

Technology Strategy (MGMT 731)

Karl T. Ulrich

Definition of technology

Roles relative to technology

What is a technology strategy?

Incremental vs. radical innovations / H1, H2, H3 innovation

S-curves

Technology push and market pull

Drivers of diffusion rates

Rogers' categories of adoption / "crossing the chasm"

Industry patterns of entry/exit and the "dominant design"

Competence-enhancing vs. competence-destroying technologies

Disruption of incumbents - disruption from below and the "innovator's dilemma."

Drivers of value capture - appropriability and complementary assets

Patents as mechanism for appropriation

Standards as mechanism for appropriation

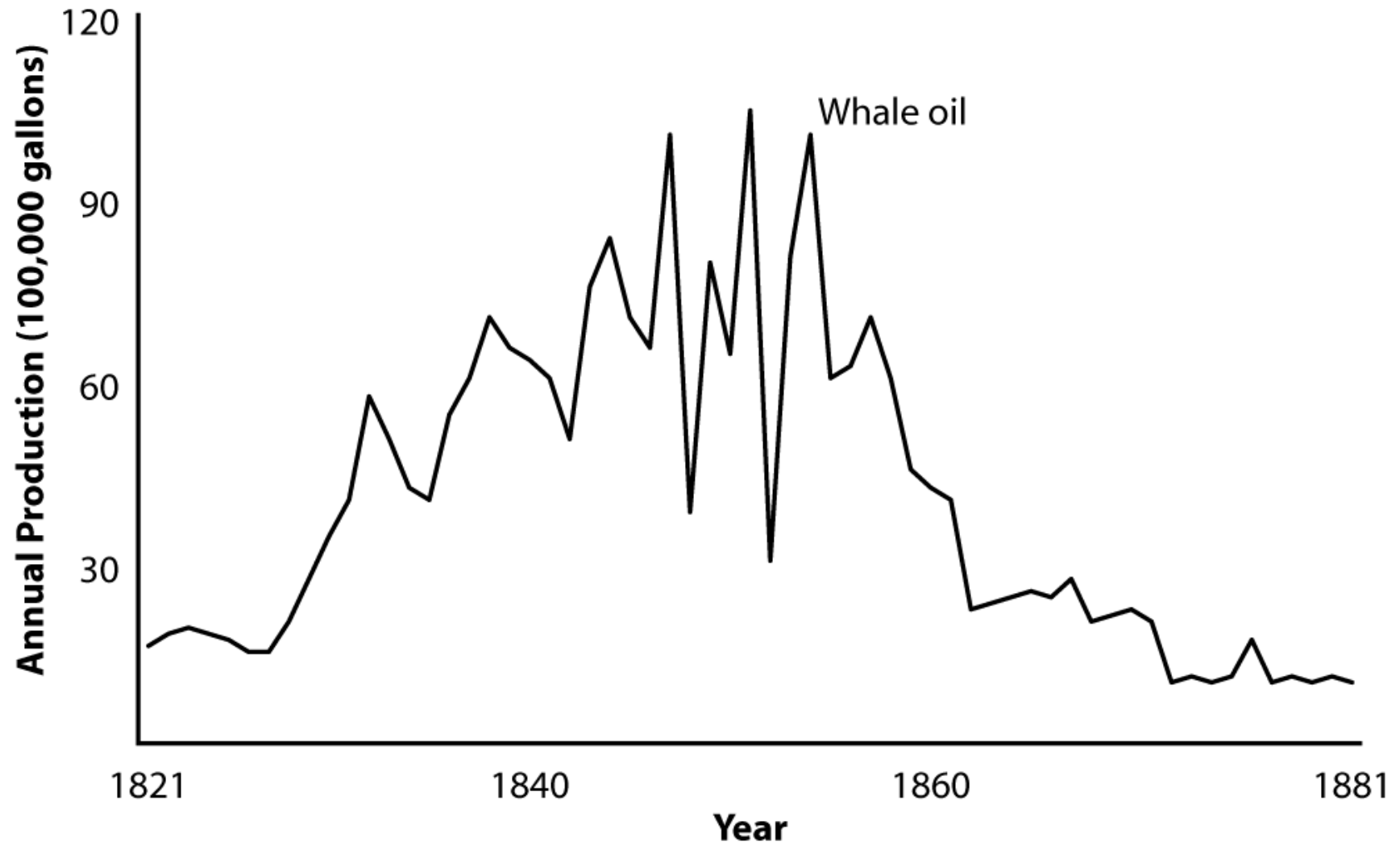
Timing of entry, first mover "advantage"

