15.356: Product and Service Development in the Internet Age

Professor Eric von Hippel, Spring, 2017 (H1)
Tuesday and Thursday 2:30-4 E51-315

How new products and services are developed is undergoing the biggest paradigm shift since the industrial revolution. Product and service development is rapidly shifting from the R&D departments of producers to innovating users – to citizens and to firms that develop and build what they need for themselves – and often share their designs for free. Producers must reorient to search for and utilize these innovations – finding commercially-profitable designs among user prototypes, rather than exclusively relying on in-house development.
This is going to be a fun year for our class – based on a new (free) MIT Press 2017 book, we will be able to very efficiently explore these new, Internet age innovation processes. We will discuss how individuals can participate, and how managers can adopt and profitably use these new processes in their own ventures and firms. I will also explain how – increasingly – free user innovations can be developed and diffused **entirely** *without producers.*

Feb 7: The Free Innovation Paradigm

Tens of millions of consumers collectively spend tens of millions of dollars developing designs for new products and services - and then give them away as "free innovations." As we will see, free innovation has very important economic impacts for entrepreneurs, producers, and society at large. BUT, from the perspective of participants, it is fundamentally *not* about money.

> **Reading**: von Hippel, *Free Innovation*, (MIT Press, 2017) Chapters 1 and 2 (Book available for free download at http://mit.edu/evhippel/www/books.htm);

Feb 9: Crowdsourcing: Why and how it works – and when it can be useful

Crowdsourcing is built upon broadcast search: anyone who thinks he or she has a solution to a posted problem is invited to join in – and people you would not think might have a solution often turn out to have the best one.
Typical commercial crowdsourcing practice involves firms asking "the crowd" to solve specific problems. A broader and more flexible process is one in which any participant can *propose* problems as well as participate in solving them. This is the process used by, for example, open source software or hardware projects.
Crowdsourcing is often seen as a more effective option than internal R&D. We will discuss when and how to use it.

> **Reading:** Jeppesen, L. B., and K. R. Lakhani. 2010. Marginality and problem solving effectiveness in broadcast search. *Organization Science* 21 (5): 1016–1033.

Feb 14: User pioneering and how producers can benefit: the "Lead User Method"

Research shows that user innovators – not producers - are systematically the pioneers with respect to developing functionally novel new products and services – the kinds the define and pioneer new markets. Producers can learn to identify these via the 'lead user method'.

> **Reading:** von Hippel, *Free Innovation* Chapter 4; von Hippel, *Democratizing Innovation*, Chapter 10.

Feb 16: A division of labor between free-innovating users and producers

Free user innovation and producer-centered innovation are natural complements. In this lecture I explain the division of labor between the users and producers that can create a more effective overall innovation development and commercialization process. It involves "tightening the loop" between them. You can benefit from tightening the loop if you want to start a firm – or if you want to collaboratively develop free innovations together with others.

> **Reading**: von Hippel, *Free Innovation*, (MIT Press, 2017) Chapters 3, 6 and 7. Antorini, Muniz, and Askildsen "Collaborating With Customer Communities: Lessons From the Lego Group" *Sloan Management Review* Spring, 2012

Feb 21- *No Class: due to President's Day*

Feb 23: Toolkits for DIY user innovators.
> *Eric von Hippel plus Jose Gomez-Marquez and Anna Young*

Toolkits for user innovation enable users to design new products and services better and faster. We describe the general principles of toolkit design. Jose and Anna then illustrate by describing toolkits they are developing for nurses with few resources to use in underdeveloped countries – an especially interesting and difficult challenge.

> **Readings:** Von Hippel, Eric and Ralph Katz (2002), „Shifting Innovation to Users Via Toolkits," *Management Science*, Vol 48, No. 7 (July) pp 821-833; Thomke, Stefan and Eric von Hippel (2002) „Customers as Innovators: A New Way to Create Value" *Harvard Business Review*, Vol 80 No. 4 April pp 74-81.

Feb 28: >>> *FIRST* **7-page paper due today.** Please format using 11pt Times New Roman font, 1.5 line spacing. [Our specific formatting request may seem silly – sorry. We ask because we find from experience that it is much easier for us to read dozens of papers in succession if we do not have to adapt to different formats when reading.] **Please upload your papers** (in .doc/.docx or pdf format) through Stellar (under the Assignment upload section)

Feb 28: Free innovators share – but they *don't* work hard to diffuse their innovations: What to do about "market failure" in the free innovation paradigm
Guest lecturer Harry Demonaco, MIT

Free innovators are self-rewarding and don't mind letting others adopt their designs for free. BUT – innovators who give things away for free have no incentive to help others to adopt them – the result is a market failure in the case of free innovation that must be fixed.

