strategy&

October 2016

2016 Global Innovation 1000

Software-as-a-Catalyst

pwc

Introduction

R&D shifts

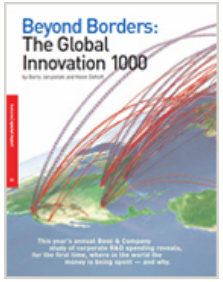
Innovation 1000 update

For the 12th year, Strategy& studied innovation trends and spending at the world's 1,000 largest publicly listed corporate R&D spenders

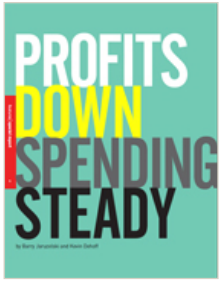
2005:
Money isn't everything

2006:
Smart spenders

2007:
The customer connection



2008:
Beyond borders



2009:
Profits down, spending steady

2010:
How top innovators keep winning

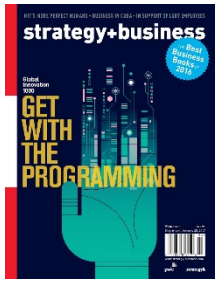
2011:
Why culture is key

2012:
Making ideas work

2013:
Navigating the digital future

2014:
Proven paths to innovation success

2015:
Innovation's new world order



2016:
Software-as-a-catalyst

The study has become a recognized contributor in better understanding what drives success in R&D and innovation

- **The Global Innovation 1000 study has received significant media and academic attention**:
  - Called *"the most comprehensive assessment of the relationship between R&D investment and corporate performance"* by the *The Economist* in 2009
  - Given *"2006 Special Achievement Award for Advancing Innovation"* by **Innovate Forum**
  - Awarded Best of Visions award from **PDMA** in 2009
  - In 2011 and 2014, awarded Silver and Gold, respectively, for original research by the **American Society of Business Press Editors** (*"the Azbee"*)
  - Cited in more than 180 publications in 27 countries

Global Innovation 1000: Selected press coverage

Introduction

R&D shifts

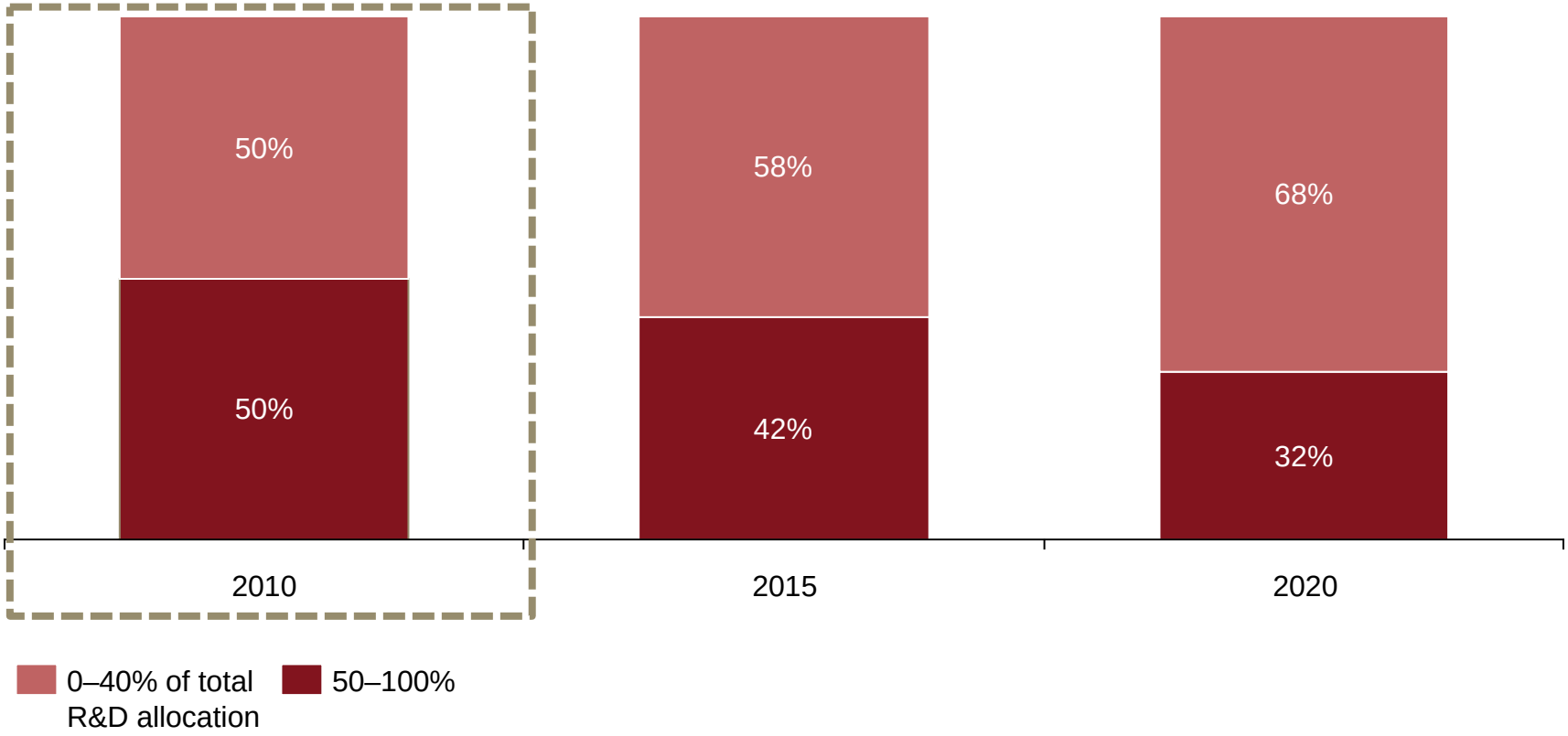
Innovation 1000 update

Executive Summary

- Companies are shifting their R&D resources away from physical products to software and services and this is paying off financially.
  - The average allocation of R&D spending for software and services increased from 54% to 59% between 2010 - 2015 and is expected to grow to 63% by 2020.
  - The average allocation of R&D spending of product-based offerings fell to 41%(from 46% in 2010), and is expected to fall to 37% by 2020 (decrease of 19% this decade).
- As R&D shifts to software and services, talent shifts as well. By 2020, the number of companies reporting electrical engineers as their top employed engineering specialty will fall by 35% and the proportion of companies who expect that data engineers will represent their largest group of employed engineers will double from 8% to 16%.
- Regionally, companies in North America are making the strongest shift to software offerings—from 15% of total R&D spending in 2010 to 24% in 2020.
- In 2016 total R&D spending by the Global Innovation 1000 increased 0.04% to $679.8 B, essentially unchanged from the previous year, as a result of fluctuations in foreign currencies.
- R&D intensity spiked to its all-time high of 4.2%, last seen in 2005, as revenue within most industries decreased - especially Chemicals & Energy.
- Apple maintains it’s #1 position over Alphabet (Google) on the 10 Most Innovative Companies list, 3M jumped to #3, and Facebook rejoined the list for the first time since 2013.

In 2010, half of all companies reported allocating 50% or more of their R&D spending to product-based offerings

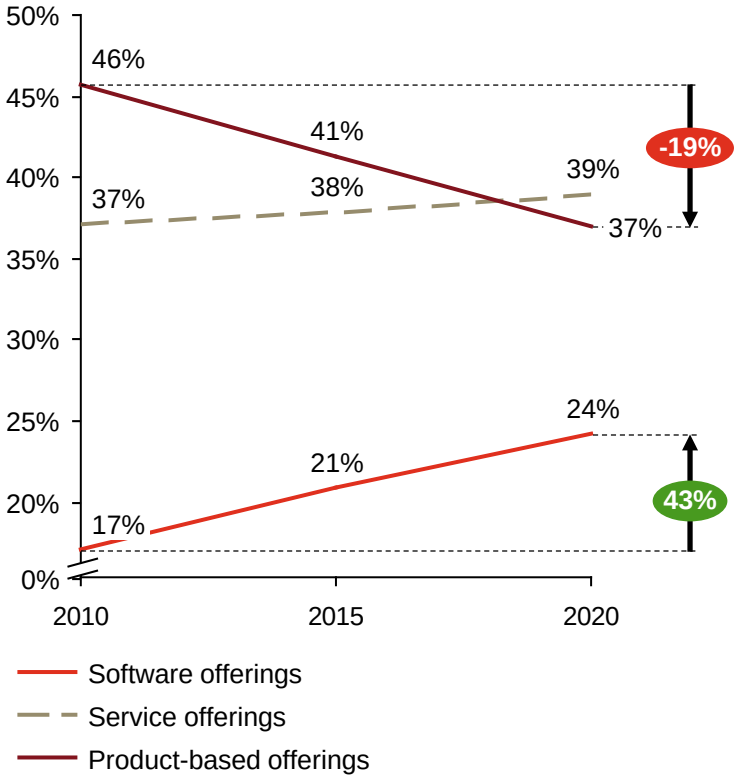
Allocation of R&D spending to *product-based* offerings



Source: 2016 Global Innovation 1000 study
Q13) Please estimate your company's allocation of R&D investment across these three offerings.
N = 466.

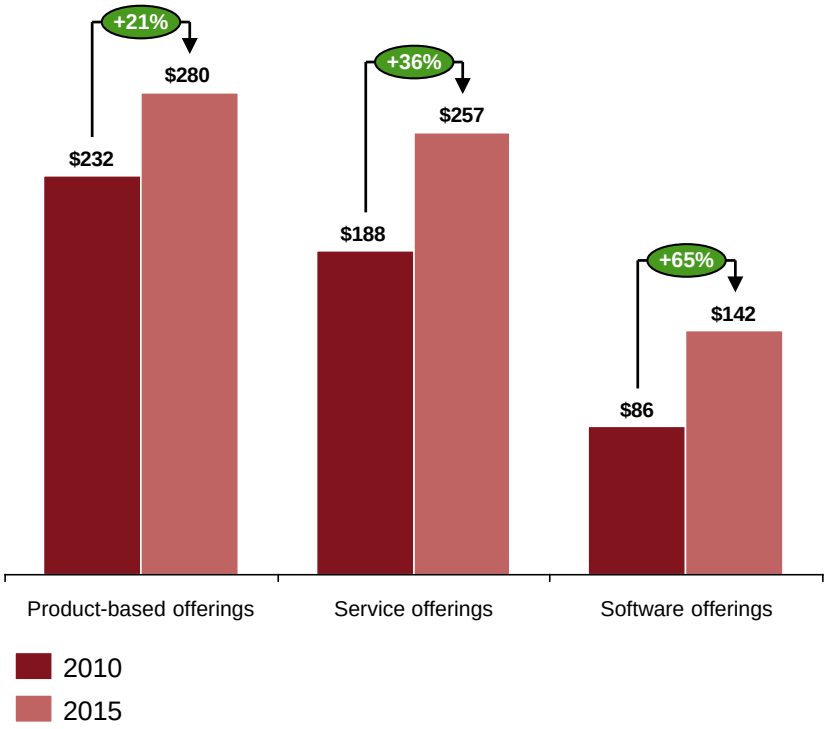
However, by 2020, companies will have shifted the majority of their R&D from product offerings to software and services