Open innovation, open tournaments

Make-buy decisions in innovation, establishing an innovation frontier

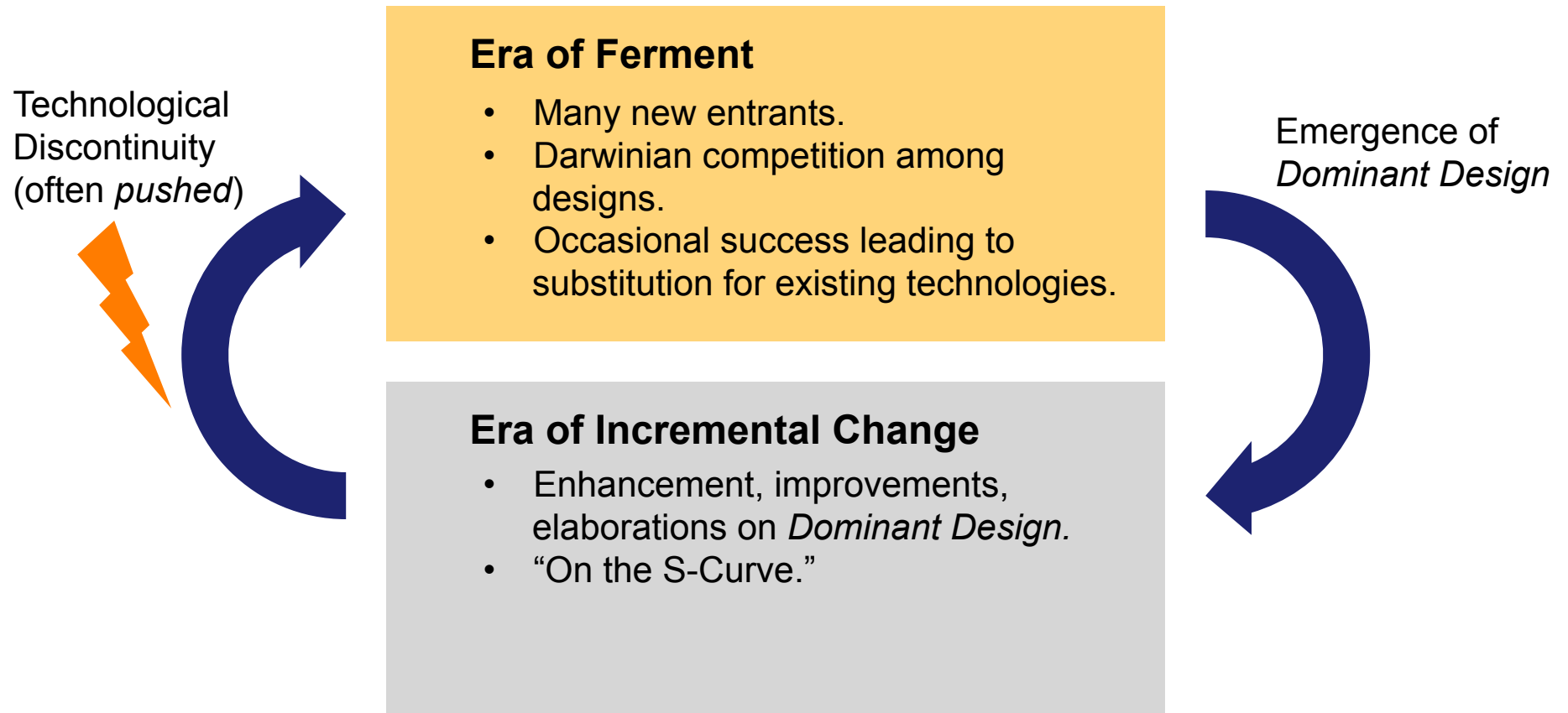
Technology ecosystems

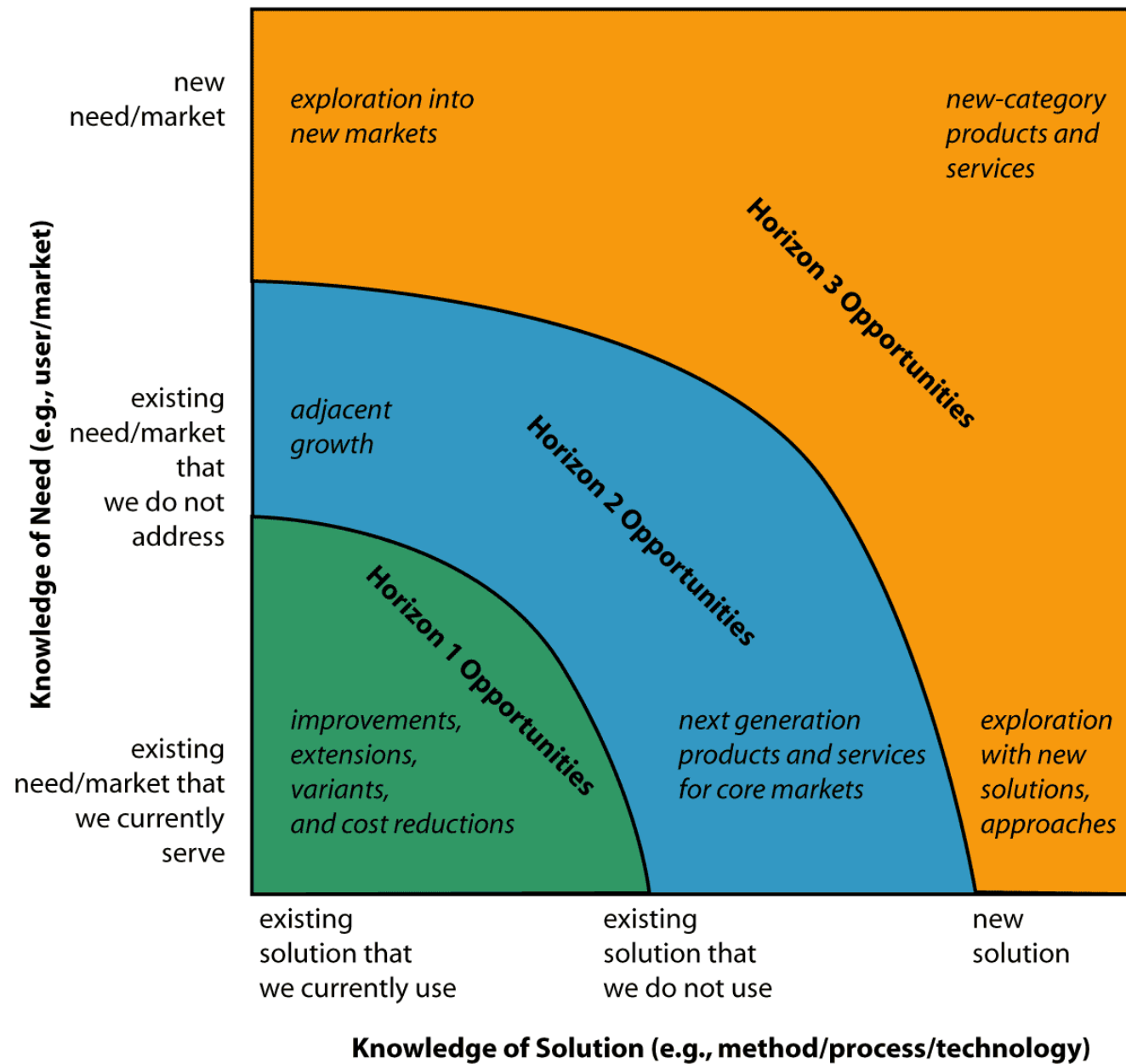
**Session 10:
Innovation Frontier**

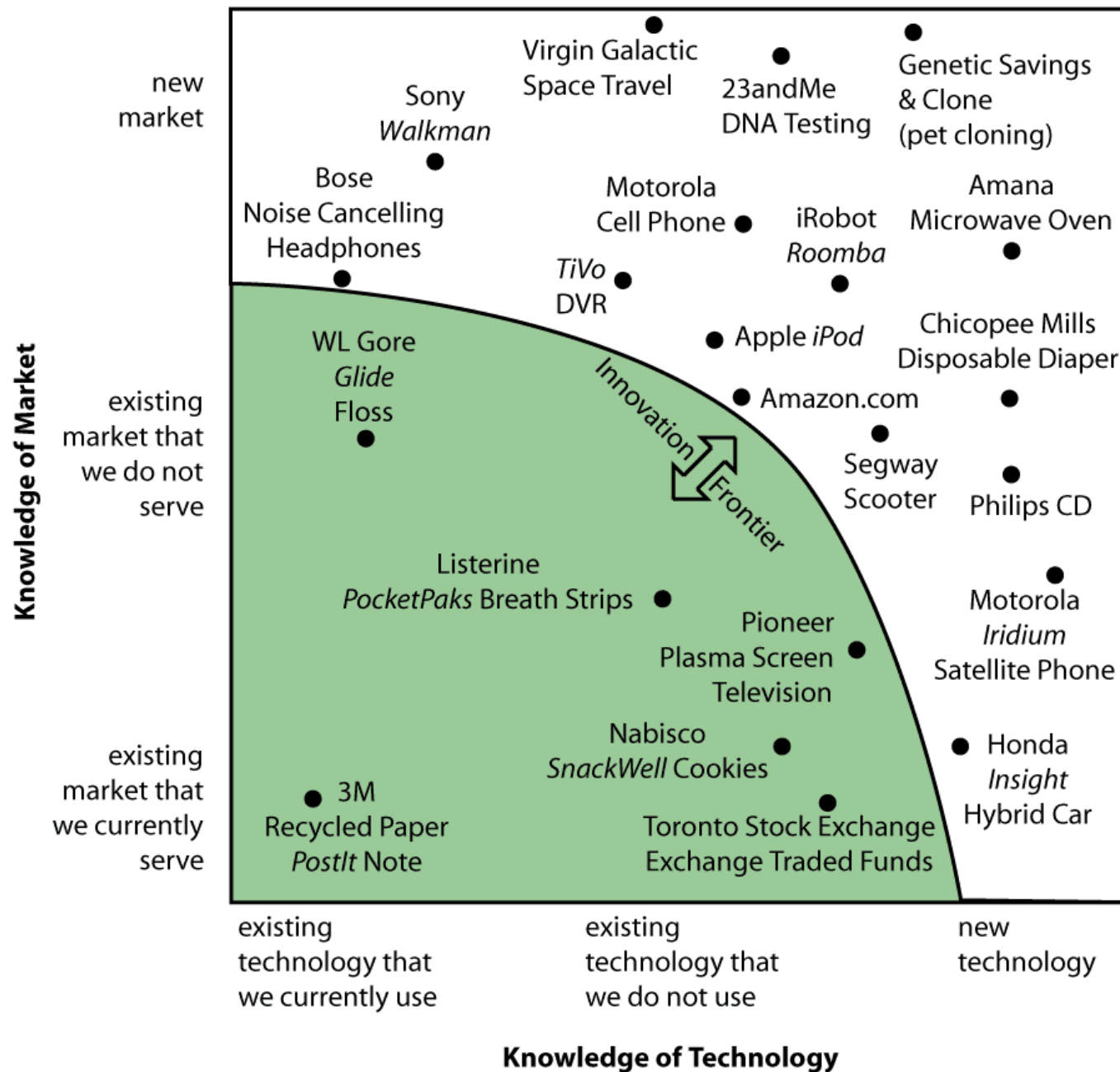


Source: Terwiesch and Ulrich. 2009. *Innovation Tournaments*.

The Technology Cycle (for Radical Innovation)







What perspective are we taking?

digital spy

