2015 Global Innovation 1000
Innovation’s New World Order
Introduction

R&D spending and trends

Globalization of R&D
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For the 11th year Strategy&, PwC’s strategy consulting business, studied innovation trends at the world’s 1,000 largest publicly listed corporate R&D spenders
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 recognition over past decade:

  - Called “the most comprehensive assessment of the relationship between R&D investment and corporate performance” by The Economist in 2009

  - Awards:
    - Silver (2011) and Gold Medals (2014) for original research by the American Society of Business Press Editors
    - “Best of Visions” award from PDMA in 2009
    - Special Achievement Award for advancing innovation dialog from the Innovate Forum in 2006

  - Cited in more than 180 publications spanning 27 countries & 6 continents
In addition to performing our annual R&D spending analysis, we examined the globalization of R&D

### R&D Spending and Trends

- **Analysis of R&D Spending and Trends**
  - Annual R&D spending across the 1,000 largest R&D spenders globally (publicly-traded firms)
  - R&D spending by region and industry (absolute spending, growth, and proportion of total)
  - R&D intensity (spending as a percent of revenue)
  - Top 20 R&D spenders globally
  - 10 Most Innovative Companies

- **Methodology**
  - Spending determined on the basis of companies’ annual reports from their most recent fiscal year, as of June 30, 2015
  - Most Innovative Companies determined based on a web survey of 369 senior R&D executives and Innovation leaders

### The Globalization of R&D

- **Understanding Global R&D Flows**
  - How much and where in the world are companies choosing to spend their R&D
  - How regional spending has changed since we last looked at this topic in 2008, “Beyond Borders”

- **Methodology**
  - We researched the global R&D footprint of:
    - Top 100 companies from the Global Innovation 1000
    - Top 50 companies in the largest three industries: auto, healthcare, and computing & electronics
    - Top 20 companies in industrials, and software & Internet
  - This resulted in 207 companies – reflecting overlap – which are headquartered in 23 countries, conducting R&D activities at 2,041 R&D sites in more than 60 countries, and represent 71% of the total Global Innovation 1000 R&D spend.
Introduction

**R&D spending and trends**

**Globalization of R&D**
Executive Summary

- In 2015, R&D spending by the Global Innovation 1000 increased 5.1% to $680 billion, the largest year-over-year increase since 2012. R&D spending is now in line with the long-term trend of R&D spending growth of 5.4% over the last 10 years.

- R&D intensity – spending as a percent of revenue - also spiked to 3.7% from 3.5% in 2014, which is the result of falling revenues experienced by the Global Innovation 1000. Similar to what happened in 2010 after the Great Recession, companies tend to stick with their innovation program despite cyclical revenue fluctuations.

- Software & Internet had the highest year-over-year growth rate (27%) of all the industries, which propelled it past the industrials sector to become the fourth-largest industry by R&D spend.

- Apple made its first-ever appearance in the Top 20 R&D Spenders list and has an intensity of 3.3%, compared to an average of 12.5% for the other 19 companies on the list.

- Apple and Google remain the two most innovative companies, according to our survey respondents, while Tesla jumps to third place, pushing Amazon down to fifth. Toyota rejoins the ranking at number 10 after a two-year hiatus.
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& 2015 Global Innovation 1000 analysis, Bloomberg data, Capital IQ data
...however, there is a minimum threshold – you can be “Too Rich” or “Too Thin”

The Performance Disadvantage of the Bottom 10% of Spenders

- Spending much less than industry median **does** lead to consistently lower performance
- Spending much more than industry median does **not** drive consistently better performance

Source: Strategy& 2015 Global Innovation 1000 analysis, Bloomberg data, Capital IQ data
In 2015, R&D spending by the Global Innovation 1000 saw the return to the long-term growth trend

Global Innovation 1000 R&D Spending
$US Billions

Y-o-Y Growth  2.2%  9.3%  12.2%  7.3%  -5.6%  10.3%  9.7%  3.8%  1.4%  5.1%

Source: Strategy& 2015 Global Innovation 1000 analysis, Bloomberg data, Capital IQ data
Innovation 1000 firm revenue fell 1%, reversing the long-term trend of decreasing R&D intensity

Global Innovation 1000 R&D Intensity (Spending as a Percent of Revenue)

Source: Strategy& 2015 Global Innovation 1000 analysis, Bloomberg data, Capital IQ data
Computing & electronics, healthcare, and auto continue to be the three largest industries in terms of total R&D spend

2015 R&D Spending by Industry
Total = $680 Billion

Source: Strategy& 2015 Global Innovation 1000 analysis, Bloomberg data, Capital IQ data

Strategy& | PwC
October 2015
Software & Internet passed industrials and healthcare is closing in on C&E as the largest industry by R&D spend.