Average allocation of R&D spending to types of offerings



Total R&D spending by type of offering

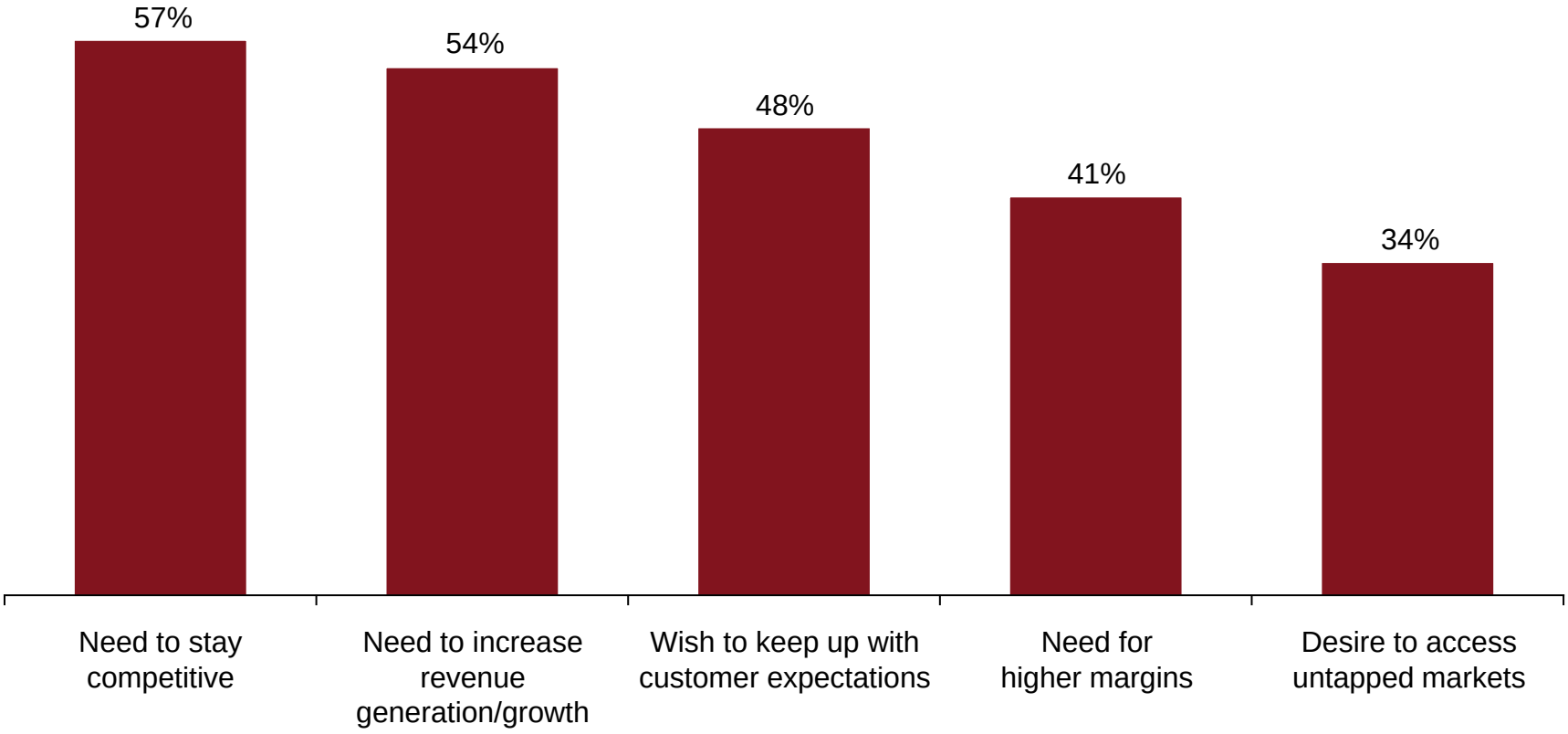
US$ Billions



Source: 2016 Global Innovation 1000 study
Q13) Please estimate your company's allocation of R&D investment across these three offerings.
N = 466.

The top reason companies are shifting R&D budgets toward software and services is the "need to stay competitive"

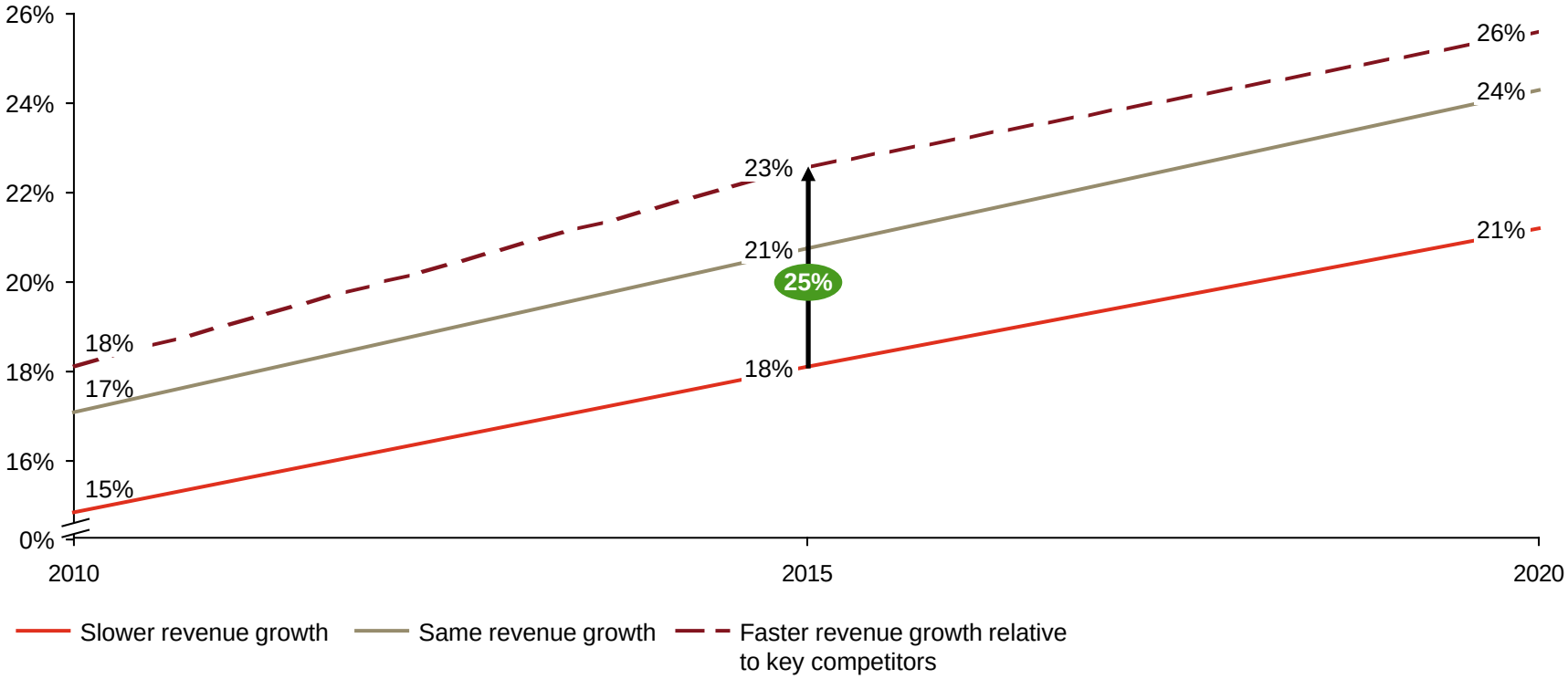
Top 5 drivers of change in R&D allocation



Source: 2016 Global Innovation 1000 study
Q14) What is driving this change in the mix of your company's R&D investment portfolio? (Please choose up to five reasons).
N = 466.

Companies that reported faster revenue growth than their competitors allocated more R&D investment to software

Average allocation of R&D spending to *software* offerings

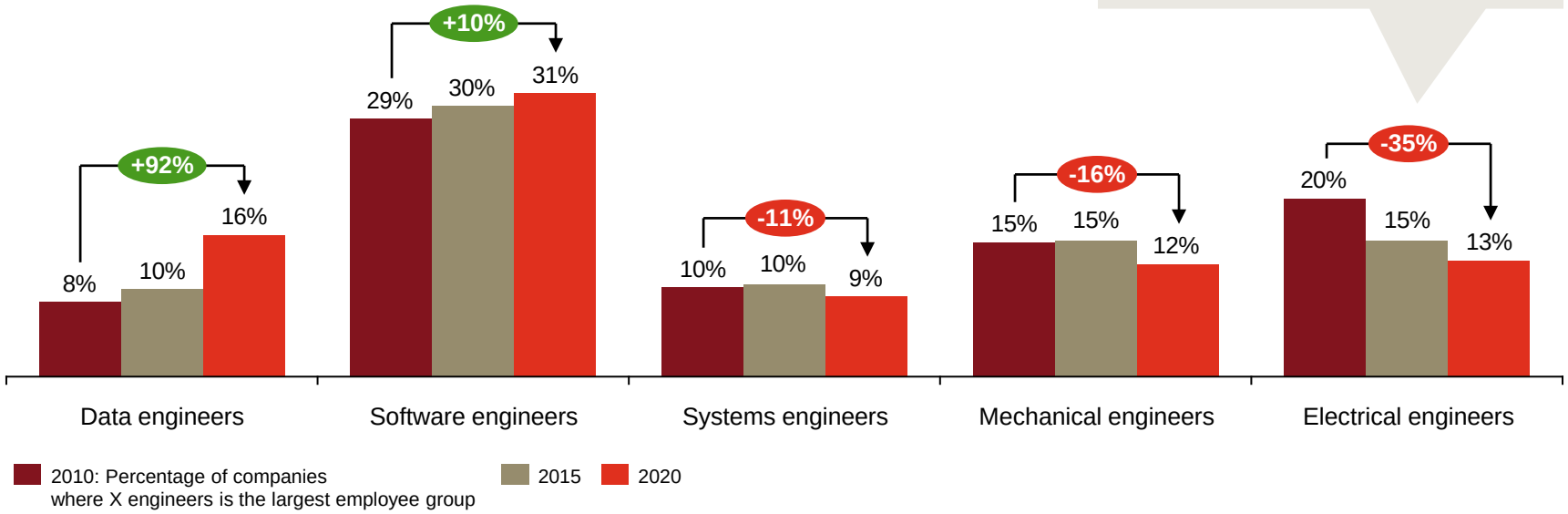


Source: 2016 Global Innovation 1000 study
Q11) How do you believe your company is performing in revenue growth relative to its key competitors?
Q13) Please estimate your company's allocation of R&D investment across these three offerings.
N = 466.

