Creating a Culture of Innovation
A Global View of Innovation

Linking Innovation with Value

Embedding a Culture of Innovation
The Increasing Pace of Change

New Technologies
(i.e., Computers, Cellphones, Internet)

Old Technologies
(i.e., Telephones, Electricity, Automobiles)

Market Penetration of U.S. Households (Million Units)

Number of Years to Adopt

Technology
- Telephone
- Electricity
- Auto
- Radio
- Refrigerator
- Air Conditioner
- Color TV
- Microwave
- VCR
- Computer
- Cellphone
- Internet

Source: Michael Felton, New York Times
When asked to evaluate their success with idea generation and idea conversion only one quarter of the respondents claimed to be highly effective at both.

Source: Strategy& analysis
Innovation Related Spend

Indexing to 1998

Innovation + R&D spending in 2015 rose 5.1% from 2014

R&D Spending

Revenue

R&D Spending as a % of Revenue

Source: Bloomberg data, Capital IQ data, Strategy& analysis
Global Shifts in Spending, 2007-15

Corporate Innovation Spending
By Headquarters
(US$ Billions)

In-Region Innovation Spending
Domestic and Imported
(US$ Billions)

Source: Bloomberg data. Capital IQ data, Strategy& analysis
A Country View of Spending, 2007-15

In-Country Innovation Spending
Domestic and Imported with +$10B Spent in 2015
(US$ Billions)

2007 2015

U.S. $109
Japan $40
Germany $28
China $25
U.K. $23
France $20
India $13
Canada $9
Italy $8
S. Korea $7
Israel $7

U.S. $145
China $55
Japan $50
Germany $32
India $28
U.K. $22
France $16
S. Korea $13
Israel $11
Italy $11
Canada $10
Change in Spending by Region - 2014-15

<table>
<thead>
<tr>
<th>Region</th>
<th>Change in Spending</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>31.6%</td>
</tr>
<tr>
<td>Rest of World</td>
<td>9.5%</td>
</tr>
<tr>
<td>North America</td>
<td>7.1%</td>
</tr>
<tr>
<td>Europe</td>
<td>4.0%</td>
</tr>
<tr>
<td>Japan</td>
<td>-6.3%</td>
</tr>
</tbody>
</table>

Weighted Average: 5.1%

Source: Bloomberg data, Capital IQ data, Strategy& analysis
China Attracts Innovation Spending

Innovation spending in China by companies headquartered in other countries nearly doubled from 2007 to 2015, led by the United States.

China’s Imported Innovation

$U.S. Billions

North America
Europe
Asia
Other

Rest of World
Other Europe
France
South Korea
Switzerland
Germany
Japan
U.S.

2007
2015

Note: Totals may not equal due to rounding
Source: Bloomberg data, Capital IQ data, Strategy& analysis
The Top 20 R&D Spenders

<table>
<thead>
<tr>
<th>Company</th>
<th>2015 Rank</th>
<th>2014 Rank</th>
<th>Change from 2014</th>
<th>% of Revenue</th>
<th>2015 US$ Billion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volkswagen</td>
<td>1</td>
<td>1</td>
<td>13%</td>
<td>5.7%</td>
<td>$15.3</td>
</tr>
<tr>
<td>Samsung</td>
<td>2</td>
<td>2</td>
<td>5%</td>
<td>7.2%</td>
<td>$14.1</td>
</tr>
<tr>
<td>Intel</td>
<td>3</td>
<td>3</td>
<td>9%</td>
<td>20.6%</td>
<td>$11.5</td>
</tr>
<tr>
<td>Microsoft</td>
<td>4</td>
<td>4</td>
<td>9%</td>
<td>13.1%</td>
<td>$11.4</td>
</tr>
<tr>
<td>Roche</td>
<td>5</td>
<td>5</td>
<td>8%</td>
<td>20.8%</td>
<td>$10.8</td>
</tr>
<tr>
<td>Google</td>
<td>6</td>
<td>9</td>
<td>24%</td>
<td>14.9%</td>
<td>$9.8</td>
</tr>
<tr>
<td>Amazon</td>
<td>7</td>
<td>14</td>
<td>41%</td>
<td>10.4%</td>
<td>$9.3</td>
</tr>
<tr>
<td>Toyota</td>
<td>8</td>
<td>7</td>
<td>1%</td>
<td>3.7%</td>
<td>$9.2</td>
</tr>
<tr>
<td>Novartis</td>
<td>9</td>
<td>6</td>
<td>-8%</td>
<td>17.3%</td>
<td>$9.1</td>
</tr>
<tr>
<td>Johnson &amp; Johnson</td>
<td>10</td>
<td>8</td>
<td>4%</td>
<td>11.4%</td>
<td>$8.5</td>
</tr>
</tbody>
</table>

