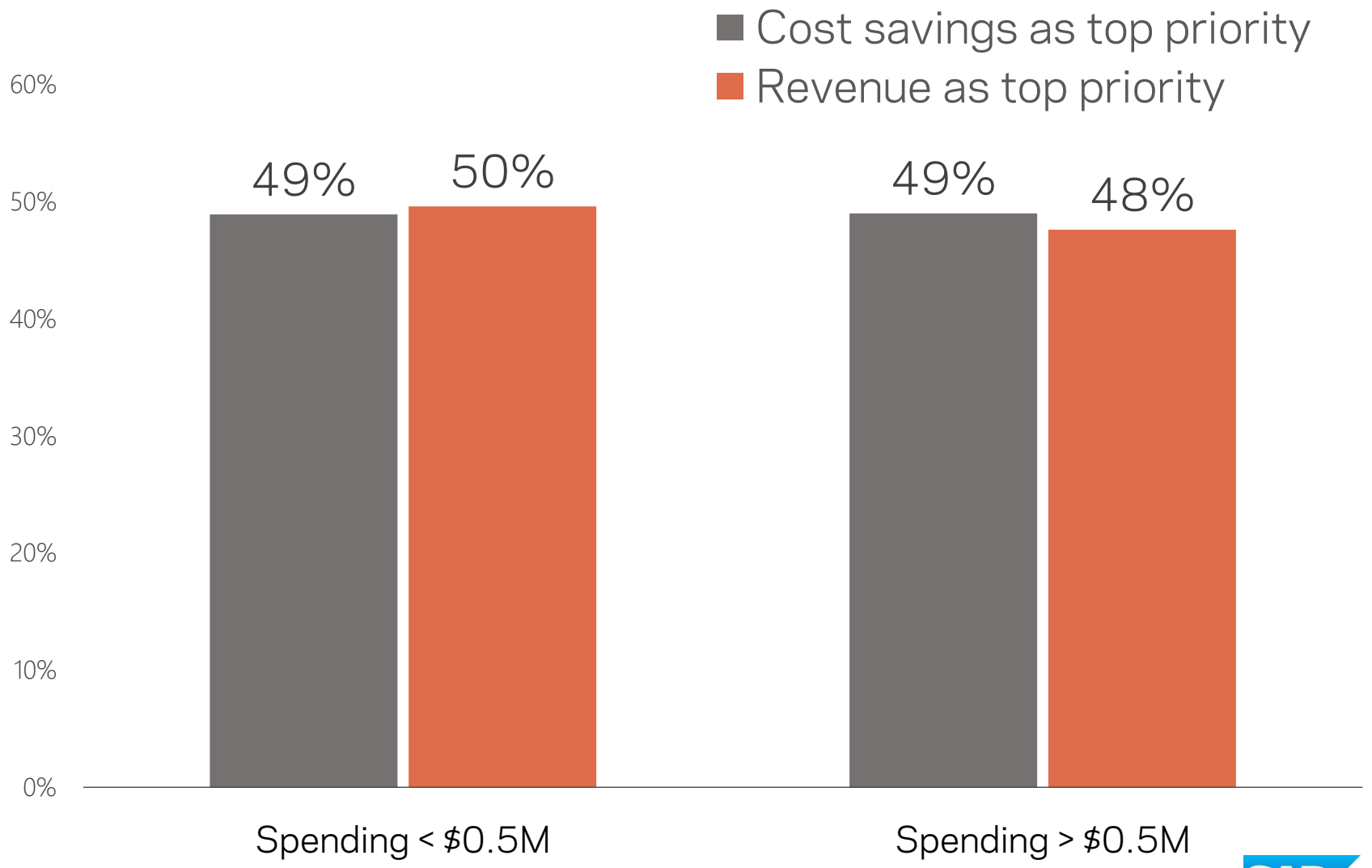
Q6. How much has your firm committed to spend this year to buy products/services to implement an Internet of Things initiative?

…but most firms expect spending growth

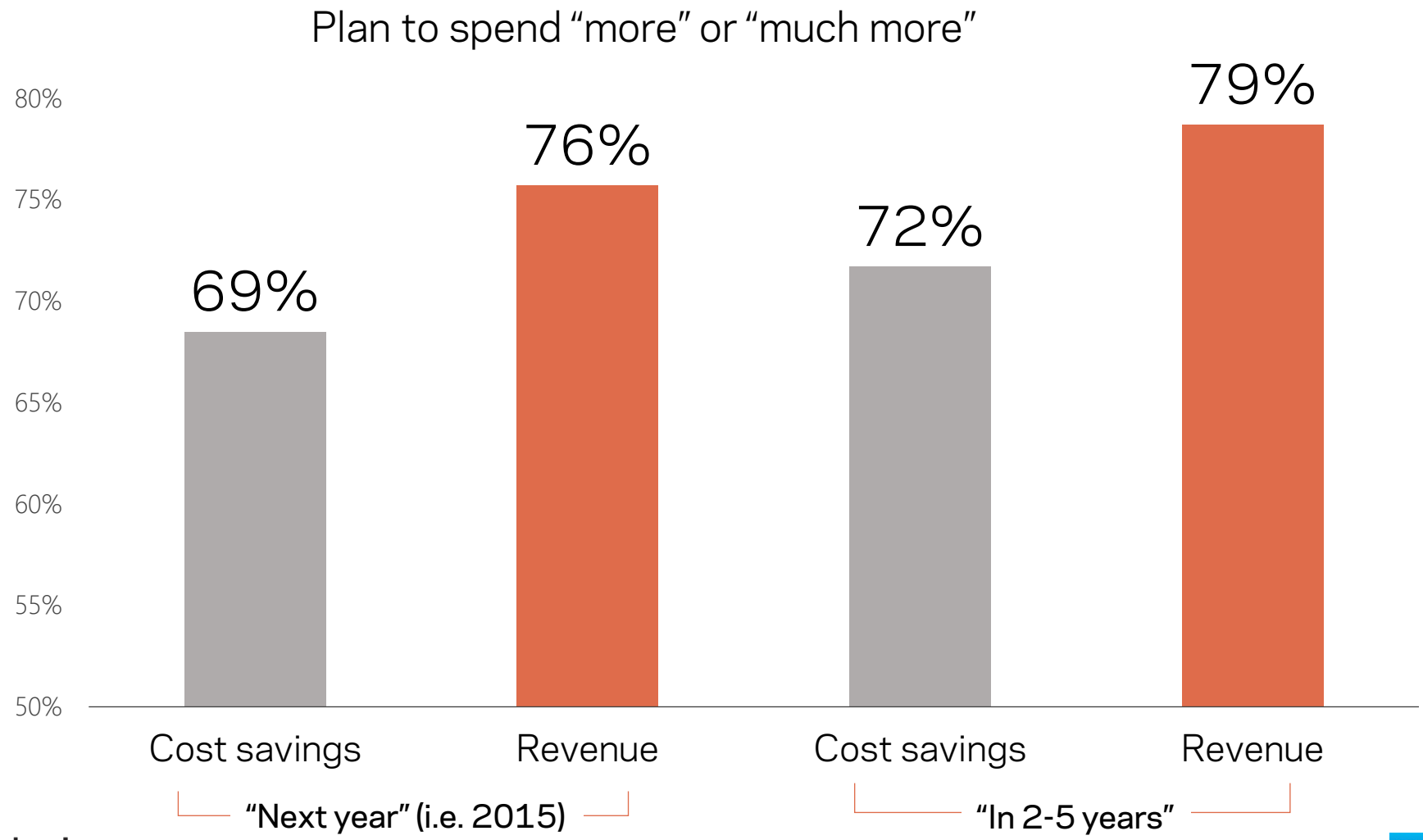


Q7. What is your firm's planned spending next year on products/services to implement Internet of Things Initiatives, as compared to this year?

