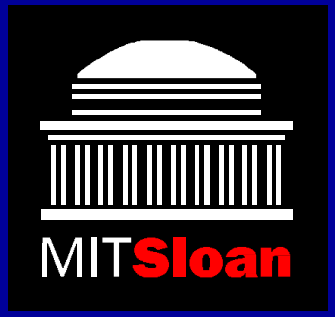
Democratizing Innovation



Eric von Hippel, MIT Sloan School of Management

Research on democratizing innovation comes from many wonderful researchers, including:

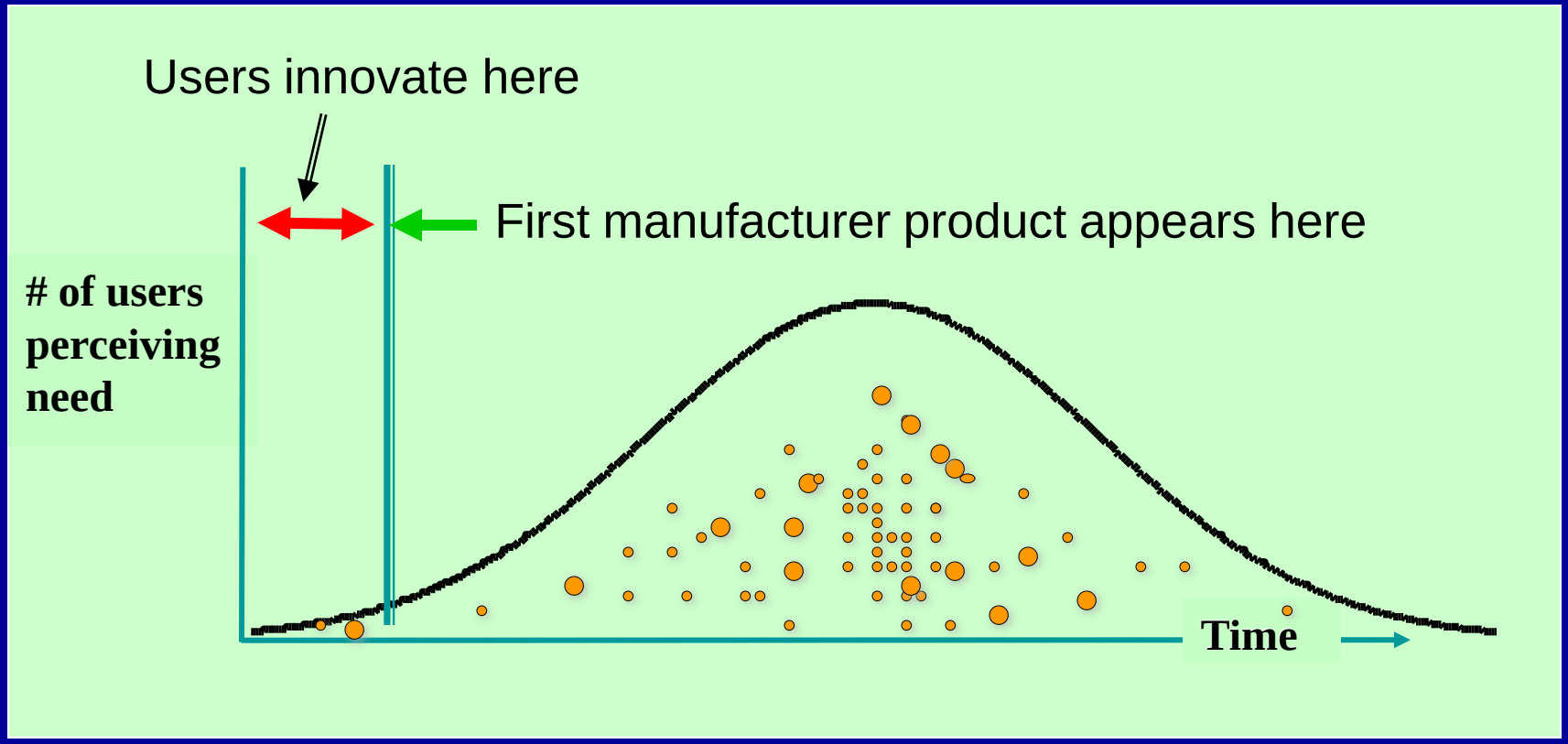
- Yun Mi Antorini (CBS)
- Carliss Baldwin (HBS)
- Irina Cojuharenco (FCEE-Catolica)
- Jeroen de Jong (Erasmus)
- Emm Fauchart (Lausanne)
- Nikolaus Franke (WU Vienna)
- Fred Gault (OECD)
- Anil Gupta (India)
- Dietmar Harhoff (LMU)
- Joachim Henkel (TUM)
- Cornelius Herstatt (TUH)
- Christoph Hienerth (CBS)
- Lars Bo Jeppesen (CBS)
- Georg von Krogh (ETH Zurich)
- Karim Lakhani (HBS)
- Christopher Lettl (WU Vienna)
- Christian Luthje (TUH)
- Pam Morrision (UNSW)
- Pedro Oliveira (FCEE-Catolica)
- Sonali Shah (U of Washington)
- Stefan Thomke (HBS)
- Glen Urban (MIT)
- Andrei Villarroel (FCEE-Catolica)
- Eric von Hippel (MIT)

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



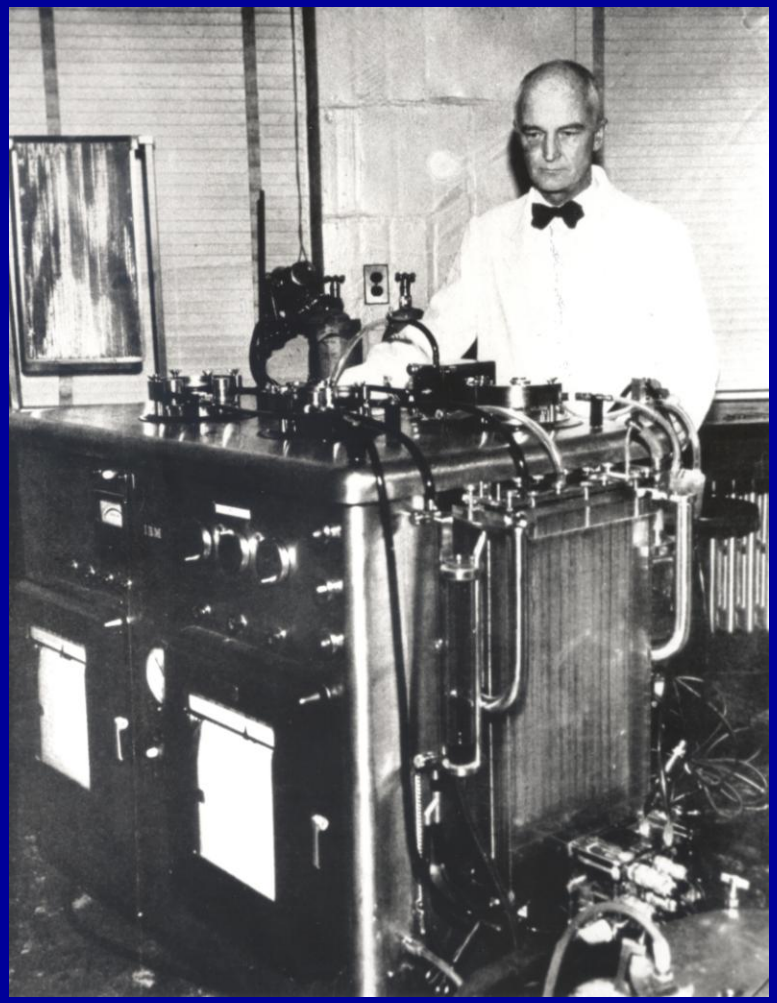
Users at the leading edge are termed “lead users:” They (1) lead the market and (2) have a strong need

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…

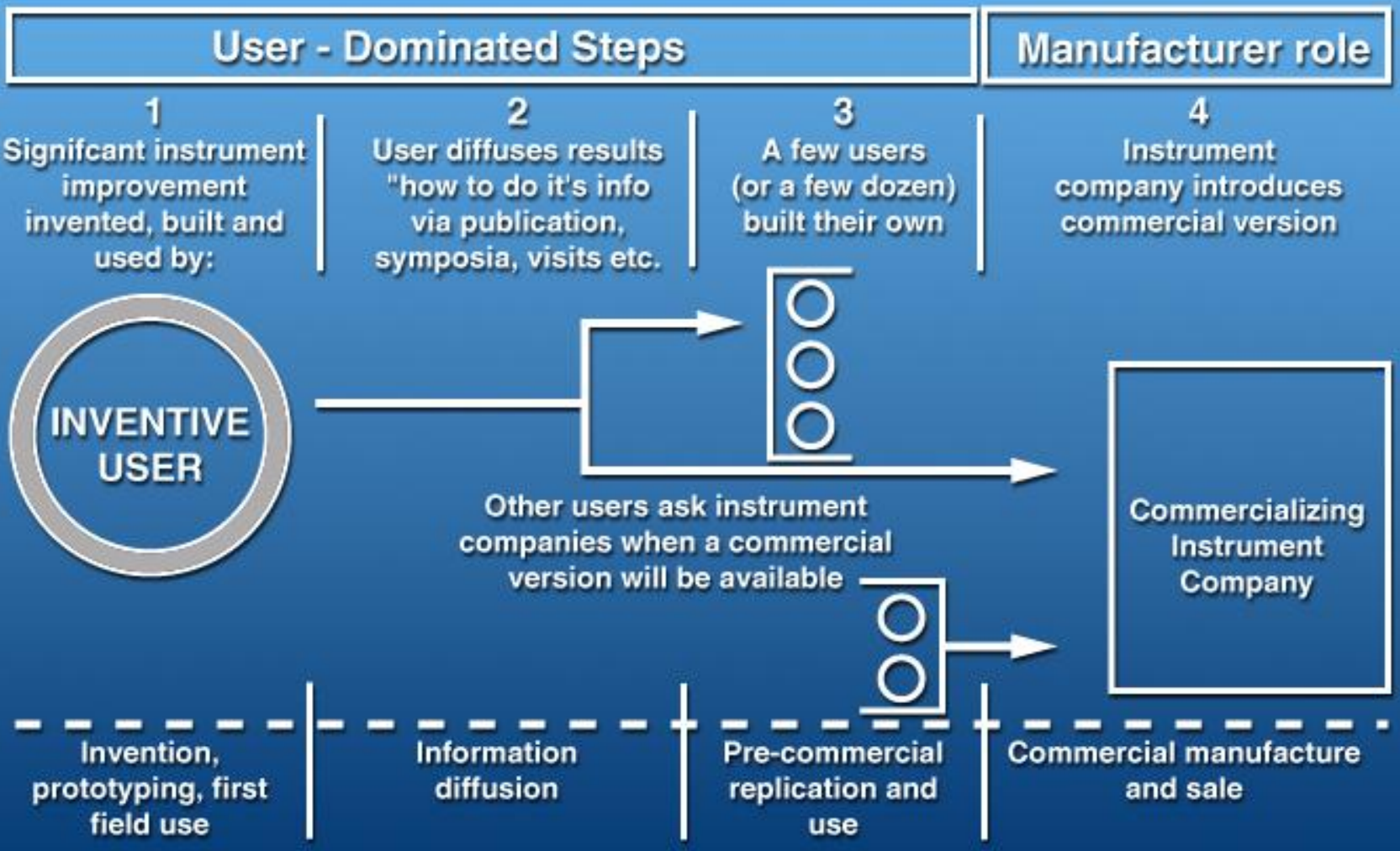
Why did a *USER* have to develop the first heart-lung machine?