TV REALITY TV **GAMING** TECH MOVIES COMICS MUSIC CELEBRITY BOLLYWOOD

Gaming News Level Up Interviews Features Game Reviews Game Previews Game Release Di

[Home](#) > [Gaming](#) > [News](#)

GAMING

Wii Remote inventor unveils 50p car fuel

Published Tuesday, Jun 3 2008, 1:20pm EDT | *By David Gibbon*

[f Recommend](#) 0 [t Tweet](#) 0 [g +1](#) 0

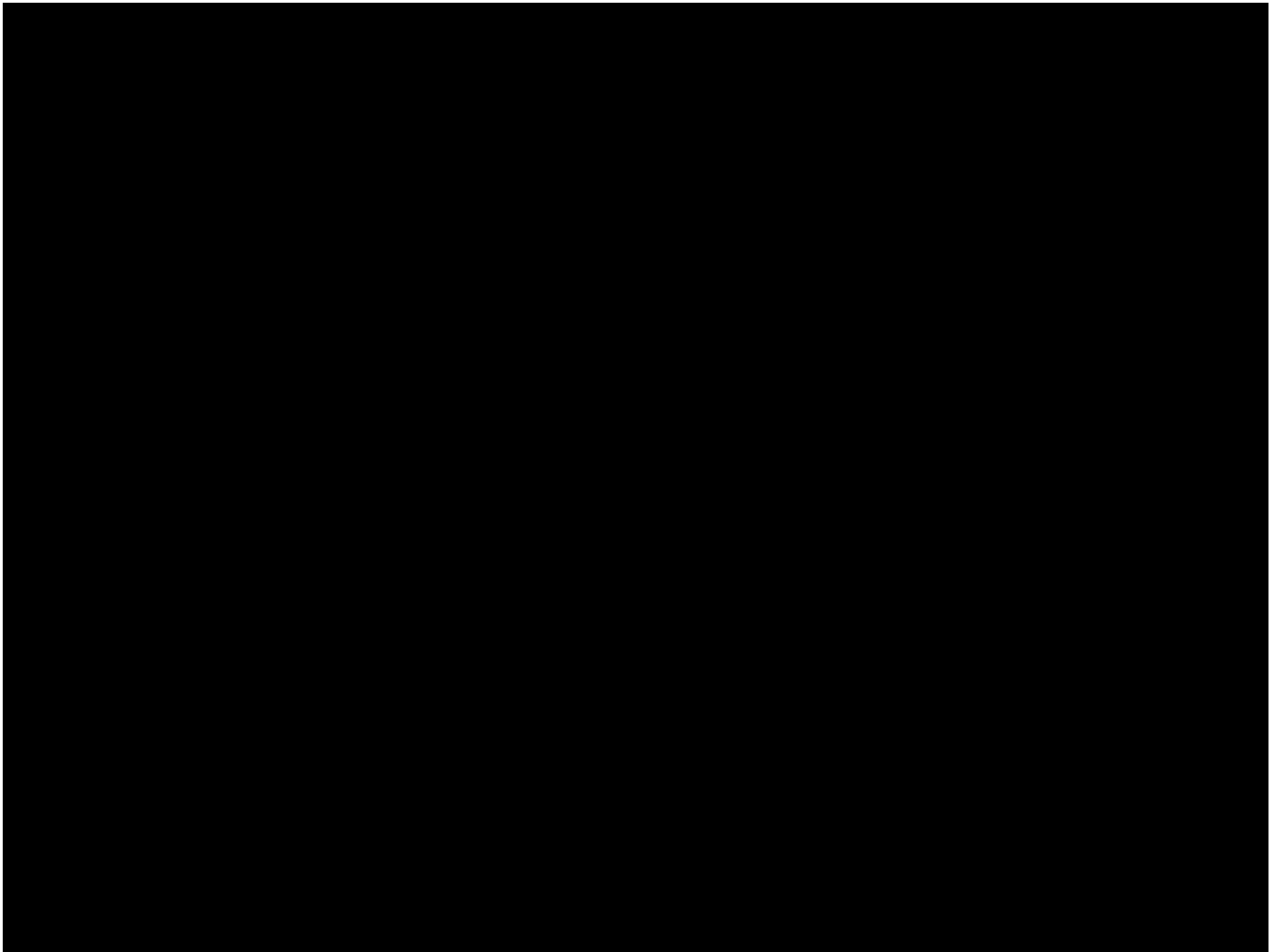


American inventor Thomas Quinn, of the Nintendo Wii Remote, has unveiled a home-based fuel pump that will cost 50p per gallon.

