The Paradigm Shift from Producer to User Innovation

- The phenomena
- The economics
- The implications

Eric von Hippel,
MIT Sloan School of Management
**Traditional, Manufacturer-Centered Innovation Paradigm**
Manufacturers identify user needs, develop products at private expense, and profit by protecting and selling what they have developed.

**User-Centered (Democratized) Innovation Paradigm**
Lead Users innovate to solve their own needs at private expense - and then freely reveal their innovations.
Users innovate when markets are small and uncertain

John Heysham Gibbon – physician, USER - inventor of the heart-lung machine.

- “The death of a young patient in 1931 motivated Dr. Gibbon to develop a heart-lung bypass machine, to enable more effective heart surgery techniques.

- Gibbon was dissuaded by all with whom he broached the subject but perservered

- In 1935 he successfully used a prototype heart-lung bypass machine on animals… In 1953 first used a heart-lung machine on a human patient…

Why did a USER have to develop the first heart-lung machine?
At the start of something really new there is no “proven” market!
User and producer innovation paradigms – and their interactions

**USER INNOVATION AND DIFFUSION**
- Innovation by users
- Free revealing followed by collaborative improvement
- Peer-to-peer diffusion

**PRODUCER INNOVATION AND DIFFUSION**
- Market research
- Internal and external R&D
- Production
- Market diffusion

User ventures & existing firms commercialize SOME user innovations
Essential Definition

The “functional” source of innovation:

- An innovation is a USER innovation when the developer expects to benefit by USING it

- An innovation is a MANUFACTURER innovation when the developer expects to benefit by SELLING it
User innovators’ motives are NOT profit

Kayak Equipment innovation study

Lead users’ Innovation motive %

Profit from innovation sales 2.07%
Personal need for innovation 54.82%
Enjoyment from creating it 21.13%
Learning from creating it 7.32%
To help others 11.98%
Other motives 2%
Two uses of the phrase ‘open innovation’

- **Open as in open information commons** – “free information” – information as a public good.
  
  (This is the most fundamental and general usage: An example is open source software like Linux)

- **Open as in P&G’s “Connect and Develop”**
  
  (This is advice and corporate procedures to “look outside for solutions to your R&D problems.” Motivation is Joy’s Law: “No matter who you are, most of the smartest people work for someone else.”)
How we discovered that users develop major new products

<table>
<thead>
<tr>
<th>Innovations Affecting</th>
<th>First Device</th>
<th>Major Improvement</th>
<th>Minor Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Chromatography</td>
<td>1</td>
<td>11</td>
<td>-</td>
</tr>
<tr>
<td>Nuclear Magnetic Resonance Spectrometry</td>
<td>1</td>
<td>14</td>
<td>-</td>
</tr>
<tr>
<td>Ultraviolet Spectrophotometry</td>
<td>1</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>Transmission Electron Microscopy</td>
<td>1</td>
<td>14</td>
<td>63</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4</strong></td>
<td><strong>44</strong></td>
<td><strong>63</strong></td>
</tr>
</tbody>
</table>
Other users ask instrument companies when a commercial version will be available.
<table>
<thead>
<tr>
<th>Innovations Affecting</th>
<th>% User</th>
<th>User</th>
<th>Mfg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Chromatography</td>
<td>83%</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Nuclear Magnetic Resonance Spectrometry</td>
<td>80%</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Ultraviolet Spectrophotometry</td>
<td>100%</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Transmission Electron Microscopy</td>
<td>72%</td>
<td>44</td>
<td>17</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>77%</strong></td>
<td><strong>72</strong></td>
<td><strong>22</strong></td>
</tr>
</tbody>
</table>
User innovators generally don’t do product engineering – producers do that.

Example: First completely automated radioimmunoassay system

First User-Developed Equipment

A Manufacturer’s Product
CLOSE-UP of one of the mobile towers of the original center-pivot machine shows the parts of the system with greater clarity. Water taken under pressure from the supply line powers a piston, which ratchets the tower ahead by means of a mechanical device called a Trojan bar that engages lugs on both support wheels. The rate of advance is set by the flow of water into the piston at outermost tower.
Services are about 80% of the GDP of advanced economies today – users innovate there too

Findings from study of computerized Retail and Commercial Banking Services
Introduced commercially by US banks 1975-2008

44% of computerized retail banking services first developed by individual consumers

55% of computerized commercial banking services first developed by user firms

100% of manual services first developed by users

Source: Oliveira and von Hippel (2011)
Example of user service prototyping

History of in-room hotel Internet services

- Hotel guests would disconnect room phones to hook up their computers to dial-up Internet providers like AOL.

