Innovation Ecosystem: From a Company to a Nation

NEDO Forum

Dr. William Jeffrey
SRI President & CEO
February 12, 2015
Today’s Agenda

• **Introduction**
• What is Innovation?
• *Survival* of the Innovative Company
• Innovation Ecosystem & the Role for Governments
• Concluding Thoughts
SRI - Who We Are

World-changing solutions to make people safer, healthier, and more productive

- Founded by Stanford in 1946
  - Located in heart of Silicon Valley
  - Nonprofit corporation
  - Independent in 1970
- 2,300 staff members
  - Approximately 50% with advanced degrees
  - More than 20 locations worldwide
- Expanding Internationally
SRI International: Changing the World -- Repeatedly

People use multiple SRI innovations every day
SRI Technology Spin-off Ventures

Publicly Traded

**Orchid Cellmark**
DNA testing services*

**Intuitive Surgical**
Surgical robotics

**Nuance**
Speech recognition for customer service

**Grabit**
Electroadhesion for materials handling

**Redwood Robotics**
Innovative robots for manufacturing/service*

Information Technology

**Desti**
Virtual personal travel guide

**Trapit**
Artificial intelligence for web personalization

**Tempo**
Artificial intelligence for calendar integration

**Siri**
Virtual personal assistant for smart phones*

**SocialKinetics**
Enterprise social media technology*

**PSC**
Stray voltage detection services

**CIC**
Electronic and digital signature solutions

**Tout**
Real-time web video streaming and sharing

**Kasisst**
Intelligent banking

**Sensar**
Iris biometric identification*

**Discern**
Customer service tools*

**NxtWave**
Digital TV technologies*

**Teachscape**
Panoramic image editing software*

**VideoFury**
Technology for K-12 and higher education

Materials

**Artificial Muscle**
Electroactive polymers*

**Sp**
Anti-counterfeiting systems*

**Colorep**
Digital color printing applications*

**Lamina**
Super-bright LED light engines*

**Lightscape materials, Inc.**
Environmentally friendly light products*

**Ayeratek**
Metal "print and plate" manufacturing process

**Princeton Lightwave**
Optical network components

Bio/Medical

**Delsys**
Drug dispensing system*

**Locus Pharmaceuticals**
Drug discovery

**Intuity** (formerly Rosedale Medical)
Glucose monitoring system

**Songbird leasing Inc.**
Disposable hearing aid*

**Redcoat Solutions**
Bed bug detection devices

*Acquired or merged
50+ Years Proudly Partnering with Japan
Today’s Agenda

• Introduction
• **What is Innovation?**
• *Survival* of the Innovative Company
• Innovation Ecosystem & the Role for Governments
• Concluding Thoughts
Defining Innovation

What is your definition of Innovation?
Defining Innovation: A Common Answer

“\textit{\textbf{I know it when I see it}}”

Great for consumers to say... \textbf{Not so great for executives}
SRI’s Definition of Innovation

*Ensure everyone is working in the same direction*

**Innovation:**

The creation and delivery of new customer value in the marketplace with a sustainable business model for the enterprise.
Innovating is a Process...

...not an “event”

Our perspective

Successful innovation is rarely the result of luck or lone genius …

… it is a disciplined, continuous improvement process with a focus on creating customer value
Today’s Agenda

• Introduction
• What is Innovation?
• *Survival of the Innovative Company*
• Innovation Ecosystem & the Role for Governments
• Concluding Thoughts
Best Practices Have Changed Dramatically Over Time

Ford
Industrial economy
Cost, cost, cost

Deming
Knowledge economy
Quality, quality, quality

Engelbart
Innovation economy
Value, value, value

Cost or quality advantages will be copied by competitors
*Sustainable* competitive advantages arise from *value* differentiation
Innovation Provides Superior Financial Returns

- Total Shareholder Return (TSR) for “Innovative Companies” is higher in the short AND long term

Which companies do you view as innovative?

<table>
<thead>
<tr>
<th>Company</th>
<th>10 Yr Annual TSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>49.1%</td>
</tr>
<tr>
<td>Amazon</td>
<td>22.5%</td>
</tr>
<tr>
<td>IBM</td>
<td>19.6%</td>
</tr>
<tr>
<td>Microsoft</td>
<td>6.3%</td>
</tr>
<tr>
<td>eBay</td>
<td>5.4%</td>
</tr>
<tr>
<td>HP</td>
<td>3.3%</td>
</tr>
</tbody>
</table>

Sources: BCG Innovation 2010; Fortune.com
## Companies Must Continuously Innovate to Remain Market Leader