Quinn, who first designed the Wii Remote, has launched a new company to produce controllers, has launched a new company to produce

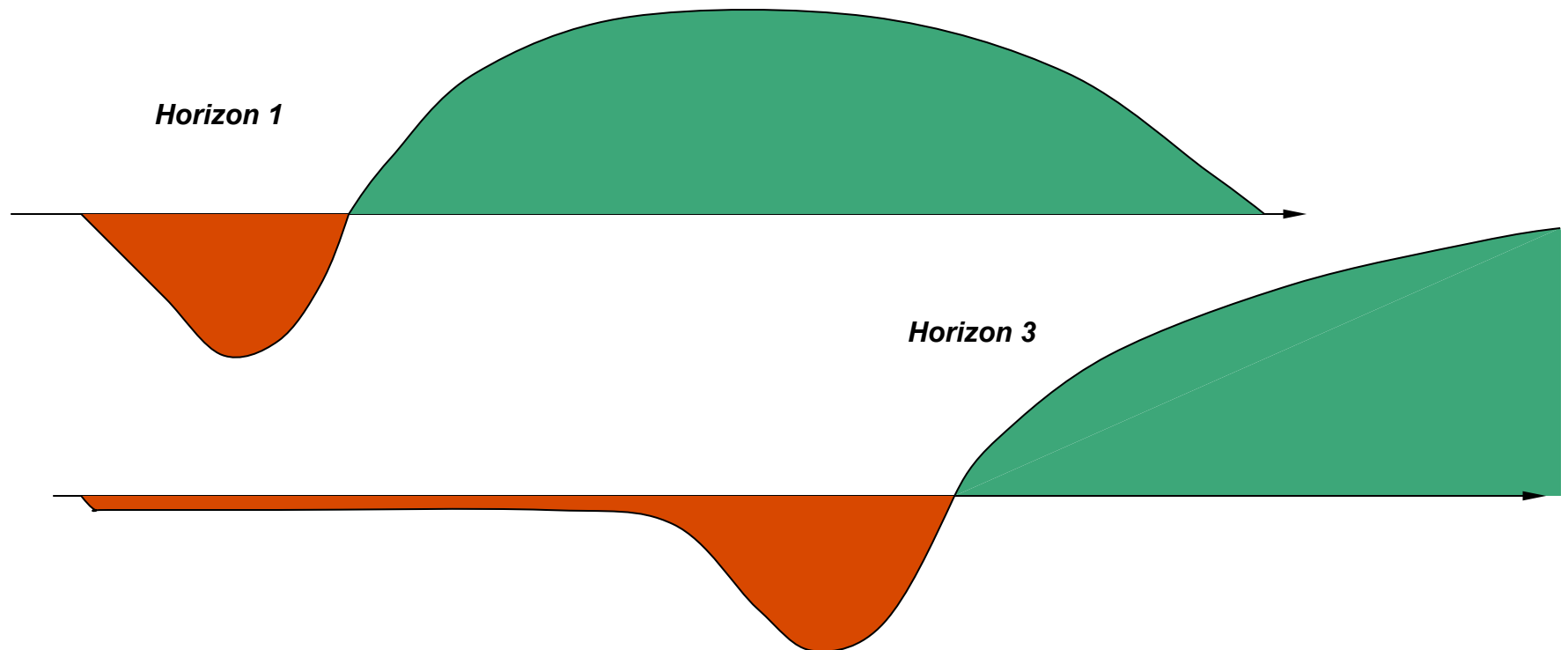
The famed inventor has designed a home-based fuel pump. The system, which is around the same size as an automatic car wash, will cost \$9,995 (over £5,000) when it goes on the market. It will give drivers access to the eco alternative for 50p per gallon.





Two Underlying Arguments for Long-Term (e.g., Horizon 3) Investment

1. Long-term innovation opportunities may be exceptionally valuable, even on a risk-adjusted basis. They can be great investments, even if their value can not be easily quantified.
2. Long-term innovation opportunities are the future. Investments in long-term opportunities lay the groundwork for future sources of growth. If we don't invest for the future, we are eating our "seed corn."

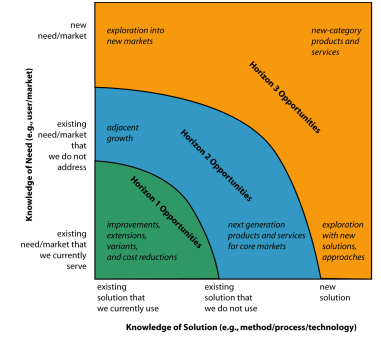
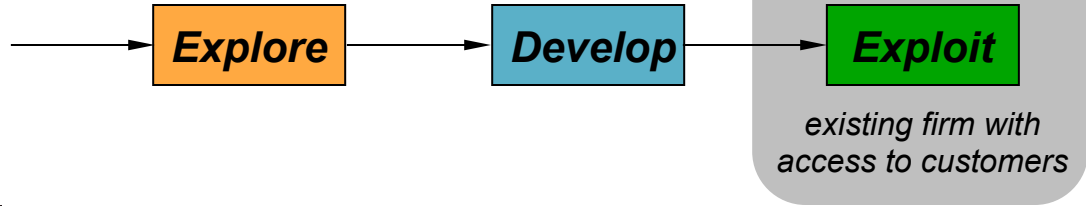


Simple Model of Maturation of Opportunities

*Horizon 3
opportunities*

*Horizon 2
opportunities*

*Horizon 1
opportunities*







The new iPod. \$399
1,000 songs in your pocket.

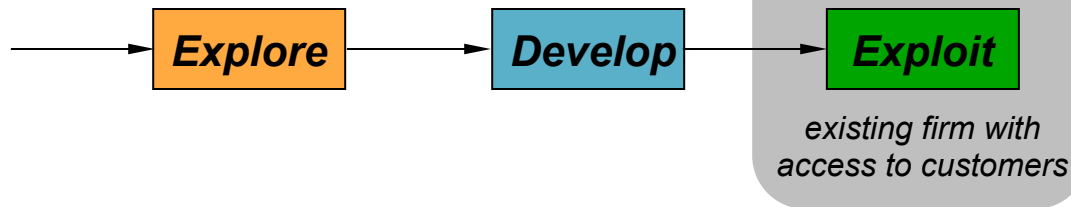




*Horizon 3
opportunities*

*Horizon 2
opportunities*

*Horizon 1
opportunities*



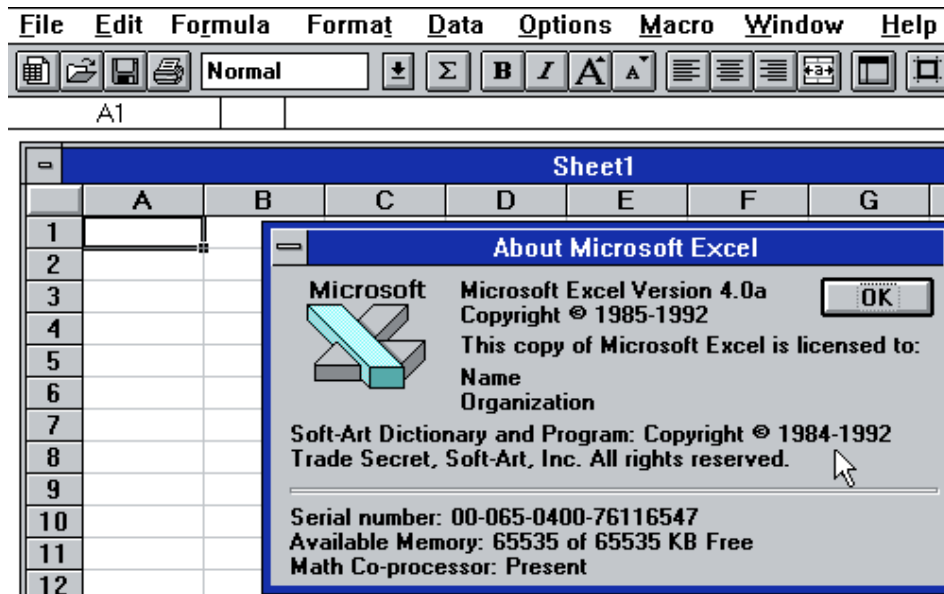
Alternatives to investing in Far-Horizon Opportunities

Wait and follow.

