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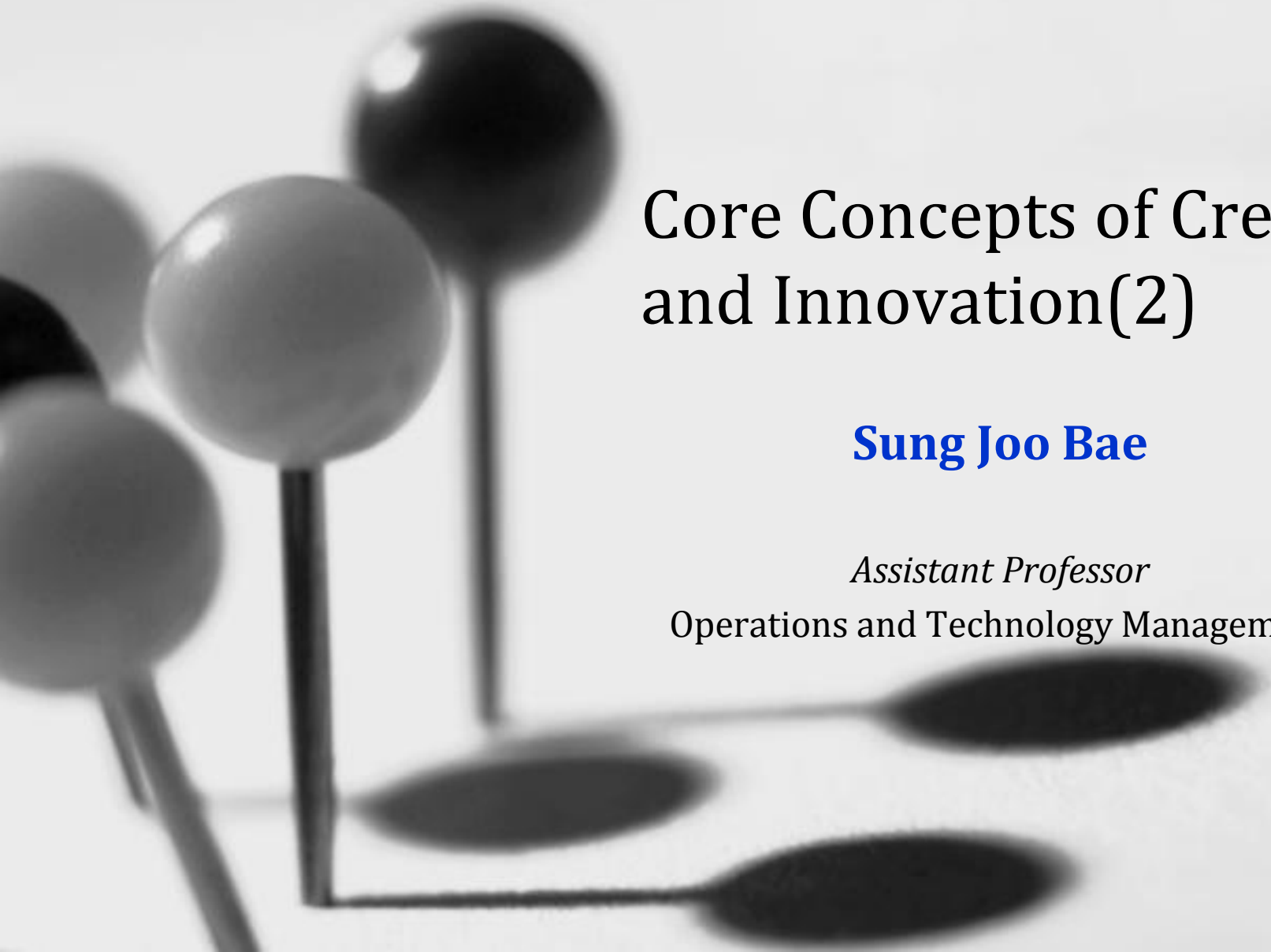


Core Concepts of Creativity and Innovation(2)

Sung Joo Bae

Assistant Professor
Operations and Technology Management

What we will do today…

- Understand basic concepts of innovation
  - Sync. our vocabulary
- Understand the nature of technical change
- Understand the importance of market in innovation
- Architecture and Design Structure Matrix

Innovation – Much More Complicated than Invention

- Invention & Innovation: Difference?

