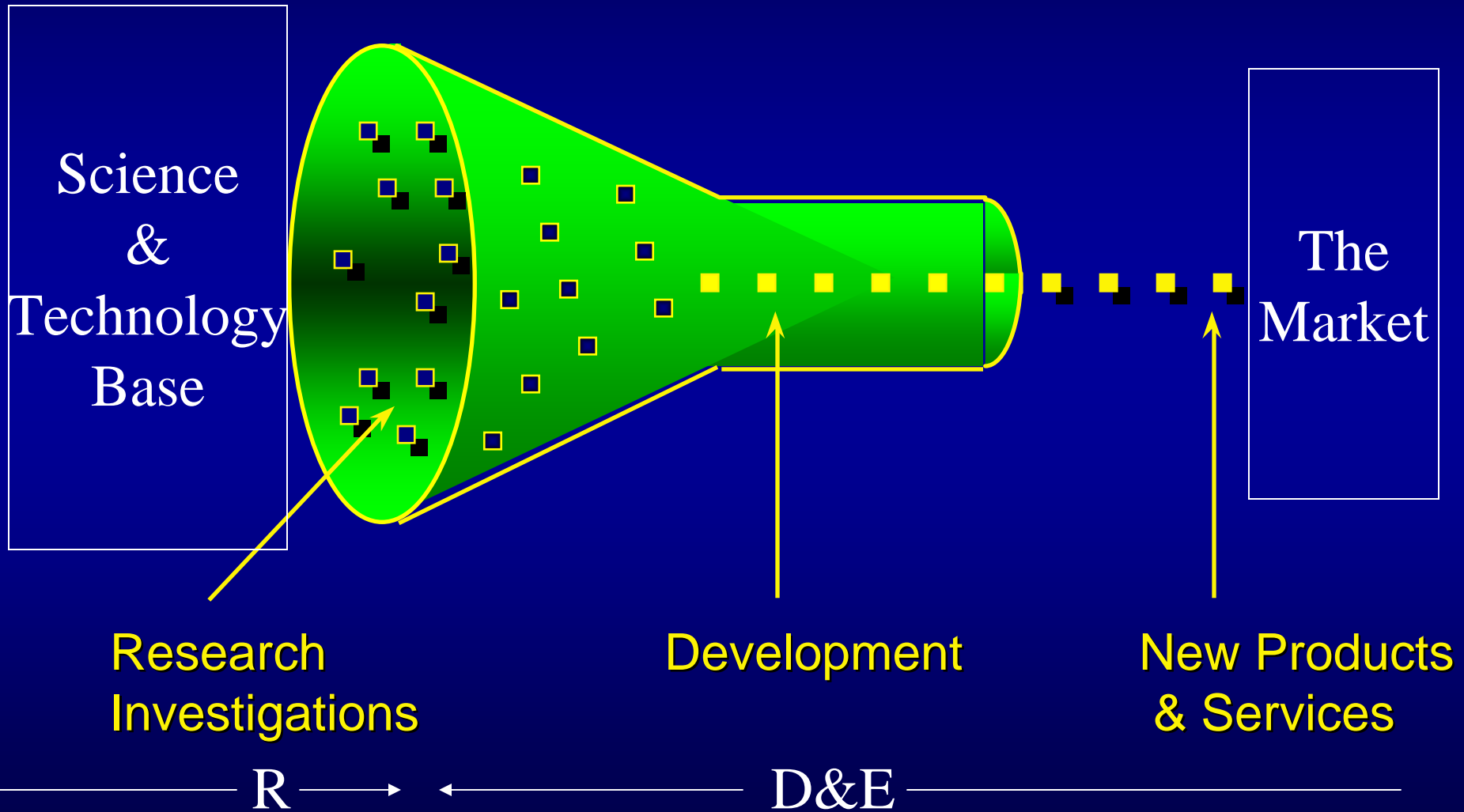


Open Innovation and Open Business Models: The Next Frontier

*Presentation to
SPIE Photonics Innovation Summit*

Henry Chesbrough
Executive Director, Center for Open Innovation
Haas School of Business
UC Berkeley

The Current Paradigm: A Closed Innovation System



Great Successes from the Closed Innovation Model

- The Chemicals Industry – Germany and later US
- Edison, GE, and the rise of electrification
- Rockefeller and Standard Oil
- World War II scientific achievements
- Chandler: Internal R&D key to the rise of the modern US corporation in 20th century

Rising Costs of R&D

Then (25 years ago)

- <\$ 30 million for a fab
- <\$ 50 million for a new drug
- < \$ 10 million for a new consumer product

Now

- > \$ 3 billion for a fab
- > \$ 800 million for a new drug
- > \$50 million for a new consumer product

Shorter Shipping Lives

- Disk drives
- Cell phones
- Generic drugs
- “80% of the senior executives we surveyed indicated that the productive lives of their *strategies* were getting shorter.”

» *Chris Zook, HBR April 2007*

Diminishing Economies of Scale: US Industrial R&D by Size of Enterprise

Company Size	<u>1981</u>	<u>1989</u>	<u>1999</u>	<u>2003</u>
< 1000 employees	4.4 %	9.2%	22.5%	22.5%
1,000 – 4,999	6.1 %	7.6 %	13.6%	14.8%
5,000 – 9,999	5.8 %	5.5%	9.0%	7.5%
10,000 – 24,999	13.1%	10.0%	13.6%	13.4%
25,000 +	70.7%	67.7%	41.3%	40.9%

Sources: National Science Foundation, Science Resource Studies, Survey of Industrial Research Development, 1991, 1999, 2001, 2003.

What changed?

Five Erosion Factors

1. Increasingly mobile trained workers
2. More capable Universities
3. Diminished US hegemony
4. Erosion of oligopoly market positions
5. Enormous increase in Venture Capital

Hidden Assumptions in the Internally-Focused Innovation System

If I discover it, I will find a market for it.