At the start of something really new *there is no “proven” market!*



How we discovered that users develop many major new products

Innovations Affecting	First Device	Major Improvement	Minor Improvement
Gas Chromatography	1	11	-
Nuclear Magnetic Resonance Spectrometry	1	14	-
Ultraviolet Spectrophotometry	1	5	-
Transmission Electron Microscopy	1	14	63
Total	**4**	**44**	**63**


User - Dominated Steps
Manufacturer role
1
Signifcant instrument improvement invented, built and used by:
2
User diffuses results "how to do it's info via publication, symposia, visits etc.
3
A few users (or a few dozen) built their own
4
Instrument company introduces commercial version
INVENTIVE USER
Other users ask instrument companies when a commercial version will be available
Commercializing Instrument Company
Invention, prototyping, first field use
Information diffusion
Pre-commercial replication and use
Commercial manufacture and sale

		First device used in field developed and built by:	
Innovations Affecting	% User	User	Mfg.
Gas Chromatography	83%	10	2
Nuclear Magnetic Resonance Spectrometry	80%	12	3
Ultraviolet Spectrophotometry	100%	6	0
Transmission Electron Microscopy	72%	44	17
Total	**77%**	**72**	**22**

Users innovate in services too – which are about 75% of the GDP of advanced economies today

Users developed 90% of important banking services

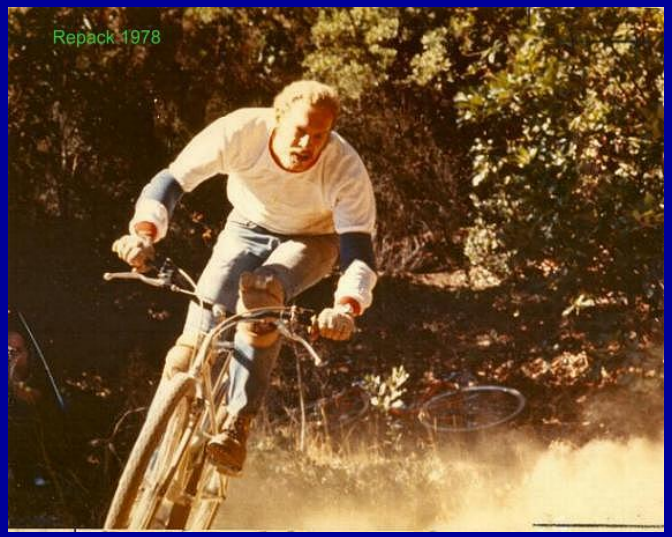
	Service Type	% User	% Bank	% Joint user & bank	Total
Retail Services	1. Account information services	100%	0%	0%	7
	2. Account transaction services	93%	7%	0%	14
	3. New banking access channels	25%	25%	50%	4
	Retail services total	**84% (21)**	**8% (2)**	**8% (2)**	**25**
Corporate Services	1. Account information services	100%	0%	0%	4
	2. Account transaction services	94%	6%	0%	16
	3. New banking access channels	0%	50%	50%	2
	Corporate services total	**86% (19)**	**9% (2)**	**5% (1)**	**22**
Complete sample	***Total (all services)***	**85% (40)**	**9% (4)**	**6% (3)**	**47**

Source: Oliveira and von Hippel (2009)

In hospitality services too, "Customers always lead"

- **Consider the history of in-room 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'!

Users also invent the techniques that give rise to needs for new product innovations



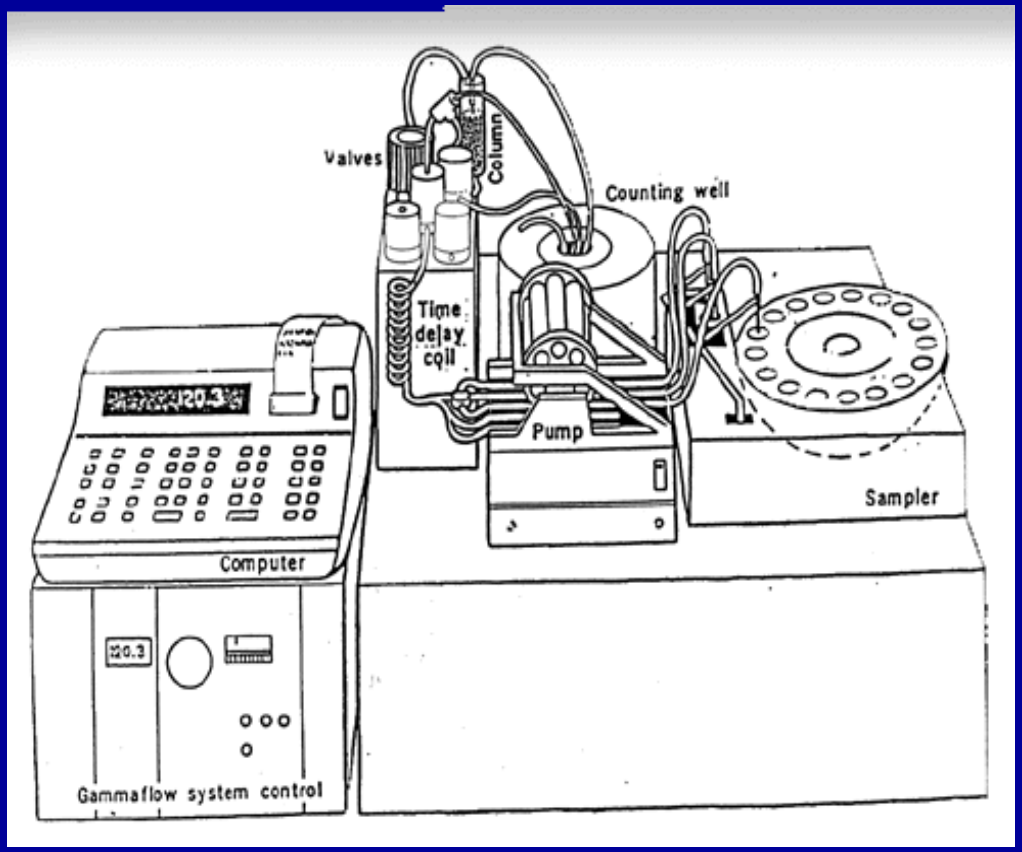
2000

1980

User innovations don't look like "products" to manufacturers

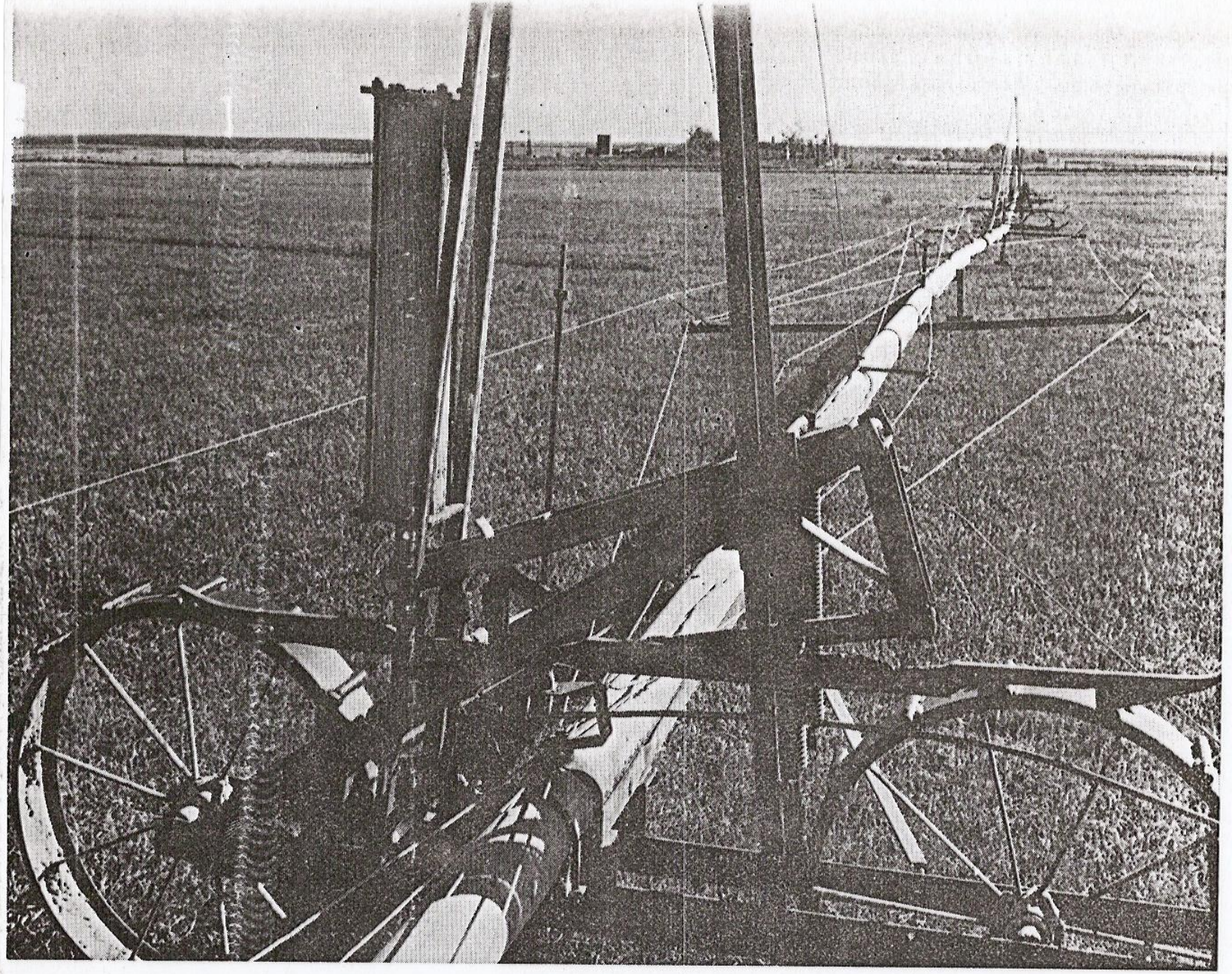
Example: First completely automated radioimmunoassay system

First User-Developed Equipment

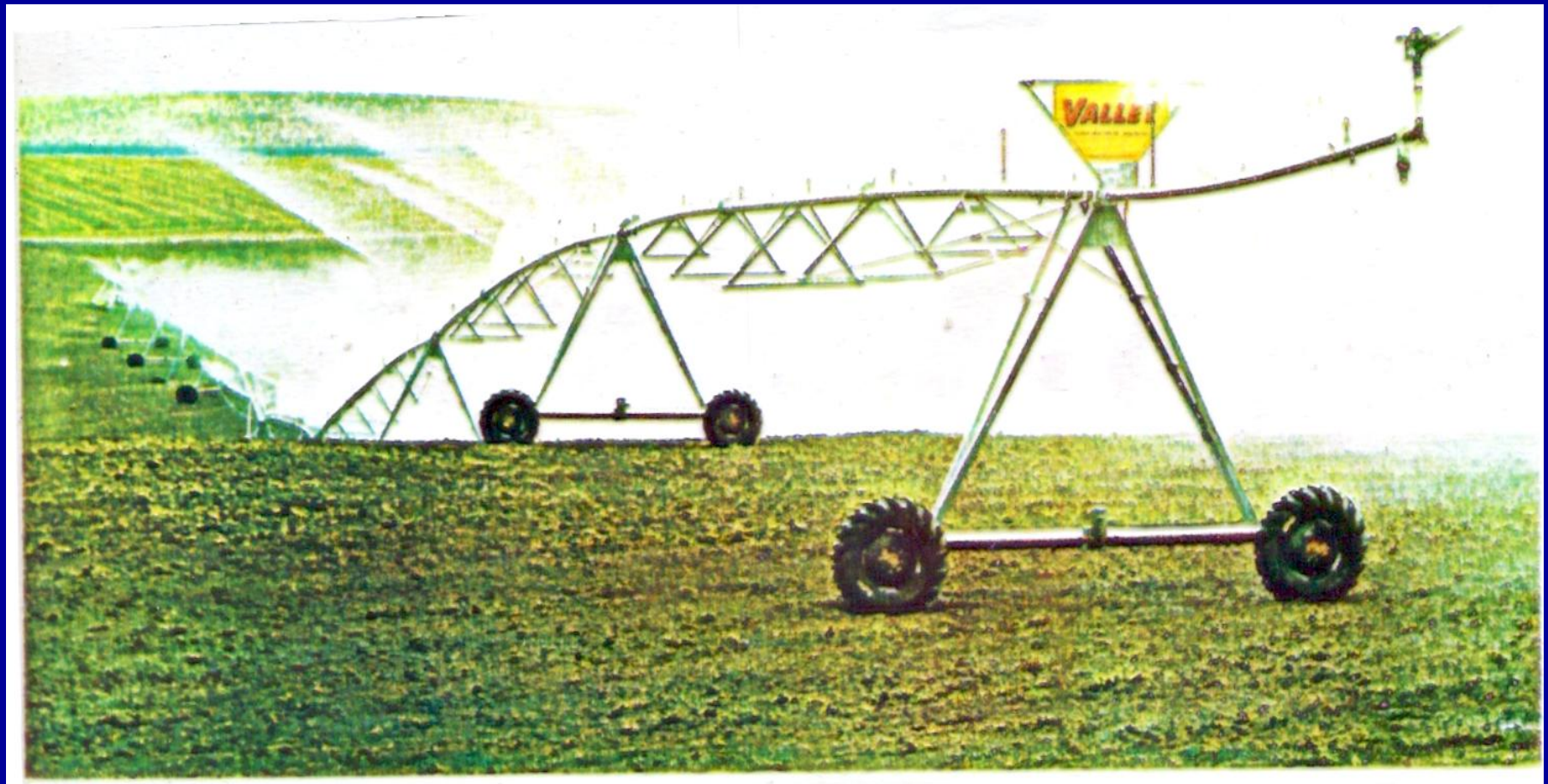


A Manufacturer's Product

ANOTHER PERSPECTIVE on the complex of center-pivot systems at Kufra is provided by this oblique aerial photograph. Irrigated fields here, supplied with water from a vast underground reservoir, are somewhat larger than usual, measuring almost a mile in diameter.