- Generation of Ideas → Problem-solving (Design) →Implementation(Mfr, Mkt, Dist) →Diffusion

- Basic Science → Applied Science → New Product Development → User Innovation
  - What is the role of the basic science?

Which is better & more prevalent?

- **Market-oriented innovation**
  (market or demand “pull” ??)

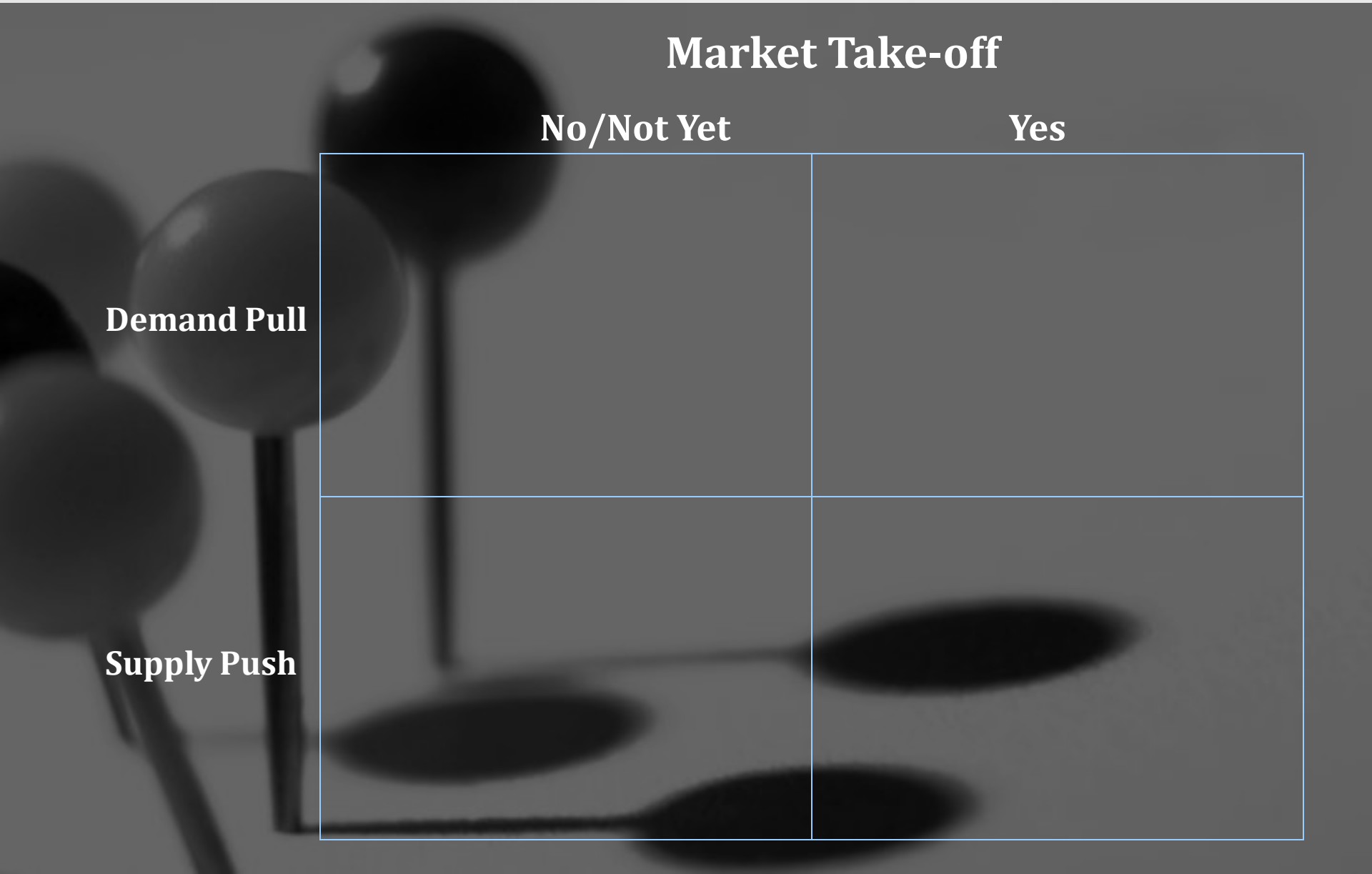
or

- **Manufacturer/service provider-driven innovation**
  (technology or supply “push” ??)