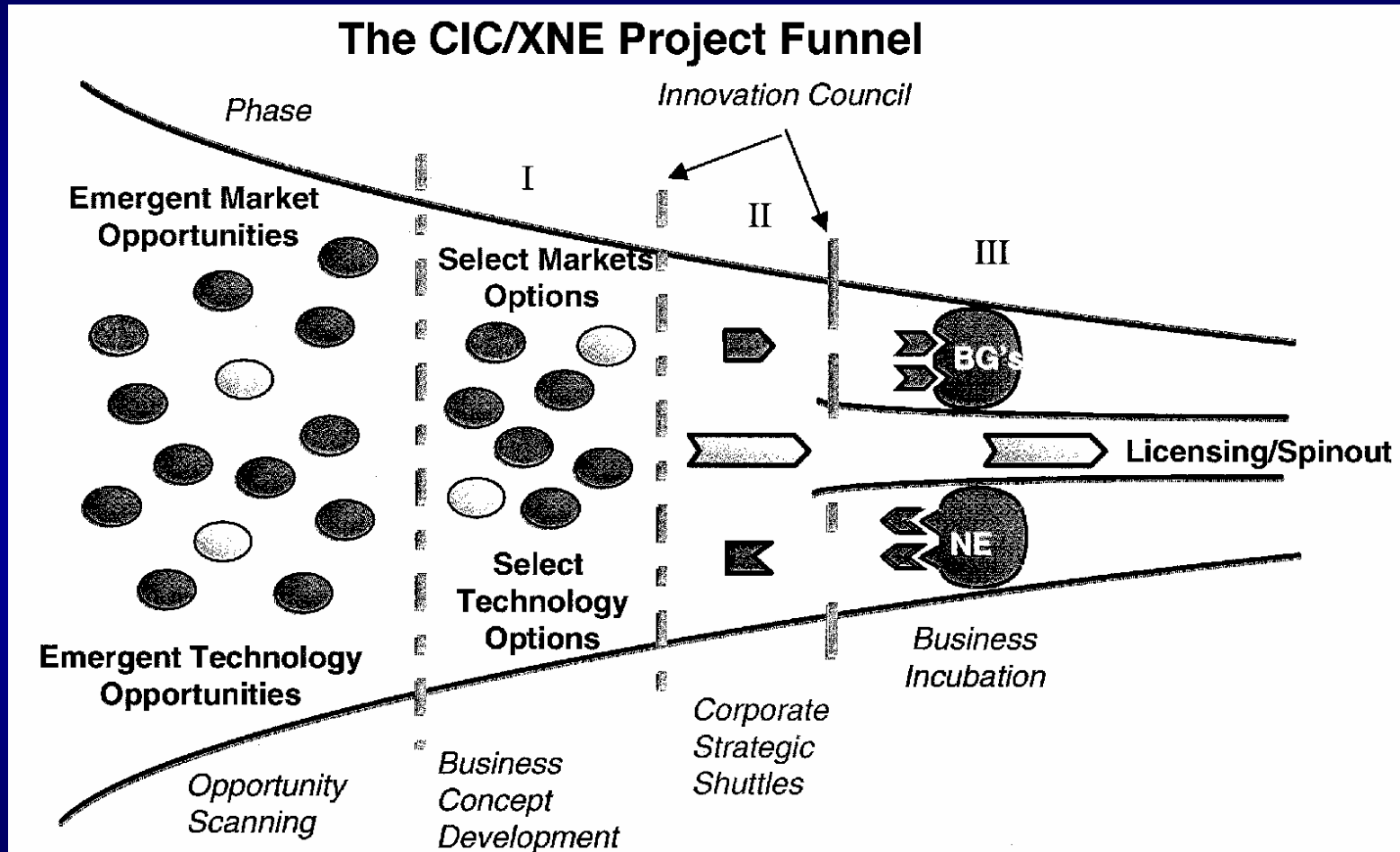
If I discover it first, I will own it.

The important technologies I will need can be anticipated in advance.

“Misfits” are regrettable, but are a cost of doing business.

The best people in this field work for us.

Type I and Type II: Xerox and PARC

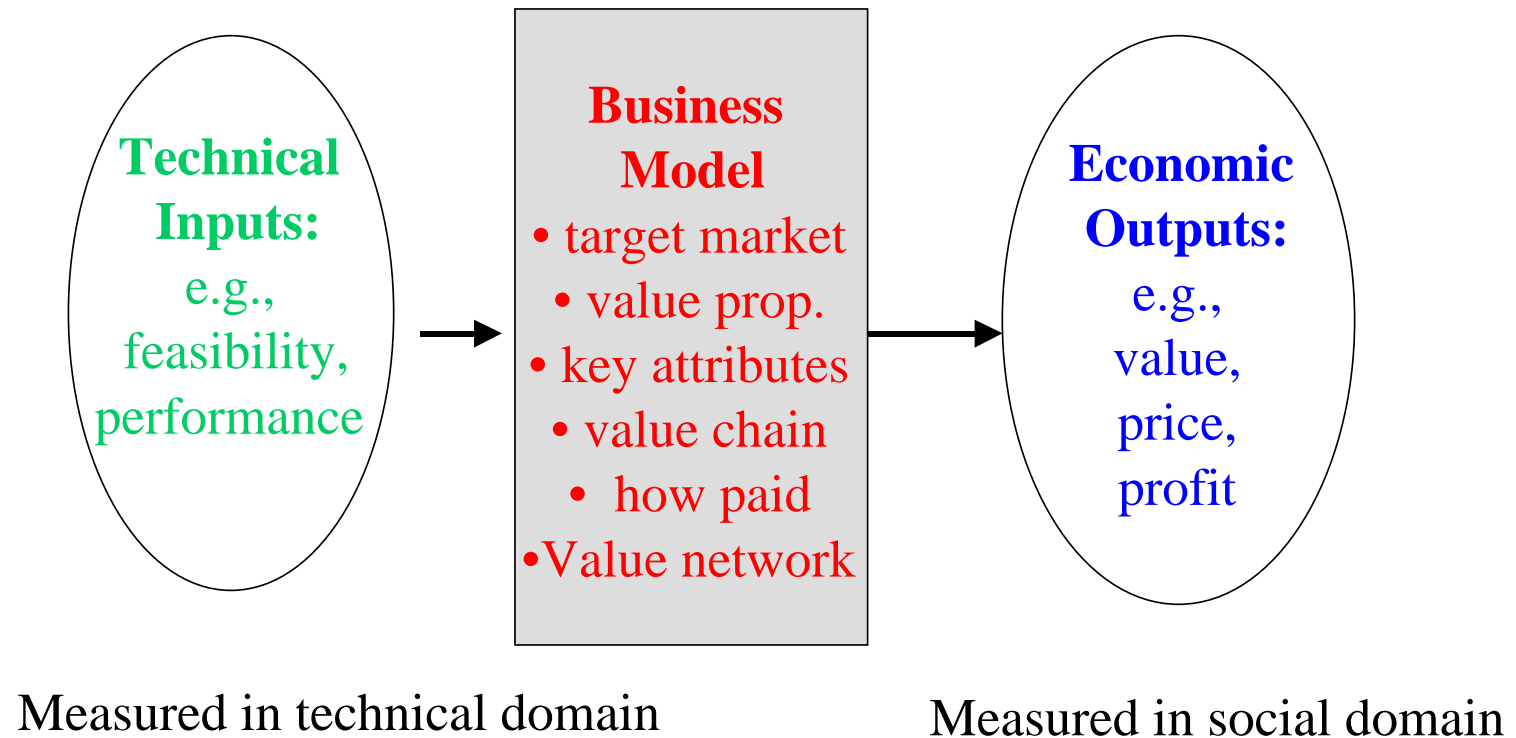


- ❑ Designed to minimize “false positive” errors
- ❑ Ignores risk of “false negative” errors

The Business Model

- Identifies a **market segment**
- Articulates the **value of the proposed offering**
- Focuses on the **key attributes of the offering**
- Defines the **value chain** to deliver that offering
- Creates **a way for getting paid**
- **Establishes the value network** needed to sustain the model

Why Business Models are Hard to Manage: Mapping Across Domains



A Classic Example: the Xerox 914 copier

- Chester Carlson develops electrostatic method to place toner on paper, a “dry” process for copying documents
- In 1955, existing processes (wet or thermal) used to make **15-20 copies per day**. Machines cost ~ \$300.
- Joe Wilson estimates **cost of building dry process copiers at ~\$2000**
- Wilson seeks manufacturing and distribution partners
 - IBM, Kodak, GE
- IBM engages ADL to study: “Although it may be admirably suited for a few specialized copying applications, **the Model 914 has no future** in the office-copying-equipment market.”