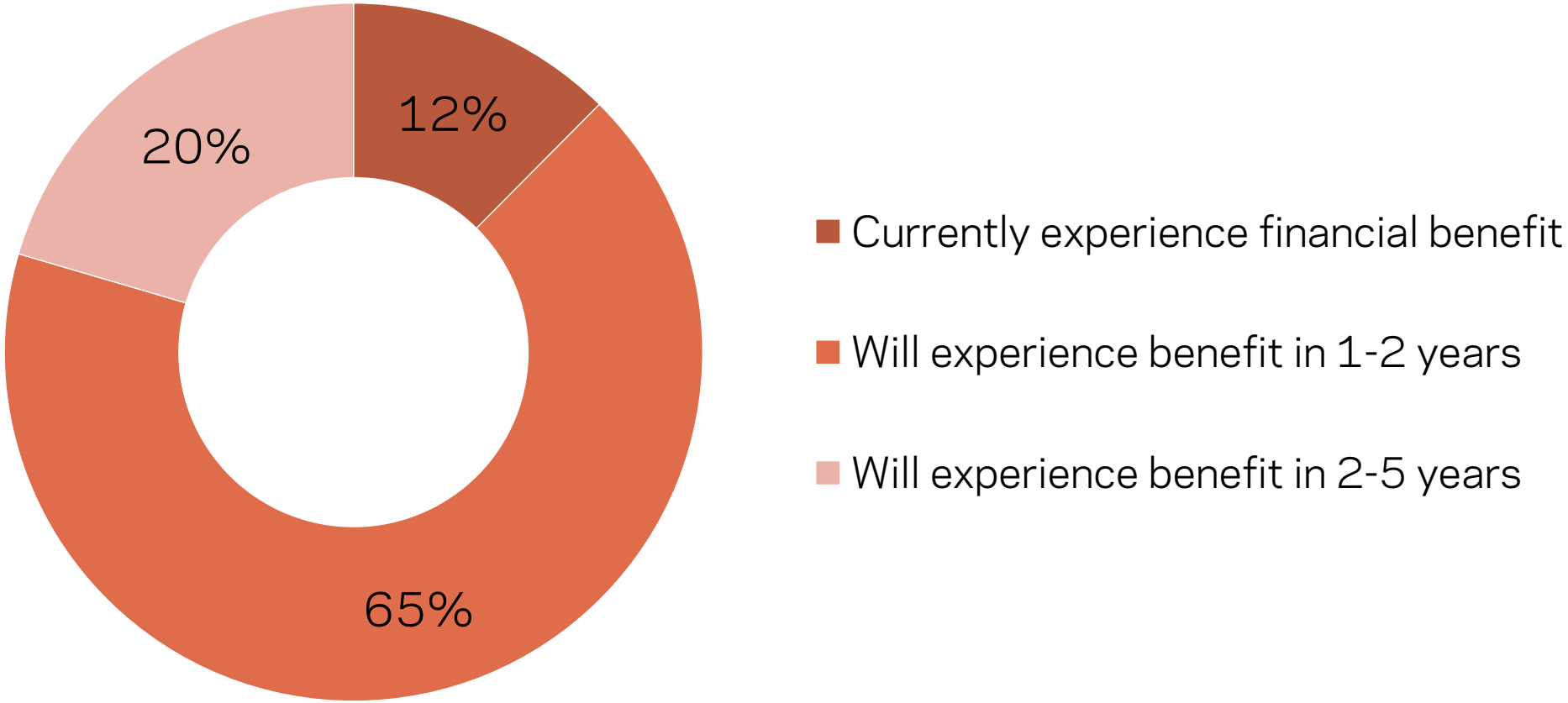
Current budgets are not yet influenced by the two core financial cases…



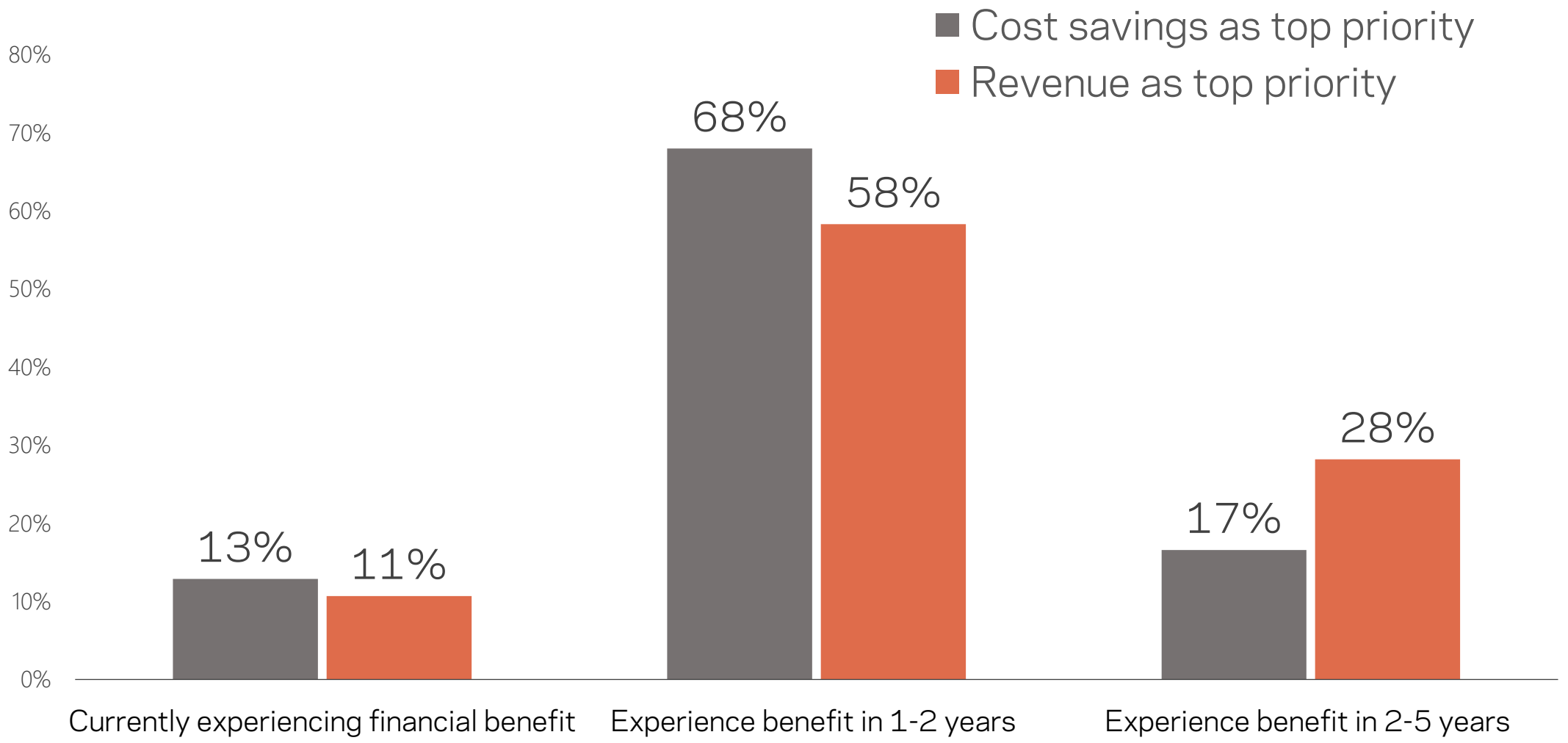
… but revenue-focused firms are more optimistic about spending growth