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.



GROUND-LEVEL VIEW of a recently installed center-pivot system demonstrates its ability to accommodate to rolling terrain. The wheeled towers in this example are driven by electric power. The photograph was supplied by Valmont Industries, Inc., of Valley, Neb.

Essential Definition

The “functional” source of innovation depends upon the *functional* relationship between innovator and 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.

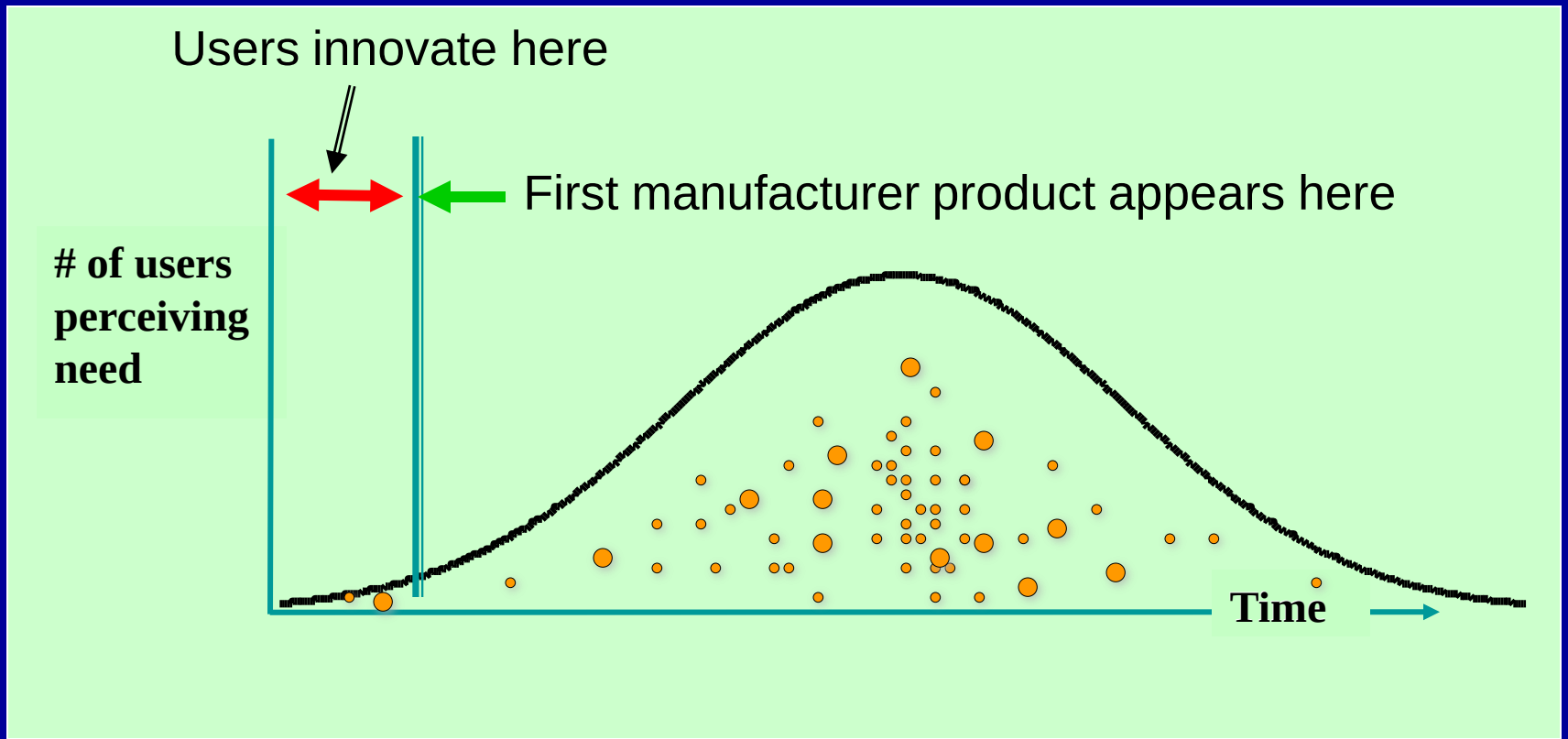
Users aren't always the innovators

Innovations Samples:	User	Mfr	Suplr	Other	NA	Total (N)
Scientific Instruments	77%	23%	-	-	17	111
Semicon & PC Crd Process	67%	21%	-	12%	6	49
Pultrusion Process	90%	10%	-	-	-	10
Sports Equipment	58%	27%	-	15%	-	48
Engineering Plastics	10%	90%	-	-	-	5
Plastics Additives	8%	92%	-	-	4	16

User-Centered (Democratized) Innovation Paradigm

First, Lead Users innovate and often freely reveal their innovations – user innovation is generally OPEN

- **Then user communities grow**
- **Then user-founded firms enter**
- **Finally, after the market opportunity has become clear, incumbent manufacturers enter**



Data shows that users develop the *functionally novel* innovations

Users develop:

- **The first heart-lung machine**
- **The first mountain bike**

Manufacturers tend to develop Dimension of Merit Improvements:

- **A more efficient heart-lung machine**

Research study example:

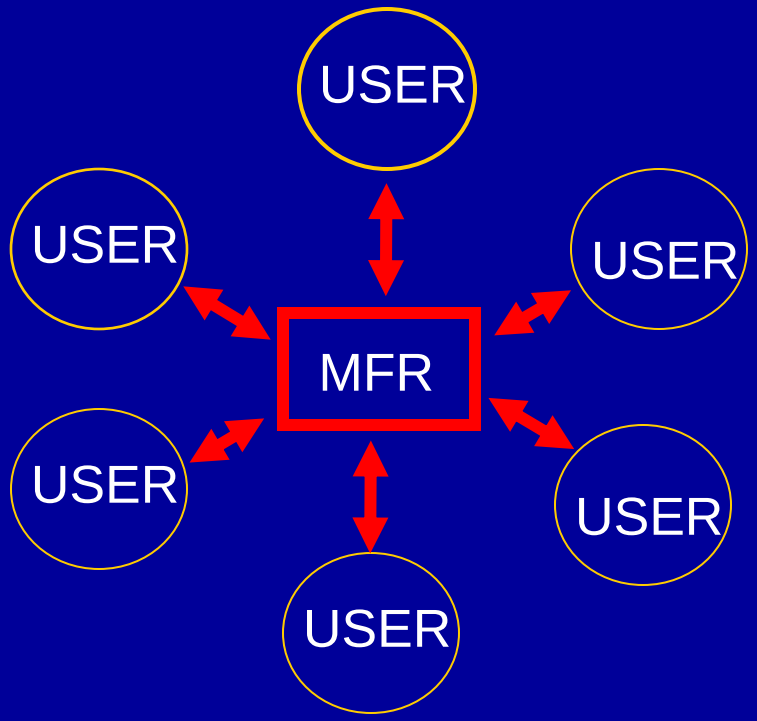
New functional capability	**82% user-developed**
DOM improvements	**87% mfr-developed**

Source: Study of Scientifc Instrument Innovations
n = 64 Riggs & von Hippel (1994)

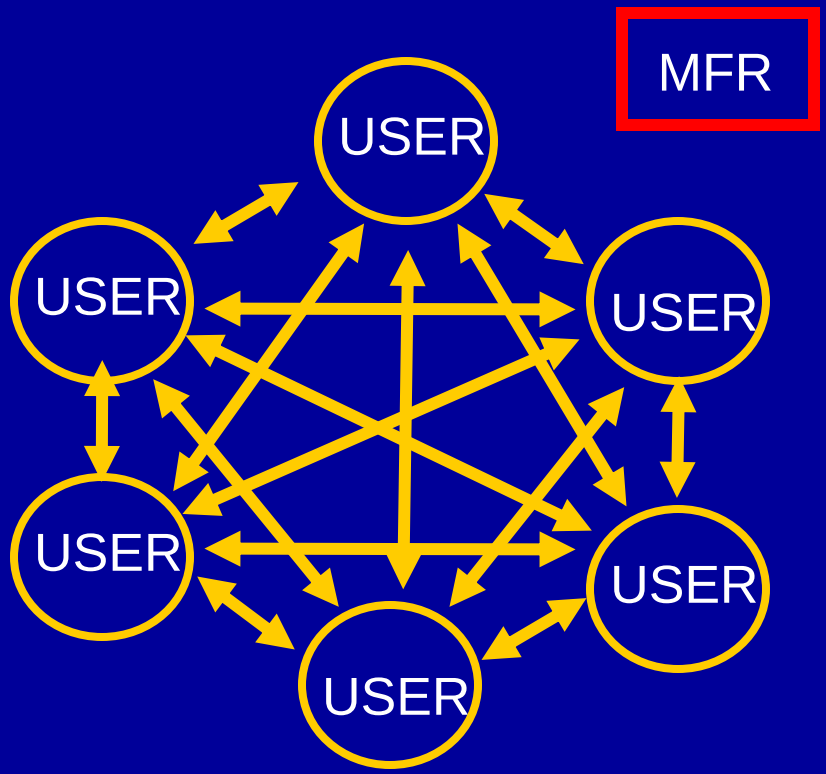
Studies show that *Many* users innovate

Industrial products	n	% innovating
Printed Circuit CAD Urban and vH	136	24.3%
Pipe Hanger Hardware Herstatt and vH	74	36%
Library IT Systems Morrison, Roberts, vH	102	26%
Software security features Franke and vH	131	19.1%
Surgical Equipment Luthje	262	22%
Consumer products	**n**	**% innovating**
Outdoor Products Luthje	153	9.8%
"Extreme" sports equipment Franke & Shah	197	37.8%
Mountain biking equipment Luthje, Herstatt, vH	291	19.2%

The Internet is enabling individual user innovators to join into *user innovation collaboratives* - an increasingly powerful competitor to manufacturer-based design



The way it was:
Producer-Innovators and
Robinson Crusoe
User-Innovators



The way it increasingly is:
User innovation
Collaboratives

Companies often ignore user communities – and miss valuable innovations – consider Lego Mindstorms