Wilson's Business Model

- ADL's study (and the other companies) viewed the dry process technology **through a traditional business model**
 - charge for the equipment (dry technology very high cost)
 - charge for the supplies as needed (no savings vs. wet)
- Joe Wilson ignored these rejections, and took the technology to market through a new Business Model
 - **\$95/ month** for first 2000 copies, **4 cents each** for additional
 - Low barrier for customer trial, **Haloid/Xerox bore the risk**
 - Enormous usage: **2000 copies per day**
 - Revenues grow **41% compounded** for next 20 years

3Com

- Metcalfe left PARC in Jan. 1979
- Did consulting work until Feb. of 1981
 - DEC, GE, Exxon
- Brokered alliance between Xerox, DEC, and Intel for IEEE 802 (aka Ethernet)
- Initial plan: sell to Unix workstations, via direct sales force

Then....

- As part of consulting, created directory of LAN dealers and VARs across US
 - first of its kind
 - sold many hundreds of copies at \$125 each
 - did this for 5 years
- IBM PC took the world by storm
- 3Com formed, Krause joined from HP
 - VCs financed:
- New plan: add-on boards for IBM PCs, sold through IBM retailers and VARs

Adobe

- Warnock and Geschke at PARC
 - creating fonts for Star Workstation
 - wanted to make into a standard
 - Xerox said no: “how can we make money if we give it away?”
- They leave, and form Adobe
- Initial plan: turnkey publishing system, complete with own hardware, software, and fonts

“We were originally going to supply a turnkey systems solution including hardware, printers, software, etc.

“Steve Jobs and Gordon Bell were key ingredients in getting things going...

Gordon said, “don’t do the whole system”

Steve said, “just sell us the software”.

That’s how the business plan formed. It wasn’t there in the beginning.”

- Charles Geschke

Today, Adobe’s market value exceeds that of Xerox

Different Financial Processes

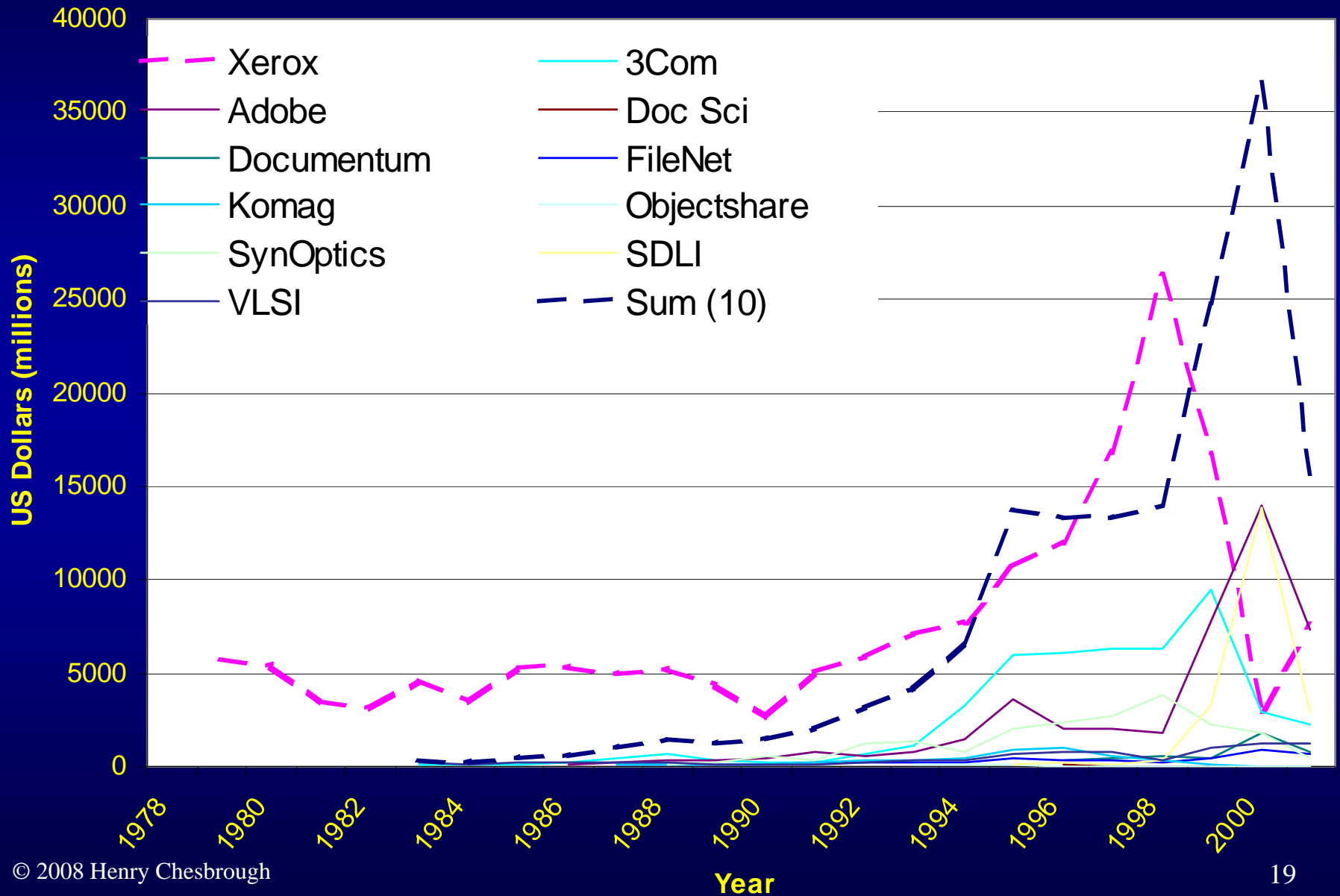
Chess: Type I errors

- Plan several moves ahead
- No new information needed
- You know what you've got, what opponent has
- NPV