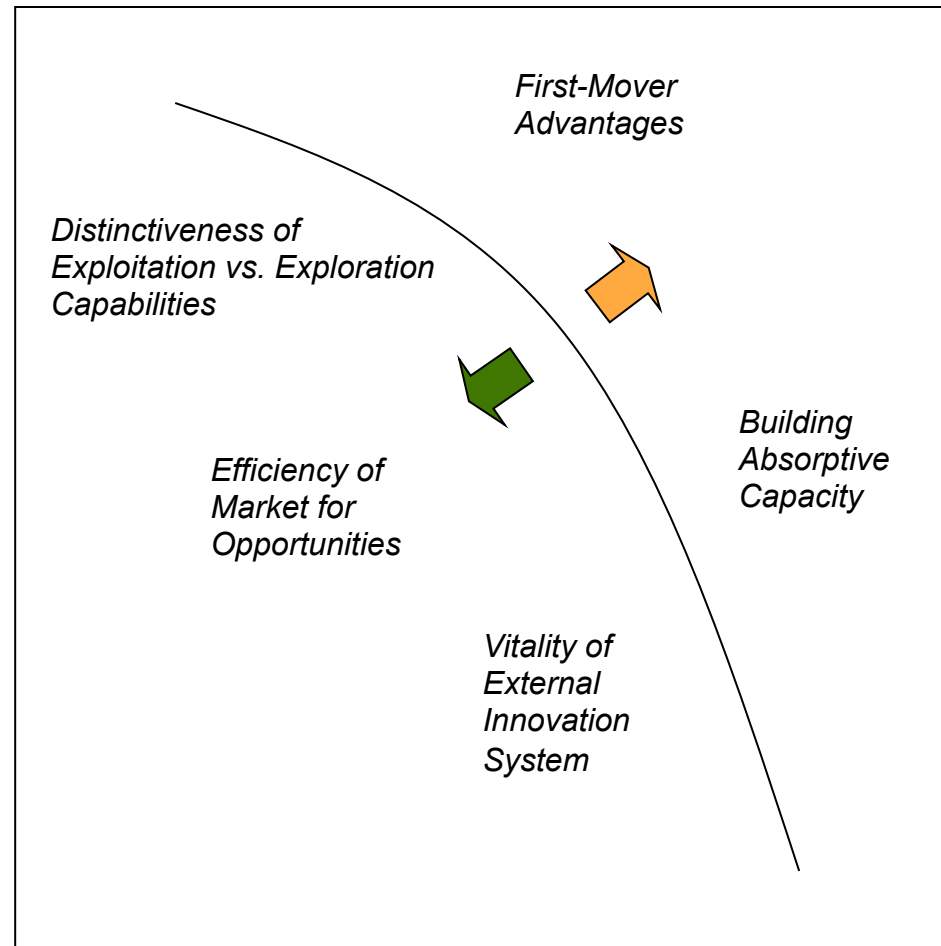
Acquire late-stage opportunities.

IP only.

Entire organization.













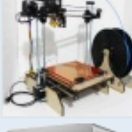
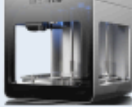
Forces on Innovation Frontier





<i>Innovation</i>	<i>Early Commercial Attempts (year)</i>	<i>First Mainstream Product (year)</i>	<i>Leader(s) During Peak Growth Period (year)</i>
<i>Cable television</i>	<i>Panther Valley Cable TV, Service Electric Cable TV 1948</i>	<i>Cox, Westinghouse, Teleprompter ~1960</i>	<i>Comcast, Time Warner, Cox, TCI, Cablevision, MediaOne ~1985</i>
<i>Compact fluorescent light bulb</i>	<i>Philips, Westinghouse ~1980</i>	<i>Philips, Westinghouse, GE ~1985</i>	<i>Philips, GE, Westinghouse, N:Vision, Sylvania ~1990</i>
<i>Disposable diapers</i>	<i>PauliStrom 1942</i>	<i>Chicopee Mills (J&J) 1949</i>	<i>Procter & Gamble, Kimberly Clark 1961</i>
<i>Microwave oven</i>	<i>Raytheon 1947</i>	<i>Amana (Raytheon) 1967</i>	<i>Litton ~1970</i>
<i>Mobile telephone</i>	<i>Motorola 1973</i>	<i>Motorola 1983</i>	<i>Nokia, Motorola ~1991</i>
<i>Mutual fund</i>	<i>Massachusetts Investors Trust 1924</i>	<i>Fidelity Fund 1928</i>	<i>Vanguard Group Fidelity Investments 1977</i>
<i>Personal computer</i>	<i>MITS Altair 1975</i>	<i>Apple II 1977</i>	<i>IBM PC 1985</i>
<i>Search engine</i>	<i>Lycos 1994</i>	<i>Excite, AltaVista, Yahoo! 1995</i>	<i>Google, 1998 Yahoo!, Microsoft, 2004</i>
<i>Television</i>	<i>Telefunken, 1934 Dumont, 1938</i>	<i>RCA 1948</i>	<i>Magnavox, Zenith, Philips ~1960</i>
<i>Video cassette recorder</i>	<i>Ampex 1956</i>	<i>Sony 1971</i>	<i>Matsushita 1976</i>

What about pharmaceuticals? Stronger appropriability?