A sample of innovations

- Web learning
- Television
- Penicillin
- Third generation (3G) wireless
- Hand calculators
- Polyester
- Digital cameras
- Tupperware
- Touch screens
- Internet gambling
- Financial options
- Transistor
- Peer-to-peer computing
- Satellite telephony
- Electronic ink
- Web-based social networking
- DARPA-net
- Alternative fuel automobiles
- Virtual Reality (Second Life)

Demand-pull and supply-push



Demand-pull and supply-push

	Market Take-off: No/Not Yet	Market Take-off: Yes
Demand Pull	•Web learning	Hand calculators Digital cameras Tupperware Penicillin Internet gambling DARPA-net Alternative fuel automobiles
Supply Push	Virtual Reality Satellite telephony Electronic ink?	Polyester Financial options Television Transistor Peer-to-peer computing Touch screens Web-based social networking?

Conventional wisdom?

Table 2. A comparison of studies of the proportions of innovations stimulated by market needs and technological opportunities.

Author	Proportion from market, mission, or production needs (%)	Proportion from technical opportunities (%)	Sample size
Baker *et al.* (*38*)	77	23	303*
Carter and Williams (*11*)	73	27	137
Goldhar (*37*)	69	31	108
Sherwin and Isenson (*17*)	61	34	710†
Langrish (*20*)	66	34	84
Myers and Marquis (*7*)	78	22	439
Tannenbaum *et al.* (*33*)	90	10	10
Utterback (*31*)	75	25	32

* Ideas for new products and processes. † Research events used in 20 developments.

The best innovations are customer/needs/demand-driven.

- Common thoughts:
  - Nothing is worse than "a technology in search of an application," or "a solution in search of a problem and a customer"
  - "Necessity is the mother of invention"
  - "How many billions of dollars has this company spent on R&D that goes nowhere?!"

Internal vs. External Sources

Of the 157 cases studied by Myers and Marquis, how many innovations are evoked by information from sources outside the firm?

98 = 62%

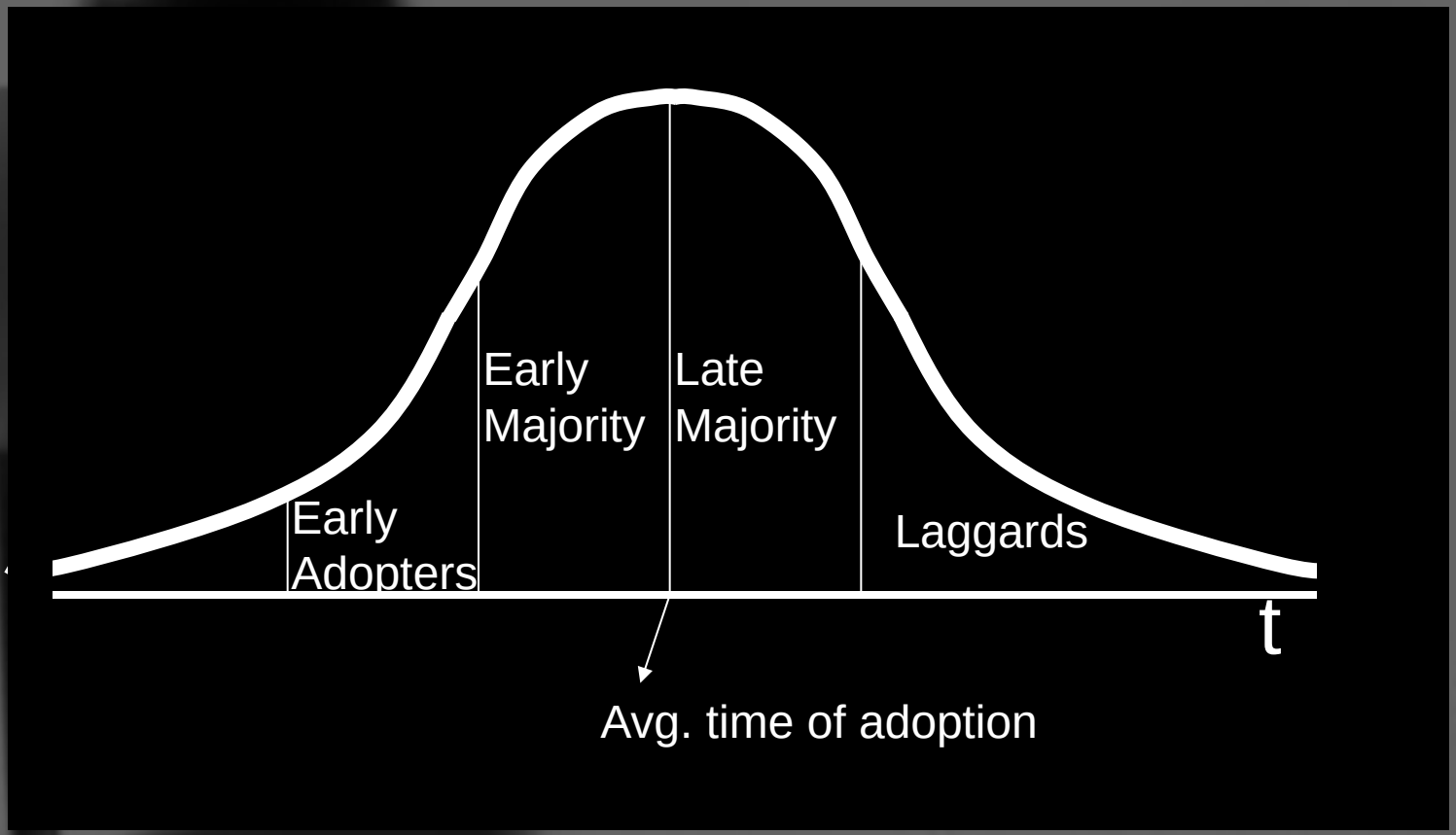
How about in the case of new scientific and measuring instruments?