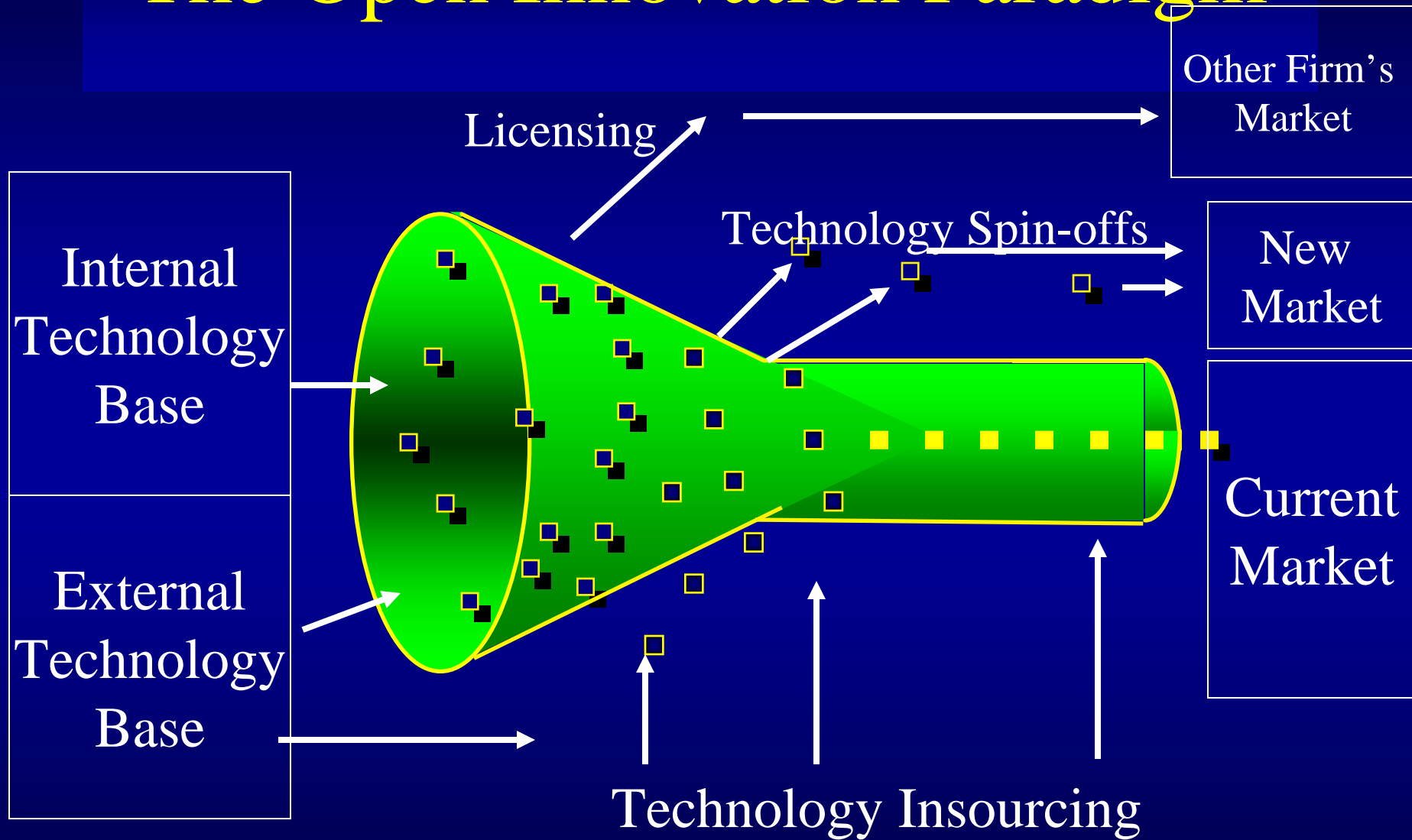
Poker: Type II errors

- Pay to play
- Pay for new information
- You discover what you've got, what other players have
- Options

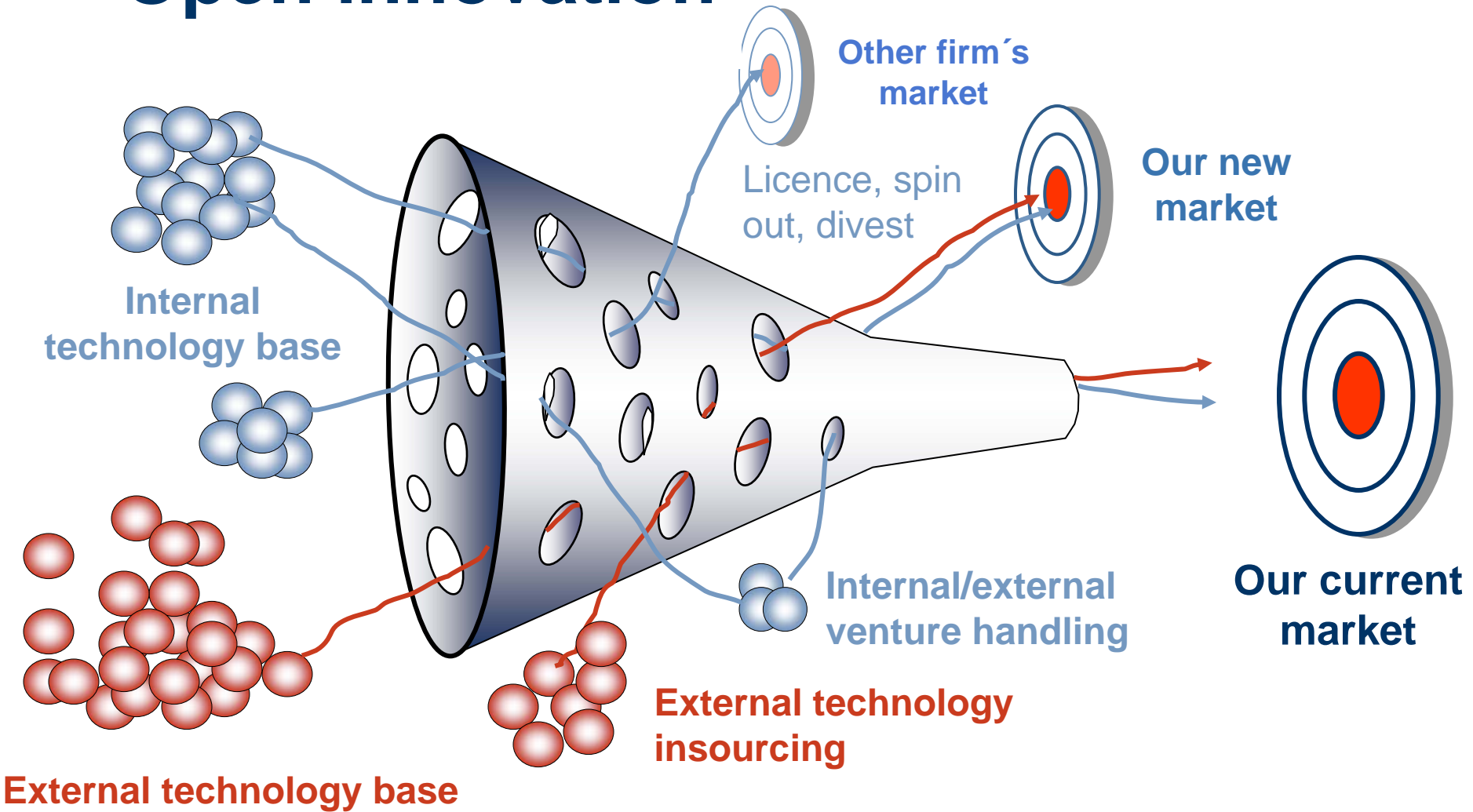
Xerox: Great at Chess, Lousy at Poker



The Open Innovation Paradigm



Open innovation



Stolen with pride from Prof Henry Chesbrough UC Berkeley, *Open Innovation: Renewing Growth from Industrial R&D*, 10th Annual Innovation Convergence, Minneapolis Sept 27, 2004



The Logic of “Open Innovation”

- Good ideas are widely distributed today. No one has a monopoly on useful knowledge anymore.
- Financial managers must play poker, as well as chess, to capture the value in false negatives.
- We must manage IP in order to manage research:
 - need to access external IP to fuel our business model
 - need to profit from our own IP in others’ business model
- Not all of the smart people in the world work for us.