R&D Spending by Industry
$US Billions

Source: Strategy& 2015 Global Innovation 1000 analysis, Bloomberg data, Capital IQ data
Software & internet grew at over 27%, far greater than the growth of all other industries from 2014 to 2015

% Change in R&D Spending by Industry
2014-2015

Source: Strategy& 2015 Global Innovation 1000 analysis, Bloomberg data, Capital IQ data
Apple made its first-ever appearance in the Top 20 R&D Spenders in 2015 despite having a low intensity

### Top 20 R&D Spenders

<table>
<thead>
<tr>
<th>Rank</th>
<th>Company</th>
<th>Region</th>
<th>Industry</th>
<th>2015 R&amp;D Spending ($B)</th>
<th>Intensity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Volkswagen</td>
<td>Europe</td>
<td>Auto</td>
<td>15.3</td>
<td>5.7%</td>
</tr>
<tr>
<td>2</td>
<td>Samsung</td>
<td>Asia</td>
<td>Computing and Electronics</td>
<td>14.1</td>
<td>7.2%</td>
</tr>
<tr>
<td>3</td>
<td>Intel</td>
<td>North America</td>
<td>Computing and Electronics</td>
<td>11.5</td>
<td>20.6%</td>
</tr>
<tr>
<td>4</td>
<td>Microsoft</td>
<td>North America</td>
<td>Software/Internet</td>
<td>11.4</td>
<td>13.1%</td>
</tr>
<tr>
<td>5</td>
<td>Roche</td>
<td>Europe</td>
<td>Healthcare</td>
<td>10.8</td>
<td>20.8%</td>
</tr>
<tr>
<td>6</td>
<td>Google</td>
<td>North America</td>
<td>Software/Internet</td>
<td>9.8</td>
<td>14.9%</td>
</tr>
<tr>
<td>7</td>
<td>Amazon</td>
<td>North America</td>
<td>Software/Internet</td>
<td>9.3</td>
<td>10.4%</td>
</tr>
<tr>
<td>8</td>
<td>Toyota</td>
<td>Asia</td>
<td>Auto</td>
<td>9.2</td>
<td>3.7%</td>
</tr>
<tr>
<td>9</td>
<td>Novartis</td>
<td>Europe</td>
<td>Healthcare</td>
<td>9.1</td>
<td>17.3%</td>
</tr>
<tr>
<td>10</td>
<td>Johnson &amp; Johnson</td>
<td>North America</td>
<td>Healthcare</td>
<td>8.5</td>
<td>11.4%</td>
</tr>
<tr>
<td>11</td>
<td>Pfizer</td>
<td>North America</td>
<td>Healthcare</td>
<td>8.4</td>
<td>16.9%</td>
</tr>
<tr>
<td>12</td>
<td>Daimler</td>
<td>Europe</td>
<td>Auto</td>
<td>7.6</td>
<td>4.4%</td>
</tr>
<tr>
<td>13</td>
<td>General Motors</td>
<td>North America</td>
<td>Auto</td>
<td>7.4</td>
<td>4.7%</td>
</tr>
<tr>
<td>14</td>
<td>Merck</td>
<td>North America</td>
<td>Healthcare</td>
<td>7.2</td>
<td>17.0%</td>
</tr>
<tr>
<td>15</td>
<td>Ford</td>
<td>North America</td>
<td>Auto</td>
<td>6.9</td>
<td>4.8%</td>
</tr>
<tr>
<td>16</td>
<td>Sanofi</td>
<td>Europe</td>
<td>Healthcare</td>
<td>6.4</td>
<td>14.1%</td>
</tr>
<tr>
<td>17</td>
<td>Cisco</td>
<td>North America</td>
<td>Computing and Electronics</td>
<td>6.3</td>
<td>13.4%</td>
</tr>
<tr>
<td>18</td>
<td>Apple</td>
<td>North America</td>
<td>Computing and Electronics</td>
<td>6.0</td>
<td>3.3%</td>
</tr>
<tr>
<td>19</td>
<td>GlaxoSmithKline</td>
<td>Europe</td>
<td>Healthcare</td>
<td>5.7</td>
<td>15.0%</td>
</tr>
<tr>
<td>20</td>
<td>AstraZeneca</td>
<td>Europe</td>
<td>Healthcare</td>
<td>5.6</td>
<td>21.4%</td>
</tr>
</tbody>
</table>

Honda fell to #21, IBM fell to #26.