Firms expect to see financial returns in the near-term…

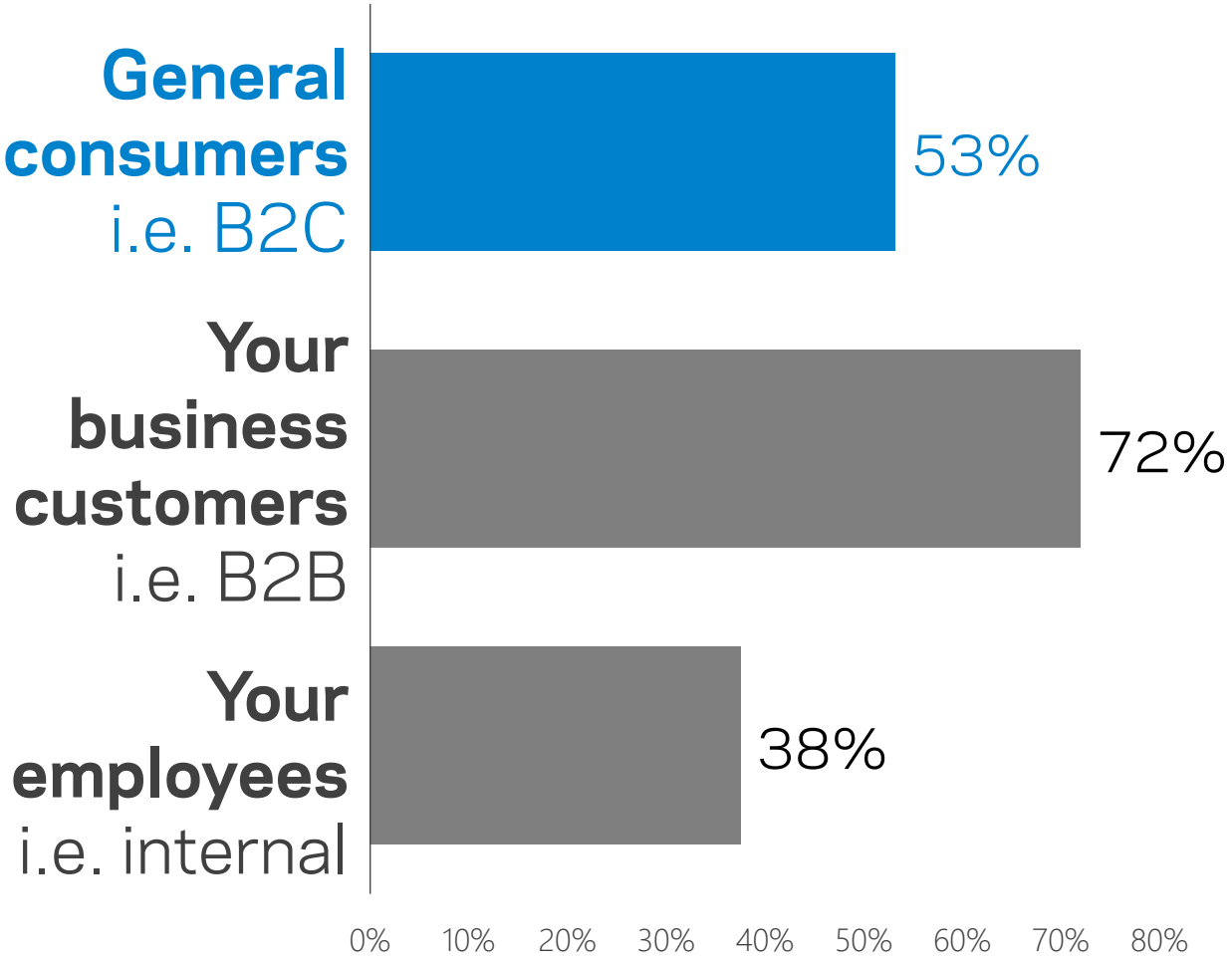


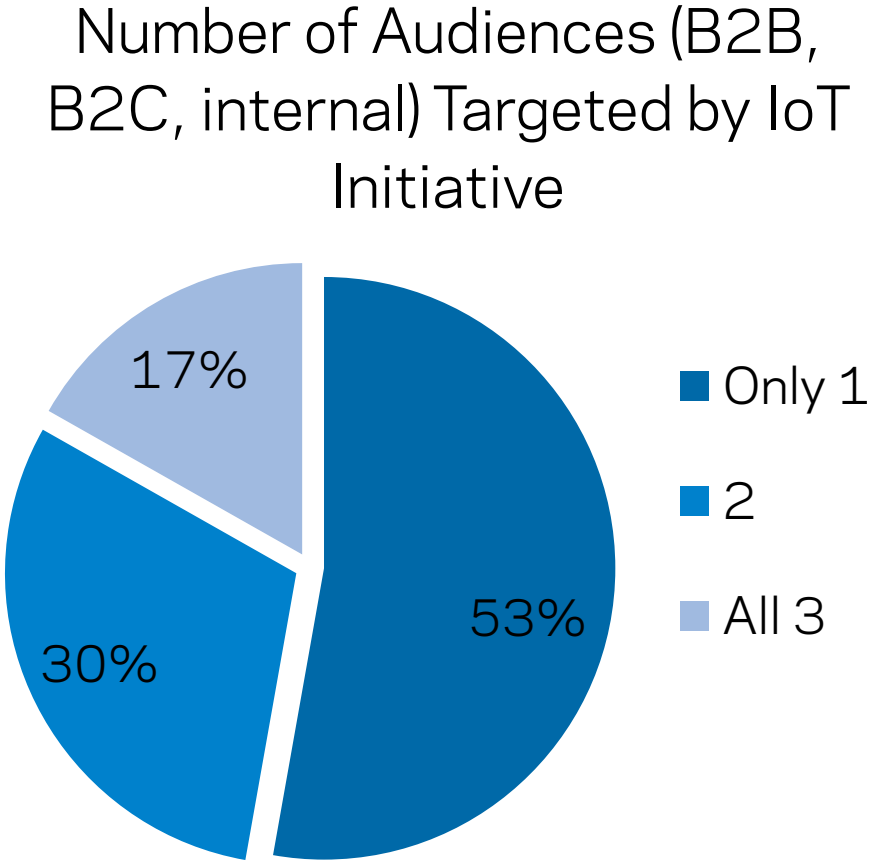
…and cost-savings-based IoT initiatives expect financial returns sooner revenue-based ones