What is Innovation?

Before

- Invention
- Product

- Technology-driven
- Internally generated
- Engineering's job

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- Invention
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After

- Commercialization
- Business, including process and biz model
- Business/value-driven
- Internal Integration of int. and ext. stuff
- Everyone's job

A New Perspective Towards R&D

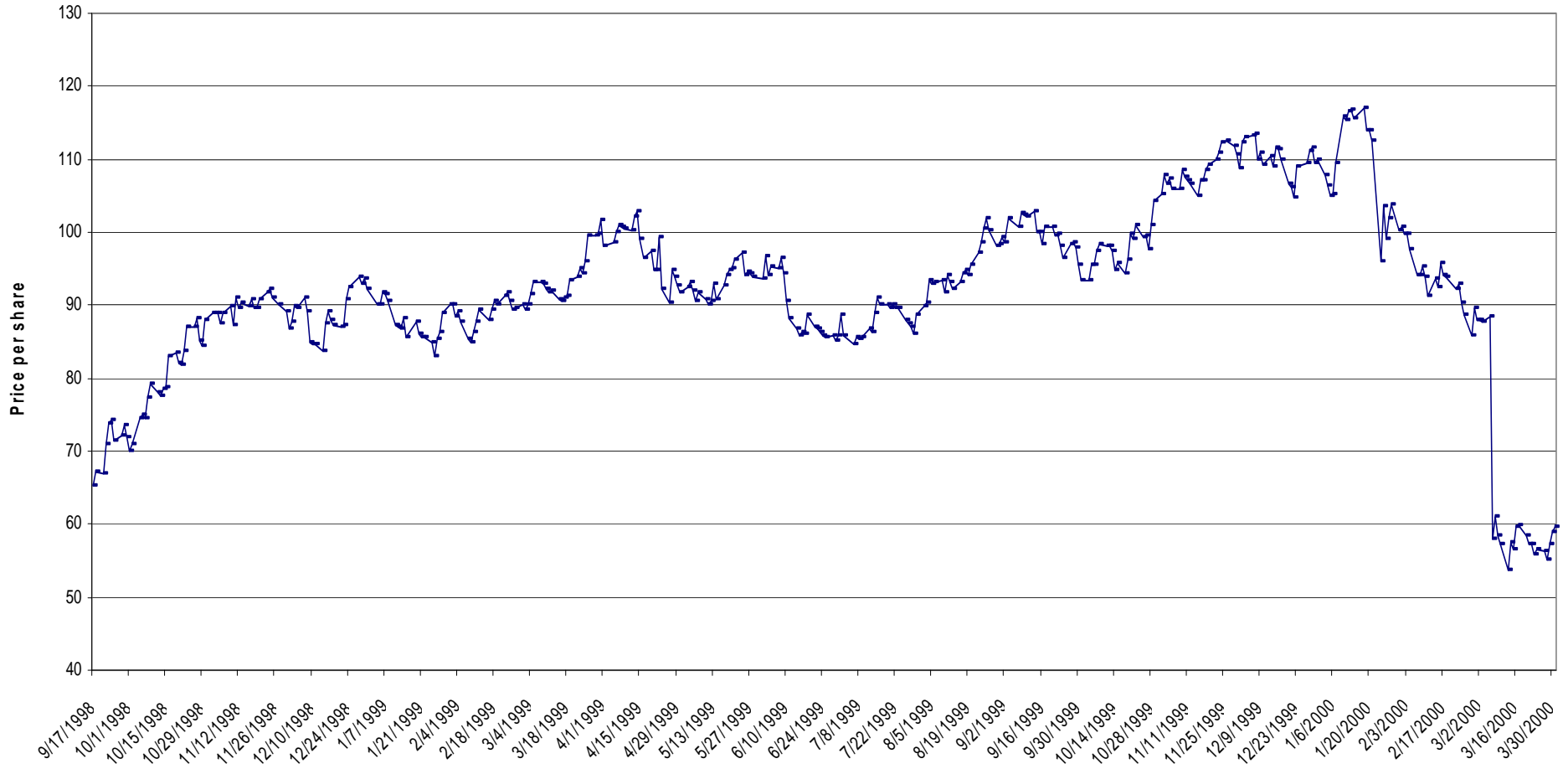


Procter & Gamble

- P&G used to be a VERY closed organization
 - “We invented Not Invented Here” – J. Weedman
- P&G financial crisis, in 2000
 - Missed a series of quarterly financial estimates
 - Stock market lost confidence in the company
 - Stock price fell by more than half in 4 months!
 - CEO (Jagr) was fired