39/59 ideas = 66%

Case of DuPont's major product and process innovations?

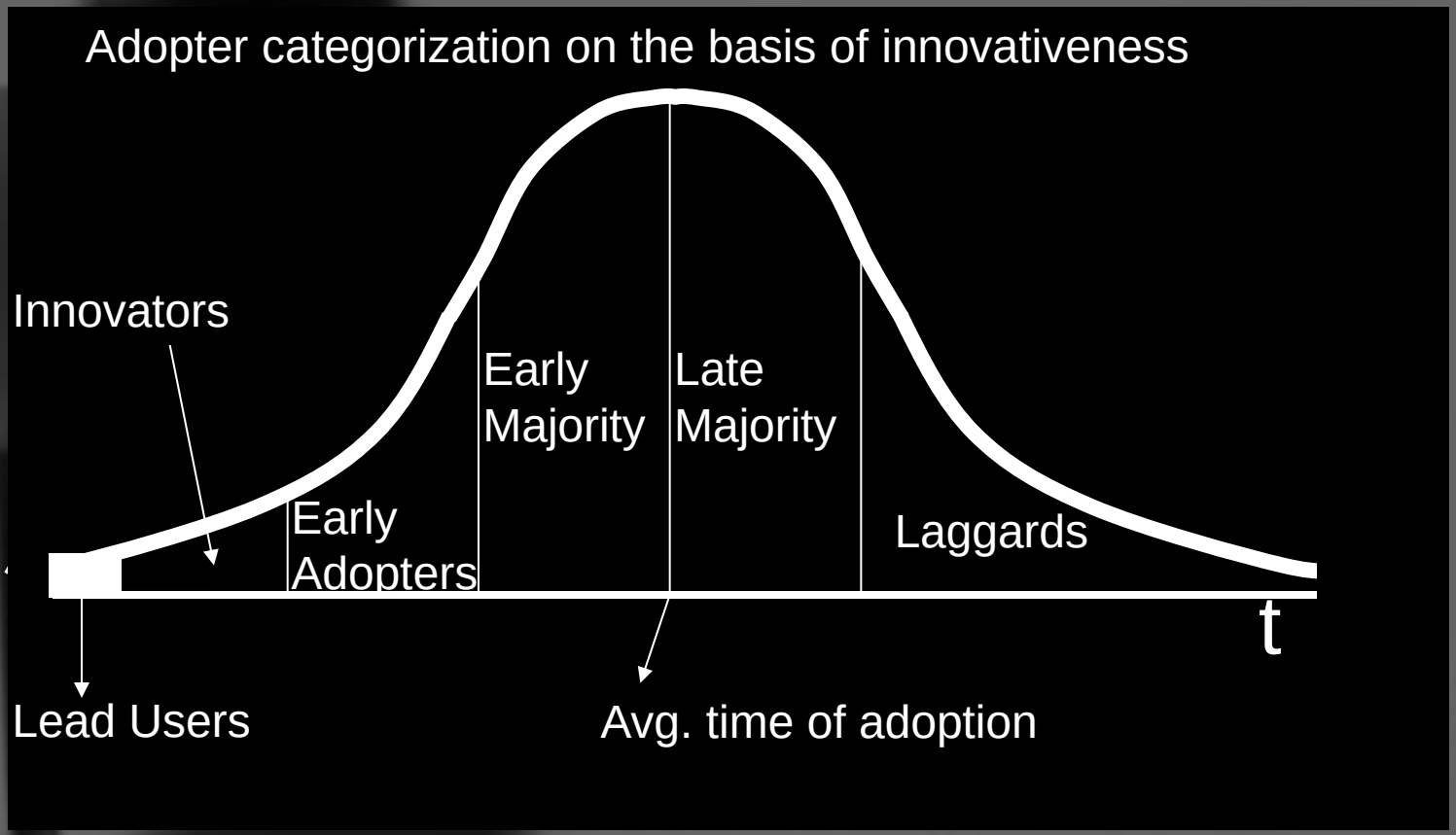
14/25 = 56%

Diffusion – An important part of the technological innovation