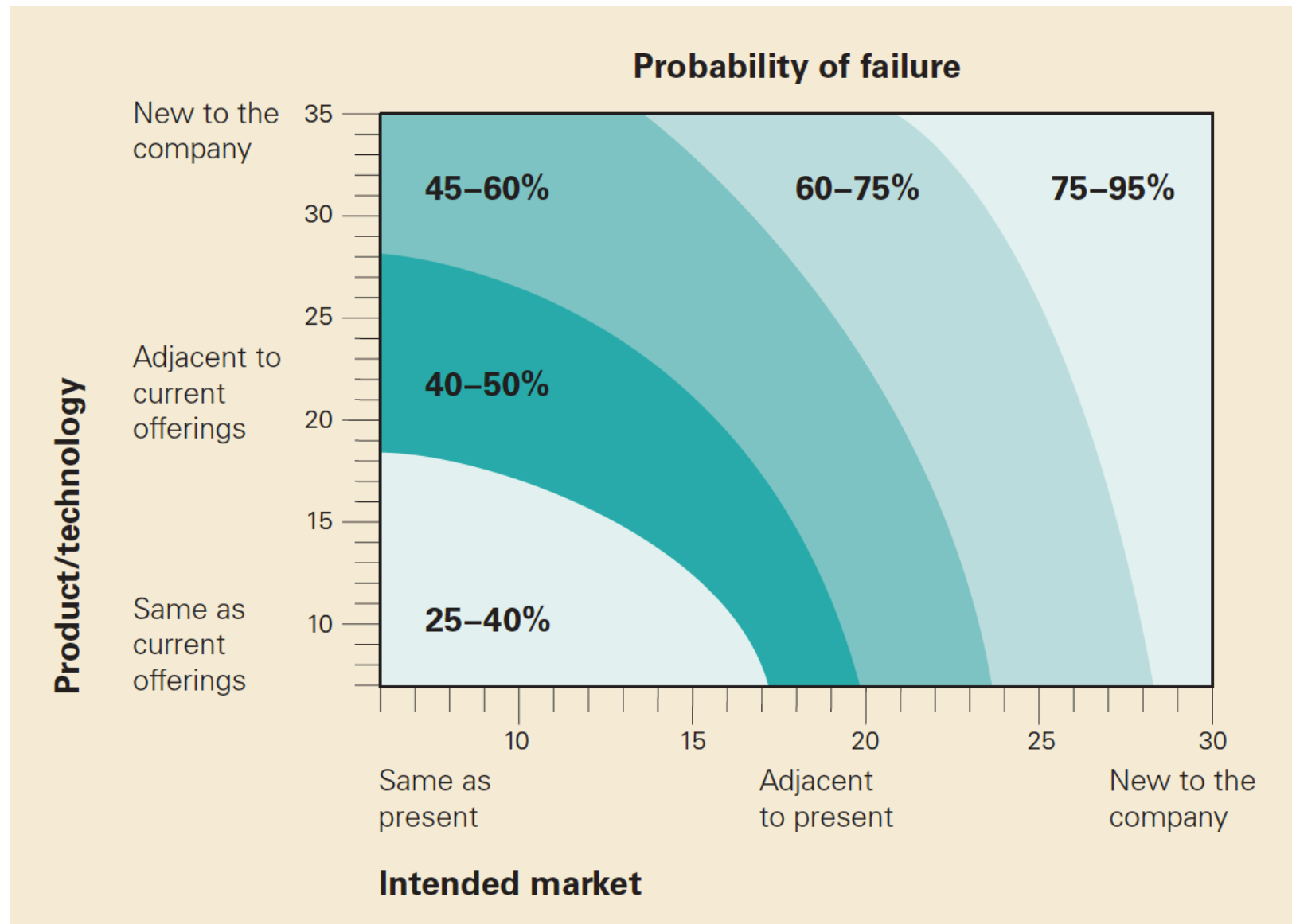
www.3ders.org 3D printer and 3D printing news				    							
Home Price Compare Videos Stats 3D Printing Basics Forums											
<h1>Price - 3D printers</h1>											
Details											
Country	Manufacturer	Model	Assembled	Build envelope (W x D x H mm)	Image	Technology	Price (US\$)	Lead time			
USA	LIX	Lix 3D pen	Yes	-		FFF	\$ 140.00	-			
USA	New Matter	MOD-t 3D printer	Yes	150x100x125		FFF	\$ 249.00	-			
USA	Cobblebot	Cobblebot 3D Printer	Yes	381x381x381		FFF	\$ 299.00	-			
USA	M3D	The Micro 3D printer	Yes	109x113x116		FFF	\$ 349.00	-			
USA	Printrobot	New Simple Maker's Kit	DIY kit	102x102x114		FFF	\$ 349.00	1-2 week			
Canada	Mixshop	Mix G1 Plus Kit	DIY kit	160x160x160		FFF	\$ 455.00	3 weeks			
China	mostfun	MostFun Sail 3D	Yes	120120120		FFF	\$ 460.00	-			

Products: [3D printer](#) [Materials](#)

 Order by: [Shop](#) [Manufacturers](#) [Model](#) [Assembled](#) [Weight](#) [Technology](#) [Price \(selected\)](#) [Lead Time](#) [Build Envelope](#) [Speed](#) [Nozzle Diameter](#) [Layer Thickness](#) [Positioning Accuracy](#) [Input format](#) [Software](#) [System configuration](#) [Power supply](#)

Filters (Countries)

Far-Horizon Innovation is Very Risky



Source: George Day. 2007. "Is It Real? Can We Win? Is It Worth Doing? Managing Risk and Reward in an Innovation Portfolio." *Harvard Business Review*.

Distinctiveness of Capabilities: Exploration vs. Exploitation



Distinctiveness of Capabilities



We wanted flying cars. Instead we got 140 characters. – Peter Thiel



Carl Dietrich, CEO Terrafugia

uBeam – Meredith Perry





RepRap founded c2009 – becomes Makerbot

NEXT STORY

Back to 1984: 3D Print Your Own Retro Mini Apple Computer, or Purchase One on Etsy

PREVIOUS STORY

From Captain America to the Incredible Hulk, This Pancake 3D Printer Can do it All!

SUBSCRIBE TO 3DPRINT BY EMAIL

Enter your email address:

Subscribe

Delivered by FeedBurner



HP Creates Entire 3D Printing Unit & Appoints New Executives Prior to Company's Split