Increase or decrease within Top 20 ranking compared with 2014

Companies that have been among the Top 20 R&D Spenders since 2005

Total $176.5

Source: Strategy& 2015 Global Innovation 1000 analysis, Bloomberg data, Capital IQ data
Apple & Google continue to lead the Most Innovative list, while Tesla has moved up to third

10 Most Innovative Companies

<table>
<thead>
<tr>
<th>Rank</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Apple</td>
<td>Apple</td>
<td>Apple</td>
<td>Apple</td>
<td>Apple</td>
<td>Apple</td>
</tr>
<tr>
<td>2</td>
<td>Google</td>
<td>Google</td>
<td>Google</td>
<td>Google</td>
<td>Google</td>
<td>Google</td>
</tr>
<tr>
<td>3</td>
<td>3M</td>
<td>3M</td>
<td>3M</td>
<td>Samsung</td>
<td>Amazon</td>
<td>Tesla</td>
</tr>
<tr>
<td>4</td>
<td>General Electric</td>
<td>General Electric</td>
<td>Samsung</td>
<td>Amazon</td>
<td>Samsung</td>
<td>Samsung</td>
</tr>
<tr>
<td>5</td>
<td>Toyota</td>
<td>Microsoft</td>
<td>General Electric</td>
<td>3M</td>
<td>Tesla</td>
<td>Amazon</td>
</tr>
<tr>
<td>6</td>
<td>Microsoft</td>
<td>IBM</td>
<td>Microsoft</td>
<td>General Electric</td>
<td>3M</td>
<td>3M</td>
</tr>
<tr>
<td>7</td>
<td>Procter &amp; Gamble</td>
<td>Samsung</td>
<td>Toyota</td>
<td>Microsoft</td>
<td>General Electric</td>
<td>General Electric</td>
</tr>
<tr>
<td>8</td>
<td>IBM</td>
<td>Procter &amp; Gamble</td>
<td>Procter &amp; Gamble</td>
<td>IBM</td>
<td>Microsoft</td>
<td>Microsoft</td>
</tr>
<tr>
<td>9</td>
<td>Samsung</td>
<td>Toyota</td>
<td>IBM</td>
<td>Tesla</td>
<td>IBM</td>
<td>IBM</td>
</tr>
<tr>
<td>10</td>
<td>Intel</td>
<td>Facebook</td>
<td>Amazon</td>
<td>Facebook</td>
<td>Procter &amp; Gamble</td>
<td>Toyota</td>
</tr>
</tbody>
</table>

Source: Strategy& 2015 Global Innovation 1000 survey data and analysis
As in previous years, the 10 Most Innovative Companies outperform the top 10 R&D spenders

2015 10 Most Innovative Companies* vs. 2015 Top 10 R&D Spenders

Financial performance normalized by indexing values within each industry

Source: Strategy& 2015 Global Innovation 1000 analysis, Bloomberg data, Capital IQ data
*Only 9 of the 10 Most Innovative Companies were included in Market-Cap Growth. Tesla was removed as it does not have Market-Cap data spanning back five years.
Introduction

R&D spending and trends

Globalization of R&D
**Executive Summary**

- R&D is now a global activity for the vast majority of major corporations, as 94% conduct R&D in countries beyond their home country.

- Asia has become the number one region for corporate R&D spending, Europe has fallen to number three, and North America remains in second place. In our 2008 study, this order was reversed.

- Asia’s rise was driven by strong imports and domestic R&D spending. Most notably, China increased in-country R&D spending by 79% and is closing in on the U.S. as the largest country destination for imported R&D.

- The U.S. is still the largest in-country (domestic and imported) R&D spender. However, its overall lead is shrinking against most Asian countries, but expanded over most Western European countries.

- Europe’s fall to third-largest region for R&D spending was the result of low growth in domestic and imported R&D, and high growth in exported R&D; most noticeably in France and Germany.