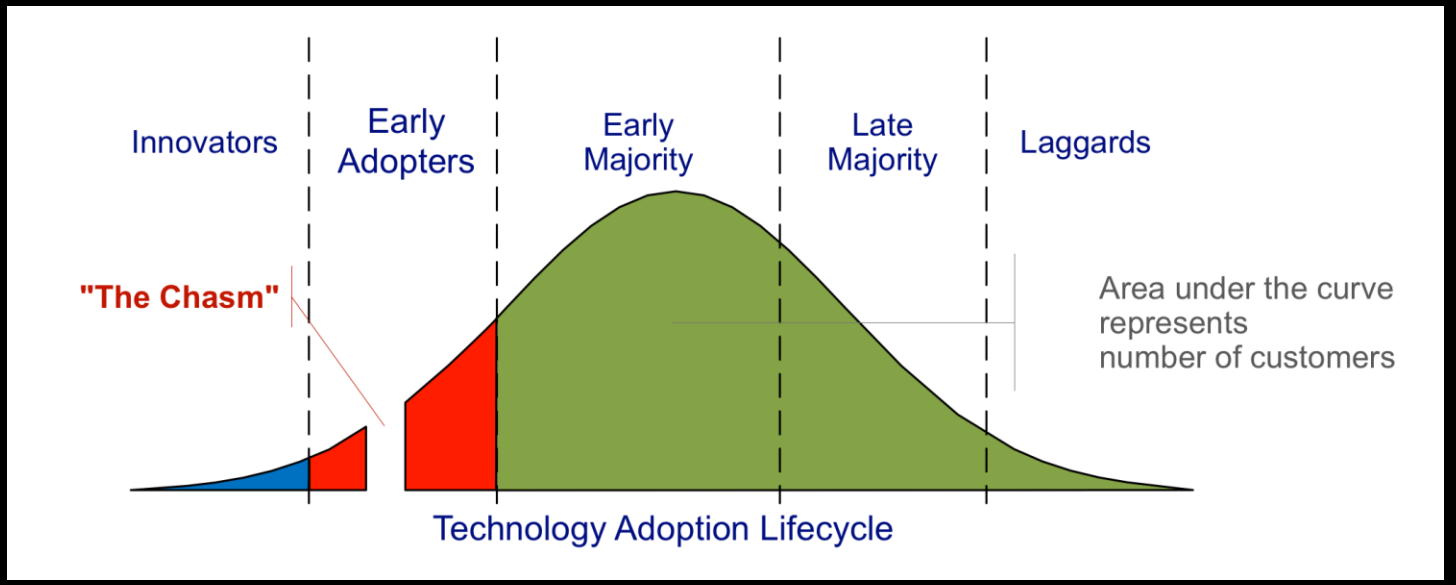
Source: Rogers (Diffusion of Innovation)

User Innovation - Another Important Factor



Source: Rogers (Diffusion of Innovation)

Chasm?