To support the shift in R&D spend, companies are significantly altering their engineering talent mix

Reported change in largest engineer employee group *

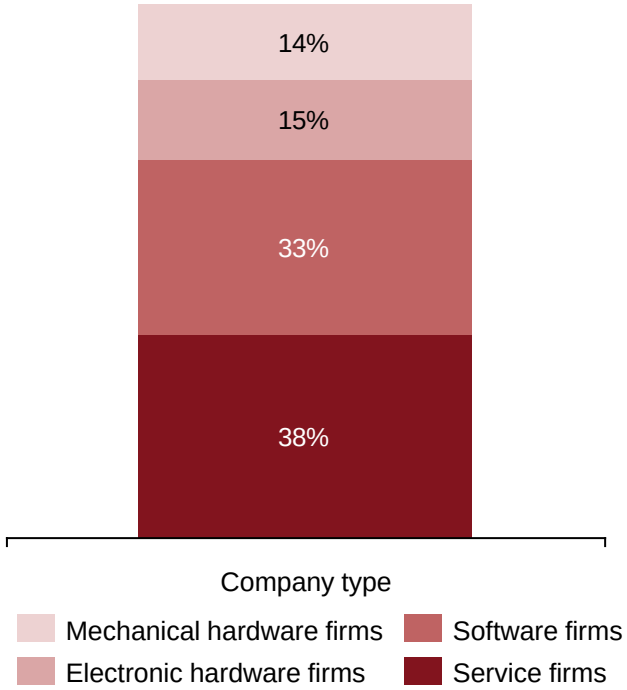
From 2010 to 2020, among companies that employ electrical engineers, the number of companies reporting that electrical engineers are the largest engineering group will fall by 35%.



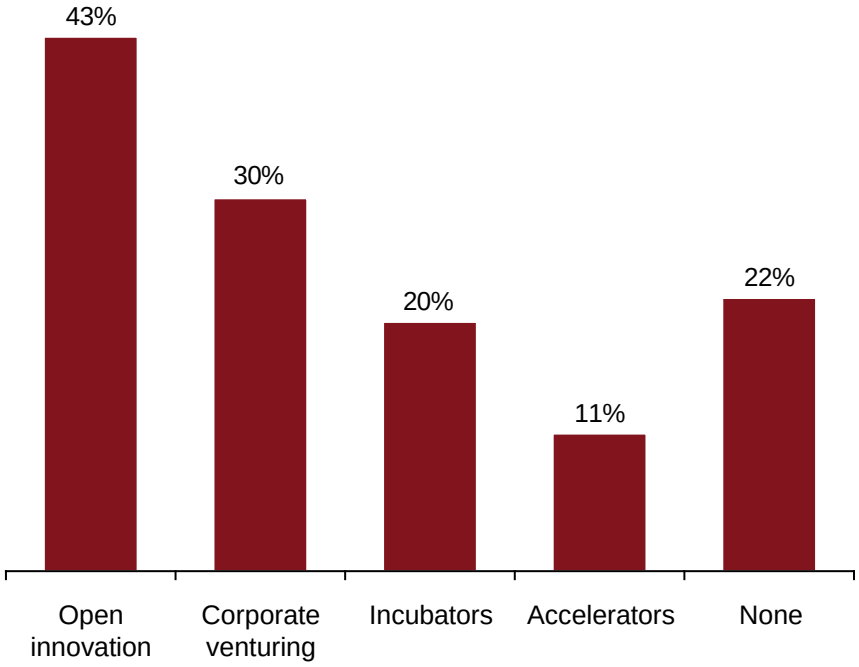
Source: 2016 Global Innovation 1000 study
**Industrial Engineers/Human Factors and Chemical Engineers/Bioengineers are not shown.*
Q18) Which innovations below, if any, has your company applied to complement its business model(s)? (Please choose up to two options).
Q19) Please choose the top four types of engineers employed by your company during each of the time periods: (Rank from 1 to 4, where 1=largest number of engineers employed).
N = 466.

Additionally, companies are acquiring service and software firms and applying new innovation models

Type of company acquired in last five years



Type of innovation applied to compliment business model

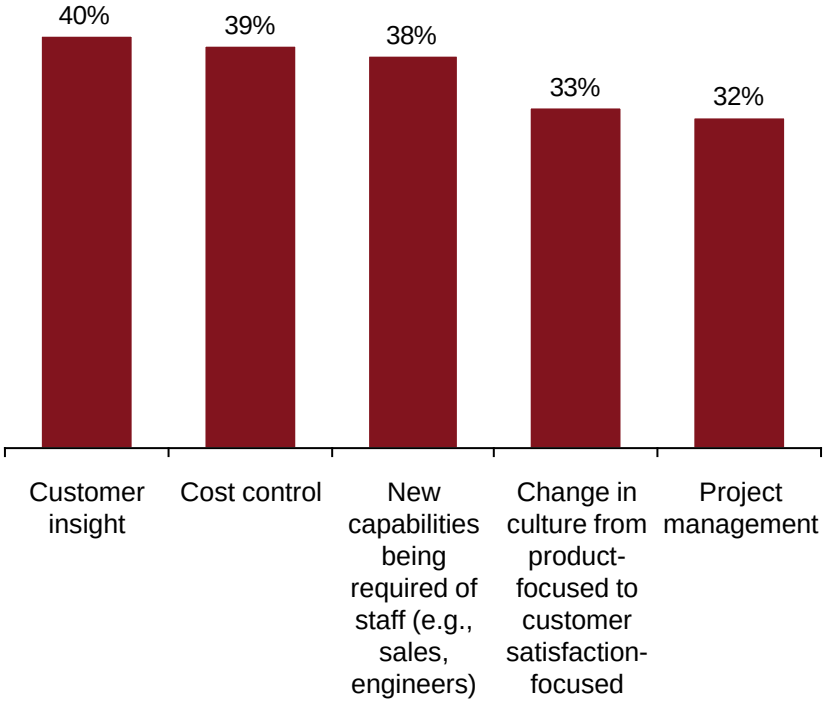


Source: 2016 Global Innovation 1000 study
Q18) Which innovations below, if any, has your company applied to complement its business model(s)? (Please choose up to two options).
Q21) Has your company acquired any of the following kinds of firms to augment its capabilities?
N = 466.

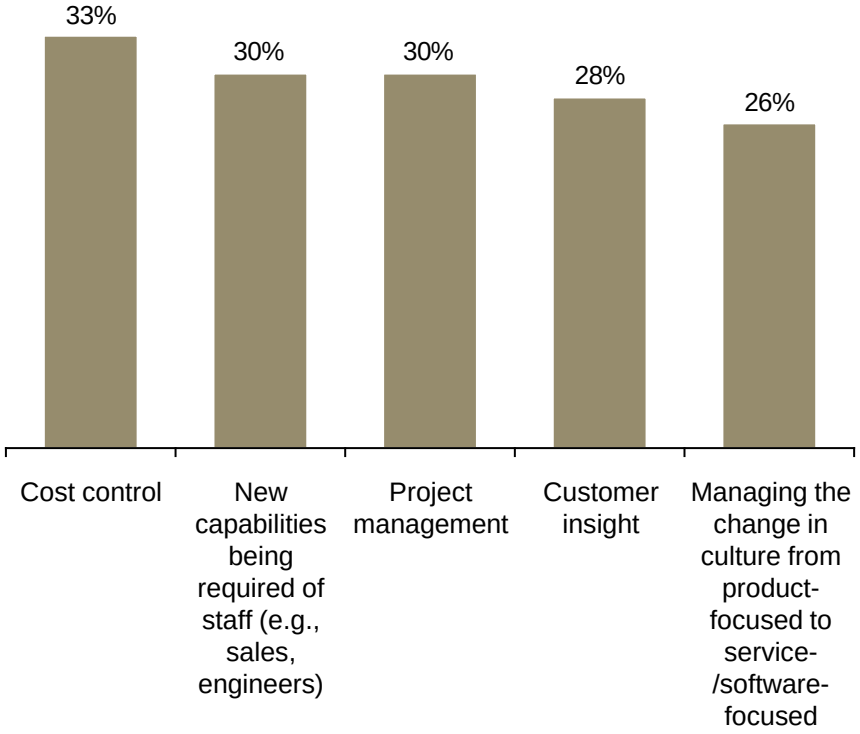
40% of companies cited "customer insight" as the top challenge for developing new services compared to just 28% for software