Companies in **RED** have been among the top 20 R&D spenders every year since 2005

Source: Bloomberg data, Capital IQ data, Strategy& analysis

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<tr>
<th>Company</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Pfizer</td>
<td>11</td>
<td>13</td>
<td>26%</td>
<td>16.9%</td>
<td>$8.4</td>
</tr>
<tr>
<td>Daimler</td>
<td>12</td>
<td>12</td>
<td>9%</td>
<td>4.4%</td>
<td>$7.6</td>
</tr>
<tr>
<td>General Motors</td>
<td>13</td>
<td>11</td>
<td>3%</td>
<td>4.7%</td>
<td>$7.4</td>
</tr>
<tr>
<td>Merck</td>
<td>14</td>
<td>10</td>
<td>-4%</td>
<td>17.0%</td>
<td>$7.2</td>
</tr>
<tr>
<td>Ford</td>
<td>15</td>
<td>15</td>
<td>8%</td>
<td>4.8%</td>
<td>$6.9</td>
</tr>
<tr>
<td>Sanofi</td>
<td>16</td>
<td>16</td>
<td>1%</td>
<td>14.1%</td>
<td>$6.4</td>
</tr>
<tr>
<td>Cisco Systems</td>
<td>17</td>
<td>20</td>
<td>6%</td>
<td>13.4%</td>
<td>$6.3</td>
</tr>
<tr>
<td>Apple</td>
<td>18</td>
<td>32</td>
<td>35%</td>
<td>3.3%</td>
<td>$6.0</td>
</tr>
<tr>
<td>GlaxoSmithKline</td>
<td>19</td>
<td>19</td>
<td>-7%</td>
<td>15.0%</td>
<td>$5.7</td>
</tr>
<tr>
<td>AstraZeneca</td>
<td>20</td>
<td>28</td>
<td>16%</td>
<td>21.4%</td>
<td>$5.6</td>
</tr>
</tbody>
</table>

Top 20 Total | $176.5 | 9% | 8.4%
# The Top 10 Most Innovative Companies

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Apple</td>
<td>$ 6.0</td>
<td>18</td>
<td>3.3%</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Google</td>
<td>$ 9.8</td>
<td>6</td>
<td>14.9%</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>Tesla Motors</td>
<td>$ 0.5</td>
<td>273</td>
<td>14.5%</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Samsung</td>
<td>$ 14.1</td>
<td>2</td>
<td>7.2%</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>Amazon</td>
<td>$ 9.3</td>
<td>7</td>
<td>10.4%</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>3M</td>
<td>$ 1.8</td>
<td>80</td>
<td>5.6%</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>GE</td>
<td>$ 4.2</td>
<td>36</td>
<td>2.9%</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>Microsoft</td>
<td>$ 11.4</td>
<td>4</td>
<td>13.1%</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>IBM</td>
<td>$ 5.4</td>
<td>26</td>
<td>5.9%</td>
</tr>
<tr>
<td>10</td>
<td>11</td>
<td>Toyota</td>
<td>$ 9.2</td>
<td>8</td>
<td>3.7%</td>
</tr>
</tbody>
</table>

Companies in **RED** have been among the 10 most innovative every year since 2010

*Source: Bloomberg data, Capital IQ data, Strategy& survey data and analysis*
Top 10 Innovators vs. Top 10 R&D Spenders

On an indexed basis, the top innovators led on all three financial metrics for the sixth straight year.

Highest possible score is 100
Source: Bloomberg data, Capital IQ data, Strategy& survey data and analysis
The Success of Need Seekers

% of Companies with Highly Aligned Business & Innovation Strategies

85.1%
54.8%
60.6%

% of Companies that Financially Outperform Their Competitors

57.6%
44.9%
39.9%

Source: Strategy& Global Innovation 1000 survey data and analysis
In the earliest stage of innovation, companies focus on and disproportionately employ the tools that are more closely aligned to their chosen innovation strategy, whether they are Need Seekers, Market Readers, or Technology drivers.

- **End-User Insight Tools**
  - Need Seekers: 1.17
  - Market Readers: 0.92
  - Technology Drivers: 0.96

- **Market Insight Tools**
  - Need Seekers: 0.91
  - Market Readers: 1.16
  - Technology Drivers: 0.91

- **Technology Foresight Tools**
  - Need Seekers: 0.85
  - Market Readers: 0.90
  - Technology Drivers: 1.21

Source: Strategy& analysis
Utility Sector Evolution

Timeline of Key Developments in the Utility Industry

Early 1900s

1960s

1980s

1990s

2000s

2010

Technology

Auto. Generation Control

System Operation Computers

Advanced Gas Turbines

Digital Relaying

High Voltage DC ("HVDC light")

Utility ‘Last mile’ Communications (Fiber-to-home, WiMax, Wi-Fi)