P&G's Stock Price: 8/1998-3/2000

P&G Stock Price



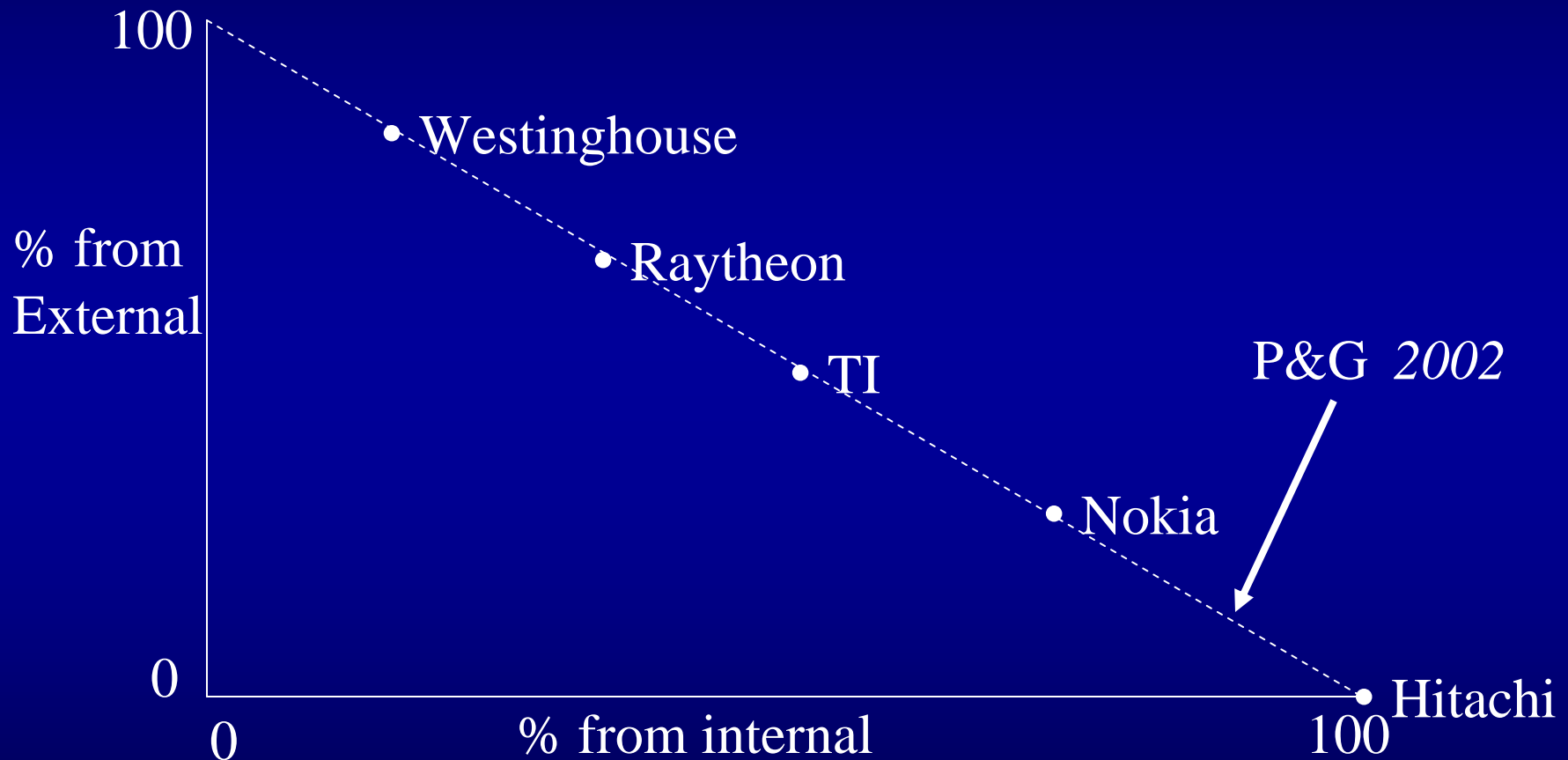
Searching for the Root Cause

- “We fundamentally had a growth problem. Our current brands were performing well. But we weren’t developing many new brands.” – C. Wynett
- To get new brands, P&G needed to open up.
- Connect and Develop
 - SpinBrush, Swiffer, Regenerist

The New P&G

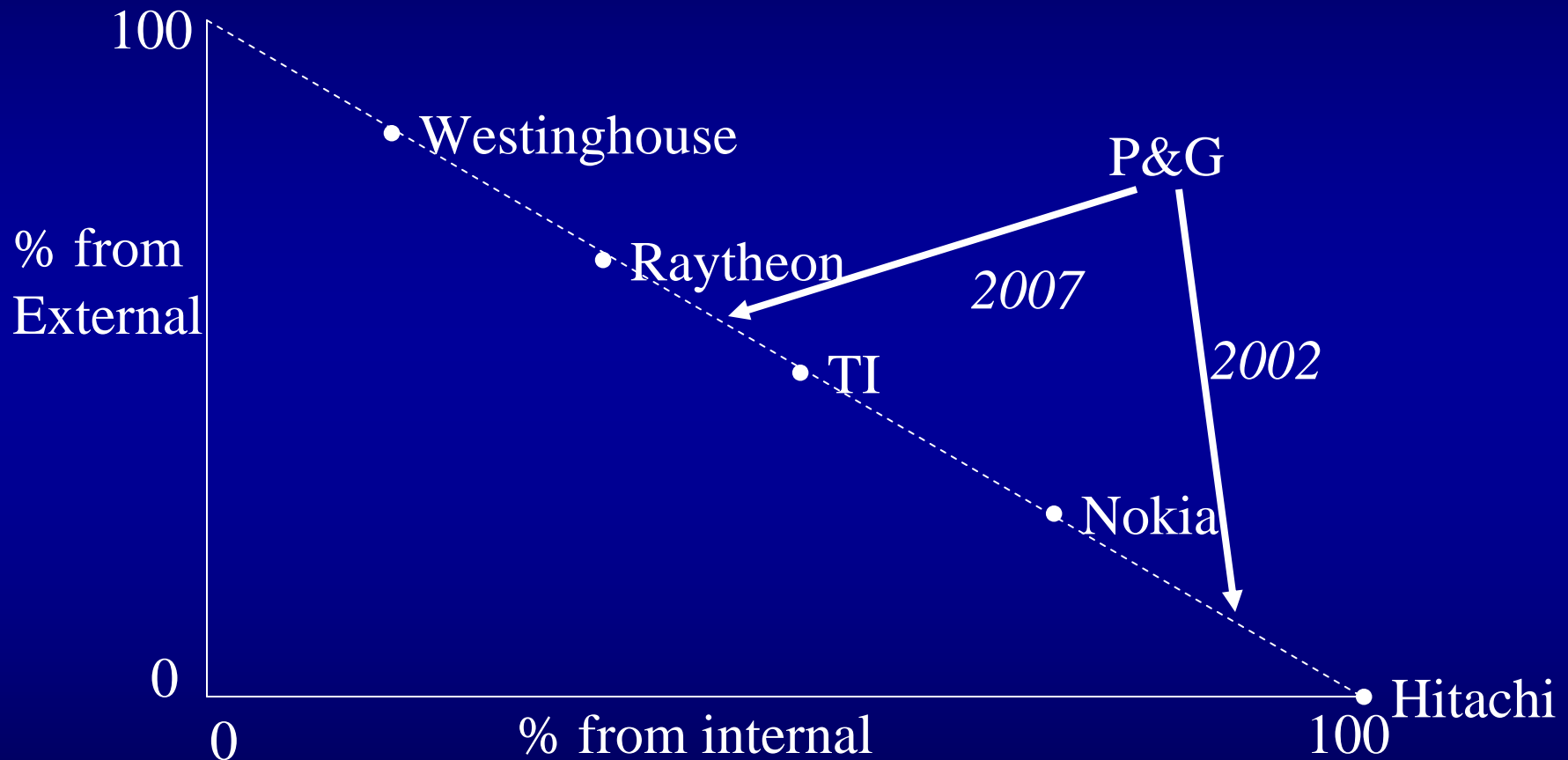
- Many processes to enable open innovation
 - Technology scouts
 - Legal templates for IP, partnering
 - Investments in Innovation Intermediaries
- The Goal Now: Become the open innovation partner of choice

Balancing Internal and External R&D Funding: P&G



Source: Gassmann, v. Zedtwicz (2002)

Balancing Internal and External R&D Funding: P&G



Source: Gassmann, v. Zedtwicz (2002)

Another Example: BP

- British Petroleum (BP) is one of the world's largest and most profitable companies
- Yet fossil fuels are not a renewable nor inexhaustible resource
- Both economic and political factors make renewable biofuels an area of long term strategic importance for BP
- Yet internally, there are only 3 biologists among BP's 100,000 person staff!