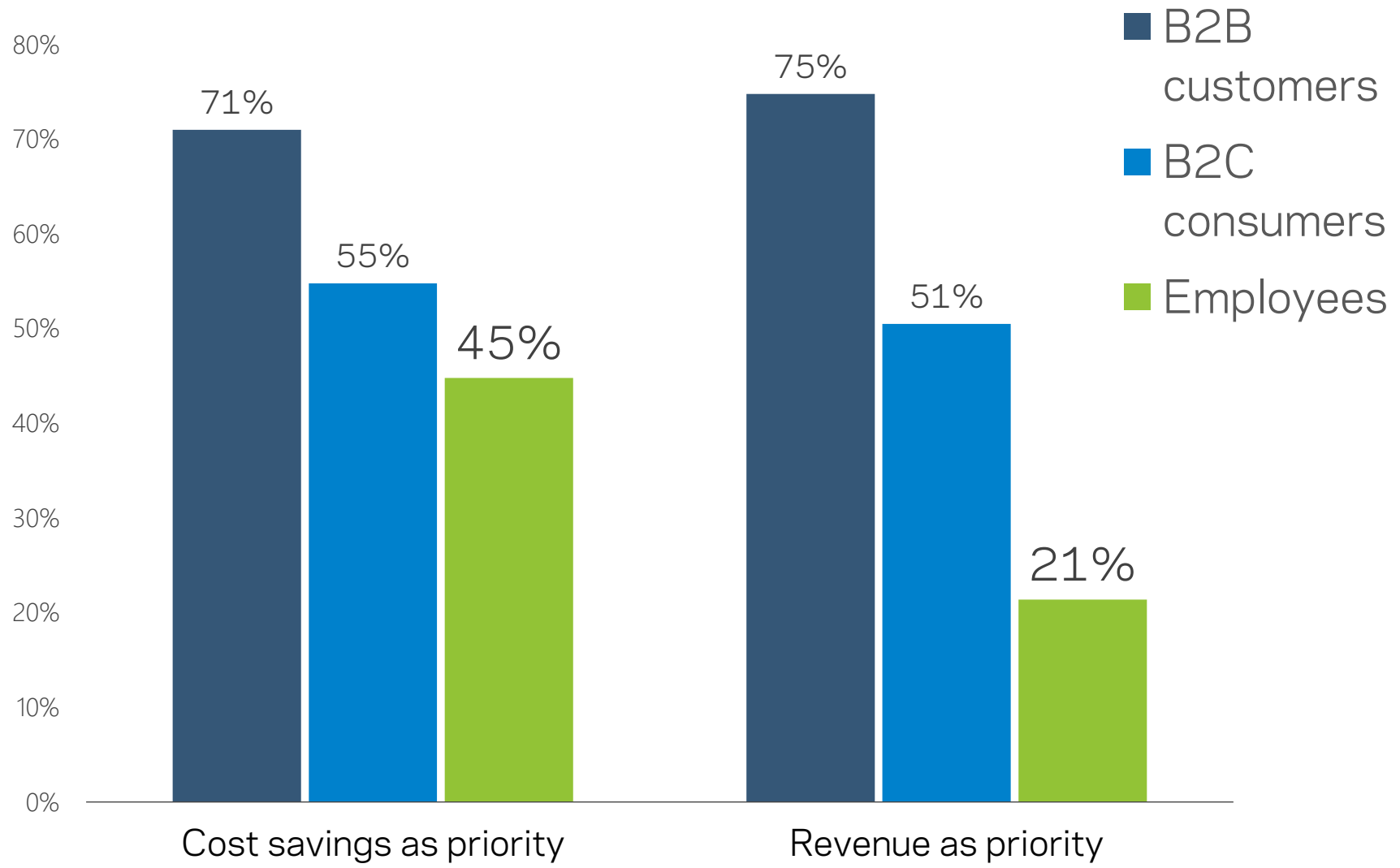
Target audiences

IoT initiatives target a range audiences





Cost-savings-based initiatives are much more likely to target their own employees



Benefits and barriers

When considering all possible benefits firms focus on actionable data and customer/user experiences…

What benefits does your firm hope to get from implementing an Internet of Things initiative?

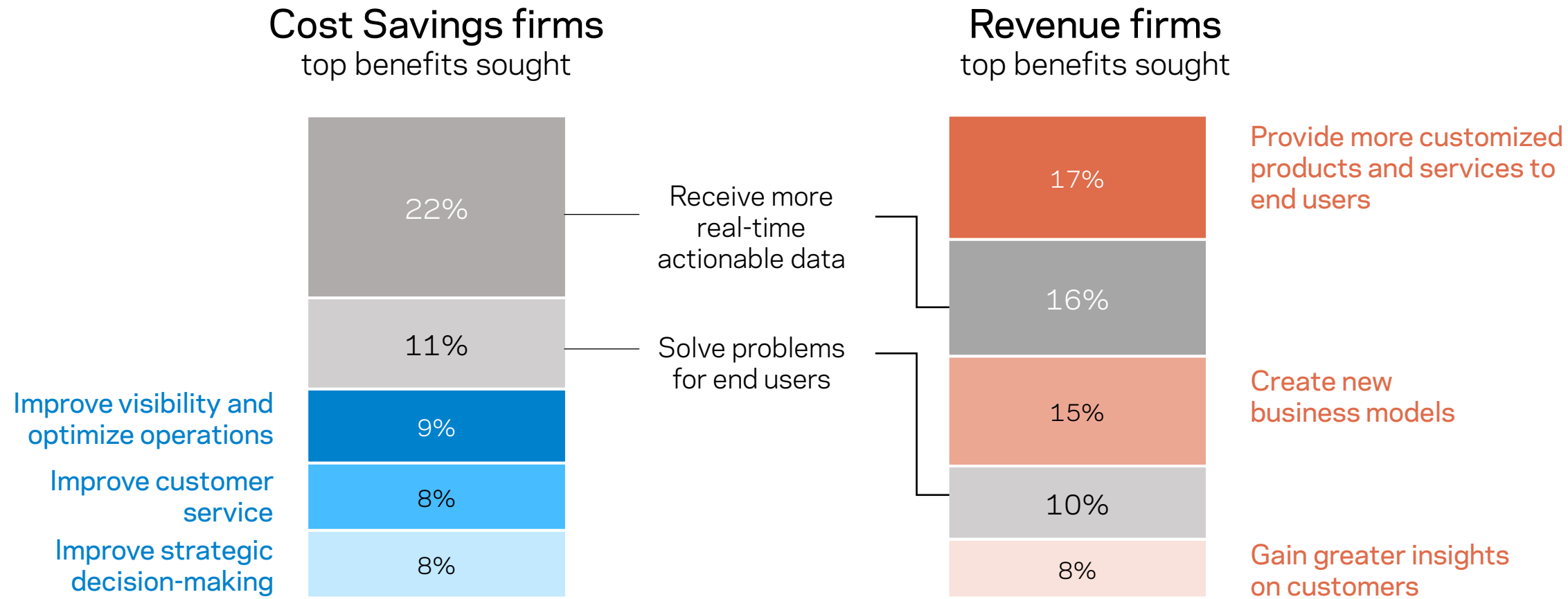
Response	Checked
Receive more real-time actionable data	53.8%
Improve customer service	48.8%
Improve customer experiences	47.4%
Solve problems for end users	45.1%
Provide increased security or control	45.1%
Improve visibility and optimize operations	43.6%
Improve operational safety	42.8%
Create new business models	41.9%
Provide more customized products and services to end users	41.6%
Improve strategic decision-making	41.6%
Gain greater insight on customers	38.7%
Aid compliance reporting	28.9%
Improve employee recruitment	22.8%

…but product and strategic goals rank higher as the top priorities for an IoT initiative

What is the top benefit your firm hopes to get from implementing an Internet of Things initiative?

Response	Top priority
Receive more real-time actionable data	20.3%
Solve problems for end users	10.7%
Provide more customized products and services to end users	10.1%
Create new business models	9.3%
Improve visibility and optimize operations	7.8%
Improve strategic decision-making	7.8%
Improve customer service	7.5%
Gain greater insight on customers	7.2%
Provide increased security or control	6.4%
Improve customer experiences	4.6%
Improve operational safety	4.6%
Aid compliance reporting	1.2%
Improve employee recruitment	1.2%

A firm's financial case also alters how it prioritizes benefits



The top barriers for IoT match those of any data-collection effort

Barrier	Total respondents
Data privacy issues	52%
Security threats	51%
IT investment keeping pace	43%
Regulatory challenges	39%
Wireless broadband availability	38%
Transitioning from legacy systems	35%
Lack of proven reliability	34%
Capital deployment decisions	33%
Inconsistent standards for device communications	33%
Unproven business model	30%

Revenue-oriented firms are, unsurprisingly, show more concerned about barriers

Barrier	Revenue	Cost savings
Data privacy issues	61%	49%
Security threats	60%	47%
Wireless broadband availability	46%	37%
Regulatory challenges	43%	37%
IT investment keeping pace	42%	44% ⬆
Lack of proven reliability	38%	32%
Capital deployment decisions	38%	32%
Transitioning from legacy systems	37%	34% ⬆
Inconsistent standards for device communications	34%	32%
Unproven business model	28%	31%