Advanced Metering

Notes: Strategy& analysis

SEL introduces digital protective relays in 1984 12-15 years for adoption

MHI developed high efficiency GT, but commercial operations took 15-18 years

AGCs took over 15 years to evolve from legacy dispatch methods

Computers for grid operations took 20 years to be adopted as today’s Energy Mgmt systems

Most digital communications developed more than 20 years ago still have less than 25% penetration in the "last mile"

ABB introduced voltage source converters; only a few projects in the last 20 years

New technology has historically taken more than a decade for market adoption

Introduces around 2005, but penetration increased in 2009-10 and stands at ~35%

Notes: Strategy& analysis
Utilities Lag Most Sectors

Source: PMG Signals of Performance, PRTM/PwC Service Innovation Benchmarking Study
The Business Foresight focus raises the key questions, ‘Where do you play, how do you play, and how do you ‘win’?’

## Capabilities of Top Performers

<table>
<thead>
<tr>
<th>Capability</th>
<th>Need Seekers</th>
<th>Market Readers</th>
<th>Technology Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer needs translated to product development</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market potential assessment</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Open innovation</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Technical risk assessment</td>
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<td></td>
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<tr>
<td>Rigorous decision making</td>
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<td></td>
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<tr>
<td>Directly generated, deep customer insights and analytics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enterprise-wide product launch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource requirement management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplier/partner engagement in development process</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detailed understanding of emerging technologies / trends</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product life-cycle management</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: Strategy& Global Innovation 1000 survey data and analysis*
The Digital Tool Landscape

Most Effective Tools
- Rapid prototyping (incl. 3D printing)
- Simulation tools
- Codesign tools
- Computer-aided design
- Interaction simulation
- Project management
- Application development
- Collaborative environments
- Mash-up tools
- Enhanced product life-cycle management systems

Least Effective Tools
- Customer immersion labs
- Big data tools
- Visual simulation
- Customer profiling
- Automated product usage tools
- Monitoring tools
- Digital focus groups
- E-commerce tracking
- Customer sentiment analysis
- Discussion platforms
- Vision narratives
- Crowdsourcing
- Social voting
- Idea capture tools
- Patent scanning
- Nascent tool provides data on customer use patterns

Market and Customer Insight Enabler Tool

Circle Size = Percentage of respondents using each tool

Source: Strategy& analysis
Stages of Innovation Pursuit

Innovation Stages

- **Level 1**: 
  - Range of Focus: Impact to Utility
  - Innovation Types:
    - **INNOVATION**: *break-through strategic moves* that create or unlock markets and build the business model of the future, e.g., advanced energy hubs
    - **Innovation**: *advanced thinking* that moves the business forward to enhanced market positioning, e.g., DERS deployment
    - **Innovation**: *incremental gains* within the business driven by an operational focus, e.g., performance execution
Defining the Culture of Innovation

What a Culture of Innovation Looks Like

- **Innovation Culture**
  - Idea Conversion
  - Incentives alignment
  - Ownership and Accountability
  - Talent Integration
  - Teamwork and Open Collaboration
  - Risk-Taking
  - Continuous Ideation
  - Market and Customer Insight and Foresight
  - Strategic Clarity and Coherence

- **Community Alignment**

- **Tangible Action Plans**

- **Strategy Articulation**

- **Challenge to Status Quo**
Embedding an Innovative Culture

**Leadership:** Inspires and supports behavior change
- Act as role models, ‘walk the talk’
- Show tolerance for risk and failure – recognition that innovation is different from development
- Provide safe and encouraging/rewarding environment

**Structure:** For innovation
- ‘Insulated but not isolated’
- Dedicated, small group to lead/drive
- Defined ties to the business
- Work virtually as needed
- Protected funding – separate from development

**Management:** That motivates
- Metrics – emphasize the right behavior (e.g., breakthroughs)
- Motivators – recognition, ‘wall of fame’, visibility
- Training

**Culture:** Of a startup
- ‘Can-do’ attitude
- Solution orientation
- Agile, flexible and quick
- Thirst for revenue
- Boot-strap approach
- Collaborative

**Talent:** Creative, non-linear
- Comfort with ambiguity
- Non-linear thinking
- Passion for business success; results-driven
- Bias for action; sense of urgency
Defining the Right Objectives

Objectives

Strategy Alignment
- Linkage of innovation priorities with enterprise priorities
- Shaping of the innovation portfolio to business needs
- Demonstration of innovation value and ROI
- Support to revenue goal attainment

Business Positioning
- Advancement of technology capabilities and deployment
- Anticipation and satisfaction of customer requirements
- Creation of a portfolio of ‘market-back’ offerings
- Fulfillment of unrecognized and unmet needs

Financial Contribution

Products and Services