Key Issues for BP to Address

- How to rapidly access world class biologists in high quantity?
- How to develop the internal capabilities to absorb biology into BP's DNA over time?
- How to shape the intellectual property that must arise for any initiative to be effective?
- Who can BP partner with externally?
 - Biology, but also agricultural science

The Solution? The Energy and Biosciences Initiative (EBI)

- A \$500 million partnership (over ten years) between BP, UC Berkeley, and U Illinois
- Significant funding for basic research in biosciences and biofuels
- Onsite group of BP staff to conduct applied research
- Governing board of UCB, UI, and BP staff to select research projects to support

The Open Innovation Promise in Action: The iPod—An Example of Collaborative Innovation

An entrepreneur with an idea comes to Apple

Independent contractor Tony Fadell develops iPod/iTunes product solution in eight weeks



Steve Jobs takes personal interest

Apple hires Tony to create and lead 35-person team from Philips, IDEO, General Magic, Apple, Connectix, and WebTV

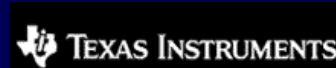
Apple developed the user interface and design

PortalPlayer manages technical design



PortalPlayer provided platform and produced reference design in collaboration with Apple and manages the design process

PortalPlayer makes \$15/iPod sold



6 months!!!

iPod



Critical success factors:

- Openness of development process
- Fast decision making
- Iterative collaborative relationship with PortalPlayer and other partners

Sources: *Electronics Design Chain* magazine, August 17, 2004; *Wired* magazine, July 21, 2004; *Forbes* magazine, February 16, 2004; and interview with Tony Fadell



“Open Innovation” beyond the Product: iPod’s Open Business Models

RESULT: Real Fiscal Impact!

Apple’s iPod powers record Q1 profit, revenue

January 17, 2007—San Jose Business Journal

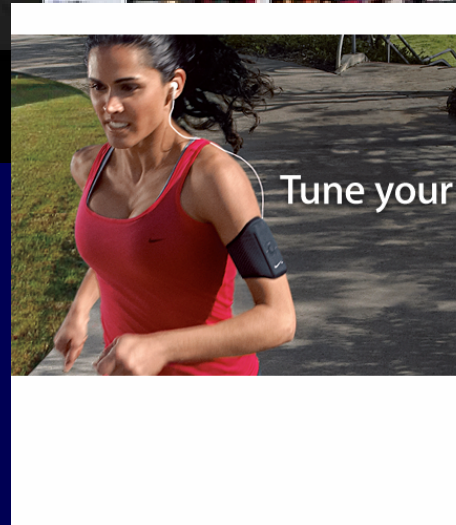
Powered by seemingly endless demand for its iPod digital music player, Apple Inc. on Wednesday reported record first-quarter profit of \$1 billion or \$1.14 cents a share, almost double the year-ago period’s \$565 million or 65 cents a share.

The Cupertino-based company (Nasdaq AAPL)—which recently dropped “Computer” from its name—shipped 21 million iPods in the holiday quarter and raked in a record revenue of \$7.1 billion compared to \$5.7 billion in first quarter of 2006.

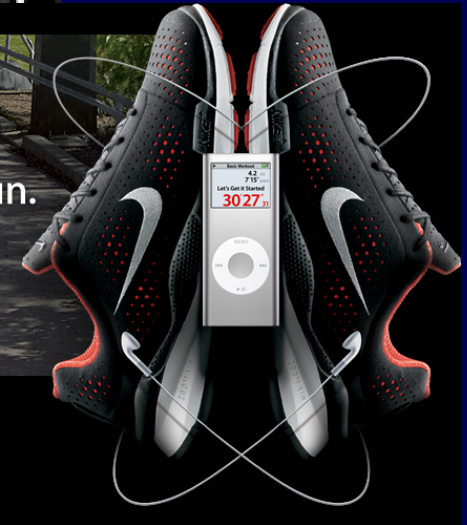
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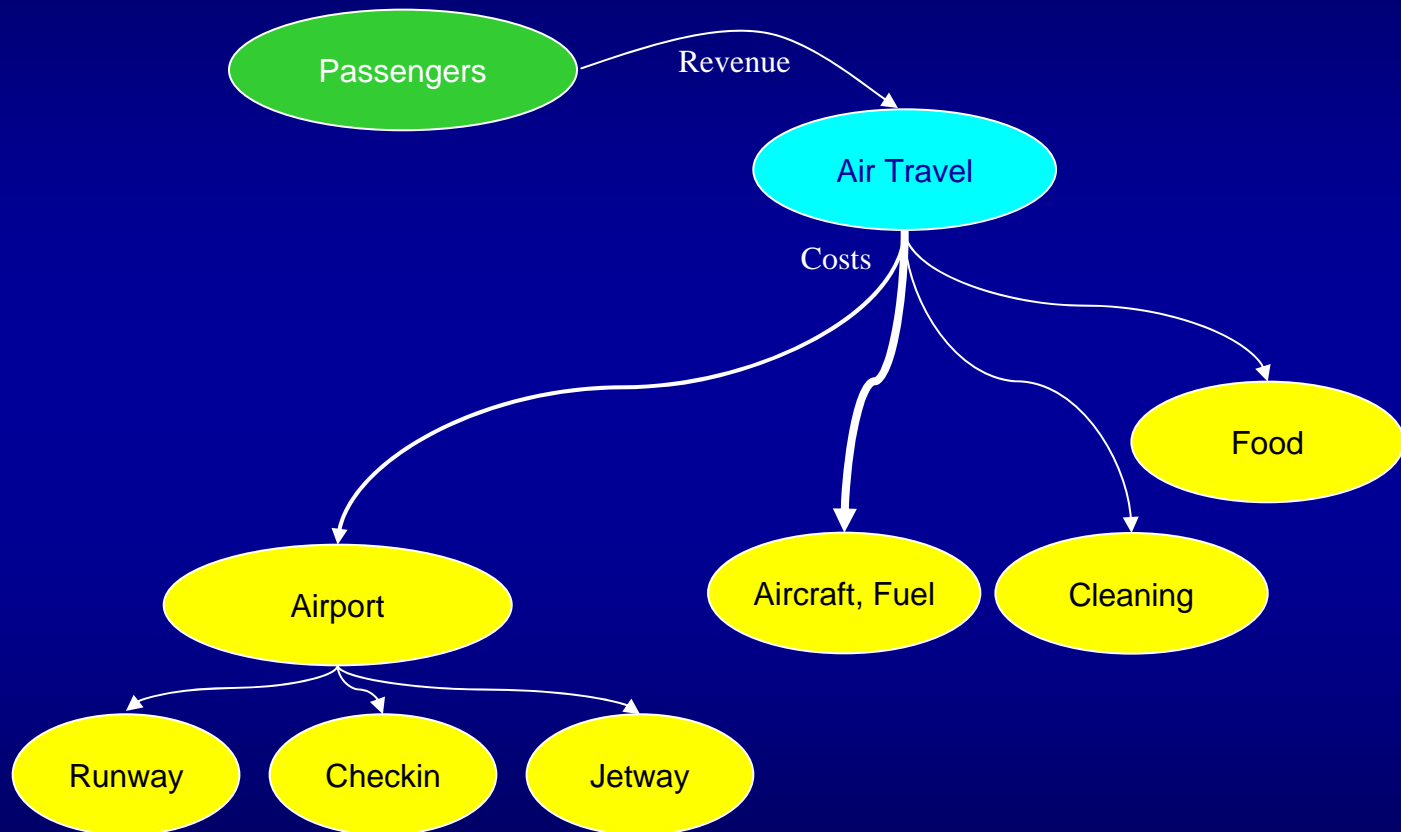
Step 3: iPod + Nike: New products through partnership and more new business models