Top 5 challenges companies experienced pursing service and software offerings

Service offerings

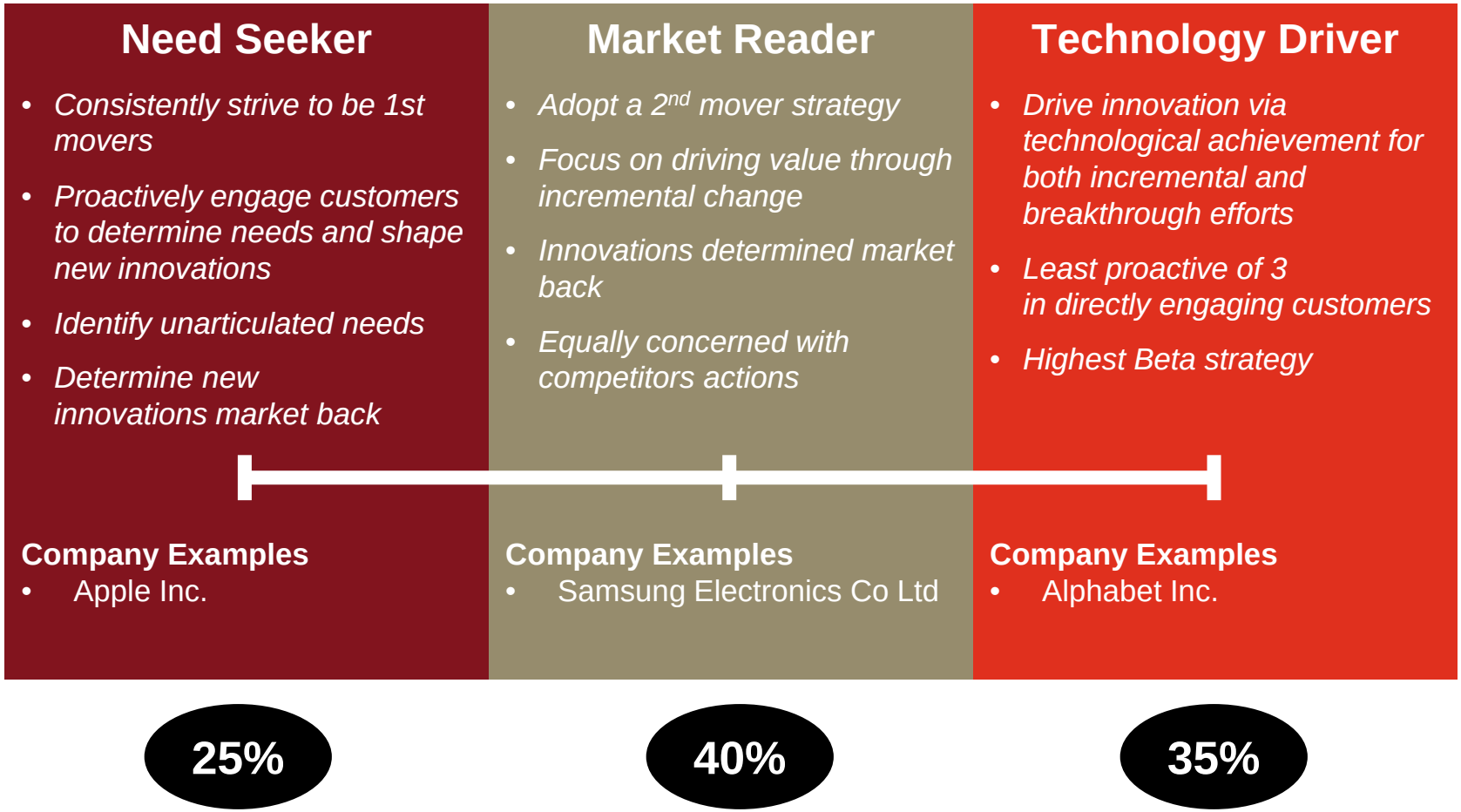


Software offerings



Source: 2016 Global Innovation 1000 study
Q15) What are the biggest challenges your company has experienced while pursuing its service and software offerings? (Please choose up to five reasons for each offering).
N = 466.

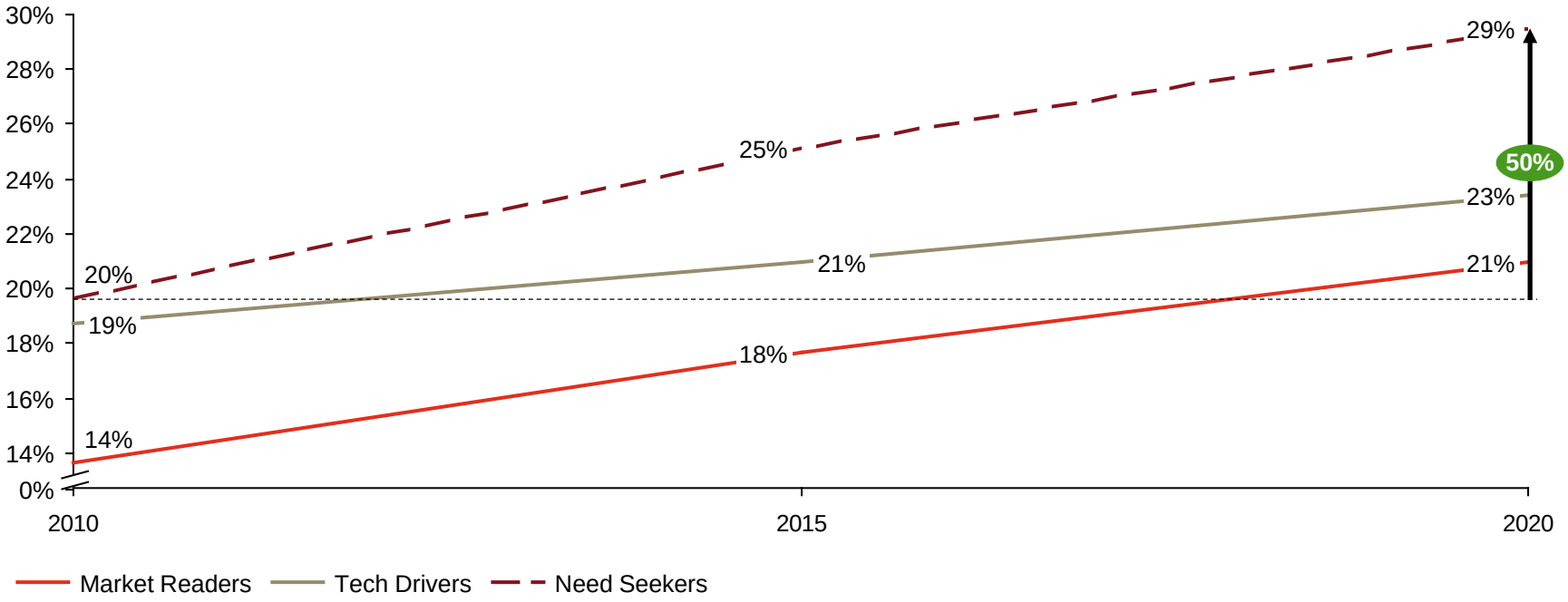
We've identified three distinct innovation strategies that cut across all industries



Source: 2016 Global Innovation 1000 study

By 2020, Need Seekers will be allocating nearly a third of their total R&D budget to software offering

Average allocation of R&D spending to *software* offerings



Source: 2016 Global Innovation 1000 study
Q11) How do you believe your company is performing in revenue growth relative to its key competitors?
Q13) Please estimate your company's allocation of R&D investment across these three offerings.
N = 466.

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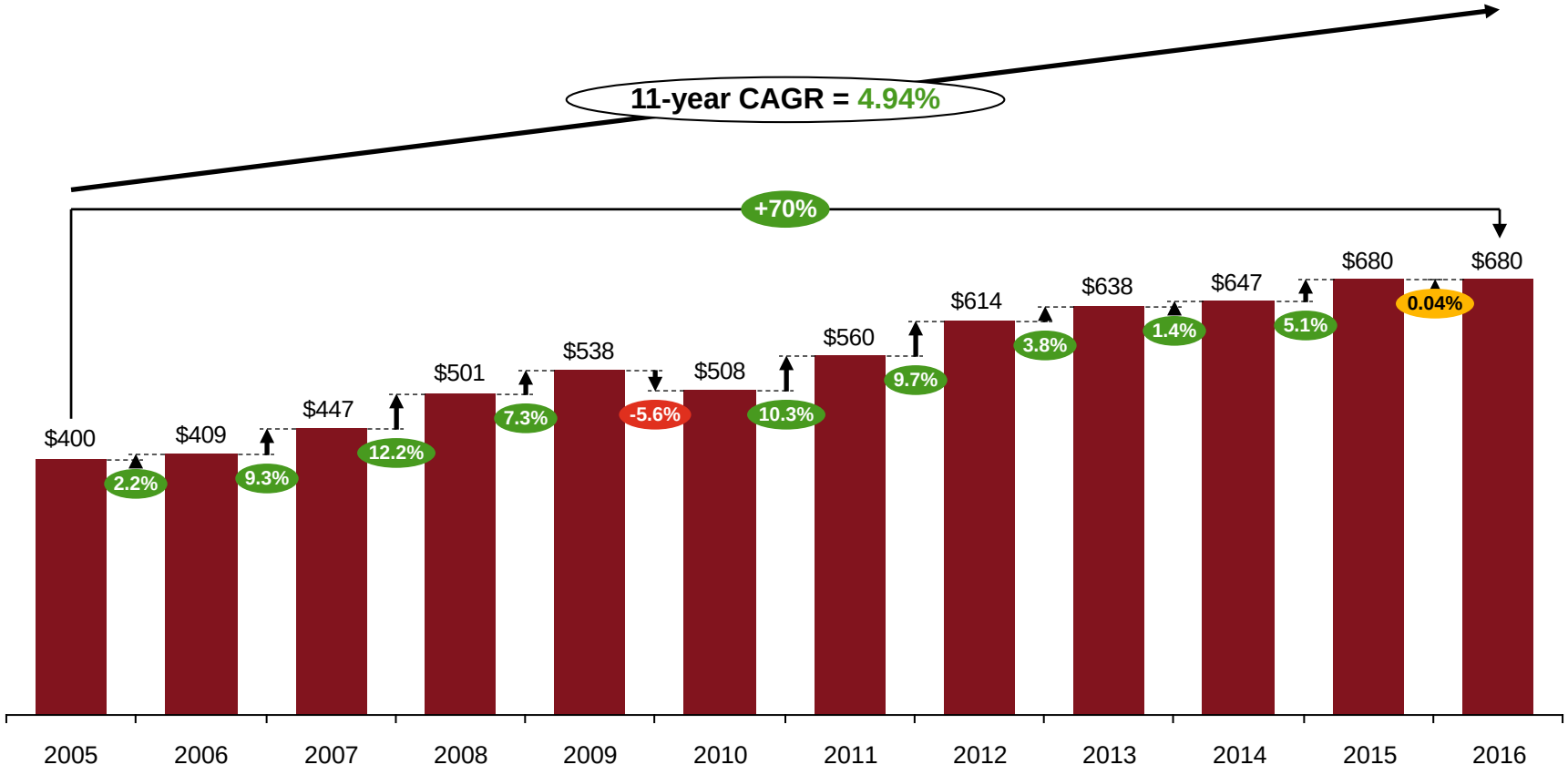
R&D shifts

Innovation 1000 update

In 2016, R&D spending of the top 1000 companies was flat as a result of currency fluctuations – strong US$