Perceptions of the challenges of IoT development grow as commitment gets deeper

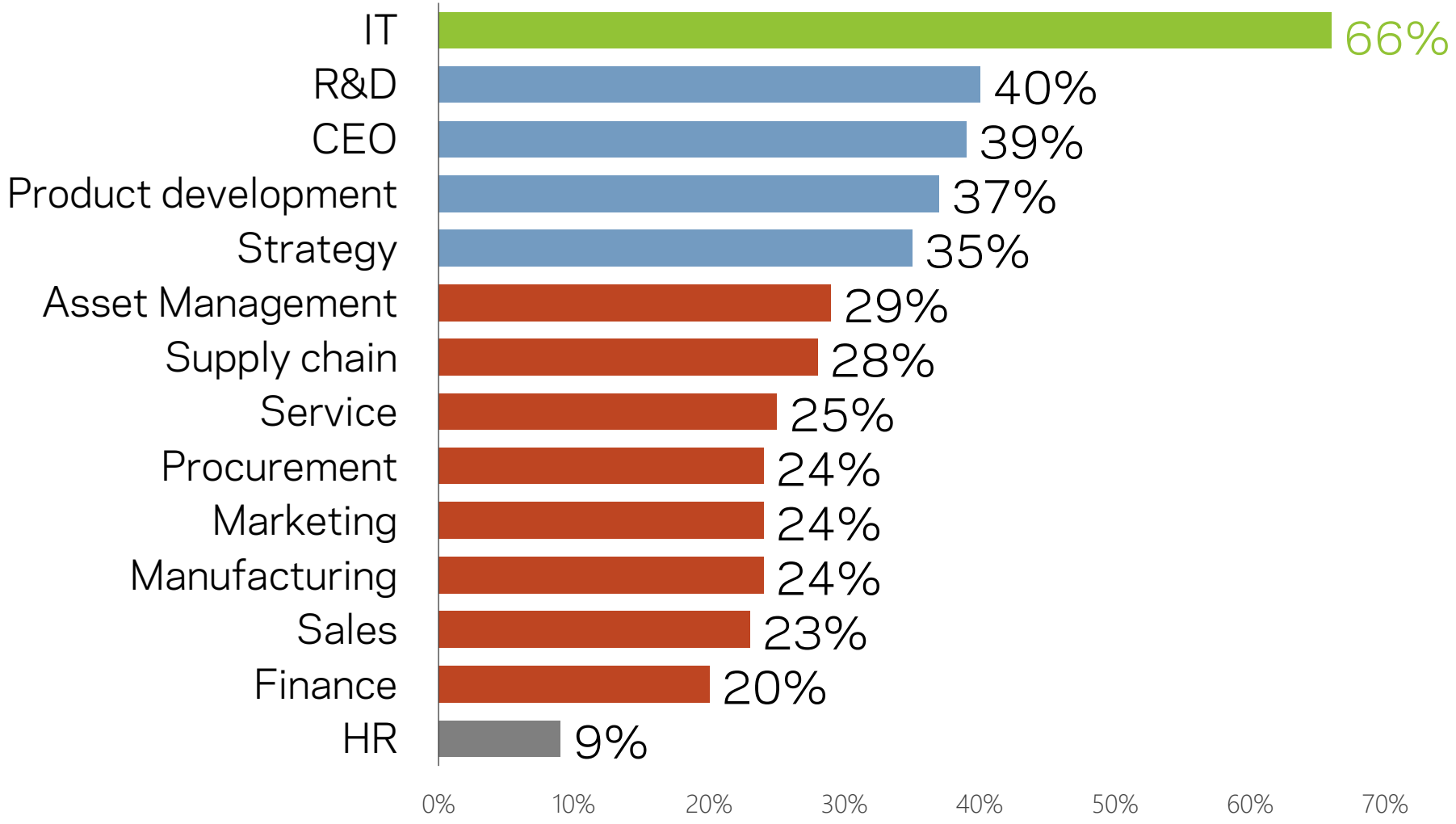
The most commonly cited barriers for IoT were data privacy, security threats, and levels of IT investment. Addressing these appears to be the price of entry for any major IoT iniative.

We found in our in-depth expert interviews a greater concern about inconsistent technical standards and unproven business models for IoT.

In addition, we found that firms with a current IoT initiative, or spending a higher amount, believe barriers pose a more significant threat

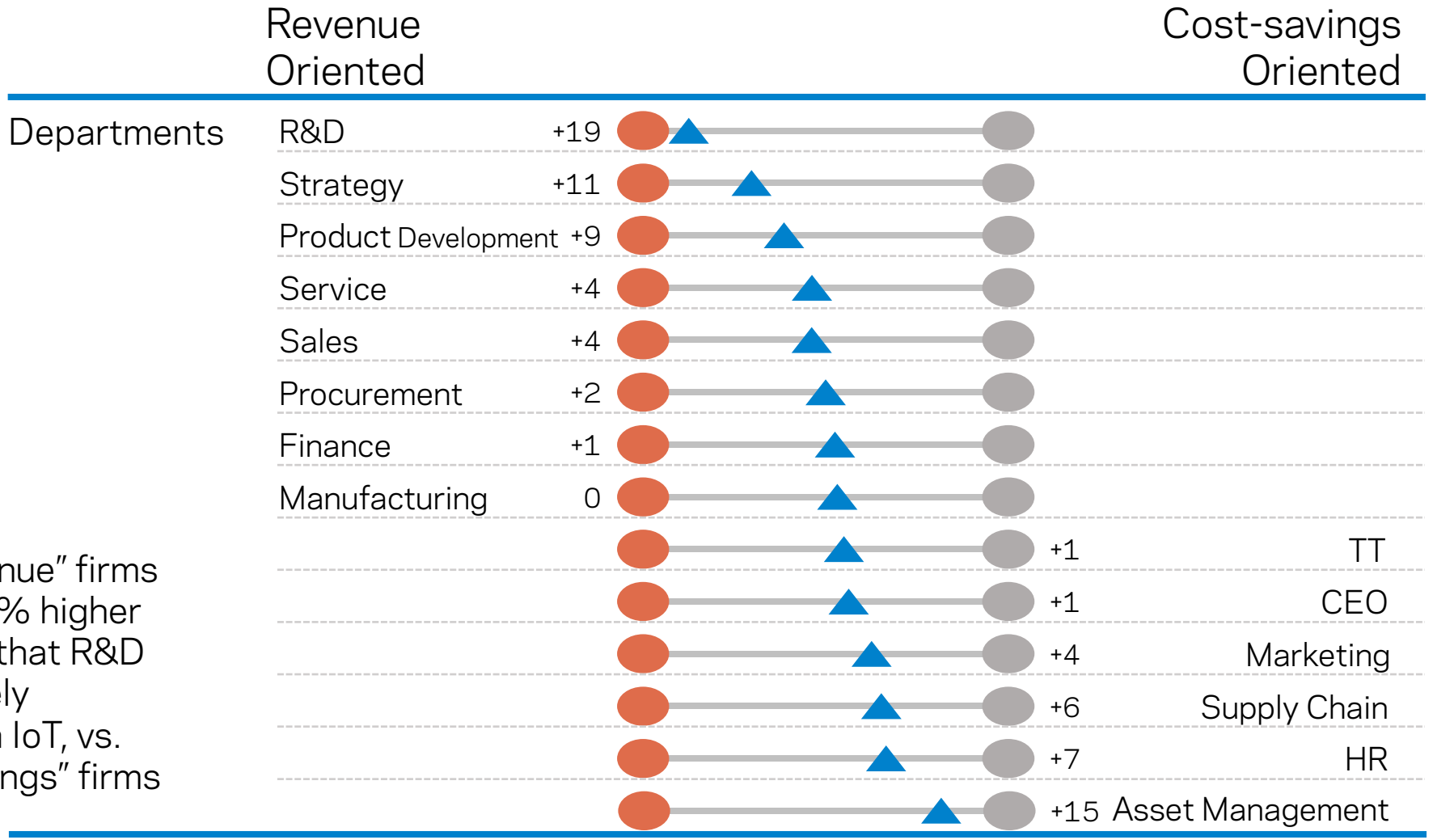
Where is IoT in the organization?

Which departments are extremely involved in IoT initiatives?



How involved are the following divisions / departments of your organization in implementing Internet of Things solutions? (TOP 1 "extremely involved")

Business case orientation does vary the level of departmental involvement



E.g. "Revenue" firms have a 19% higher likelihood that R&D is extremely involved in IoT, vs. "Cost-savings" firms

Why does the financial case affect who is involved?