BY SCOTT J GRUNEWALD · SEPTEMBER 3, 2015

 Like 90

 Tweet 132  22

 Share 90

 Share



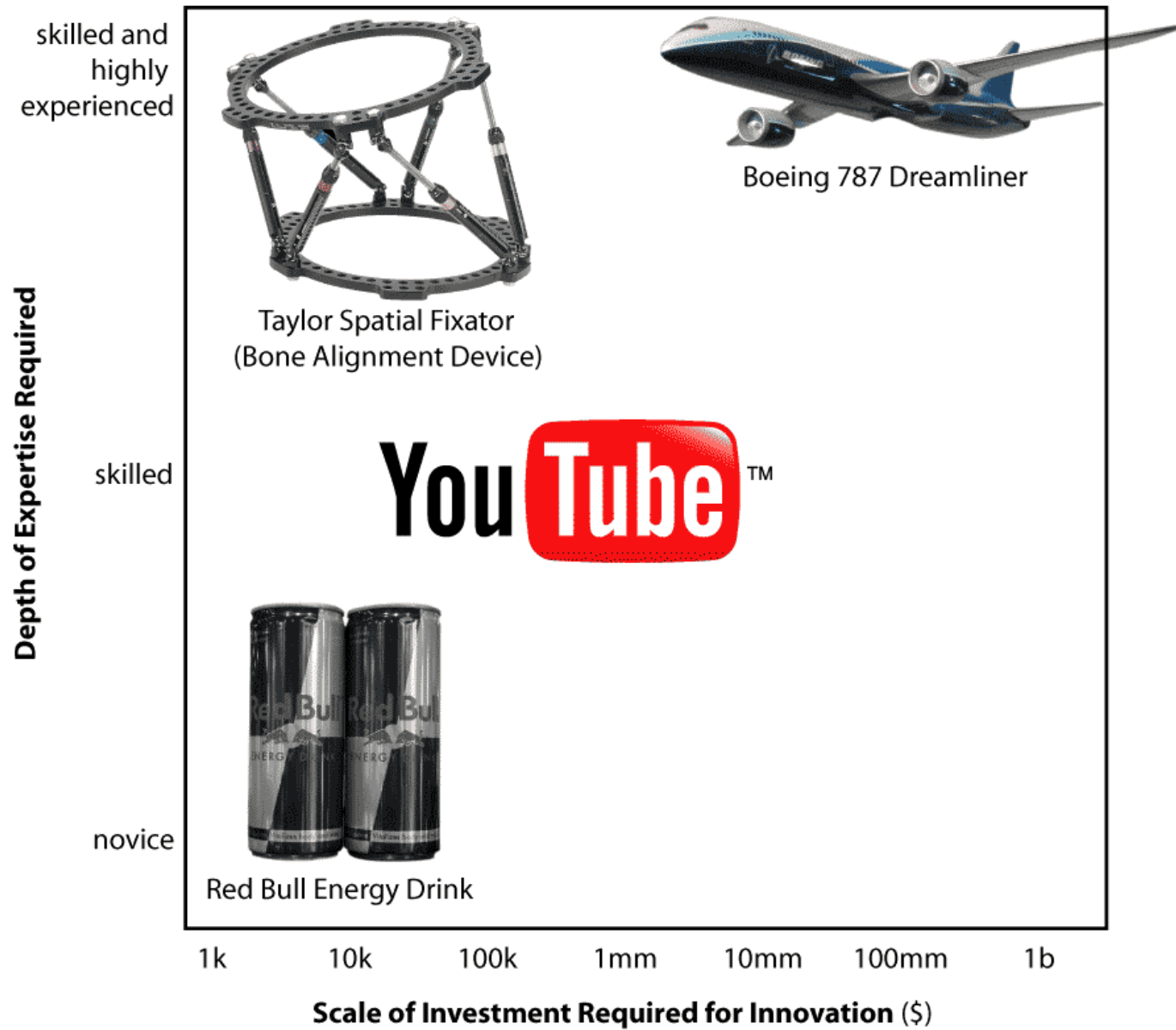
191

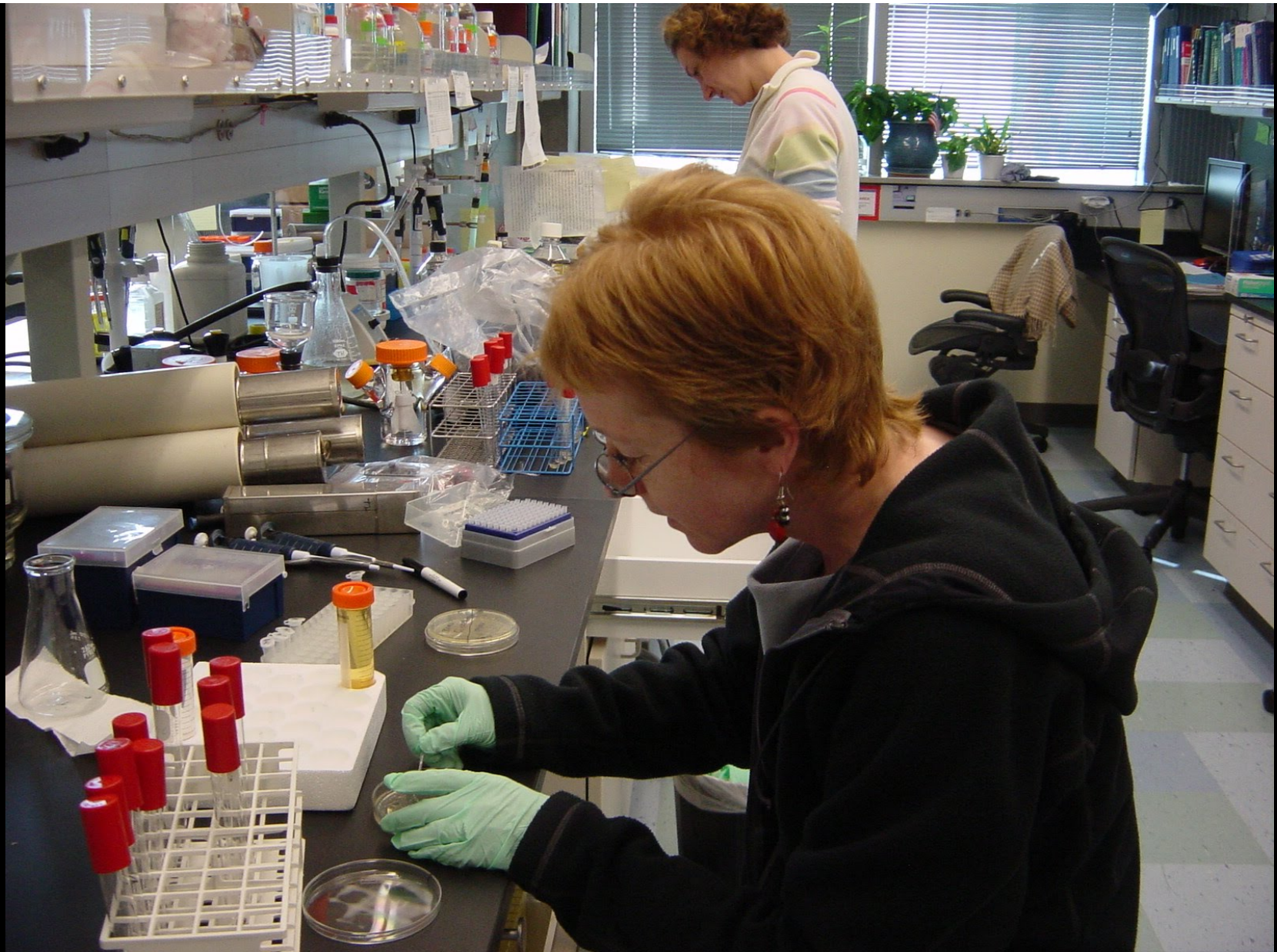


Hewlett-Packard has been threatening, I mean hinting, that they were going to be jumping into the commercial 3D printing market in a big way for well over a year now, but they aren't hinting anymore. Last month Hewlett-Packard CEO Meg Whitman announced that they would be [officially splitting the company into two](#) separate businesses n November 1st. Hewlett-Packard Enterprise would focus entirely on their server, data center technology and business consulting while HP Inc. would try to turn the rapidly declining printer and personal computer portion of the business around. Whitman would continue to run Hewlett-Packard Enterprise while Dion Weisler would remain in charge of the side

<http://www8.hp.com/us/en/commercial-printers/floater/3Dprinting.html>









~~First Mover~~
~~Advantages~~

*Distinctiveness of
Exploitation vs. Exploration
Capabilities*

*Efficiency of
Market for
Opportunities*

*Building
Absorptive
Capacity*

*Vitality of
External
Innovation
System*



Most Common Complaints About “Innovation Culture”

1. We are risk averse.

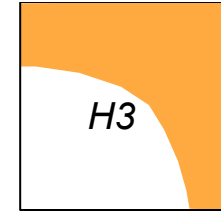
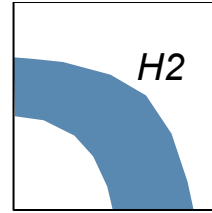
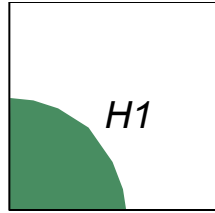
- We prefer a 90% chance of 1mm USD to a 25% chance of 4mm USD.
- Our managerial systems punish project failure.