Global Innovation 1000 R&D spending

2005–2016, US$ Billions

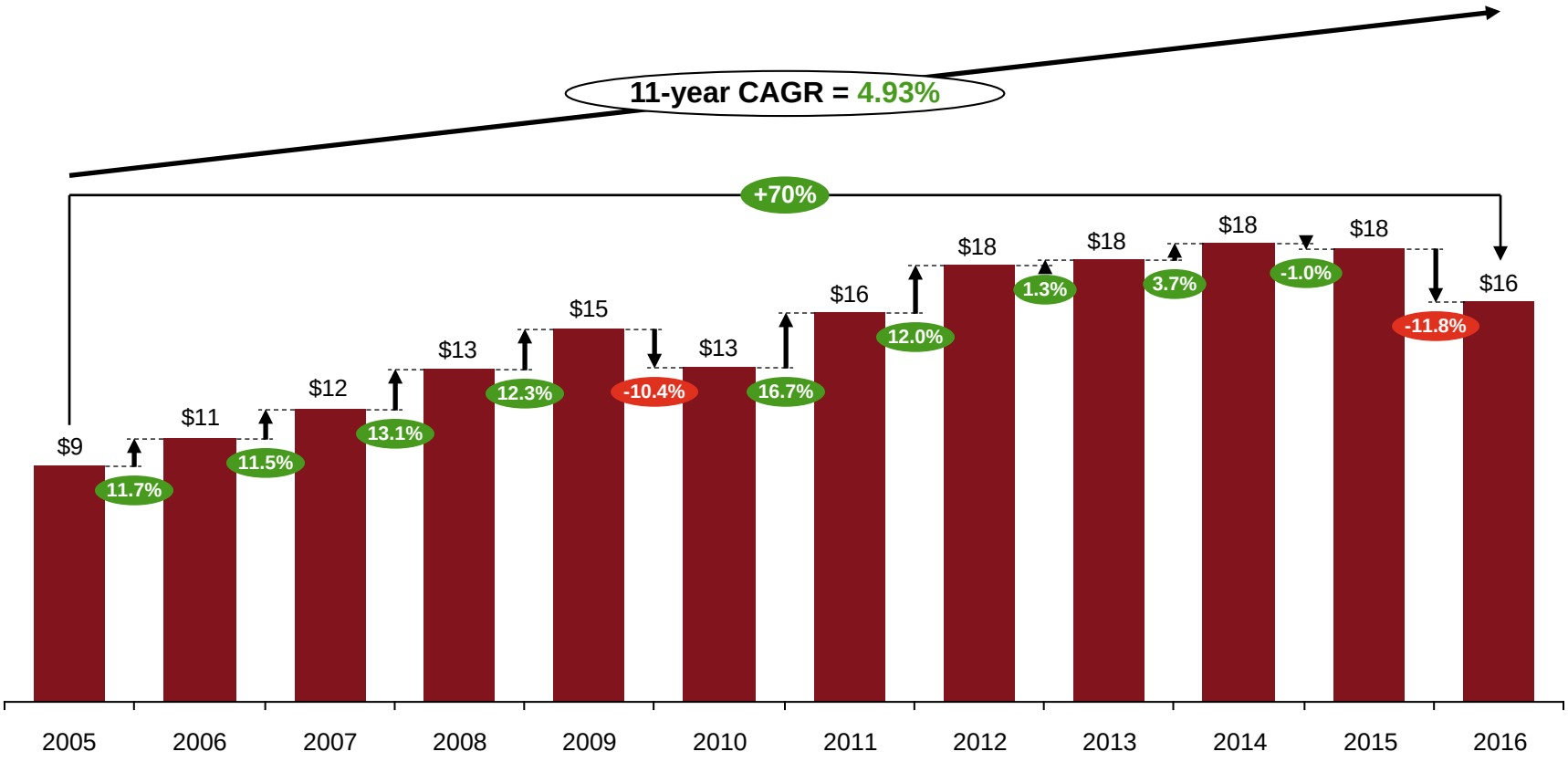


Source: 2016 Global Innovation 1000 study

Total revenue for the Innovation 1000 fell by 11.8%

Global Innovation 1000 revenue

2005–2016, US$ Trillions

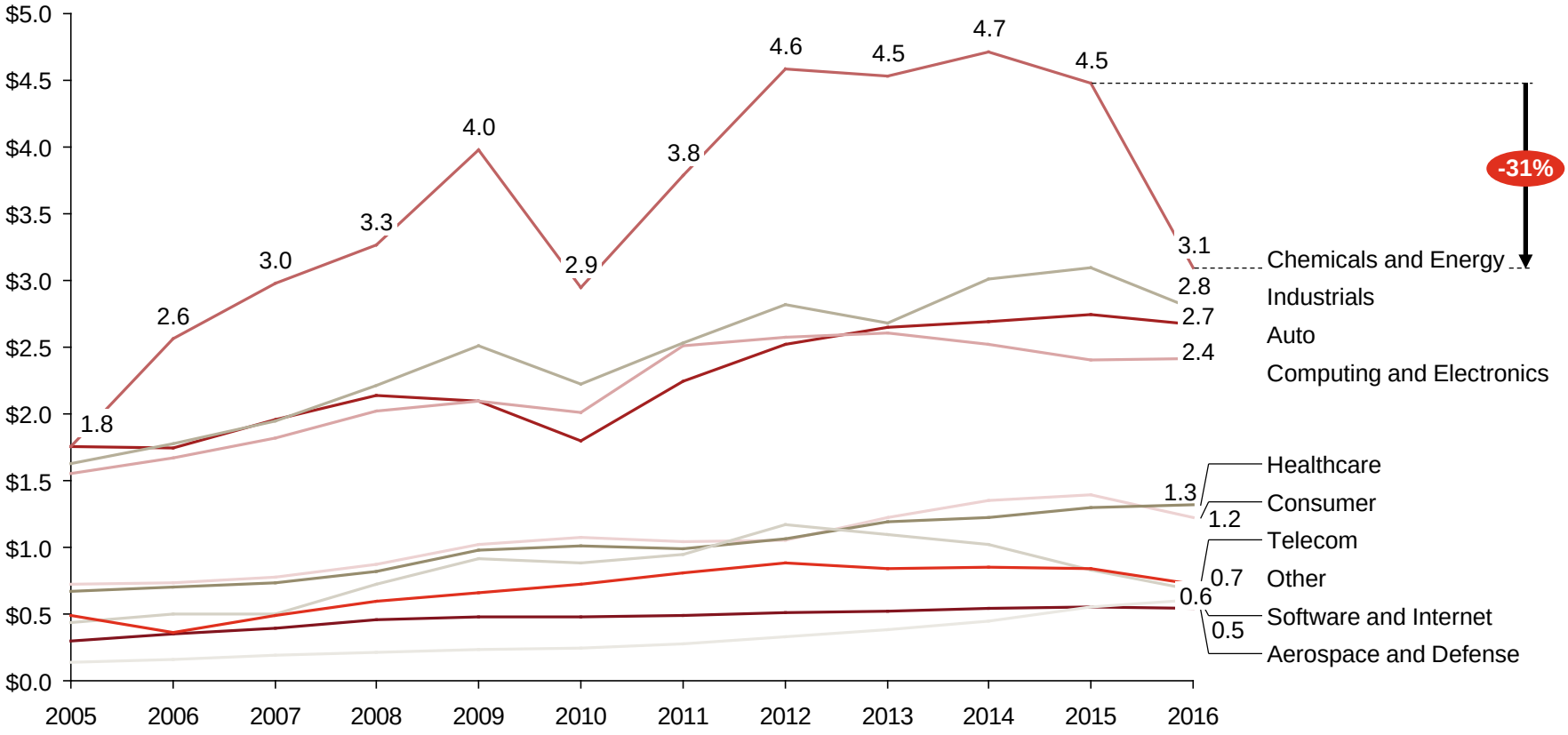


Source: 2016 Global Innovation 1000 study

Primarily due to a 31% decline in revenue in the Chemicals & Energy industry

Revenue by industry

2005–2016, US$ Trillions

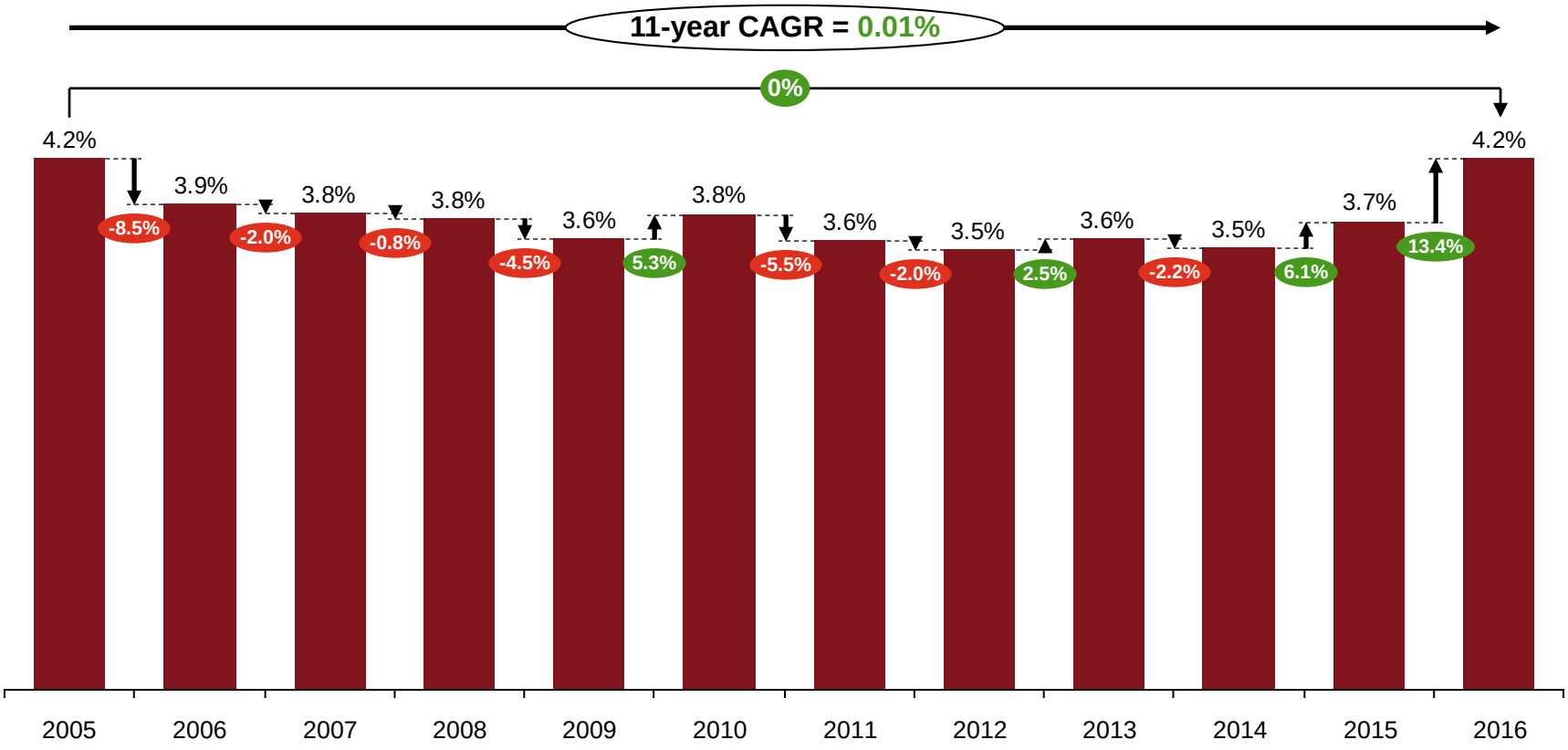


Source: 2016 Global Innovation 1000 study

Resulting in a spike in R&D intensity back to its all-time high of 4.2%, last seen in 2005