More important to a revenue goal

- R&D is key to incubating commercial IoT
- Strategy helps commercialize, and determine M&A options
- Product development is core to crafting the offer

More important with a cost savings goal

- Supply chains are a key area to find efficiencies
- Marketing can use data for more efficient targeting
- Asset management wants adopt the best use of firm's current asset base

Public vs. private networks

The Spectrum of Public to Private Networks

The use of the term "Internet" can be a bit misleading when discussing all the players and devices that are being incorporated into the Internet of Things discussion.

We believe the "Network of Things" is a more appropriate phrase. A wide range of use cases exists in which devices gather and transmit data, but not all of the data transfers and device activations will take place over the Internet.

For decades, industrial applications under the machine-to-machine (M2M) moniker, have often involved data transfers on private servers, without the need for an Internet protocol.

Today, many of the initiatives involving consumer devices, like smart watches or plugs in the smart home are also not directly connecting to the internet, or not connecting to the Internet at all.

A range of short-range communications protocols – from Bluetooth to Zigbee – are connecting this mesh of devices in the home, the office, or the factory.

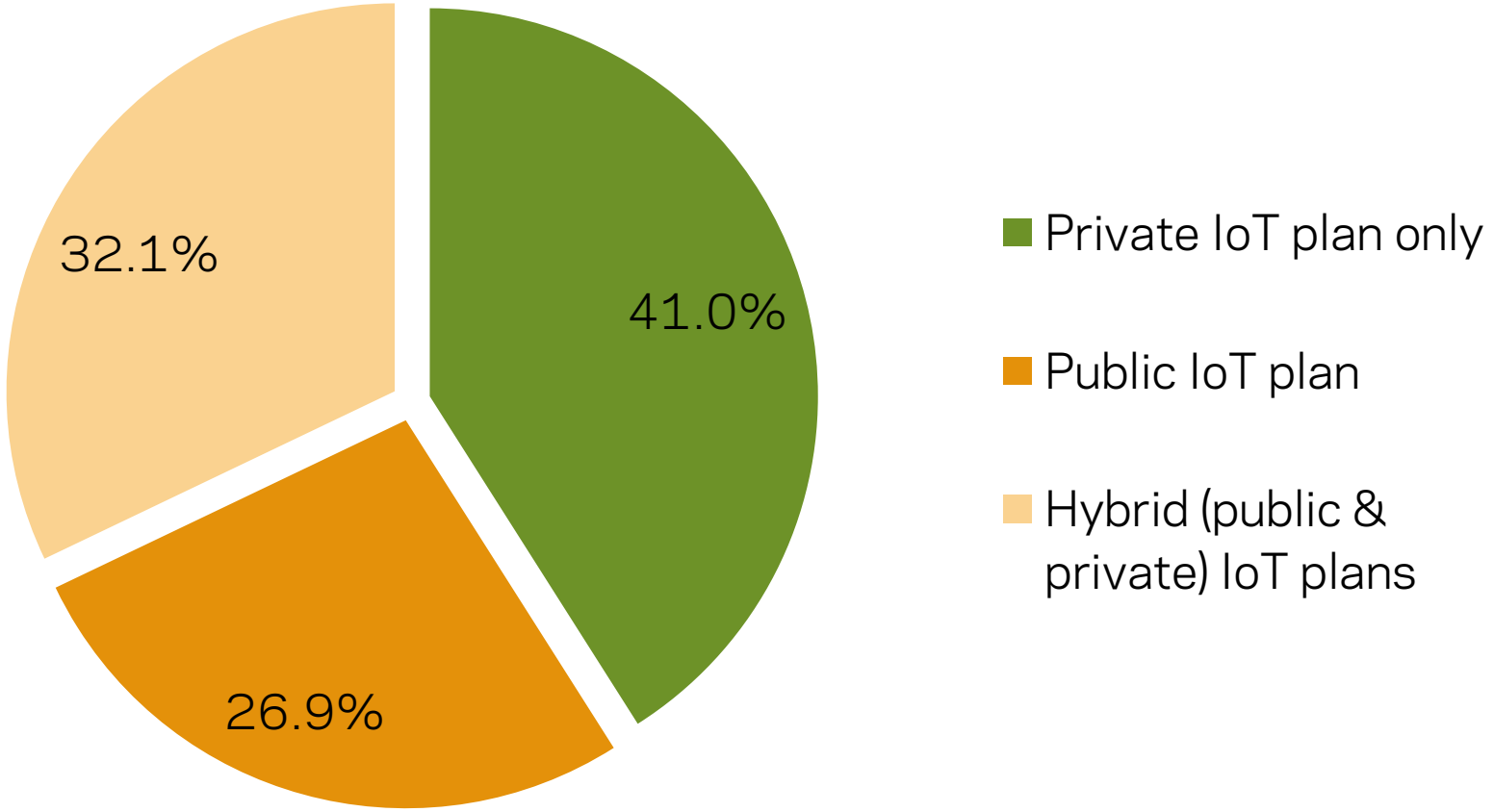
It is true that much, or almost all, of the data from these devices may end up in the cloud. But at the same time, the operation and control of these devices may not occur via a remote connection.

Beyond the already established industrial plant examples, on the consumer side one can turn to differences in smart home locks. Some are controlled via remote access, but others can only be opened when a smartphone with unlocking permissions is near the device, using an Internet-free connection like Bluetooth.

In sum, we are building a ubiquitous "network of things," that will often, but not always, make use of the public cloud of the Internet.

Flavors of IoT: Public vs. Hybrid vs. Private

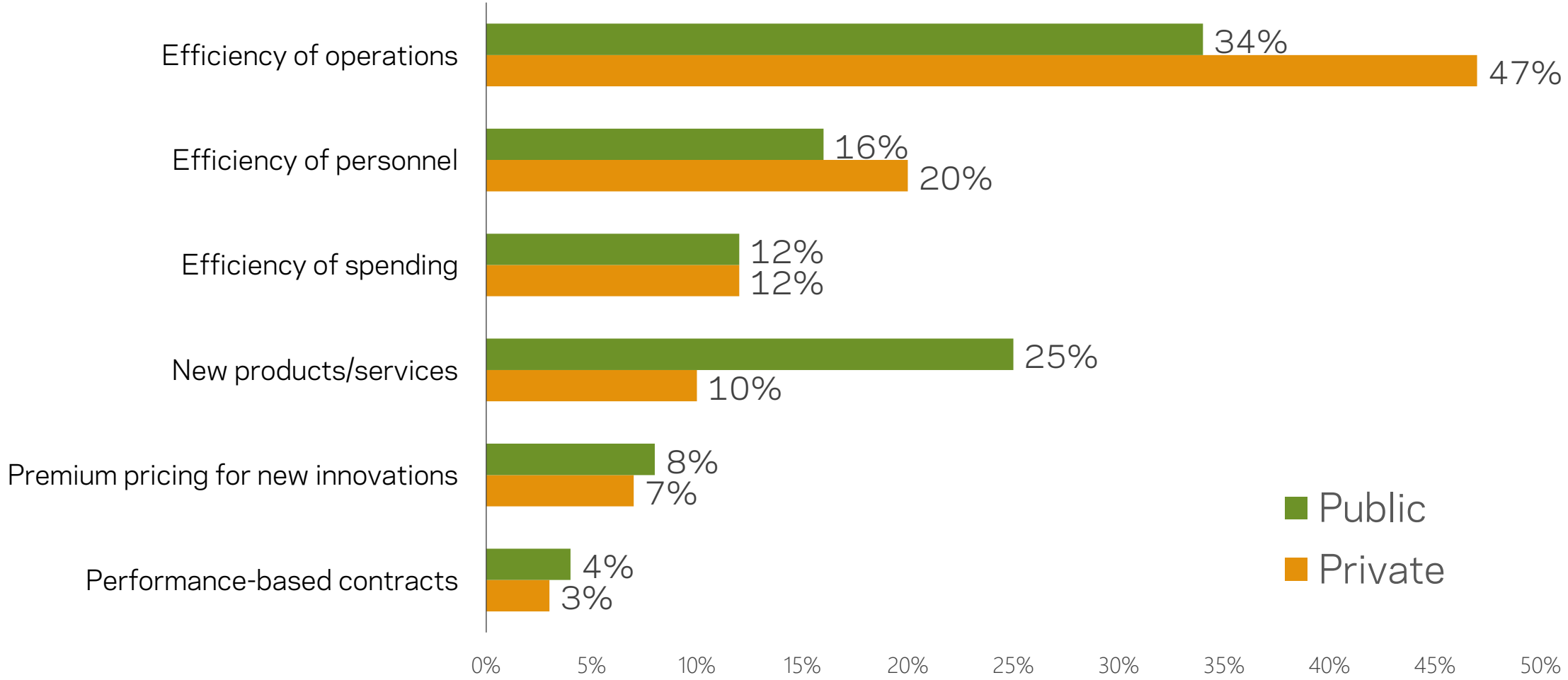
59% of firms have at least some elements of their IoT initiative with public accessibility



Will your IoT initiative over the next five years be: 1) "private" (i.e. data would only be accessible to internal employees), 2) "public" (data transferred openly through the internet), or 3) "hybrid" (data accessible to customers or developers).