Mindstorms robot kit

The brain
- Computer "brain" within Lego brick

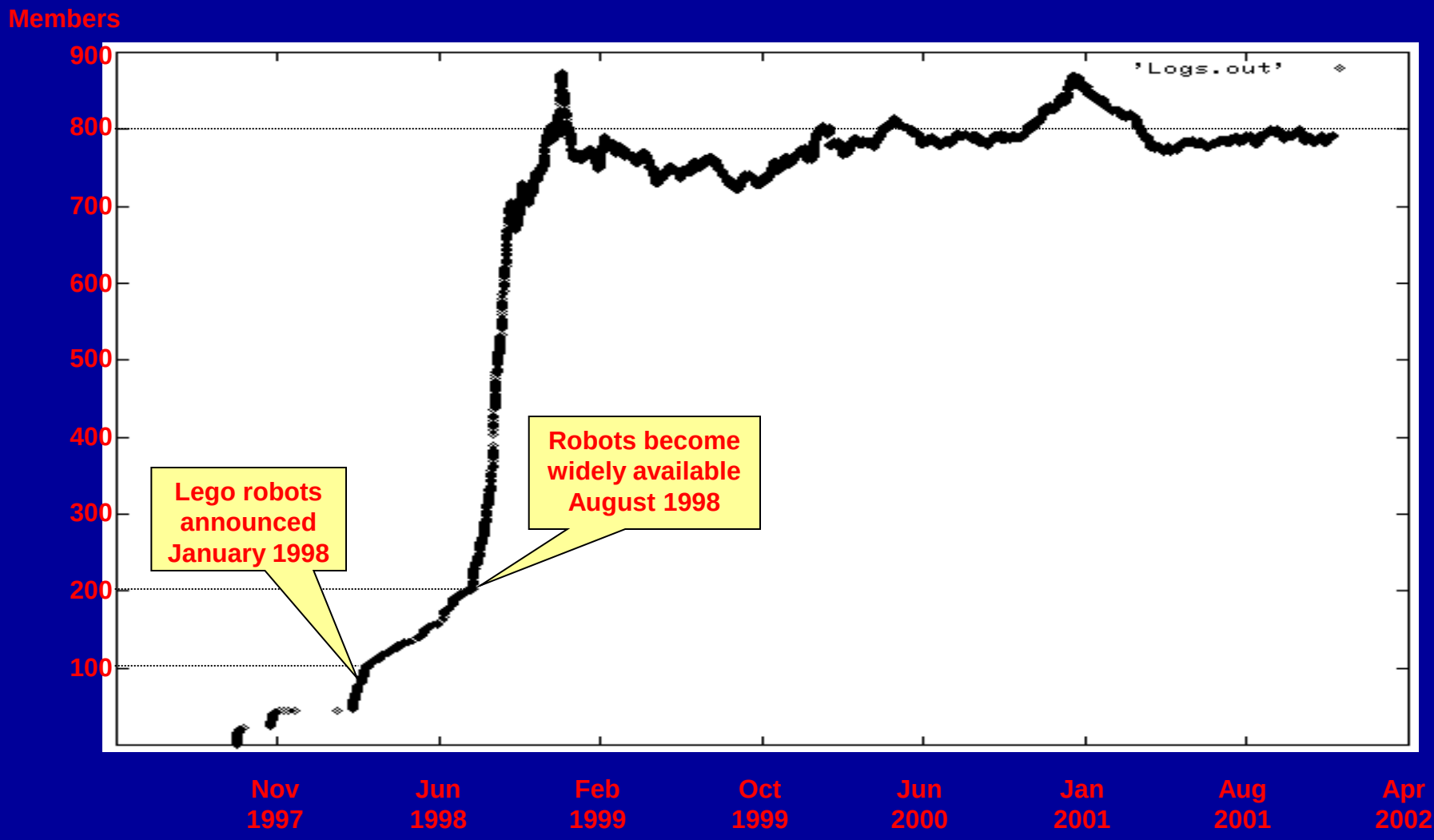
Movement
- 3 stepper motors

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)

Within 3 weeks of commercial introduction of Lego Mindstorms system, users had improved it significantly

The rules

Robots follow 7 meter "track" of tape
- Light sensors detect tape
- Internal software tells robot how to move

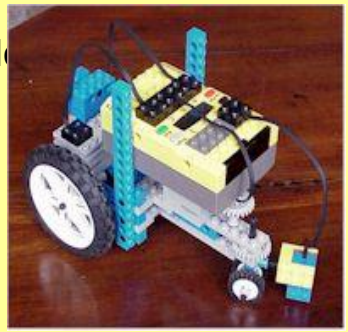
Fastest time around track wins

About one dozen participants

The results

Winner (below left)
- Used hacker-developed LegOS software
- Time under 10 seconds (73 cm/s)

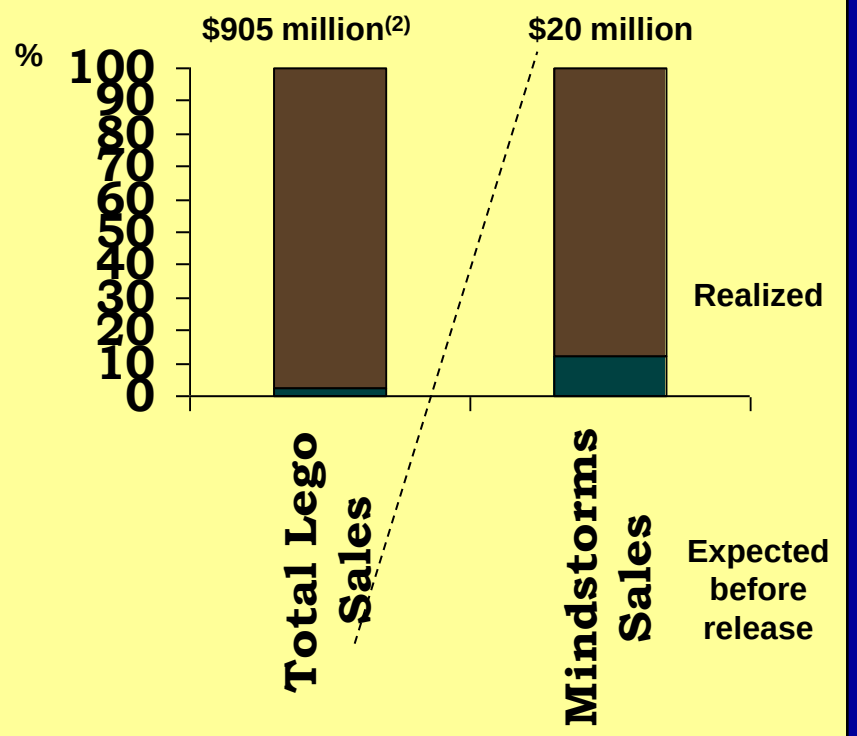
Second place (below right)
- Used program based on LEGO firmware
- Time of 25 seconds (28 cm/s)



Source: Italian Lego Users Group (http://www.itlug.org/). Contact Mario Ferrari [mario.ferrari@edis.it] LegOS Lego firmware

Mindstorm sales greatly surpassed Lego expectations

Sales in 1998[1]



Adults drove increased sales

70% of customers over age 18
- Craze among "techie" adults
- Silicon valley firms forced to ban Lego's at work

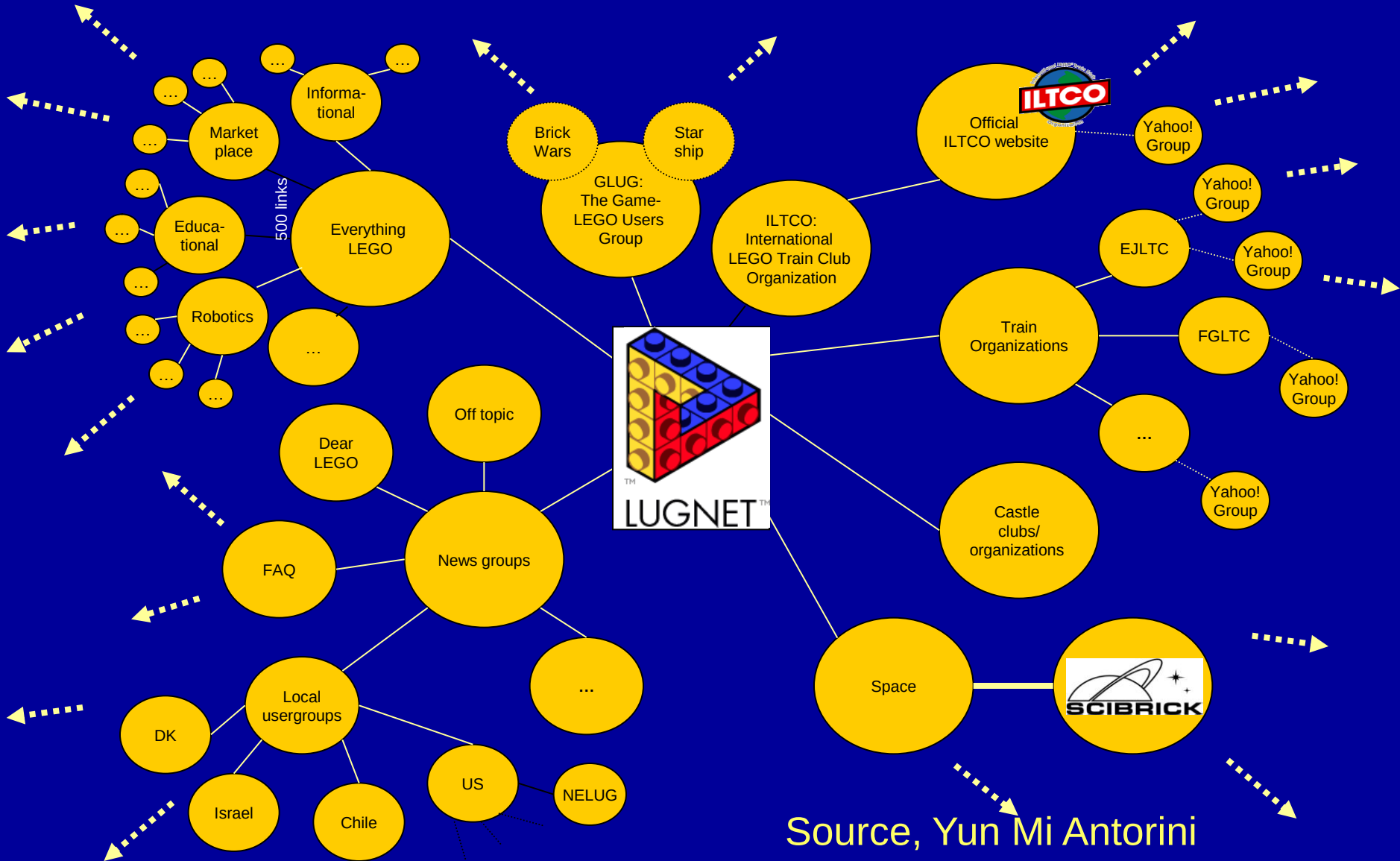
Online communities accelerated purchasing

Lego unable to keep up with demand
- Sold out 2 weeks before Christmas 1998

Major universities built curriculum around Lego
- Hacker software allows advanced robotics using Lego's hardware
- MIT, Duke among campuses using Mindstorms

(1) First year toys were offered
(2) Lego sales include theme parks, retail outlets and other non-core businesses
Source: Business 2.0, BCG Analysis

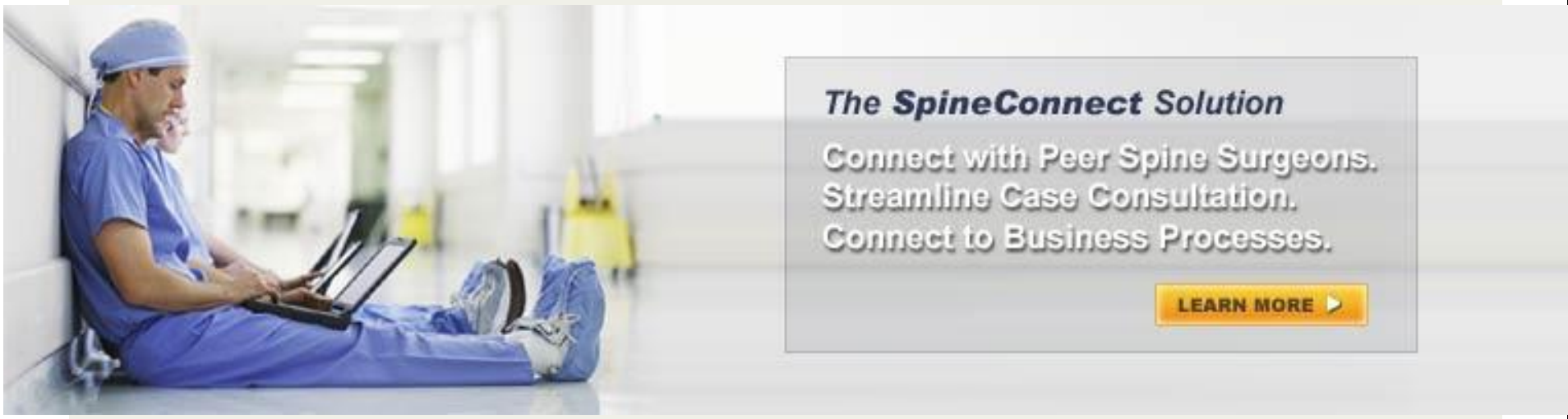
There are ~ 200 internal R&D people at Lego.
There are 20,000+ AFOL's – many innovate.
More Lego-related R&D outside Lego than inside?