<table>
<thead>
<tr>
<th>Sector</th>
<th>1994</th>
<th>2000</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>#1 IBM</td>
<td>Microsoft</td>
<td>Apple</td>
</tr>
<tr>
<td></td>
<td>#2 Microsoft</td>
<td>Cisco</td>
<td>Google</td>
</tr>
<tr>
<td>Financials</td>
<td>#1 AIG</td>
<td>Citigroup</td>
<td>Wells Fargo</td>
</tr>
<tr>
<td></td>
<td>#2 Fannie Mae</td>
<td>AIG</td>
<td>JPMorgan Chase</td>
</tr>
<tr>
<td>Healthcare</td>
<td>#1 Merck</td>
<td>Merck</td>
<td>Johnson &amp; Johnson</td>
</tr>
<tr>
<td></td>
<td>#2 Johnson &amp; Johnson</td>
<td>Pfizer</td>
<td>Pfizer</td>
</tr>
<tr>
<td>Consumer</td>
<td>#1 GM</td>
<td>Time Warner</td>
<td>Amazon</td>
</tr>
<tr>
<td></td>
<td>#2 Ford</td>
<td>Home Depot</td>
<td>Walt Disney</td>
</tr>
<tr>
<td>Industrials</td>
<td>#1 General Electric</td>
<td>General Electric</td>
<td>General Electric</td>
</tr>
<tr>
<td></td>
<td>#2 3M</td>
<td>Tyco</td>
<td>United Technologies</td>
</tr>
<tr>
<td>Consumer Staples</td>
<td>#1 Coca-Cola</td>
<td>Wal-Mart</td>
<td>Wal-Mart</td>
</tr>
<tr>
<td></td>
<td>#2 Altria</td>
<td>Coca-Cola</td>
<td>Proctor &amp; Gamble</td>
</tr>
<tr>
<td>Energy</td>
<td>#1 Exxon</td>
<td>Exxon Mobil</td>
<td>Exxon Mobil</td>
</tr>
<tr>
<td></td>
<td>#2 Mobil</td>
<td>Chevron</td>
<td>Chevron</td>
</tr>
<tr>
<td>Materials</td>
<td>#1 DuPont</td>
<td>DuPont</td>
<td>Dupont</td>
</tr>
<tr>
<td></td>
<td>#2 Dow Chem</td>
<td>Alcoa</td>
<td>Monsanto</td>
</tr>
<tr>
<td>Utilities</td>
<td>#1 Southern Co</td>
<td>Duke Energy</td>
<td>Duke Energy</td>
</tr>
<tr>
<td></td>
<td>#2 Duke Energy</td>
<td>AES</td>
<td>Nexterea Energy</td>
</tr>
<tr>
<td>Telecom</td>
<td>#1 Southwestern Bell</td>
<td>Southwestern Bell</td>
<td>Verizon</td>
</tr>
<tr>
<td></td>
<td>#2 GTE</td>
<td>ATT</td>
<td>AT&amp;T</td>
</tr>
</tbody>
</table>

Source: KPCB; CapIQ updated as of 5/21/14
Innovate or Die: Decreasing Lifetime of U.S. S&P 500 Companies


* Source: 2012 BCG Global Innovators Survey
Innovate or Die: Decreasing Lifetime of U.S. S&P 500 Companies

“Innovation” now ranked as a top strategic priority by 76% of Senior Executives*

* Source: 2012 BCG Global Innovators Survey

* Source: 2012 BCG Global Innovators Survey

Changing World Provides Huge Opportunities

Or risks if not prepared

Example: Product Lifecycles are Getting Shorter

Multiple Reasons:

- Faster information flow
- Faster development cycles
- Worldwide competition
- Faster logistics
- Elevated expectations
- Outsourcing – everywhere!

Sales Volume

Development
Introduction
Growth
Maturity
Decline

Time
Market Size is Growing Exponentially

Computing Devices


- Mainframe: 1MM+ Units
- Minicomputer: 10MM+ Units
- PC: 1B+ Units/Users
- Mobile Internet: 10B+ Units???

Increasing Integration

More than Just Phones
- iPad
- Smartphone
- Kindle
- Tablet
- MP3
- Cell phone/PDA
- Car Electronics
- GPS, ABS, A/V
- Mobile Video
- Home Entertainment
- Games
- Wireless Home Appliances

Source: KPCB, Morgan Stanley Mobile Internet Report (12/09)
Technologies Changing *Even Faster than Exponential*

- Cost to sequence genome now US $1,000/24 hours
  - 99.99% decrease since 2001

Source: KPCB, Illumina, UK Department of Health & American Clinical Lab Association/Battelle Technology Partnership Practice
Computers Will Have Processing Ability of Human Brain

![Graph showing the increase in brain power equivalent from 1960 to 2060. The X-axis represents years from 1960 to 2060, and the Y-axis represents brain power equivalent. The graph compares different organisms from bacteria to monkeys to neuromorphic systems.](image-url)
Can Innovation Totally Disrupt a Mature Industry?