2. If we can't precisely quantify the pay-off, we treat it as worth zero.

3. We have a short-term perspective.

- We are not willing to invest today's resources towards ensuring/growing future resources.

4. We are slow and bureaucratic in responding to opportunity.



Objective

*Improvement
(75-90% success)*

*Adjacent Growth
(25-75% success)*

*New Category
(<25% success)*

*Elements
of Culture*

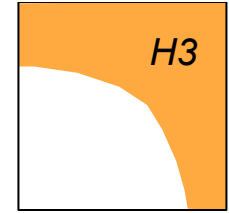
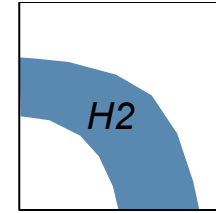
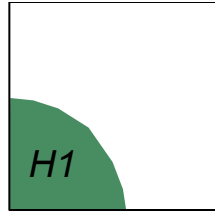
- *Customer focus.*
- *Continuous improvement.*
- *Problem solving.*
- *Measurement, analysis.*

- *Portfolio perspective.*
- *Continual generation of opportunities.*
- *Inexpensive exploration of feasibility and value.*

- *Irrational optimism.*
- *Vivid imagination of possibility.*
- *Adaptive and dynamic planning.*
- *Tenacious commitment.*
- *Enthusiastic tech push.*

Universally Desirable Elements of Culture

- *Respect for the individual*
- *Reliability*
- *Opportunities for personal development*
- *Accountability*
- *Autonomy*
- *Trust*
- *Recognition*
- *Cooperation*



Objective

*Improvement
75-90% success*

*Adjacent Growth
25-75% success*

*New Category
<25% success*

*Elements
of Culture*

- *Customer focus.*
- *Continuous improvement.*
- *Problem solving.*
- *Measurement, analysis.*

*Elements of
Process*

- *Six Sigma / TQM.*
- *PDCA/problem solving.*
- *Phase-gate development process.*

Metrics

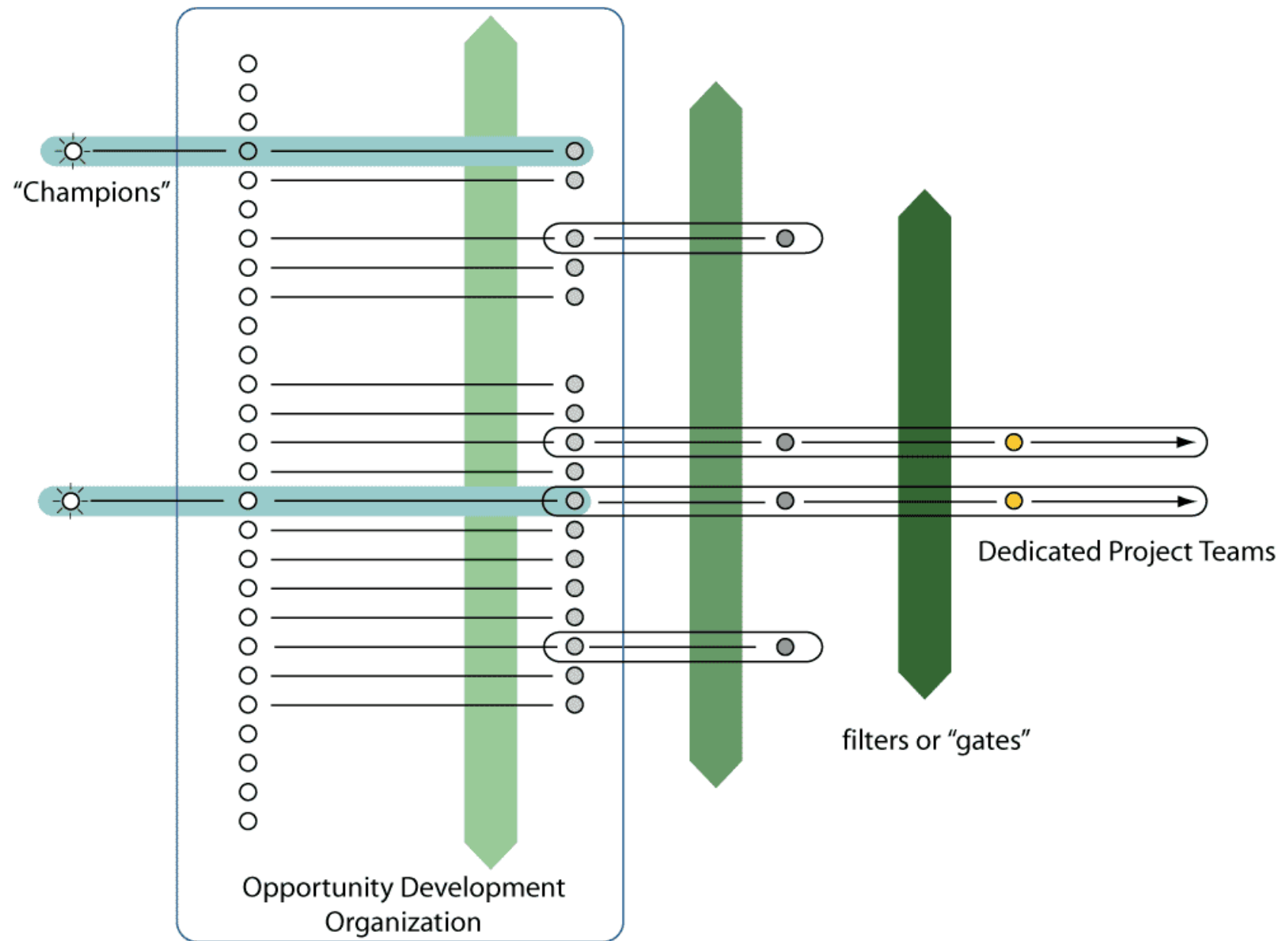
- *Project outcomes.*
- *Cost, quality, time.*

- *Portfolio perspective.*
- *Continual generation of opportunities.*
- *Inexpensive exploration of feasibility and value.*

- *Resources for unspecified exploration.*
- *Centralized innovation function.*
- *Tournament/Pipeline.*

- *Average (portfolio) outcomes.*
- *Process inputs (N ideas generated, etc.).*

Foundation of universally desirable elements of culture



Summary (Culture)

- Fix *Foundation* and *Continuous Improvement Process* first.
(If these aren't right, you have a problem with culture in general, not with your culture of innovation.)
- Define your innovation frontier, probably letting go of Horizon 3.
- *Process* is the most direct lever on culture.
- If you will pursue Horizon 2 innovation (Adjacent Growth),
 - Make an aggregate, general investment in exploration (e.g., 0.25 – 0.5% of revenues/budget).
 - Assign centralized organizational responsibility for H2 innovation (e.g., an innovation group).
 - Explicitly manage the opportunity portfolio and pipeline.