Source, Yun Mi Antorini

Now LEGO is creating links to innovating fans

Of course, the trend is affecting high tech fields too



International community of leading spine surgeons

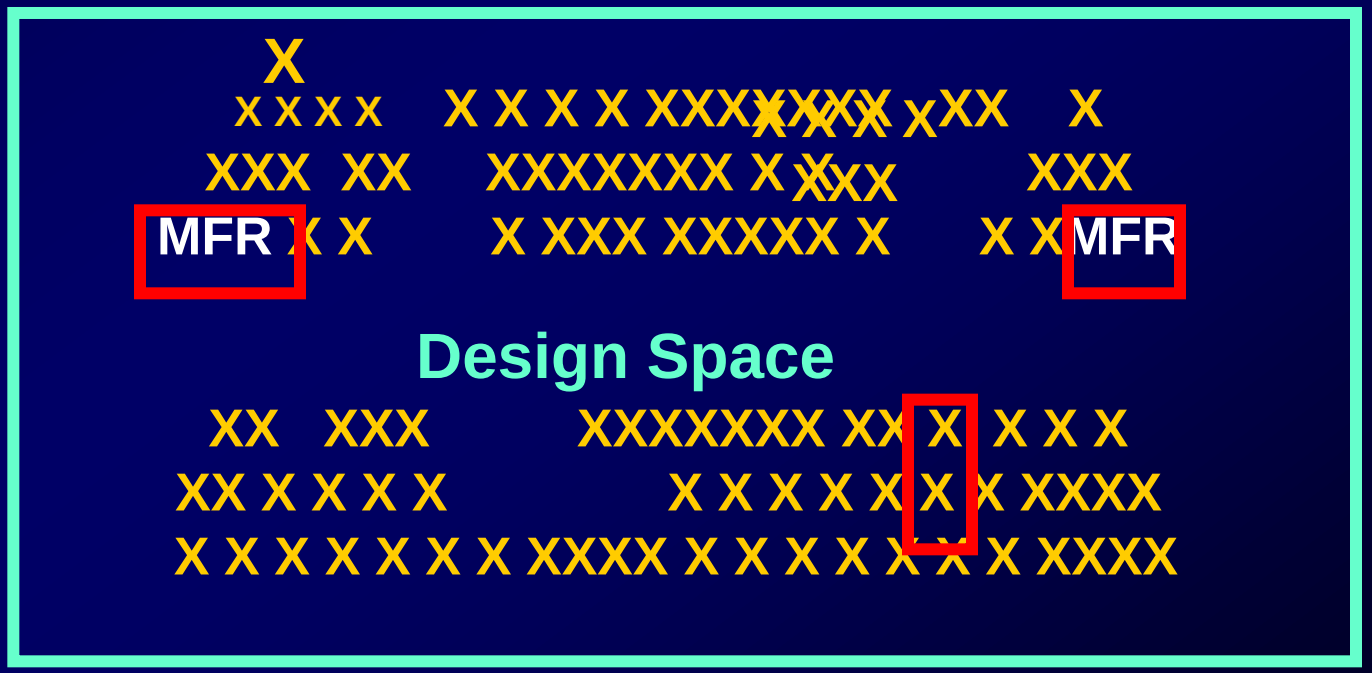
"SpineConnect is the leading collaborative knowledge network for spine surgeons to collaborate on difficult and unusual cases."

Every day, over 750 spine surgeons from around the world:

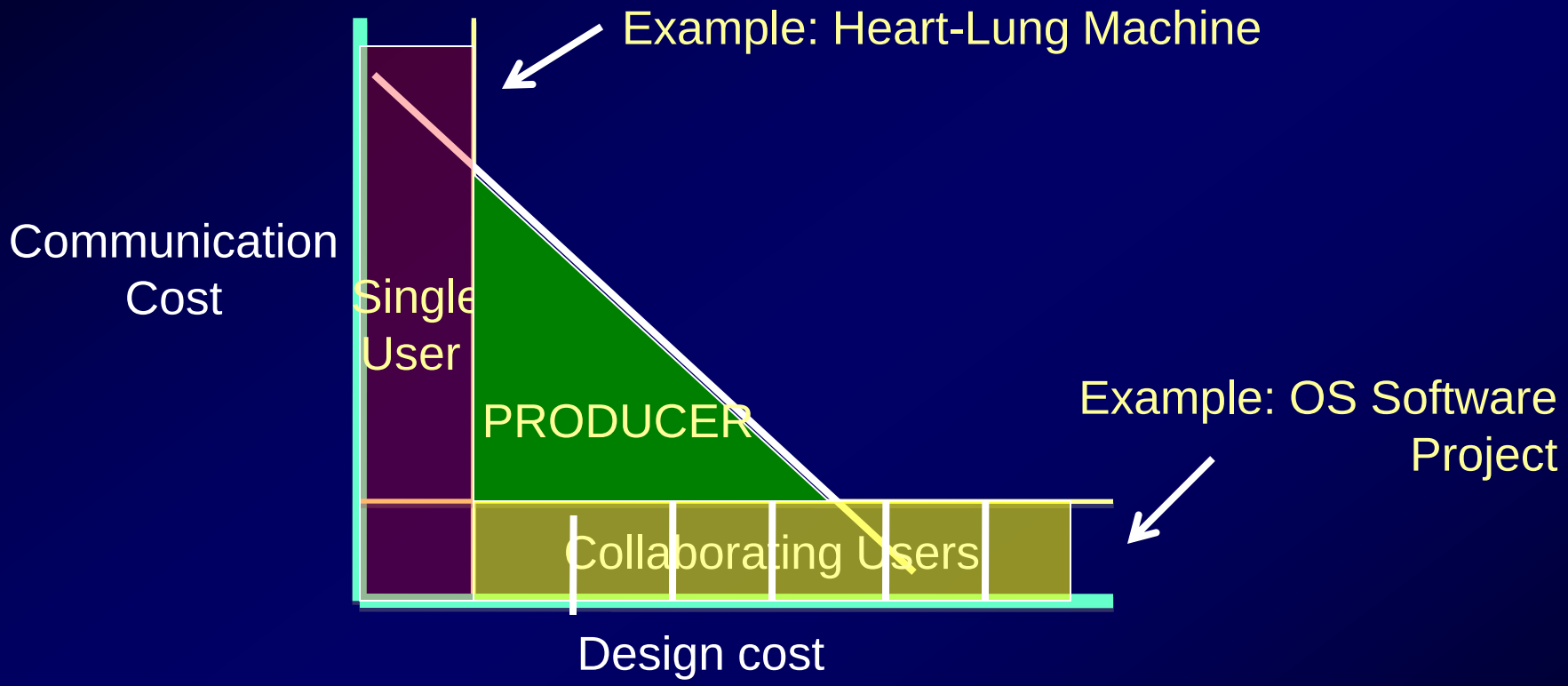
- Develop novel approaches to treatment,
- Address the top challenges in spine healthcare,

Why user collaboratives can out-compete producers in design:

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.



Where do single users, collaborating users, or producers dominate design?



Source: Baldwin and von Hippel 2009

Many Successful New Firms are based on User Innovations: 80% of juvenile products start-ups Founded by users (Source: Shah and Tripsas 2008)

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 tires from his garage. and the three-wheeled "Baby Jogger " was born.

Original
Jogging stroller

Motion Bed to
prevent colic

Car seat for
low birth-weight babies

Many Successful New Firms are based on User Innovations

Since the development of kitesurfing in the late 1970s and early 1980s, more than 200 companies have been founded or started to sell products and/or services related to kitesurfing. (Hienerth 2007)

3D Kiteboarding, Addiction Kiteboards, Adrenalin, Advance Kites, Aeros, Aggression, AHD, Airea, Airforce Kiteboards, Airtime, Airush, Amundson Customs, Anton Kiteboards, AP Kiteboards, Arribarri, Ascan, ASD Windsurfing, Atan,Bang, Banshee Kite, Best Kiteboarding, BIC Sport, Boom Kites, Brunotti, Bull, Bump & Jump, Cabrinha, Camaro, Cape Doctor, Cardboards, Carved, Catapult Kiteboarding, Caution Kites, Challenger, Chikite, China Kites, Clamcleats Limited, Cobra Kites, Concept Air, Costa Ovest Surfboard, Crave, Crazy Fly, Cyclone, Cyclone Kitelines, Da Kine, Da Vinci, David Stubbs, Dc Woody, Delta Designs, Depart, Devil, Dlight, DVNT, Dynamit, Early Bird Kiteboarding, Elbecustoms, Elliot, Eric Hertsens, Euphoria, F.one, Faction Kites, Fanatic, FCS, Flexifoil, Flowbeekite Reel International, Flying Objects, Flysurfer, Freaksoffashion, Force, Fox Watersports, FST Kitesurfing, Gaastra Kites, Gath, Globerider, Gun, Hammersurf, Hana Crew, Handmade, Hawaiin Pro Line, Hein, HIFLY, Highwind Criminal, Hooley, HTS, Impact 3D, ION, ITV, Jimmy Lewis, JN, Jogiboards, Jonah Lepak Designs, Jorguse Surfpower, Kailuha-Boards, KAYBIS Kiteboarding Lifestyle, King, Kite Chicks, Kiteboarding Company, Kiteloose, Kiteski, Kitesurfer, Kronic Kiteboards, Krunk Kiteboarding, La Ola Kiteboards, Liquid Force, Liquid Sky Kiteboarding Inc., Litewave Designs, Logosz, Long Ocean, Loose Boards, Lorch, Lost Cause, Lunatic, Manta Sailbords, Maohi Kiteboarding, Martin Technologies, Maui Fin Company, Max-X , Mixpowersports, Monkey Kites, Mormaii, Mystic, Naish, Neil Pryde, Nice Bindings, Nobile, North Kiteboarding, Northshore, NRG Hawaii, NSI, Obsession, Ocean2air, Ocean Rodeo, Ockert, OES Australia, Okespor, ON Boards, Open Ocean, Ozone, Pat Love, Peter Lynn, Powerline, Pro, Limit, Protest, Prototyp, Quadrifoil, Radical, Rainbow Fin Company, Ram-Air, Rip Curl, Rogue Wavebords, RRD Robert Ricci Designs, RSC, Sailboards Tarifa, Schrenk Boards, Schroeder Eric, Sea Jump, Seasmik, Seatrend Boards, Shroder Boards, Skytiger, Skywalker Kiteboards, Slingshot, Snaketower, Solid Kiteboards, Sonic33, SOS Kiteboards, Spleene, Starboard, Stonker Boards, Stretch Boards, Surfactory, Surfproducts, Takoon, Tarifa Max Sports, TRB, Tecno Limits, Tekkno Sport, Temavento, TFC, Threesixty, Timpone Hawaii, Tribal Shapes, Twintail Kiteboards, Two AG, Ul Profil GmbH, Ultra Nectar, Underground, Vade Retro, Vio Kites, Viper, Vliegerop, Voo-Doo, Wallend AirWanikou Technologie, WARK BOARDS, Waterboards, Wavelords, Wave´s, White Water, Wichard, Windart, Winddummy, Windtech, Windtools, Windwing, Wings Flugsysteme, WIPIKA, Witchcraft, Woodyfish, Xeleratorkiteboarding, XTC, x-blanks, X-Shooter, X-Sports, Zenith

Many Successful New Firms are based on User Innovations

Kitesurfing was a new field user innovation - and developed into numerous innovations, products and services. Each area of products/services was entered by a growing number of companies.