Global Innovation 1000 R&D intensity

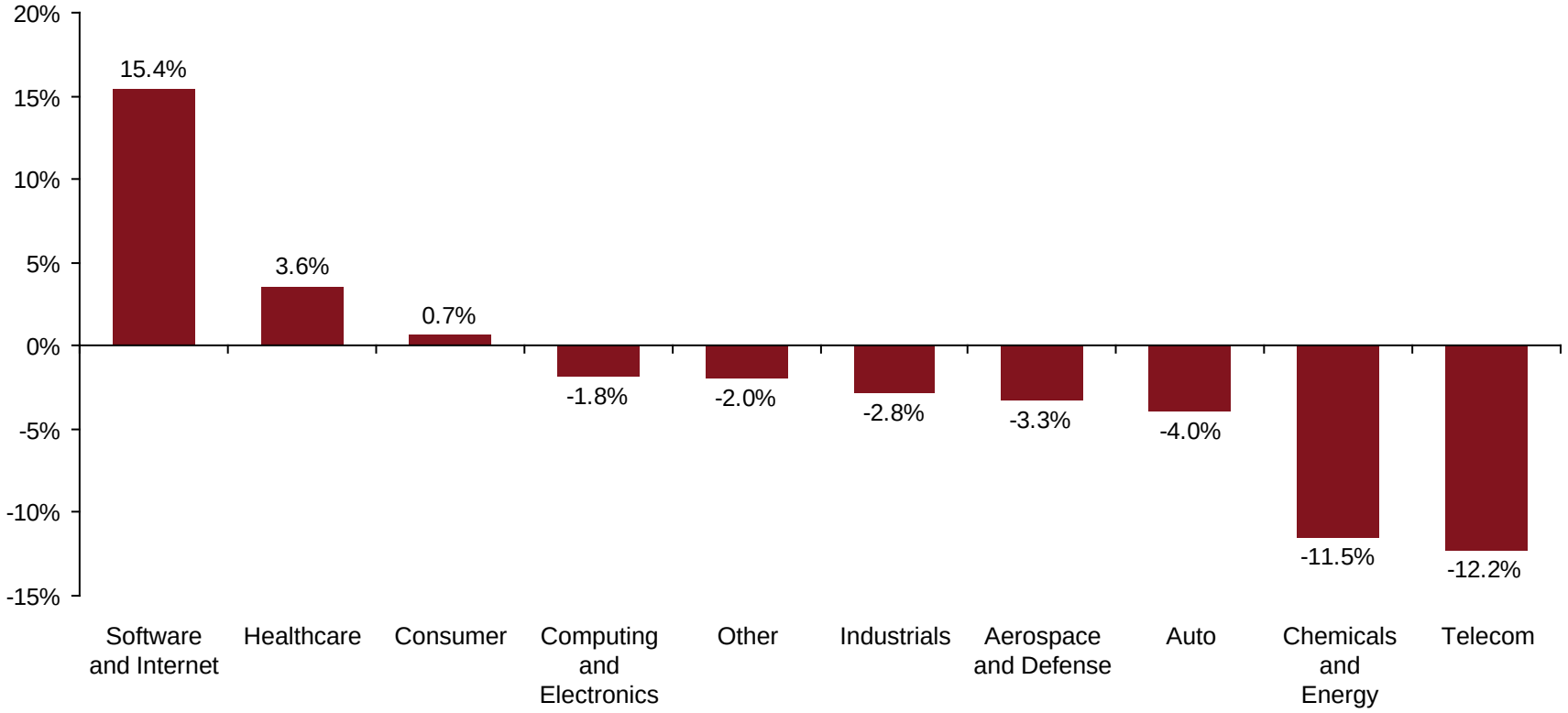
2005–2016



Source: 2016 Global Innovation 1000 study

Only three out of nine industries increased R&D spending

Change in R&D spending by industry
2015–2016

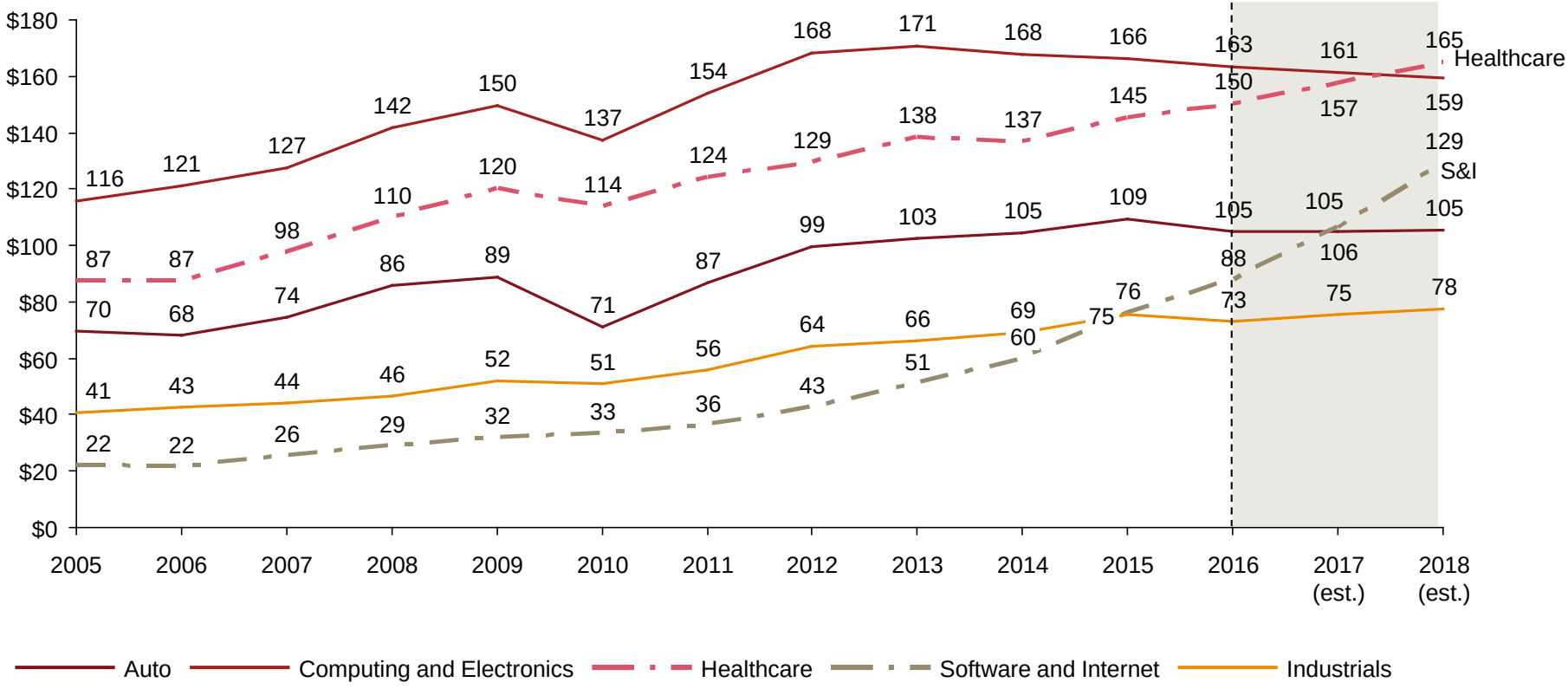


Source: 2016 Global Innovation 1000 study

By 2018, Software & Internet and Healthcare will be the first and third largest industries by R&D spend

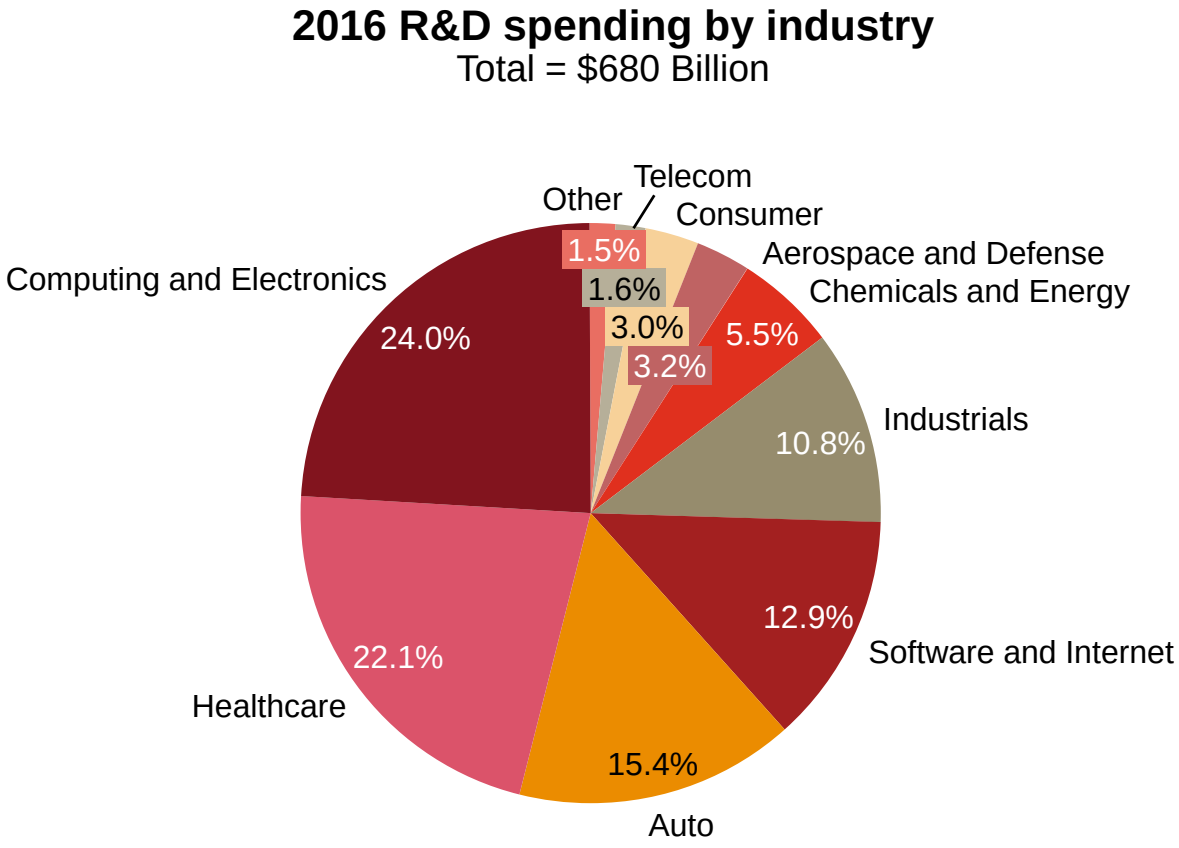
R&D spending by Top 5 industries

2005–2018, US$ Billions



Source: 2016 Global Innovation 1000 study

Computing & Electronics, Healthcare, and Auto are the three largest industries representing about 62% of total R&D spend