Tune your run.



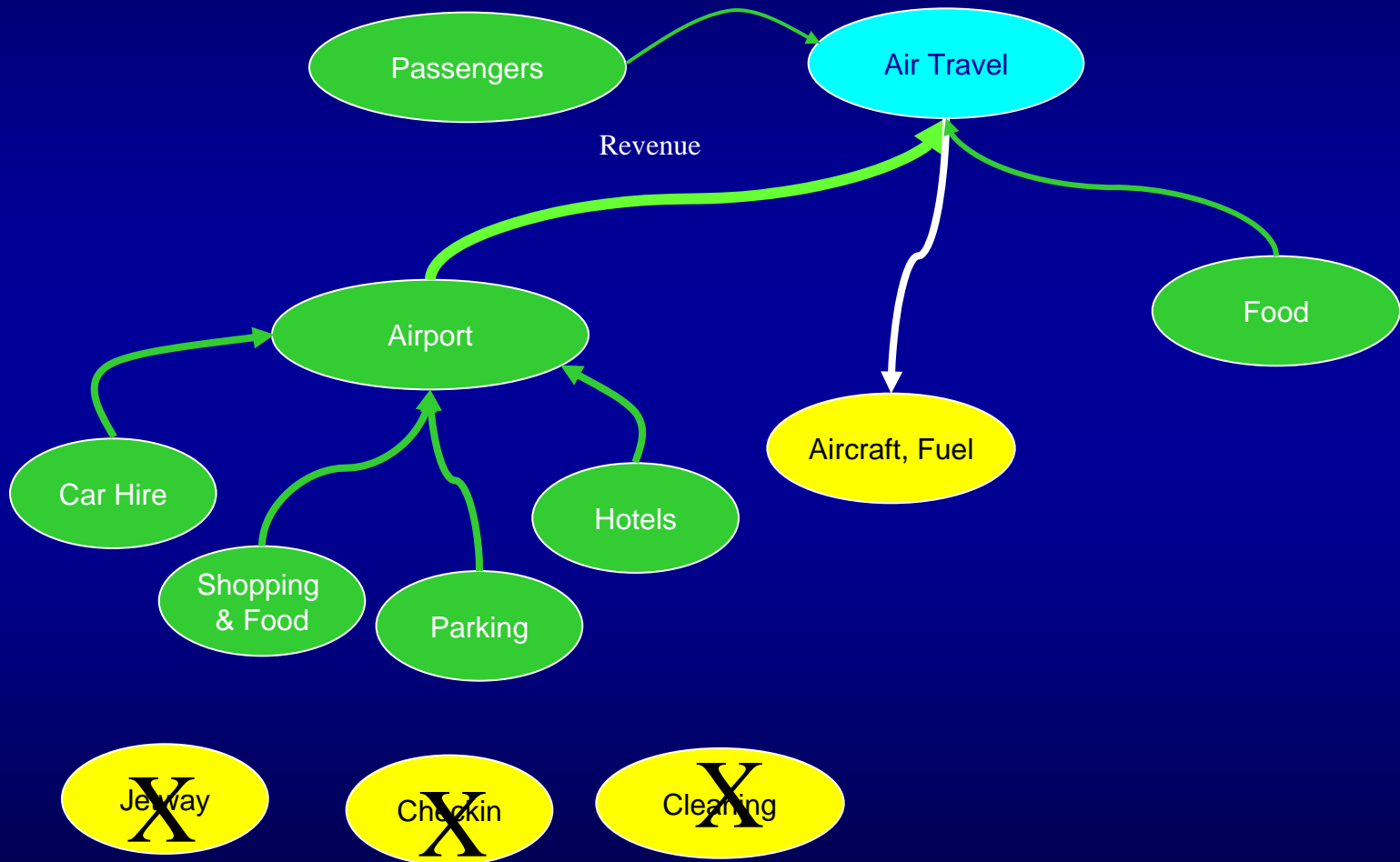
Graphic Illustration of a Generic Airline Business Model



Ryan Air

- Ryan Air is a regional low-fare airline operating in the United Kingdom and northern Europe.
 - Only flies into regional airports, no landing fees.
 - Guarantees airport certain # passengers in their terminal
 - Airport pays Ryan Air to operate out of its airport
 - Airport provides Ryan Air a percentage of the revenues from shops, restaurants, car hire and hotels at airport.

The Ryan Air Business Model



A Second Example: Radiohead's “In Rainbows”

- Prior Radiohead albums had sold around 200-300,000 copies each
- In 2007, Radiohead decided to open up sales of its next album “In Rainbows” to its fans
 - Fans decide how much (if anything) to pay!
 - Range of offerings, from individual tracks to full CD, to collector's CD

Source: Warner Chappell presentation, You are in control, Reyjavik, Iceland, Oct 15, 2008

The Result?

- After being made available for free for 3 months the album was no.1 in the UK and in the US
 - 1st Radiohead album on iTunes – no.1 album selling 30,000 units in the US in the first week
 - The physical CD has sold 1.75 million to date
 - They sold 100k boxsets
 - Nearing 17 million plays on last.fm
 - 1.2 million fans will see the tour
- More than 3 million units sold across all channels!

Source: <http://musically.com/blog/2008/10/15/exclusive-warner-chappell-reveals-radioheads-in-rainbows-pot-of-gold/>

Who Owns Business Model Innovation?



FOREWORD BY JOHN SEELY BROWN

HENRY CHESBROUGH

OPEN
INNOVATION

The New Imperative
for Creating and Profiting
from Technology

HARVARD BUSINESS SCHOOL PRESS

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NAMED A "TOP 50 INNOVATOR" BY SCIENTIFIC AMERICAN

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How to Thrive in the
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