Core Products




Equipment

Safety


Fashion

User Innovation

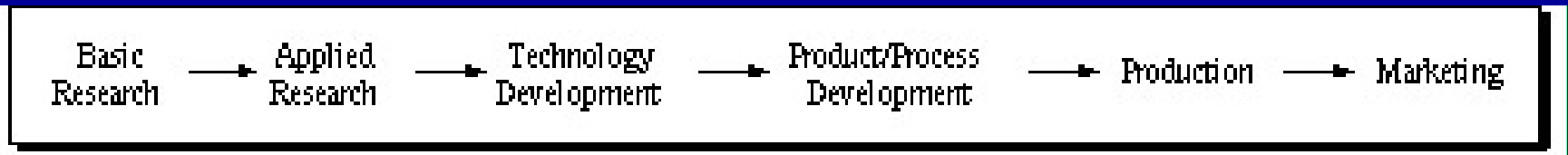
Training, schools


Films, videos

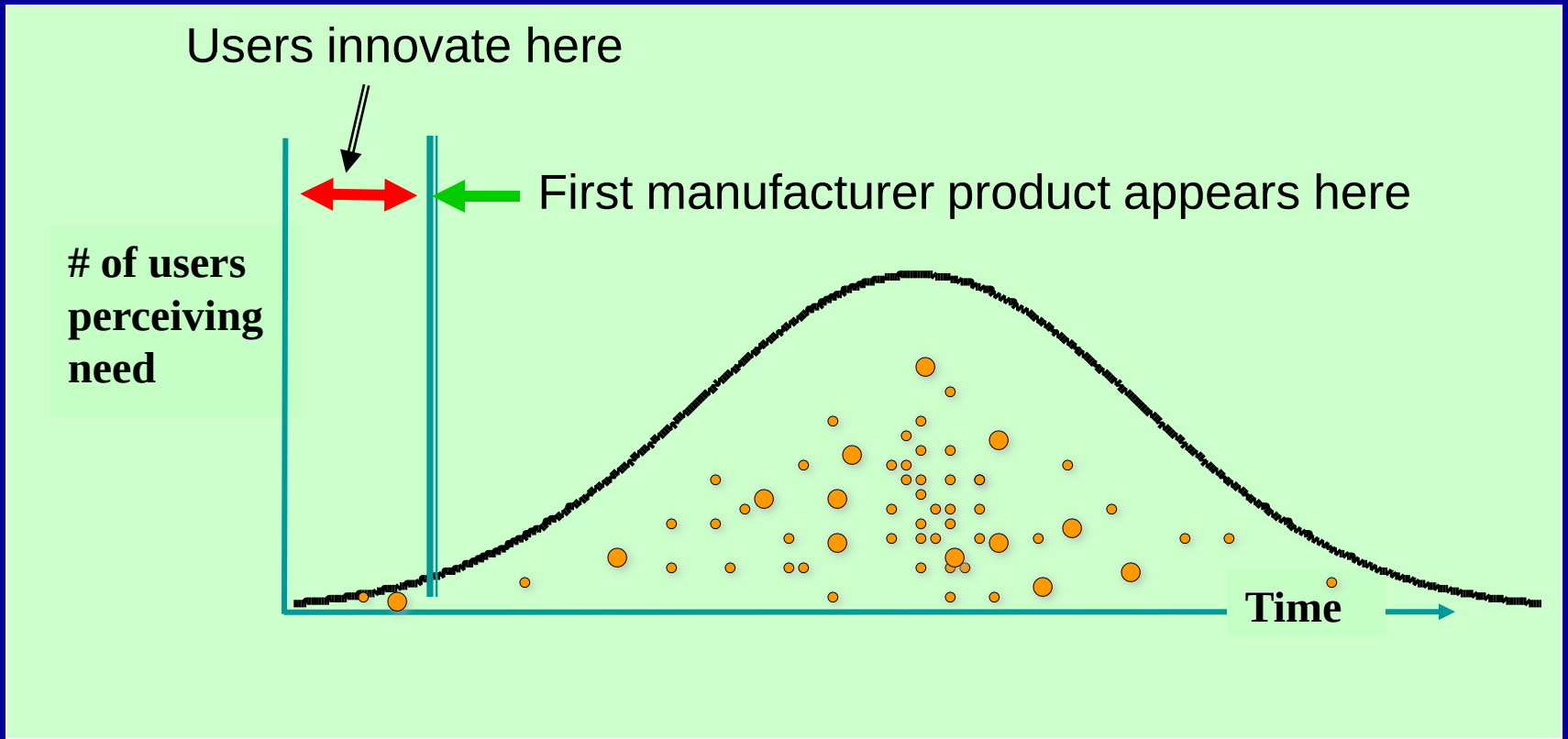

Insurance


Traveling


User innovation and the "linear innovation model" Have very different policy implications.



For example: should we focus just on R&D and patents?
Or shall we also consider open user innovation policies?



User-innovator firms often transfer their innovations for free – implications for IP Policy

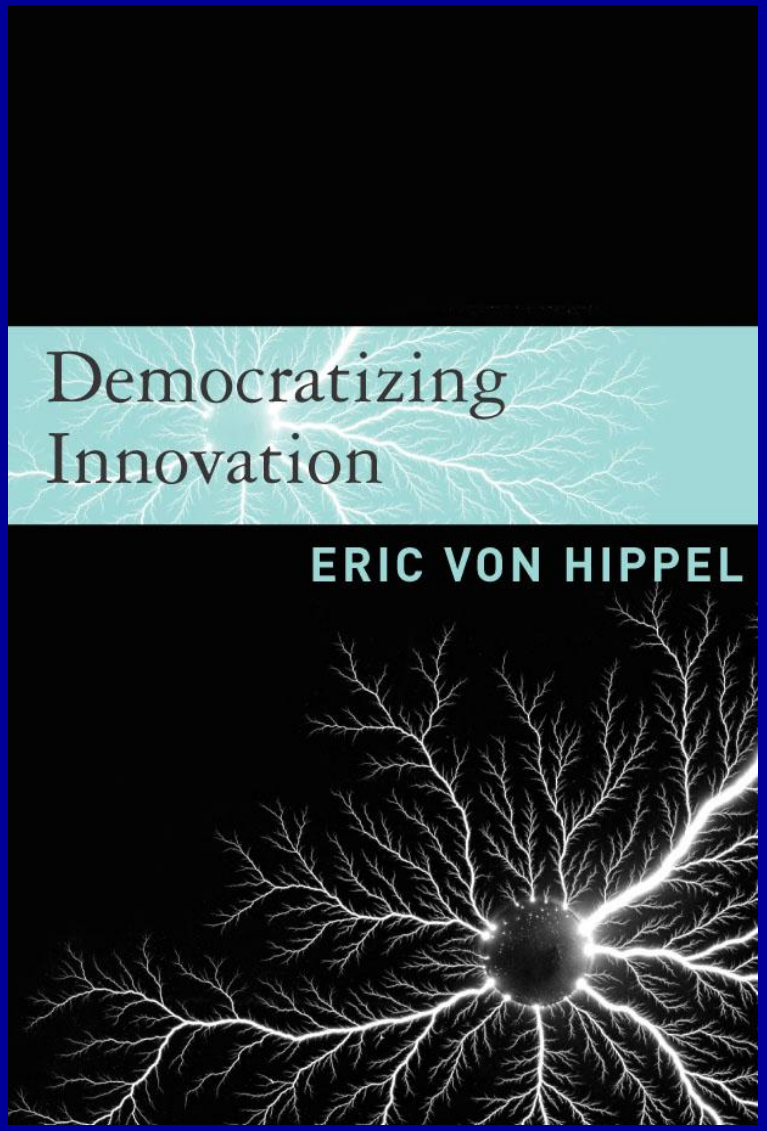
	UK	Holland	Canada
% Most recent User Innovations **transferred to producers**	**21.7%** (n=199)	**25%** (n=191)	**25.8%** (n=524)
% of innovations transferred that were transferred at no cost	**56.5%** (n=112)	**48%** (n=92)	**60.7%** (n=318)

Many CONSUMERS also innovate – and 90% transfer their innovations to others for free

Innovating UK consumers aged 15+	**6.2% ~ 3 million people**
% Most recent User Innovations **transferred to producers**	**25%**
% of innovations transferred that were transferred at no cost	**90%**

If you want to learn more…
THIS BOOK AVAILABLE FREE from my MIT Website

http://mit.edu/evhippel/www/books.htm



New pioneering project starting in Portugal

- **The Ministry of Science, Technology and Higher Education (MCTES)**
  - Department of Science and Innovation Statistics (GPEARI-Statistics)
  - MIT-Portugal and the Carnegie-Mellon Portugal Programs

- Research team:
- Eric von Hippel, MIT Sloan School of Management
- Pedro Oliveira, FCEE-Catolica University
- Jeroen de Jong, RMS Eurasmus University
- Irina Cojuharenco, FCEE-Catolica University

Danish Government makes support of “user driven innovation” a national priority (Feb, 2005)

In the Danish Government's strategy for Denmark in the next 4 years "user driven innovation" has been made a national priority.

"Strengthening user-driven innovation and knowledge diffusion" the Government will develop a particular program for the so-called user-driven innovation. Danish companies build their ability to change on knowledge which comes from many different sources and Danish companies may have specific capabilities when it comes to creating successes based on an effective interplay between companies and users"…etc.

– **Source: Nye Mal Regerings Grundlag, VK Regeringen II, February, 2005**

But what actually happened was quite different
The “definition of user-driven innovation” was made very broad
- And EVERY FIRM AND EVERYONE WAS DEFINED AS A USER!

DANISH ENTERPRISE AND CONSTRUCTION AUTHORITY

Definition of user-driven innovation

User-driven innovation is to be understood as a systematic approach to the development of new products, services, processes, forms of organisation, etc., on the basis of research or inclusion of users' life, practice or needs, including the identification of non-realised needs that are expected to subsequently materialise in terms of demand from larger user segments.

Users are defined in the broad sense of consumers, customers, employees, enterprises, cooperation partners, suppliers or citizens. Research and inclusion are defined as, for instance, observation, dialogue or active user participation in the course of the entire innovation process.

Source: Jacob Holm “Insight into user-driven innovation 2007”

ERHVERVS- OG BYGGESTYRELSEN

And then they spread projects all over Denmark

Program for Brugerdreven innovation

62 projekter igangsat

62 projects started

Mere end 200 danske virksomheder deltager

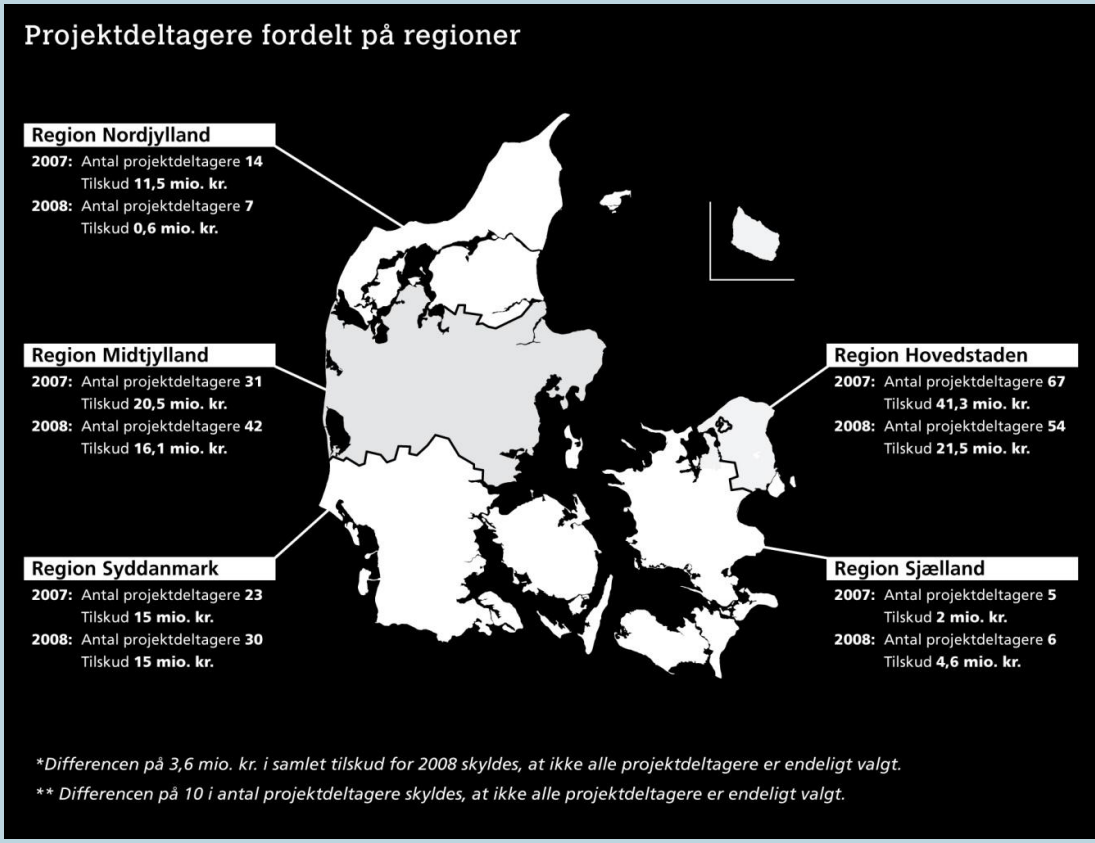
More than 200 Danish companies participate

Foreløbige effekter: nye metoder, redskaber og modeller er udviklet

Temporary effects: new methods, tools and models have been developed

Midtvejsevalueres i april 2009

Midtvejsevalueres in April 2009



None of the projects supported had anything to do with innovation BY users.

Example from 2009:

Self-reliant with technology (2.130.000 kr.)

Investigations show that being able to be self-reliant gives added quality of life for elderly citizens. The users in the project are recipients of home help and citizens at nursing homes.