Columbia Business School
Center on Global Brand Leadership

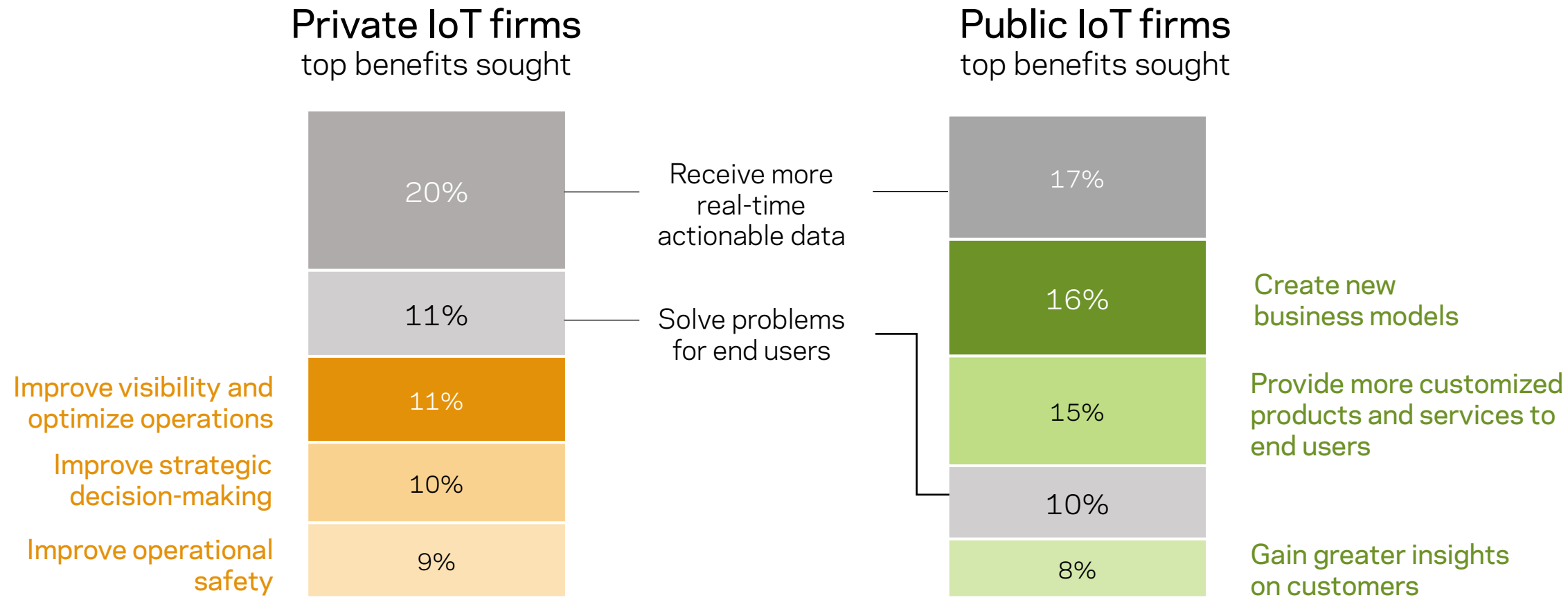
The IoT finance case impacts the choice of public vs. private networks



Spilt between PRIVATE only (142 respondents) vs either PUBLIC or HYBRID as a deployment plan (203 respondents)

Columbia Business School
Center on Global Brand Leadership

Public vs. private networks deliver different benefits

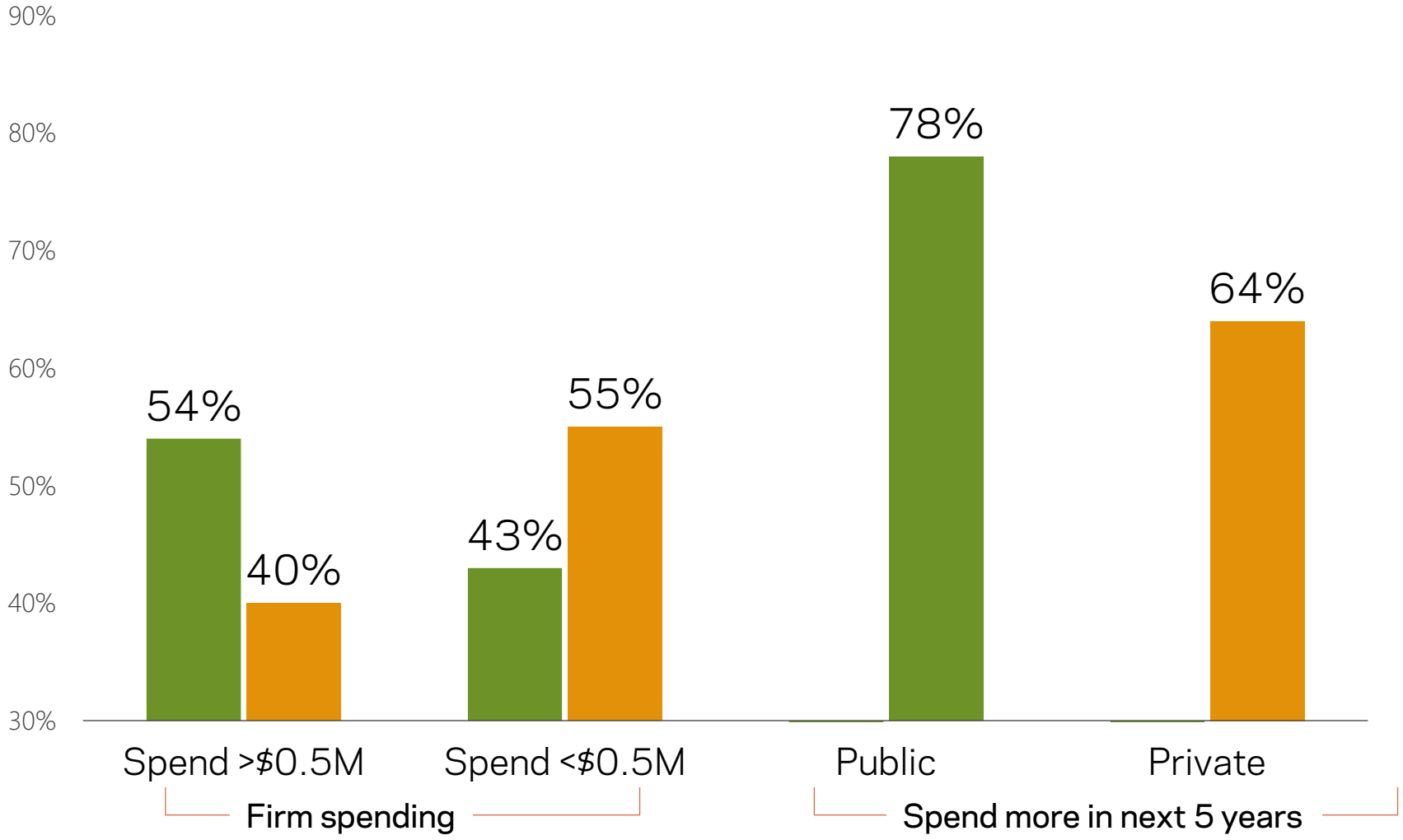


What benefits does your firm hope to get from buying and implementing an Internet of Things initiative? (CHECKED as TOP 1 benefit)