- Hotel’s response: Install tamper-proof screws.

- Guests’ response: “Guests brought special screwdrivers and kept on doing it!”

- Eventual hotel response: begin to offer in-room internet as ‘our new service innovation’!
## Scale of user product development by consumers – huge and previously invisible

<table>
<thead>
<tr>
<th>National surveys</th>
<th>U.K.</th>
<th>U.S.</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>% population innovating</td>
<td>6.1% (2.9 mil people)</td>
<td>5.2% (11.7 mil people)</td>
<td>3.7% (3.9 mil people)</td>
</tr>
<tr>
<td>Total spending</td>
<td>$5.2 billion</td>
<td>$20.2 billion</td>
<td>$5.8 billion</td>
</tr>
<tr>
<td>% of R&amp;D spending by firms on consumer products</td>
<td>140%</td>
<td>33%</td>
<td>13%</td>
</tr>
<tr>
<td>% with IPRs</td>
<td>2%</td>
<td>9%</td>
<td>0%</td>
</tr>
</tbody>
</table>
Scale of process innovation by firms for own use is also huge

<table>
<thead>
<tr>
<th>Survey</th>
<th>Date</th>
<th>Sample</th>
<th>% user innovation</th>
<th>% protecting with Patents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>1998</td>
<td>4,200 producers (&gt; 20 employees.)</td>
<td>48% user innovators</td>
<td></td>
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<tr>
<td>Arundel et al.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Canada</td>
<td>2007</td>
<td>6,478 producers (&gt; 20 employees.)</td>
<td>43% user innovators</td>
<td>64%</td>
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<tr>
<td>Gault et al.</td>
<td></td>
<td></td>
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<tr>
<td>Netherlands</td>
<td>2008</td>
<td>498 high-tech small firms (&lt; 100 emps)</td>
<td>54% user innovators</td>
<td>13%</td>
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<tr>
<td>De Jong et al.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>2008</td>
<td>2,416 small firms (&lt; 100 emps.)</td>
<td>21% user innovators</td>
<td></td>
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<tr>
<td>De Jong et al.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>2009</td>
<td>1,000 SMEs (10-250 emps.)</td>
<td>&gt;15% user innovators</td>
<td></td>
</tr>
<tr>
<td>Flowers et al.</td>
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</tbody>
</table>
Zones where user innovation is viable are increasing

Example: Heart-Lung Machine

Example: OS Software Project

Source: Baldwin and von Hippel 2011
The power of collaborative open innovation

**USER INNOVATION AND DIFFUSION PARADIGM**

- Innovation by users
- Collaborative Evaluation, Replication, and Improvement
- Peer-to-Peer Diffusion

**PRODUCER INNOVATION AND DIFFUSION PARADIGM**

- New Ventures and Information
- Market Research
- Research and Development
- Production
- Market Diffusion
User innovation communities can supplant product development by manufacturers

Consider Kitesurfing

Photographs courtesy of Joseph Dsilva and Michael Hanscom on Flickr.
Users develop and post kite designs – often better than designs by kite manufacturers

EXAMPLE: Super high AR mountain board kite
“From Sebastian in Argentina.. a super high AR inflatable design for mountain boarding…”

Posted by saul at 05:58 PM

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Kite design tools posted by users are often better than manufacturers’ internal tools

Kite modeling tools

Patterns for building kites
(Can be sent to sail lofts as CAD files.)

Aerodynamic modeling tools
RESULT: User Innovation Communities may drive kite manufacturers right out of product design – innovation is being “democratized”

HAS BEEN An industry of manufacturers that develop and sell kites of their own design. $100mm in equipment sales in 2002 – growing fast.

TODAY – some firms are moving to a “build only” specialization – leaving product innovation to the user community (Firms are starting to download and build user designs instead of creating their own kite designs.)
Why user collaboratives can out-compete producers in design – MANY innovators, collaborating OPENLY

Given modularity, heterogeneous users innovating independently and freely revealing can produce more and better design work that is collectively available than can individual producers that each protect their private innovations.