The purpose of the project is to use user-driven innovation methods *to uncover users' needs*

Measuring and supporting user innovation is essential: They may spend more on innovation than producers – but what they spend and who spends it is invisible today

INVESTMENTS OVER TIME	TECHNIQUE INNVOVATIONS	HARDWARE INNOVATIONS		
	ONLY developed by users	User Investment	User / mfr Investment	Manufacturer Investment
1950's and 60's	455 man-years	455 man-years	-	5 man-years
investment		$1.250 million	-	$ 100,000
1970's	975 man-years	975 man-years		5 man-years
investment		$ 9.375 million		$ 200,000
1980's	264 man-years	134 man-years	-	-
Investment		$ 1.040 million	-	-
1990's	2,470 man-years	210 man-years	20 man-years	4 man-years
investment		$ 1.350 million	$ 600,000	$ 300,000
	USERS	USERS	PRODUCERS	
Total - hours	4,164 man-years	1,781 man-years	20 man-years	14 man-years
Total - costs		$ 13.015 million	$ 600,000	$ 500,000

Hienerth and von Hippel (2010)

Consumers develop product innovations – and 90% give them away without protection

Total User Innovators in UK = 3 million people	**6.2%**
Modified a consumer product for own use	5.9%
Created a consumer product for own use	4.4%
Thought they were the first to develop the innovation they reported	4%
Sample	(n=2109) Consumers aged 15+

Source: Flowers et al. NESTA 2010

Transfers of process innovations from user firms to process equipment producers

	UK	Holland	Canada
% of Most recent User Innovations transferred to producers	**21.7%** (n=199)	**25%** (n=191)	**25.8%** (n=524)
% of innovations transferred that were transferred at no cost	**56.5%** (n=112)	**48%** (n=92)	**60.7%** (n=318)

Users develop much more than new products: In this example, they develop the sport itself, the techniques, the products, the infrastructure…

- In whitewater kayaking, users developed 100% of the important technique innovations and 73% of the important hardware innovations.

Source: Hienerth (2006)

User firms tend to be more open about process innovations than product innovations. This has implications for IP policy

	User (process innovation)	Producer (product innovation)
Protect with IPR?	11% yes (8% patented)	45% yes (36% patented)
Others copy?	26% yes	16% yes
Transfer voluntary?	**85% yes**	**17% yes**
Tot. development expenditure	30K euros	82.5K euros

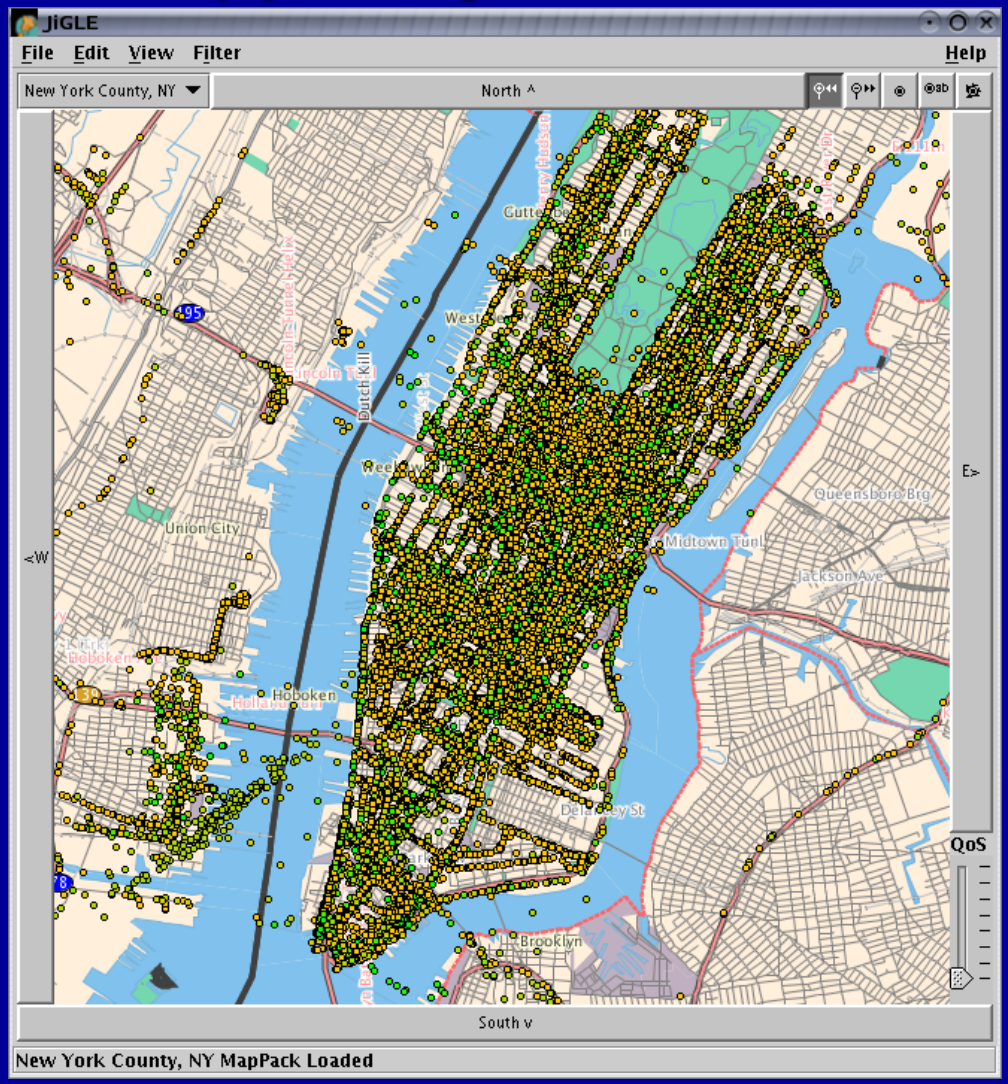
148 Dutch SMEs surveyed on their product vs process innovation practices.
De Jong and von Hippel 2010

It can be possible to re-architect problems to fit economic conditions suitable for collaborative user innovation.
Consider the $12billion example of GPS

Welcome to Skyhook – a geographical positioning system based on millions of unique wireless points mapped by users - for free

The Wi-Fi Positioning System from Skyhook Wireless (and other firms) is a software-only location platform that provides 20 meter positioning accuracy to any Wi-Fi enabled mobile device. Unlike satellite based GPS systems, WPS uses terrestrial based Wi-Fi access points to determine location.

Example: Wi-Fi points mapped in Manhattan



„Wardriving is the act of searching for Wi-Fi wireless networks from moving vehicles.

A German Wardriving Community

- **14.000 members**
- **95.000 posts**
- **Members predominately men (18 – 30)**
- **Founded 2002**
- **Typical mailing list discussion topics:**
  - **Wardriving methods, hardware, software and legal issues**

http://www.wardriving-forum.de/

Wardrivers in Action

User FIRM innovation frequencies: International comparisons

	UK	Netherlands	Canada
Total User Innovators	**15.3%**	**54%**	**43.3%**
Modifiers	10.3	32	21.1
Creators	8.6	41	22.2
Sample	(n=1004) All firms 10-249 employees	(n=364) Hi-tech firms 1-100 employees	(n=1219) Manf firms >10 employees

Why does user innovation require policymaking intervention?
(1) Major Spillovers exist: Most innovating users give away their unprotected innovations

13%	Share of user innovations that is somehow protected (mainly with patents)
25%	Share of user innovations adopted by producer firms that users are aware off

Shared voluntary?

yes=87%

No=13%

Compensation?

None=48%

Informal = 39% (reductions, advice, staffing services)

Royalties = 13%

Source: Sample of 364 user innovations in technology-based SMEs, 2007

More accurate measurement of user innovation changes innovativeness rankings of industries – A NL basis for policymaking

	Share of firms with… in past 3 years		
	Process innovation	User innovation	Rank order
All SMEs (n=2 416)	30%	21%	
Industries:			
- Farming (n=169)	29%	23%	**6 → 3**
- Manufacturing (n=562)	45%	36%	1 → 1
- Construction (n=168)	19%	21%	**8 → 5**
- Trade (n=547)	29%	17%	**5 → 8**
- Lodging and meals (n=81)	12%	10%	9 → 9
- Transport (n=187)	28%	21%	**7 → 6**
- Financial services (n=72)	30%	19%	**4 → 7**
- Business services (n=496)	37%	25%	2 → 2
- Other services (n=134)	32%	22%	**3 → 4**

Because of information is sticky, each user responds to local needs using local solution information

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.

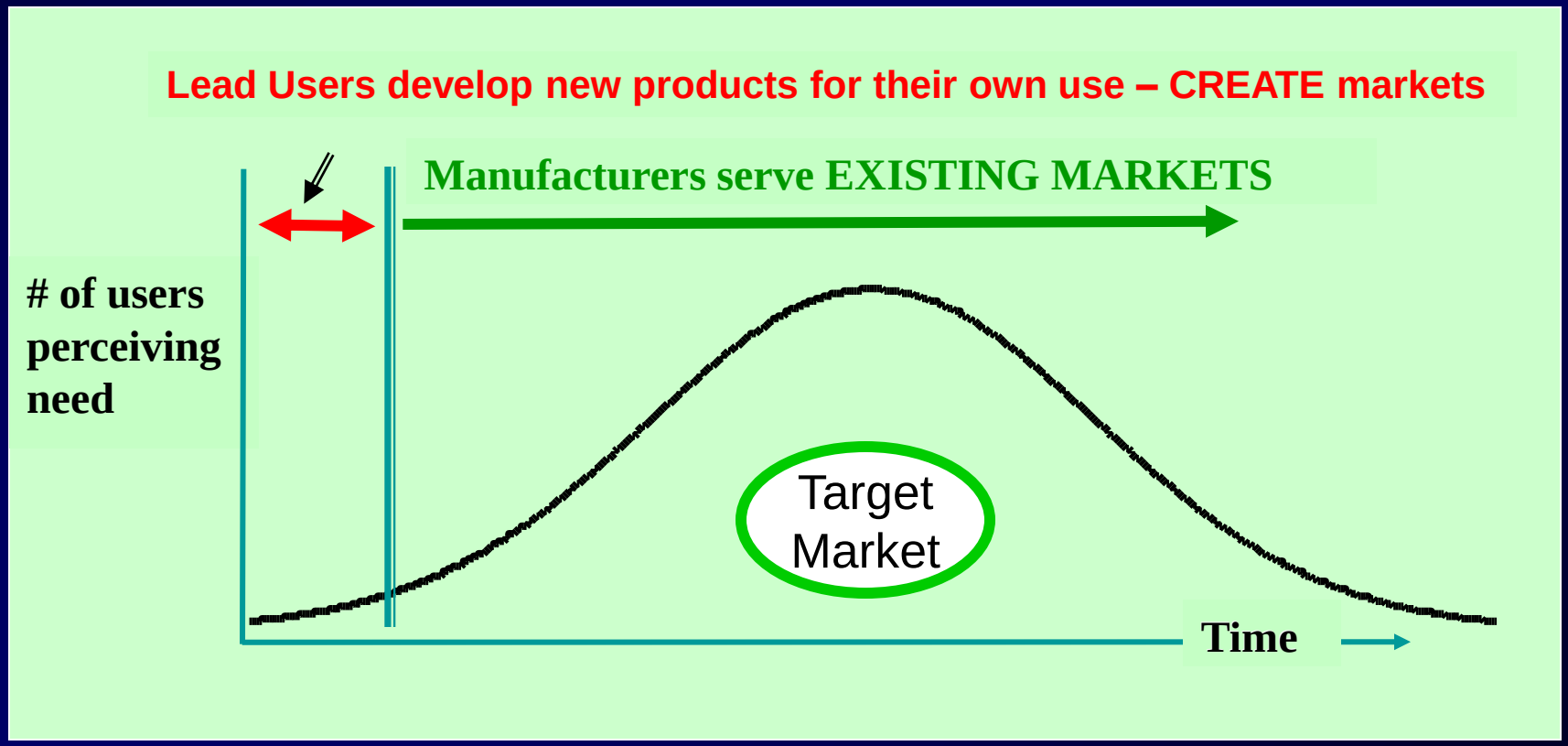
To prevent dehydration during a summer bike race, he fashioned a drinking system from surgical tubing and an IV bag that he sewed to his shirt.