- Automobile adoption rates have been well studied for 50 years
  - What if is no longer valid?

\[ V_i = V_{sat} e^{\alpha \beta GDP_i} \]

Gompertz Function

Source: US DOE, Projection of Chinese Motor Vehicle Growth, Oil Demand, and CO2 Emissions through 2050, 2006
Merging Societal Trends with Innovations

• Societal Trends:
  – Rapid urbanization
  – Autos spend 90% of the time parked\(^{*}\)
  – 30% of traffic in looking for parking!\(^{*}\)
  – 90% of accidents are attributable to the driver!\(^{+}\)

• Innovations:
  – Autonomous vehicles
  – Secure pay (e.g., Apple Pay)
  – App based car on demand (e.g., Uber)

\(^{*}\)2012 Emerging Trends in Parking Survey, International Parking Institute
\(^{+}\)Top 10 Causes of Accidents, Automobile Association
Picture credit: Flickr user jurvetson (Steve Jurvetson)
Given the Exponential Changes -- *How Can a Company Keep Pace?*

- **1\textsuperscript{st} Generation**: Internal R\&D centrally directed with strong IP ownership
- **2\textsuperscript{nd} Generation**: Open Innovation with centrally managed collaboration
- **3\textsuperscript{rd} Generation**: TBD – Decentralized collaborations and strong cross-fertilization of IP.
It Could Look Like Silicon Valley...

“Tire Track” Model for Innovation In IT

Today’s Agenda

- Introduction
- What is Innovation?
- *Survival* of the Innovative Company
- Innovation Ecosystem & the Role for Governments
- Concluding Thoughts
8 Pillars of Successful Entrepreneurial Ecosystems

What makes up an entrepreneurial eco-system: According to over 1000 entrepreneurs throughout the world…

Source: Entrepreneurial Ecosystems around the Globe and Company Growth Dynamics
World Economic Forum
3 Critical Pillars as Voted by Entrepreneurs

The same in every region

ENTREPRENEURIAL ECO-SYSTEM

Accessible Markets  Human Capital Workforce  Funding and Finance  Mentors Advisors Support Systems  Regulatory Framework and Infrastructure  Education and Training  Major Universities as Catalysts  Cultural Support

Markets  Talent  Funding

= Role for National and/or Regional Government

Source: Entrepreneurial Ecosystems around the Globe and Company Growth Dynamics World Economic Forum
# Entrepreneurial Ecosystems Around the Globe

*Pillar Available by Region*

<table>
<thead>
<tr>
<th></th>
<th>US-Silicon Valley</th>
<th>North America</th>
<th>Europe</th>
<th>Australia/NZ</th>
<th>Asia</th>
<th>Middle East/Africa</th>
<th>Latin America</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessible Markets</td>
<td>Blue</td>
<td>Green</td>
<td>Yellow</td>
<td>Green</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>Workforce</td>
<td>Blue</td>
<td>Green</td>
<td>Yellow</td>
<td>Green</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>Funding</td>
<td>Blue</td>
<td>Green</td>
<td>Yellow</td>
<td>Green</td>
<td>Red</td>
<td>Red</td>
<td>Green</td>
</tr>
<tr>
<td>Support Systems</td>
<td>Blue</td>
<td>Green</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>Regulations</td>
<td>Green</td>
<td>Green</td>
<td>Yellow</td>
<td>Green</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>Education</td>
<td>Green</td>
<td>Green</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>Universities as Catalysts</td>
<td>Green</td>
<td>Green</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>Cultural Support</td>
<td>Green</td>
<td>Green</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
</tr>
</tbody>
</table>

Source: Entrepreneurial Ecosystems around the Globe and Company Growth Dynamics
World Economic Forum
Silicon Valley is the Most Complete Model

A society and ecosystem built for innovative success

- Top 10 R&D universities
- Global industrial clusters
- Leading VCs
- Rapid ideation
- Diverse population
- Collaborative environment
- Positive government policies
- Entrepreneurial culture
- Meritocracy = achievement

Silicon Valley Stands Apart in VC $

- > 50% of CEOs born outside the US
- 25 companies with > $4B annual revenue
- 2 companies with > $100B annual revenue

<table>
<thead>
<tr>
<th>Region</th>
<th>VC $ (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicon Valley</td>
<td>$6,984</td>
</tr>
<tr>
<td>New England</td>
<td>$2,113</td>
</tr>
<tr>
<td>New York</td>
<td>$1,416</td>
</tr>
<tr>
<td>Southeast</td>
<td>$986</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>$954</td>
</tr>
<tr>
<td>San Diego</td>
<td>$903</td>
</tr>
<tr>
<td>Midwest</td>
<td>$721</td>
</tr>
<tr>
<td>Northwest</td>
<td>$705</td>
</tr>
<tr>
<td>Texas</td>
<td>$645</td>
</tr>
</tbody>
</table>