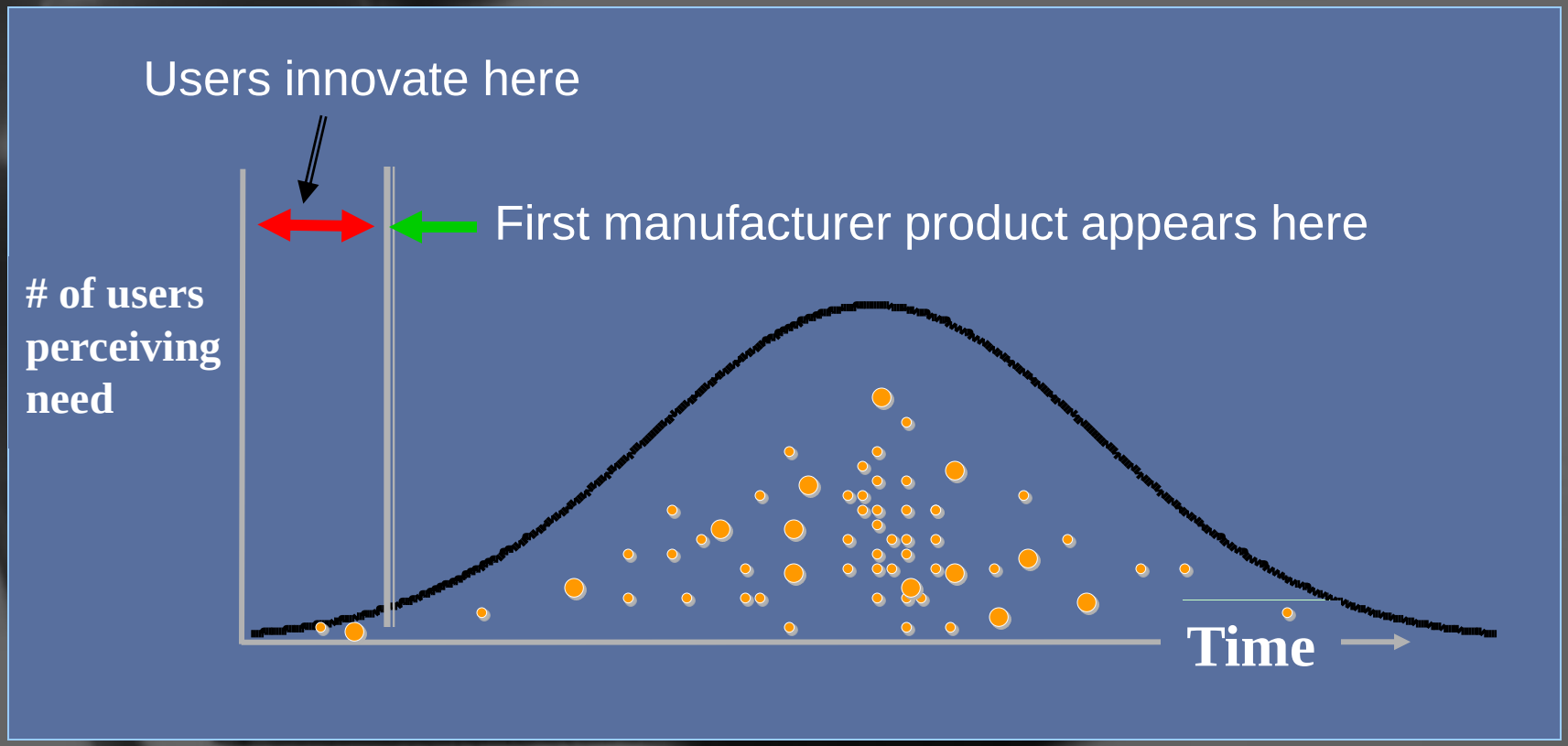
Source: Rogers (Crossing the Chasm)

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



What is meant by "Innovation is becoming democratized?"

- **Increasing numbers of users are able to develop innovations *for themselves* at a steadily more professional level.**

Why?

  - **Improvements in design tools via computing (like simulation)**
  - **Improvements in communication (like the Internet)**
  - **All being provided at lower costs**

Harnessing the Capability of Users