Public networks raise greater concerns about barriers to IoT

Barriers	Public	Private
Data privacy issues	58%	42%
Security threats	55%	49%
Wireless broadband availability	49%	45%
IT investment keeping pace	42%	45%
Regulatory challenges	39%	37%
Lack of proven reliability	37%	30%
Transitioning from legacy systems	35%	35%
Inconsistent standards for device communications	35%	30%
Capital deployment decisions	34%	32%
Unproven business model	32%	27%

Public IoT projects spend more now and are more optimistic about future spending than private projects



Spilt between PRIVATE only (142 respondents) vs either PUBLIC or HYBRID as a deployment plan (203 respondents)

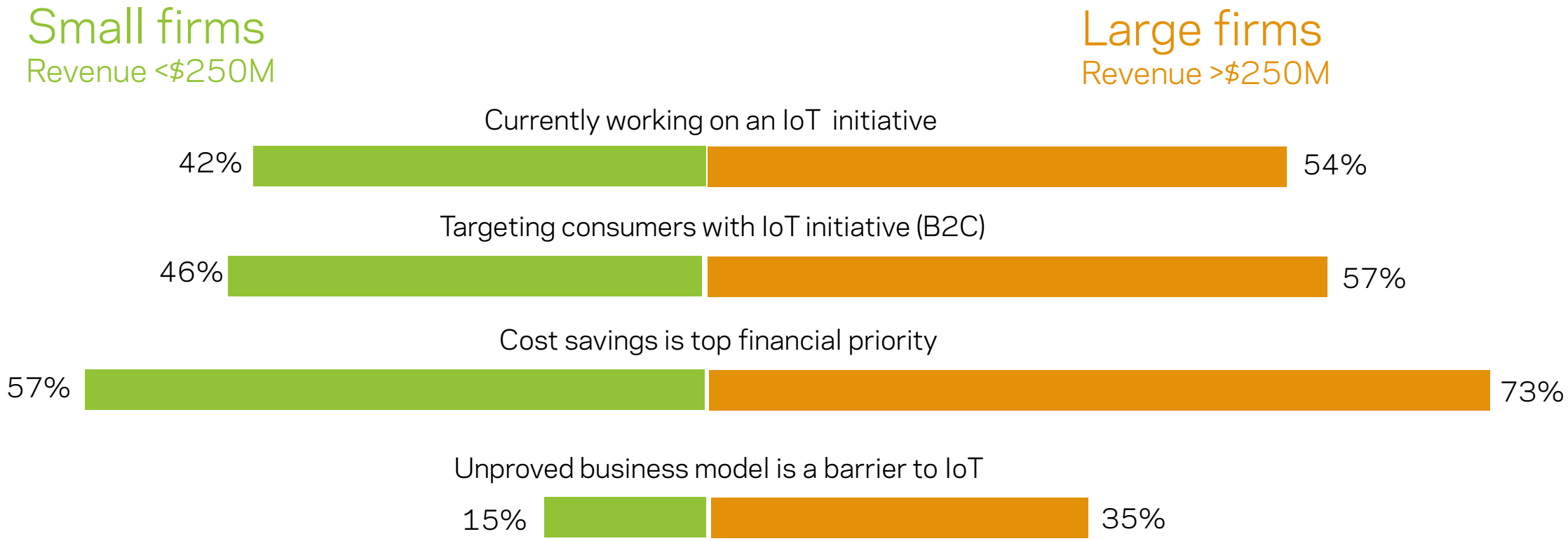
Strategic recommendations

What to Consider in Developing Your IoT Business Model

- Clarify your benefits, audience, and ROI model – to set budget, timetable, and who will lead
- Address your key barriers upfront
- Figure out if you're connecting to public cloud, or just a closed network
- Plan for your full stack (i.e. how do you get there?)

Appendices

There are only a few key areas where firm size influences elements of an IoT initiative



Spilt between small firms (below $250M revenue - 89 respondents) and large firms (above $250M" - 256 respondents)

Authors

Matthew Quint (mq2120@columbia.edu) is the Director of Columbia Business School's Center on Global Brand Leadership, which creates, gathers, and shares insights on what it takes to build strong brands. In this role, Matthew researches, writes, and presents on a wide range of issues critical to successful brand building and management. He has particular expertise in marketing ROI, strategies for marketing in the digital age, and the development of creative and effective brand communications.

Matthew is the co-producer of the Center's acclaimed BRITE Conference series on brands, innovation, and technology, now in its 9th year, which brings together over 500 big thinkers in industry and academia to discuss how innovation and technology help build strong brands. He has worked with senior executives from various leading companies — including Aimia, Coach, Deloitte, Edelman, Lonza, and SAP — to conduct research, produce events, and promote knowledge sharing among branding and marketing leaders.

David Rogers (david.rogers@columbia.edu) is a globally recognized leader on brands and digital business strategy, known for his pioneering model of customer networks. He is author of three books, most recently, *The Network Is Your Customer: 5 Strategies to Thrive in a Digital Age*, as well as the forthcoming, *The Digital Transformation Playbook* (2016).

At Columbia Business School, David teaches global executives as the faculty director of Executive Education programs on Digital Marketing Strategy. His recent research has focused on in-store mobile shoppers, big data, and digital marketing ROI. He is also the founder of the Center on Global Brand Leadership's acclaimed BRITE conference.

David has consulted and developed executive programs for global companies such as Google, Toyota, Pernod Ricard, Visa, SAP, Lilly, Combiphar, IBM, China Eastern Airlines, Kohler, Saint-Gobain, and MacMillan, among many others. He has delivered strategic workshops for executives in hundreds of companies from 64 countries. David is a board member of the Marketing Hall of Fame, and is president-elect of the NY American Marketing Association.

Acknowledgments

Deep thanks go to Fatima LaHay and Annie Balant from Vision Critical for their project management and fielding of the survey. Crucial support, comments, and questions came from the Aimia Institute team (a sponsor of the Center on Global Brand Leadership) during the early days of survey development and in feedback on the data analysis. Thanks to Aaron Dauphinee, Martin Hayward, Michelle Stern, Nicola Waterman, and Laura Hewitt.

Finally, special thanks go to Isadora Levy, a graduate student at Columbia Business School, who supported the data analysis, and Gabriela Torres Patiño and Allie Abodeely from the Center on Global Brand Leadership for their research and editing support.

Methodology

The online survey was designed by Columbia Business School and fielded by Vision Critical from February 3-11, 2015. A total of 8,160 respondents completed the survey: 2,004 from the United States; 2,036 from the United Kingdom; 2,111 from Canada; 1,007 from France, and 1,002 from India. Qualified respondents were age 18 or older, and resided in the US, UK, Canada, France, or India. The respondents were closely representative of the general population (not just the online population) of age 18+ respondents in each country, with the exception of India, where the respondents slightly over-indexed as younger and more affluent than the overall Indian population.

For the industry-specific sections — primarily the Findings sections 2 & 3 — each respondent was randomly provided two (of six) industries to consider. Comfort-related questions used a standard 5-point Likert Scale from Very Comfortable to Very Uncomfortable. Agreement-related questions used a standard 5-point Likert Scale from Strongly Agree to Strongly Disagree. The brand trust section used a 3-point scale: Much more likely to share, Somewhat more likely to share, No more likely to share. The data-enabled benefits section used a standard 5-point Likert Scale from Very Likely to Very Unlikely. A downloadable copy of this research report and a complete list of the survey questions can be obtained online at: gsb.columbia.edu/globalbrands or visit Aimia Institute at aimia.com.


Columbia Business School
Center on Global Brand Leadership
SAP