Basing New Commercial Products on “Lead User” Innovations

Professor Eric von Hippel
MIT Sloan School of Management
Two ways to identify lead user innovations:

1. Observe crowd adoptions of new user innovations;
2. Explore activity at the leading edge of a known trend.

![Diagram showing lead users innovate here and the first manufacturer product appears here.](image)
Lead users are...

“Lead User” innovations form the basis for new products and services of value to manufacturers.

“Lead Users” are users that:

1. Have needs that *foreshadow general demand* in the marketplace;

2. Expect to *obtain high benefit* from a solution to their needs. (Such users are more likely to innovate – “Necessity is the mother of invention!”)
The pathway from user innovation to commercial products

- “Lead users” innovate and usually reveal what they have done
- IF others want the same innovation, they copy and adopt it
- User-founded firms enter to serve the growing market
- Finally, after the market opportunity has become clear, larger producers enter – and some user startups grow large
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 persevered

- 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!
Approach (1) Finding the crowd: Learning from what they are doing
May be the source of most firms in some industries: 80% of juvenile products firms were founded by user-innovators (Source: Shah and Tripsas 2008)

Example: In 1980, Phil Baechler decided he wanted to go for a run with his son in tow. He realized that the standard wheels on his baby stroller would never last. So he decided to replace them with bicycle wheels from his garage. - and the three-wheeled "Baby Jogger " was born.

Original Jogging stroller
User innovation

Commercial version – not so different!

Many other examples:
E.g., Car seat for low birth-weight babies also developed by a user
Often, the first to “observe the crowd” and develop a firm are **members** of the crowd.

46.6% of US ventures based upon innovations and surviving 5 years were founded by users (Shah et al. 2011 Kauffman report)

**Source:** von Hippel and Raasch 2012
New questions for innovation management – How do you integrate / benefit from user innovation? Consider Lego Mindstorms

**Mindstorms robot kit**

**The brain**
- Computer “brain” within Lego brick

**Movement**
- 3 stepper motors

**Sensors**
- Light
- Touch
- Temperature

**Teaching**
- Kid-friendly, graphical programming environment
- Programs downloaded from PC via infrared

**Price ~ $200**
Lego mindstorms user communities grew rapidly - without company involvement

(1) Lego Users Group NETwork. An independent discussion site for Lego enthusiasts
Source: Russel Nelson, administrator of lego-robotics (russnelson.com)
There are ~ 50 internal model developers at Lego. There are 20,000+ AFOL’s – many innovate. More Lego-related R&D outside Lego than inside?

Courtesy of Yun Mi Antorini. Used with permission.
Approach (2):
Find an important marketplace trend and learn what users are doing at the leading edge

- Only lead user prototypes available
- Commercial versions of product available
- Identify and focus on an important marketplace trend “Name that trend!”
It is not easy to find lead users who have developed THE innovation: Users who develop important innovations seldom do it twice

Few users developed more than one major commercialized innovation

<table>
<thead>
<tr>
<th>Innovation Type</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>6</th>
<th>na</th>
<th>(n)</th>
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<td>0</td>
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<td>0</td>
<td>0</td>
<td>7</td>
</tr>
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</table>

* Source, von Hippel 1988, Appendix: GC, TEM, NMR Innovations
** Source, Riggs and von Hippel, Esca and AES
*** Source, von Hippel 1988, Appendix: Semiconductor and pultrusion process equipment innovations.
**** Source, Shah 2000,
Example: was a trend towards longer Bike races – but which users had the best solution to problems like hydration?

U.S. Troops Make Use of Water Gear
The New York Times
July, 2003

Many troops have custom backpacks that serve as personal water-carrying and drinking systems.

Camelbak’s patented "personal hydration system" was invented in 1988 by a Texas paramedic, Michael Edison.

To prevent dehydration during a summer bike race, he fashioned a drinking system from surgical tubing and an IV bag that he sewed to his shirt.


Camelbak photograph courtesy of ussocom.ru on Flickr.
A free practical workbook and videos on how to do lead user innovation projects

http://mit.edu/evhippel/www/teaching.htm
Performance Assessment of Lead User Research at 3M

Research Team: Prof. Gary Lilien, Penn State University; Prof. Pam Morrison, University of New South Wales; Dr. Kate Searls, ASI Associates, Mary Sonnack, Division Scientist, 3M; Prof. Eric von Hippel, MIT

For the complete article and other Lead User Videos and articles: Go to leaduser.com on the Web
## Assessment Results: Lead User vs. Non-Lead User Funded Ideas

<table>
<thead>
<tr>
<th></th>
<th>LU Ideas (n=5)</th>
<th>NON-LU Ideas (n=42)</th>
<th>Sig.</th>
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</thead>
<tbody>
<tr>
<td><strong>“Newness” of Idea</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Novelty compared to competition</td>
<td>9.6</td>
<td>6.8</td>
<td>0.01</td>
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<tr>
<td>Newness of needs addressed</td>
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<td>5.3</td>
<td>0.09</td>
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<tr>
<td><strong>Projected Profitability</strong></td>
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<tr>
<td>% market share in year 5</td>
<td>68%</td>
<td>33%</td>
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<td>Estimated sales in year 5</td>
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<td><strong>Fit with Business</strong></td>
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<td>Intellectual property protection</td>
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<td>Fit with mfr. Capabilities</td>
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<tr>
<td>Fit with distribution channels</td>
<td>8.8</td>
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<td>0.61</td>
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</table>

Note: Items measured on 10 pt. Scale, 10=high, 1=low
Essential Definitions

“Breakthrough:”

- Determines Future Business Growth and Margins
- Major Product line >20% of Division Sales

Incremental improvement:

- Valuable to existing business
- Extension to existing line

<table>
<thead>
<tr>
<th></th>
<th>Incremental</th>
<th>Breakthrough</th>
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<tbody>
<tr>
<td>Traditional 3M Method</td>
<td>41</td>
<td>1</td>
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<tr>
<td>LU Method</td>
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<td>5</td>
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<tr>
<td>At 3M</td>
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ACTIVITY: Think about possible Lead Users in your markets

Step 1  Select a specific market & specific major trend to think about

Step 2  Brainstorm possible lead users within that target market
- Which types of individuals or firms have needs at the leading edge of the trends?
- Which ones have a high incentive & the resources to solve their leading edge needs?

Step 3  Brainstorm possible lead users outside target market
- Which types of users in other fields & applications are facing a similar need but in a more demanding form?

Step 4  Specify what you might learn from each type of LU
Breakthrough solutions are often found in “advanced analog” applications and markets.

Only lead user prototypes available

Commercial versions of product available

Aircraft Braking

# of users perceiving need

Race Car Braking

Trend: Improved AUTO Braking

Sedan Braking

Time
Breakthrough solutions are often found in “advanced analog” applications and markets.

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# of users perceiving need

Trend: Reduced surgical infections

Reduced infections under extreme conditions: MASH units; oncology surgeons

Surgical Drapes

Veterinary Hospitals
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