- Surveyed R&D professionals ranked access to talent and proximity to customers higher than tax advantages in choosing where to conduct R&D.
The largest spenders by region have remained the same, but where they spend their R&D has changed

Corporate R&D by Companies
Headquartered Region
2007 & 2015 $US Billions

<table>
<thead>
<tr>
<th>Region</th>
<th>2007</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td>24%</td>
<td>34%</td>
</tr>
<tr>
<td>Europe</td>
<td>34%</td>
<td>45%</td>
</tr>
<tr>
<td>North America</td>
<td>42%</td>
<td>25%</td>
</tr>
<tr>
<td>Rest of World</td>
<td>0%</td>
<td>1%</td>
</tr>
</tbody>
</table>

Corporate In-Region (Domestic & Imported) R&D
2007 & 2015 $US Billions

<table>
<thead>
<tr>
<th>Region</th>
<th>2007</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td>27%</td>
<td>34%</td>
</tr>
<tr>
<td>Europe</td>
<td>34%</td>
<td>28%</td>
</tr>
<tr>
<td>North America</td>
<td>33%</td>
<td>35%</td>
</tr>
<tr>
<td>Rest of World</td>
<td>9%</td>
<td>5%</td>
</tr>
</tbody>
</table>

In 2015, almost half of all R&D spend came from North American companies, but only about a third of all R&D was actually done in North America.

Asia is now the top regional destination for R&D spending, followed by North America and Europe. In 2007, that order was reversed.

Source: Strategy& 2015 Global Innovation 1000 analysis
Asia’s rise as the top region for R&D spending was driven by both robust imports and domestic spending

Asia In-Country (Domestic & Imported) R&D
2007 & 2015 $US Billions

Source: Strategy& 2015 Global Innovation 1000 analysis
Leading the way for Asia was China, which is closing in on the U.S. as the largest country for imported R&D

Top Five Countries That China Imported R&D from
2007 & 2015 $US Billions

Imported R&D by Country
2007 & 2015 $US Billions

Source: Strategy& 2015 Global Innovation 1000 analysis
R&D professionals ranked strategic reasons higher than cost advantages when moving R&D functions to China

What Are the Benefits of Moving R&D Functions to China?

n = 369

Top three responses based on proximity

- Proximity to High Growth Market: 71%
- Proximity to Key Manufacturing Sites: 59%
- Proximity to Key Suppliers: 54%
- Lower Development Costs: 53%
- Access to Technical Talent: 39%
- Easier Place to Export to the Rest of the World: 33%
- Experienced Labor Market: 30%
- Reliability of Project Execution: 26%

Source: Strategy& 2015 Global Innovation 1000 survey data and analysis
The U.S. remains the largest in-country R&D spender...

In-Country (Domestic & Imported) R&D
2007 & 2015 $US Billions

Source: Strategy& 2015 Global Innovation 1000 analysis
...however, its lead against key Asian countries is eroding

% Change 2007-2015, In-Country (Domestic and Imported) R&D Relative to the U.S.
Height of bar = 2015 In-Country R&D Spend ($US Billions)

Source: Strategy& 2015 Global Innovation 1000 analysis
*Eastern Europe Includes: Russia, Poland, Romania, Czech Republic, Slovakia, Croatia, Hungary, Bulgaria, Estonia, Latvia, Serbia, Turkey, and Slovenia
**U.S. firms significantly increased R&D performed in low-cost Asian countries such as China and India**

**U.S. HQ Firms’ R&D Allocation**

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>45%</td>
<td>43%</td>
</tr>
<tr>
<td>Asia</td>
<td>27%</td>
<td>25%</td>
</tr>
<tr>
<td>Europe</td>
<td>17%</td>
<td>21%</td>
</tr>
<tr>
<td>Rest of World</td>
<td>11%</td>
<td>11%</td>
</tr>
</tbody>
</table>

**Top 7 Countries That the U.S. Exported R&D to**

<table>
<thead>
<tr>
<th></th>
<th>2007 $US Billions</th>
<th>2015 $US Billions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Canada</td>
<td>6%</td>
<td>7%</td>
</tr>
<tr>
<td>Germany</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>Israel</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>China</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>India</td>
<td>10%</td>
<td>15%</td>
</tr>
<tr>
<td>Rest of World</td>
<td>36%</td>
<td>36%</td>
</tr>
</tbody>
</table>

In 2007, the U.K. was the top export destination for U.S. R&D. In 2015, it was third.