> **Readings:** *Free Innovation*, (MIT Press, 2017) Chapter 5; von Hippel, Eric, Harold Demonaco, and Jeroen de Jong (2016) "Market failure in the diffusion of clinician-developed innovations: The case of off-label drug discoveries" *Science and Public Policy.*

March 2: Users' legal rights to innovate – protecting the innovation wetlands
Guest lecturer Professor Andrew Torrance – Kansas U School of Law

Individuals have strong legal rights to develop and use what they want individually and collectively. For example, if you want to develop a medical treatment and use it on yourself – wisely or unwisely – the FDA cannot stop you. The government also cannot stop you from exercising your rights of free speech to tell others about what you have learned, and how to copy your innovations for themselves. Andrew Torrance explains the situation.

> **Readings**: Torrance, Andrew and Eric von Hippel (2015) "The right to innovate." *Michigan State Law Review* 2015:793 pp. 793 - 829. OR Free Innovation, Chapter 10.

March 7: Drug infusion pumps: a seven billion-dollar user innovation
Guest lecturer: Dr. Nat Sims, Massachusetts General Hospital

A baby was dying because someone misplaced a decimal point in a hand-done calculation of the dose of anesthetic to be used during that baby's surgery. Nat Sims, a pediatric anesthesiologist at Mass General Hospital, saved the baby – *and* decided that the problem needed to be solved more generally. He developed the first drug infusion pump as an anesthesiologist user – resulting in a 7 billion dollar industry 20 years later.

March 9: Producer-free innovation: The e-Nable network

Guest lecturers: Ivan and Jen Owen – free innovators

Many kids are born without hands. Ivan and Jen Owen, artists, along with a carpenter from South Africa, created a free solution improved and diffused by a world-wide "e-Nable" network of collaborators. Kids get very effective 3D-printed hands for free, based upon free designs. The production cost per hand is about $20. Inferior commercial alternatives are priced above $5,000. Wave of the future?

March 14: Resistance to the transition to free innovation

When something fundamentally new comes along, resistance can be fierce. Free innovation is no exception. For society, firms, and individuals to fully reap the benefit of the present transition from innovation scarcity to innovation abundance everything from innovation definitions to producer practices to intellectual property rights and other innovation policies must change. Owners of the status quo have reasons to resist.

> **Readings:** von Hippel, *Free Innovation*, (MIT Press, 2017) Chapter 11. Elting Morison, "Gunfire at Sea", Chapter 2 in *Men, Machines and Modern Times*, MIT Press. Clive Thompson, "Build it. Share it. Profit" *Wired (Magazine)* Nov, 2008 pp. 166-176

March 16: Presentation of cool free and user innovation cases by class members
>>> *SECOND* 7-page paper due today. Please format in 11pt Times New Roman font, 1.5 line spacing. **Please upload your papers** (in .doc/.docx or pdf format) through Stellar (under the Assignment upload section)

Some class attendees will have had your own experiences with free and user innovation. We will devote this final class to brief presentations by some who wish to describe their experiences, and lessons learned.

15.356 PROCEDURAL NOTES

Course Readings:

> Free downloads of both *Free Innovation* (MIT Press 2017) and *Democratizing Innovation* (MIT Press 2005) can be made from Eric's MIT Website at http://mit.edu/evhippel/www/books.htm

> All other assigned readings are available from the course website.

Assignments and Grading:

> Your course grade will be determined primarily on the basis of the quality of two 7 page papers that each build on one course-related topic that especially interests you. We can discuss good paper topics for each of you as the term

progresses. In addition you are, of course, expected to prepare for classes by doing the assigned readings and participating in class discussions!

Office Hours:

Professor von Hippel evhippel@mit.edu and the course TA, Arvind Karunakaran arvindk@MIT.EDU (Phone 814-206-4189), will be happy to schedule meetings with students throughout the term at times of mutual convenience. Meetings can be set up either by chatting after class, or by contacting either of us via email.

Explanation of Paper Assignments

For each paper:
(1) *Choose a topic* covered in this class that especially interests you.
(2) *Briefly explain* topic at start of paper   Devote 1-2 pages to this. No extra reading needed here: derive from class lectures and discussions, assigned readings and other sources of information that you may already have.

(3) Expand the topic in your direction of interest. State and summarize where you are going with the topic and then go to it! Devote remainder of paper to this. Fine to draw in your personal experience and views in addition to findings from extra reading on the topic.

EXAMPLE

Topic:
(1) Brainstorming" as a concept generation method
(2) Brief explanation of topic:
Here is how brainstorming was described in class readings and lectures. Here is how it is thought to work, and what its advantages and disadvantages are thought to be (1-2 pages)

(3) Expansion of topic in your direction of interest:
Brainstorming is based on analogical thinking. I want to explore what kinds of innovations analogical thinking is likely to reveal. Can it reveal/invent any kind of innovation – or are their limitations?
Here are my ideas.
Next, here is what some studies of problem-solving say about analogical thinking.
Finally, here are the conclusions I draw with respect to the characteristics of brainstorming as a method for generating concepts for radical new products and services.

When are the papers due? Feb 28 and March 16, as indicated in the syllabus