Examples of Important Consumer Product Innovations

Category	Example
Health Products	Gatorade
Personal Care	Protein-base Shampoo Feminine Hygiene
Sports Equipment	Mountain Bike White water kayaking
Apparel	Sports Bra
Food	Chocolate Milk Graham Cracker Crust
Office	White-out Liquid
Computer Application Software	Electronic Mail Desk Top Publishing

Due to "sticky information" and market size effects:

USERS tend to develop novel functional capabilities and create new markets
PRODUCERS tend to develop dimension of merit improvements and serve established markets



The stronger an innovator's lead user characteristics, the more commercially desirable is its innovation

- Innovations developed by lead users have high commercial value – Morrison and several other authors

- Commercial value of innovations users develop goes up as "lead user" characteristics of innovators intensify – Franke & vH

Figure 1:
Attractiveness of Innovations as a Function of the Lead User Construct

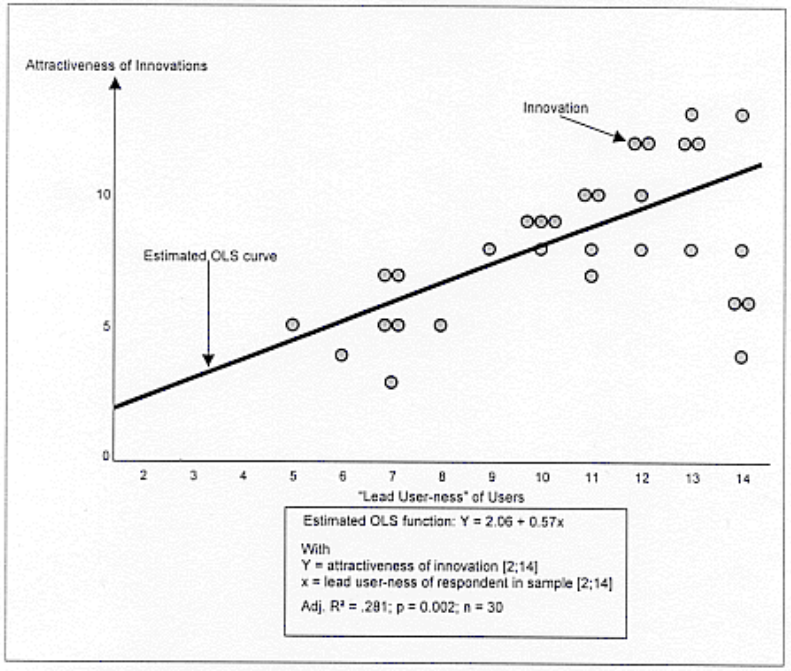


Figure 1 graphically summarizes two important findings. First, the increased concentration of innovations towards the right indicates that the likelihood of innovating is higher for users having higher lead user index values. Second, the rise in average innovation attractiveness as one moves from left to right indicates that innovations developed by lead users tend to be more attractive.

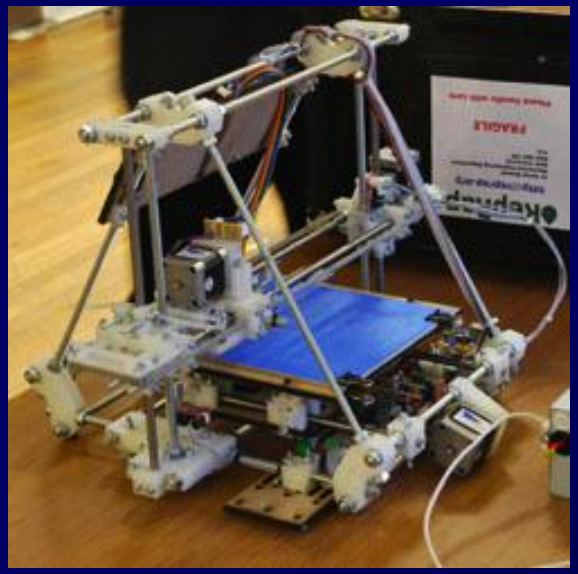
Systematic method exists for capturing lead user innovations: Assessment Results at 3M

	LU Ideas (n=5)	NON-LU Ideas (n=42)	Sig.
"Newness" of Idea			
• Novelty compared to competition	9.6	6.8	0.01
• Newness of needs addressed	8.3	5.3	0.09
Projected Profitability			
• % market share in year 5	**68%**	**33%**	0.01
• Estimated sales in year 5	**$146m**	**18m**	0.00
Strategic Value			
• Strategic importance	9.6	7.3	0.08
• Fit with Strategic plan	9.8	8.4	9.24
Fit with Business			
• Intellectual property protection	7.1	6.7	0.80
• Fit with mfr. Capabilities	7.8	6.7	0.92
• Fit with distribution channels	8.8	8.0	0.61

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

Of course, the trend is affecting high-tech fields too **Open, collaborative innovation in 3-D filament printers is outstripping producer innovation: 1,000 hackers vs 50 developer employees in Stratasys**

Stratasys low-end
3D printer $25-40K



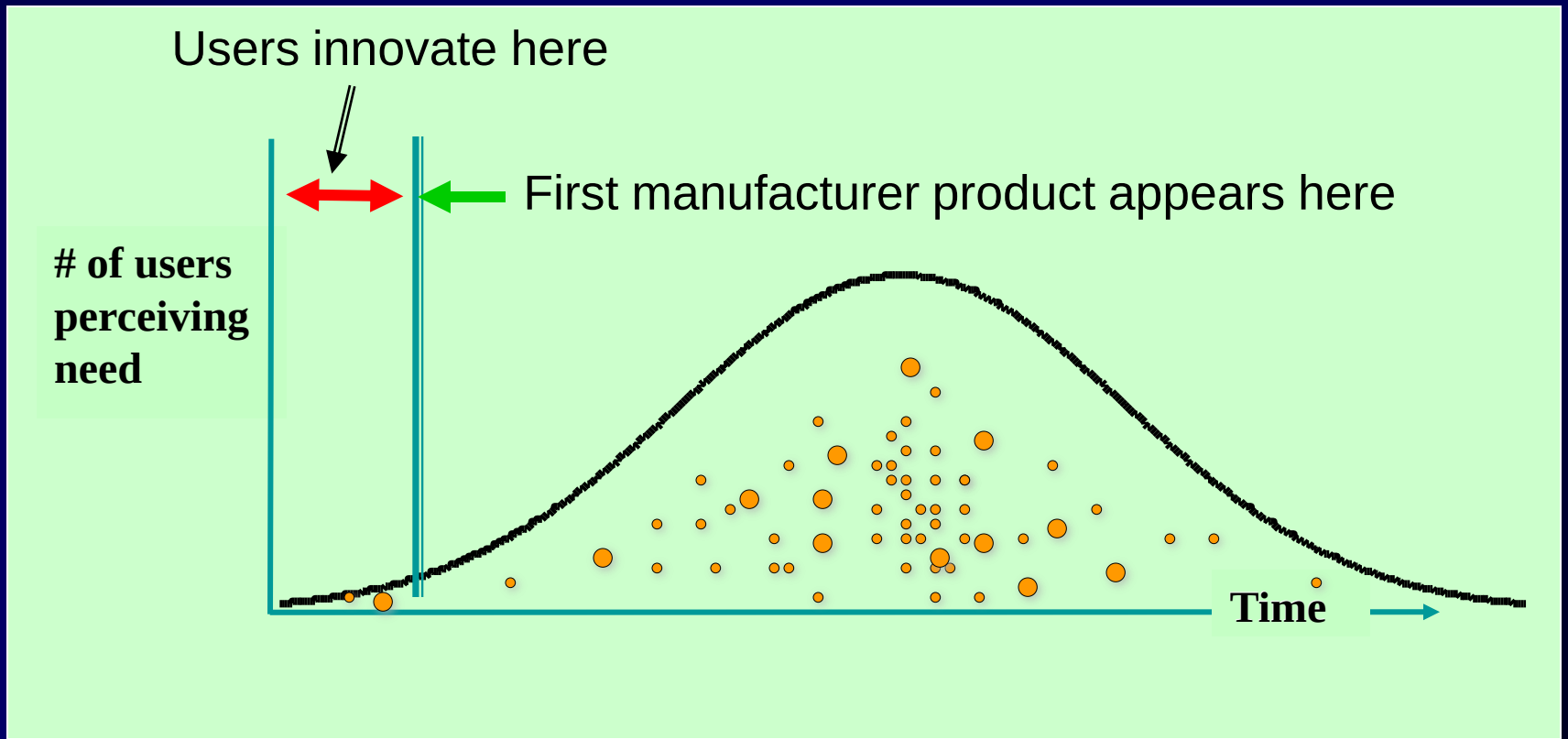
Rep-rap homemade
$275 parts cost

Rep-rap kit $875
(Makerbot)

User-Centered (Democratized) Innovation Paradigm

First, Lead Users innovate and often freely reveal their innovations
SOME of these innovations appeal to other users

- **Then user communities grow**
- **Then user-founded firms enter**
- **Finally, after the market opportunity has become clear, incumbent manufacturers enter**



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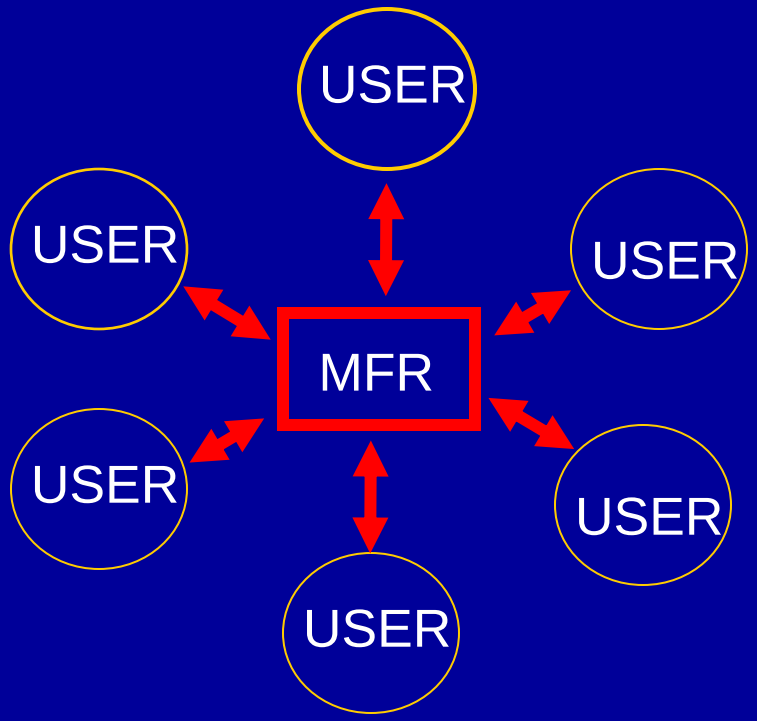
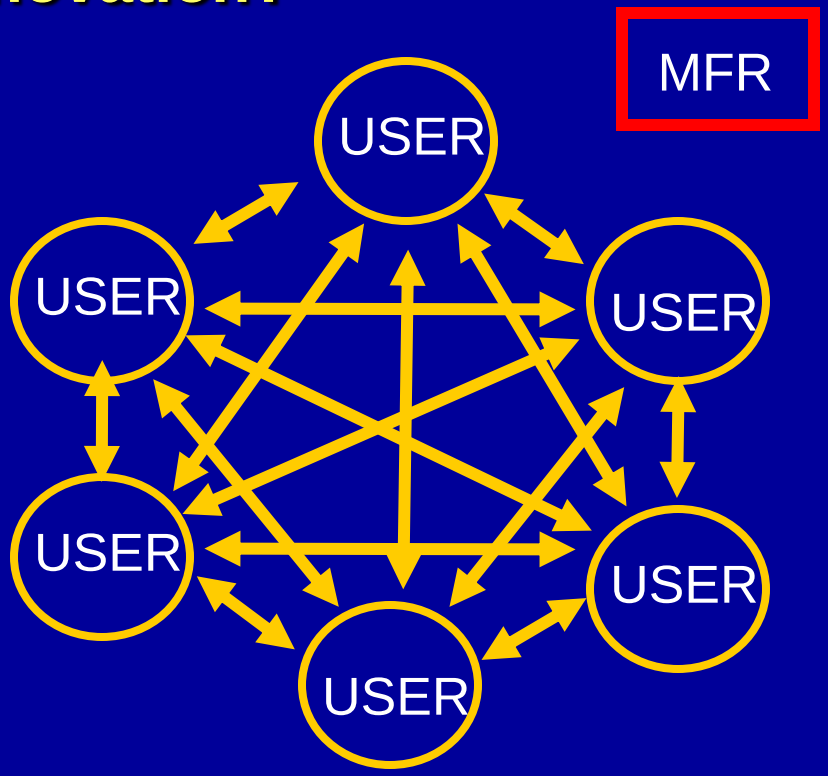
What new policies are required by the ongoing shift to user-collaborative centered innovation?





Producer-Innovators need:

Strong Intellectual Property, Economies of scale (supported by public investments like roads)

User innovation Collaboratives need:

Protection for Intellectual commons, Low networking and collaboration costs, Human resources training and support