Source: Strategy& 2015 Global Innovation 1000 analysis
Europe’s decline was the result of low growth in domestic and imported R&D, and high growth in exported R&D

% Change in R&D Spending By Region
2007-2015

North America
Europe
Asia

Source: Strategy& 2015 Global Innovation 1000 analysis

Strategy& | PwC

October 2015
European firms increased their R&D allocation to Asian and North American high-cost countries

European HQ Firms’ R&D Allocation
2007 vs. 2015 $US Billions

Source: Strategy& 2015 Global Innovation 1000 analysis
Note: High-cost countries (HCC) refers to countries with an average engineering wage > $35,000. All countries with an average engineering wage of less than or equal to $35,000 are low-cost countries (LCC).

European firms decreased their total R&D allocated to Europe from 57% in 2007 to 48% in 2015.
The three largest economies in Europe - the U.K., France, and Germany - all increased their share of exported R&D

R&D Allocation by Country
2007 vs. 2015 $US Billions

Source: Strategy& 2015 Global Innovation 1000 analysis
In fact, France only saw positive growth in exported R&D, but those exports were not to other European countries.

% Change in R&D Spending in France 2007-2015

<table>
<thead>
<tr>
<th>% Change</th>
<th>R&amp;D Imported</th>
<th>R&amp;D by Domestic Companies</th>
<th>R&amp;D Exported</th>
</tr>
</thead>
<tbody>
<tr>
<td>-21%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-20%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

% Change in R&D Spending in France 2007-2015

French HQ Firms’ R&D Export Allocation 2007 & 2015 $US Billions

- 2015:
  - Europe: 33%
  - North America: 29%
  - Asia: 29%
  - Rest of World: 12%

- 2007:
  - Europe: 32%
  - North America: 38%
  - Asia: 26%
  - Rest of World: 0%

Source: Strategy& 2015 Global Innovation 1000 analysis

North America replaced Europe as the primary destination for French R&D.
R&D professionals ranked access to talent and proximity to customers as top factors in choosing where to conduct R&D

The Most Important Attributes When Considering Where to Conduct Your R&D
n = 369

Source: Strategy& 2015 Global Innovation 1000 survey data and analysis
R&D professionals ranked attributes related to managing employees most challenging when conducting R&D abroad

The Most Challenging Attributes When Conducting R&D Outside of Home Country
n = 369

- Finding/Retaining Talent: 53%
- Intellectual Property Protection: 51%
- Quality and Customer Focus: 47%
- Risk/Project Management: 43%
- Managing Cultural Differences: 41%
- Focus on Profitability*: 39%

Source: Strategy& 2015 Global Innovation 1000 survey data and analysis
* Focus on profitability includes those who voted for "Currency risk" and "Return on investment"
In both 2007 and 2015, companies investing in R&D globally performed ~20% better over local R&D spenders.

Global R&D vs. Local R&D Driven
Median of OI CAGR, Op Margin, and ROA

Discussion
- Global R&D Driven companies invest more than 60% of their R&D spend on facilities outside their home country annually.
- Local R&D Driven companies invest less than 60% of R&D spend on facilities outside their home country annually.

Source: Strategy& 2015 Global Innovation 1000 analysis
Note: In 2015, 38.57% is the median R&D spend at home among the universe of 207 companies studied; % of R&D spend in home countries ranges from 0 to 100%; Companies selected for the study are top 100 R&D spenders overall, the top 50 spenders in Auto, C&E and Health, and the top 20 in industrials and software.
Unlike in 2007, companies with more dispersed R&D footprints now outperform companies with focused ones.

Highly Focused vs. Dispersed R&D Footprints
Median of OI CAGR, TSR, and Market Cap CAGR

Discussion
- Highly Focused R&D Footprint players have the smallest number of R&D sites, after indexing against sales.
- Dispersed R&D Footprint players have a widespread network of R&D locations.

Source: Strategy& 2015 Global Innovation 1000 analysis
Note: In 2015, highly focused R&D footprint companies have less than 1.3 sales indexed R&D location, (1.3 representing the 25% percentile in the universe of 207 companies); Number of indexed R&D locations range from 0.03 to 40.77; Dispersed R&D Footprint companies have more than 1.3 sales indexed R&D location.
For the complete study and more information on the annual Strategy& Global Innovation 1000 study

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

For media or other inquiries, please contact: Kiran Chauhan
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kiran.chauhan@ca.pwc.com
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