Silicon Valley  863
New England  348
New York  247
Southeast  137
Los Angeles  159
San Diego  107
Midwest  219
Northwest  132
Texas  111
How Governments (Federal and Local) Support the Innovation Ecosystem

• Establish a stable macroeconomic, political, and legal environment
• Provide and improve infrastructure (e.g., roads, schools, standards)
• Set rules and incentives governing competition (e.g., investment incentives, antitrust laws, intellectual property protection)
• Establish and participate in an ongoing process for defining competitive priorities (e.g., funding basic research and facilitating a shared vision with industry and universities)
Govt. Research Funding is for Precompetitive Ideas

Example of Basic Research Creating Value: Apple IPOD

1988: “giant magnetoresistive effect” (GMR) is discovered, creating the field of spintronics
Basic research foundation: DOE funding for thin-film metallic multilayers

1990: development of the lithium-ion battery.
Basic research foundation: DOE funding for Electrochemistry

1988: Thin film transistor LCD displays emerge.
Basic research foundation: NIH, NSF, DoD fund liquid crystal research

1960–70s: Very Large Scale Integration (VLSI) system and circuit design pioneered.
Basic research foundation: IBM, DARPA funding

1965: The “Fast Fourier transform” revolutionizes the field of signal processing.
Basic research foundation: Army Research Office funding

Large Societal Rate of Return by Leveraging Basic Research and University-Industry Relationships

Economic Impact of Standards (NIST) – Example: Time

**NIST F1:**
1s in 60 million years (1999)

**Optical clock:** Potential accuracy of 1s in 30 billion years

**Early mechanical clocks**
- Roughly measured local time of day
- Did not permit remote synchronization

**Advanced mechanical clocks**
- Reliable navigation by stars
- ~1900: Remote synchronization at the 1 sec level for a few clocks

**Atomic clocks**
- Telecommunications
- Computers
- GPS satellite navigation
- Utility networks
- Electronic financial transactions
- Global synchronization at the nsec level widely available

New $100+B Industries Enabled as Accuracy Improved – What’s Coming Next?

Source: NIST and JILA
Economic Impact of Reference Standards (NIST)

Radiopharmaceutical standards
97:1 benefit-to-cost ratio

Alternative refrigerants
4:1 benefit-to-cost ratio

Sulfur in fossil fuels
113:1 benefit-to-cost ratio

Average benefit-to-cost from 19 impact studies: **44:1**

Source: NIST (Greg Tassey)
Importance of Creating a Shared Vision

- Sets priorities on investments
  - Basic research by govt. and development by industry
- Creates a broad community of interest
- Provides direction for tiered suppliers
- Establishes government priorities on infrastructure
  - Standards development
  - Shared research facilities

Today’s Agenda

• Introduction
• What is Innovation?
• *Survival* of the Innovative Company
• Innovation Ecosystem & the Role for Governments
• *Concluding Thoughts*
Innovation is Critical to the 21st Century Global Economy

• We are in the Global Innovation Economy
• Innovation skills are essential to survive and grow
• Innovation will drive new, high income jobs
• Companies face increasing challenges to keep up
• Companies that can’t innovate will die
• You need an Innovation *Process* to Succeed
• Successful innovation ecosystems have close collaboration between government, academia, large companies and start-ups

Goal: **Sustainable Value Creation through innovation**
There are Virtually Unlimited Opportunities Arising...

- Food technology
- Intelligent services
- Additive manufacturing
- Advanced logistics
- Digital education
- Social media
Concluding Questions

• Are you prepared?
• Do you have a disciplined innovation process?
• Do you have a robust innovation ecosystem?
• How will you scale to address an exponentially changing world?
• Are you adaptable enough to pivot as the market / technology changes?
Concluding Thoughts

“... some societies will be more open to innovation, and some will be more resistant. The ones that do adopt new crops, livestock, or technology may thereby be enabled to nourish themselves better and to outbreed, displace, conquer, or kill off societies resisting innovation."

-- Jared Diamond, Guns, Germs, and Steel: the Fates of Human Societies.
ありがとうございます

Headquarters: Silicon Valley
333 Ravenswood Avenue
Menlo Park, CA 94025-3493
650.859.2000

Washington, D.C.
1100 Wilson Blvd., Suite 2800
Arlington, VA 22209-3915
703.524.2053

Princeton, New Jersey
201 Washington Road
Princeton, NJ 08540
609.734.2553

Additional U.S. and international locations

www.sri.com