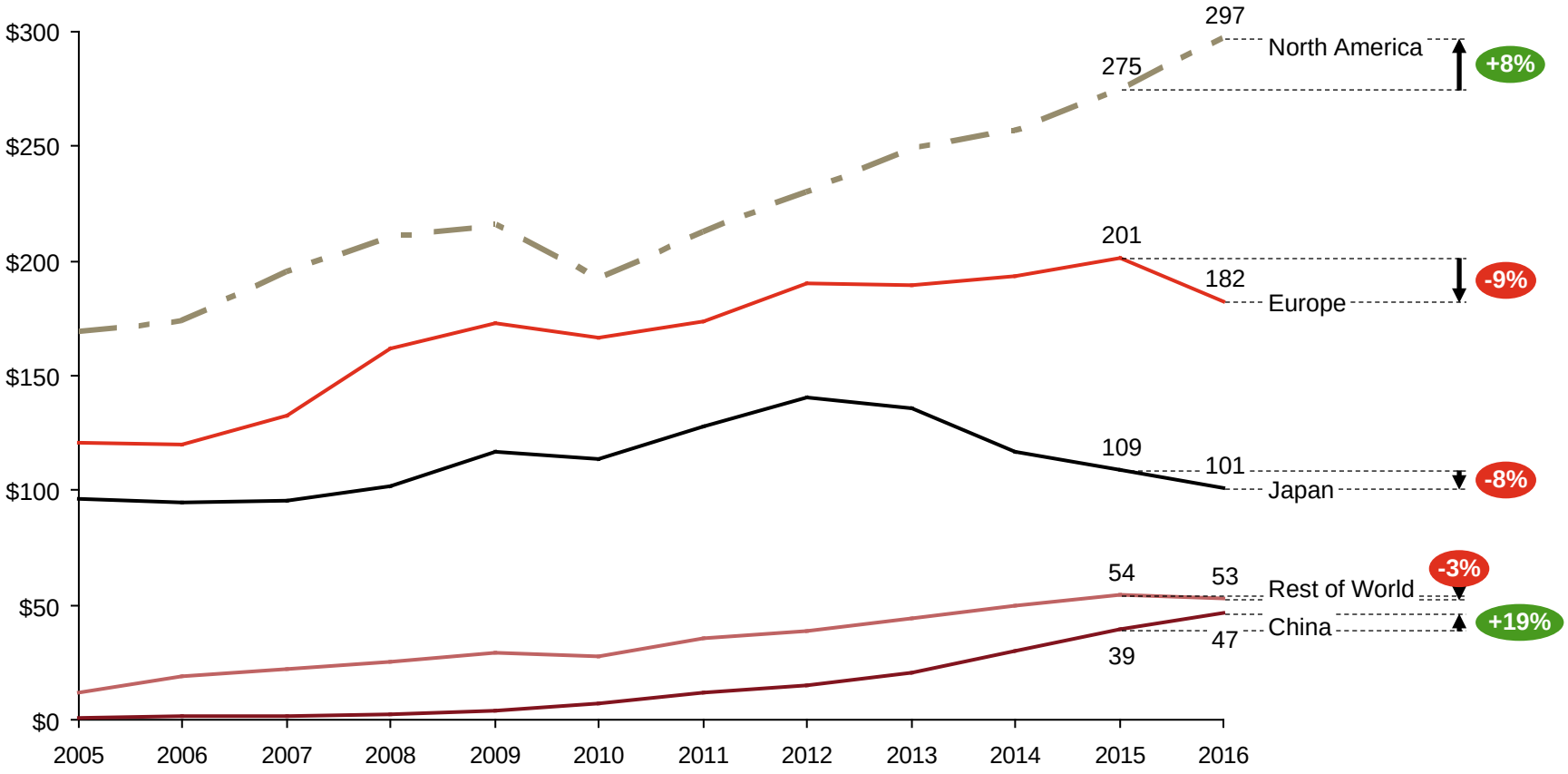


Source: 2016 Global Innovation 1000 study

R&D spending declined in Europe and Japan, but increased in North America and China

R&D spending by region

2005–2016, US$ Billions

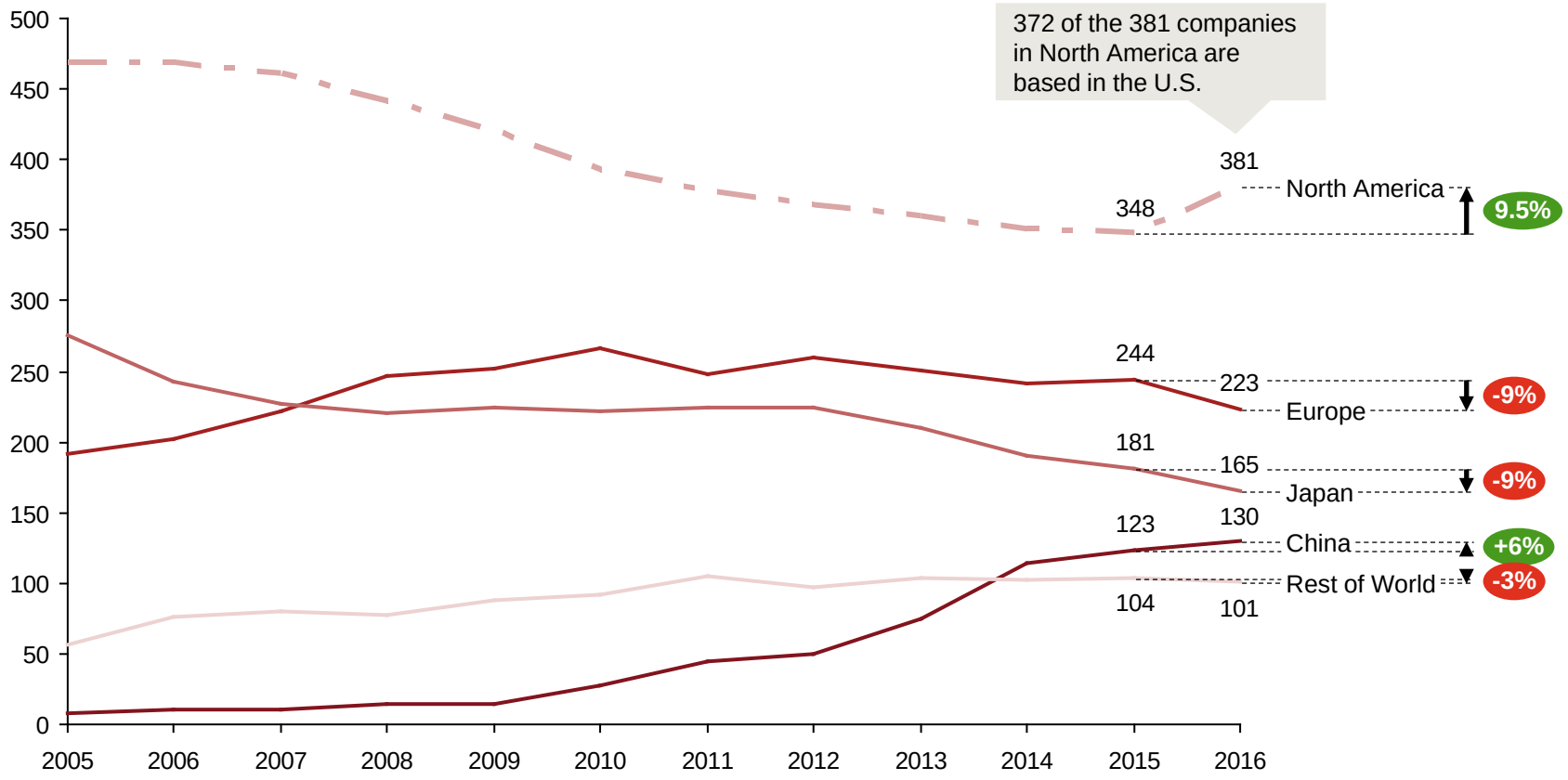


Source: 2016 Global Innovation 1000 study

For the first time in the study's history, N. America increased the number of companies in the top 1,000 – Up 9.5% y-o-y

Number of companies in the top 1,000 by region

2005–2016

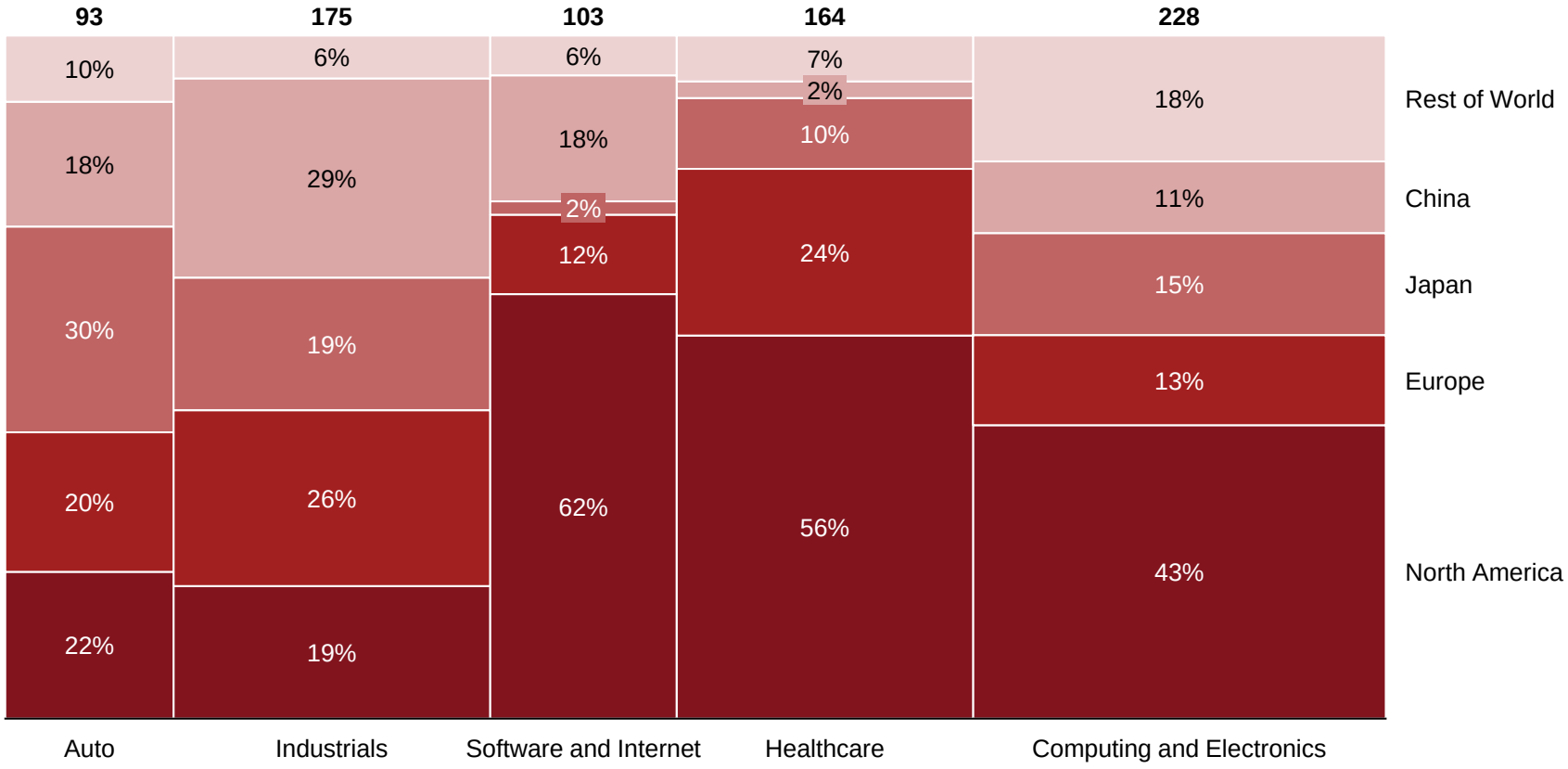


Source: 2016 Global Innovation 1000 study

US growth is driven by its large presence in high-growth R&D industries of Software & Internet and Healthcare

Number of companies in top 5 industries by region

2016



Source: 2016 Global Innovation 1000 study

Bristol-Myers Squibb and Oracle joined the top 20 largest R&D spenders and Apple moved up to 11th

Top 20 R&D Spenders

Rank 2016	Rank 2015	Change	Company	Geography	Industry	R&D spending (US$ Billions)	Revenue (US$ Billions)	R&D intensity
1	1	NA	Volkswagen AG	Europe	Auto	13.2	236.9	5.6%
2	2	NA	Samsung Electronics Co Ltd	South Korea	Computing and Electronics	12.7	177.5	7.2%
3	7	+4	Amazon.com Inc	North America	Software and Internet	12.5	107.0	11.7%
4	6	+2	Alphabet Inc	North America	Software and Internet	12.3	75.0	16.4%
5	3	-2	Intel Corp	North America	Computing and Electronics	12.1	55.4	21.9%
6	4	-2	Microsoft Corp	North America	Software and Internet	12.0	93.6	12.9%
7	5	-2	Roche Holding AG	Europe	Healthcare	10.0	50.1	19.9%
8	9	+1	Novartis AG	Europe	Healthcare	9.5	49.4	19.2%
9	10	+1	Johnson & Johnson	North America	Healthcare	9.0	70.1	12.9%
10	8	-2	Toyota Motor Corp	Japan	Auto	8.8	236.8	3.7%
11	18	+7	Apple Inc	North America	Computing and Electronics	8.1	233.7	3.5%
12	11	-1	Pfizer Inc	North America	Healthcare	7.7	48.9	15.7%
13	13	NA	General Motors Co	North America	Auto	7.5	152.4	4.9%
14	14	NA	Merck & Co Inc	North America	Healthcare	6.7	39.5	17.0%
15	15	NA	Ford Motor Co	North America	Auto	6.7	149.6	4.5%
16	12	-4	Daimler AG	Europe	Auto	6.6	166.0	4.0%
17	17	NA	Cisco Systems Inc	North America	Computing and Electronics	6.2	49.2	12.6%
18	20	2	AstraZeneca PLC	Europe	Healthcare	6.0	24.7	24.3%
19	32	+13	Bristol-Myers Squibb Co NEW	North America	Healthcare	5.9	16.6	35.7%
20	22	+2	Oracle Corp NEW	North America	Software and Internet	5.8	37.0	15.6%
Total						**179.4**	**2069.0**	**8.7%**

Source: 2016 Global Innovation 1000 study

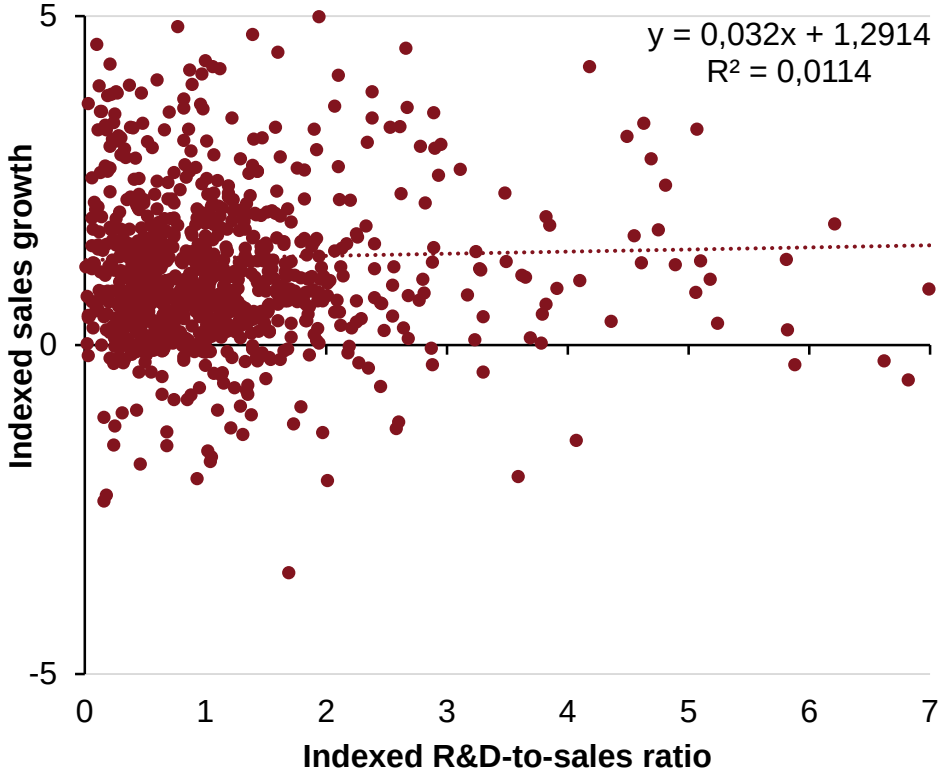
However, higher R&D spend doesn't ensure performance

The performance disconnect

Example analysis showing relation between R&D & financial performance

~10,000 analyses found *NO* statistical relationship between R&D spend and

- Sales growth
- Gross profit growth
- Operating profit growth
- Operating Margin
- Net profit growth
- Net Margin
- Market cap growth
- Total shareholder return



Source: Strategy& Global Innovation 1000 study

Apple and Alphabet (Google) continue to lead the most innovative list, while Facebook rejoined and 3M returned to third

10 Most Innovative Companies

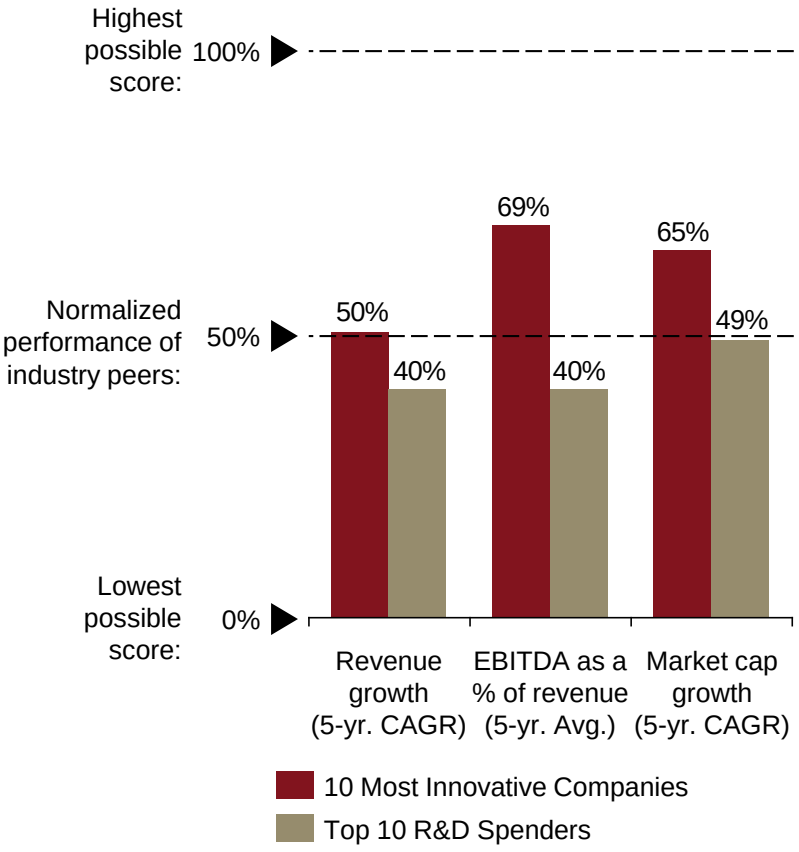
Rank	2010	2011	2012	2013	2014	2015	2016
1	Apple	Apple	Apple	Apple	Apple	Apple	Apple
2	Google	Google	Google	Google	Google	Google	Alphabet*
3	3M	3M	3M	Samsung	Amazon	Tesla	3M
4	General Electric	General Electric	Samsung	Amazon	Samsung	Samsung	Tesla
5	Toyota	Microsoft	General Electric	3M	Tesla	Amazon	Amazon
6	Microsoft	IBM	Microsoft	General Electric	3M	3M	Samsung
7	Procter & Gamble	Samsung	Toyota	Microsoft	General Electric	General Electric	Facebook
8	IBM	Procter & Gamble	Procter & Gamble	IBM	Microsoft	Microsoft	Microsoft
9	Samsung	Toyota	IBM	Tesla	IBM	IBM	General Electric
10	Intel	Facebook	Amazon	Facebook	Procter & Gamble	Toyota	IBM

Source: 2016 Global Innovation 1000 study. The 10 Most Innovative Companies are named by respondents to the 2016 survey of global innovation experts.
**In 2015, Google announced a corporate restructuring forming an umbrella company called Alphabet.*

For seven straight years, the 10 Most Innovative Companies have outperformed the Top 10 R&D Spenders

10 Most Innovative Companies* vs. Top 10 R&D Spenders

Rank	10 Most Innovative Companies	2016 R&D spend (US$ Bn)	R&D intensity	Top 10 R&D Spenders	2016 R&D spend (US$ Bn)	R&D intensity
1	Apple Inc	8.1	3.5%	Volkswagen AG	13.2	5.6%
2	Alphabet Inc	12.3	16.4%	Samsung Electronics Co Ltd	12.7	7.2%
3	3M Co	1.8	5.8%	Amazon.com Inc	12.5	11.7%
4	Tesla Motors Inc	0.7	17.7%	Alphabet Inc	12.3	16.4%
5	Amazon.com Inc	12.5	11.7%	Intel Corp	12.1	21.9%
6	Samsung Electronics Co Ltd	12.7	7.2%	Microsoft Corp	12.0	12.9%
7	Facebook Inc	4.8	26.9%	Roche Holding AG	10.0	19.9%
8	Microsoft Corp	12.0	12.9%	Novartis AG	9.5	19.2%
9	General Electric Co	4.2	3.7%	Johnson & Johnson	9.0	12.9%
10	International Business Machines Corp	5.2	6,4%	Toyota Motor Corp	8.8	3.7%



Source: 2016 Global Innovation 1000 study. The 10 Most Innovative Companies are named by respondents to the 2016 survey of global innovation experts.
**Facebook did not have Market Cap data spanning back 5 years.*

For the complete study and more information on the annual Strategy& Global Innovation 1000 study

Please visit:
http://www.strategyand.pwc.com/innovation1000

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