



Open Innovation and How to Use the Crowd

Karim R. Lakhani | k@hbs.edu | [@klakhani](https://twitter.com/klakhani)

Harvard Business School | Harvard Institute for Quantitative Social Science

Crowd Innovation Lab | NASA Tournament Lab



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Solving the Toughest Analytics and Innovation Problem More than 300 Years Ago Through “Crowds”



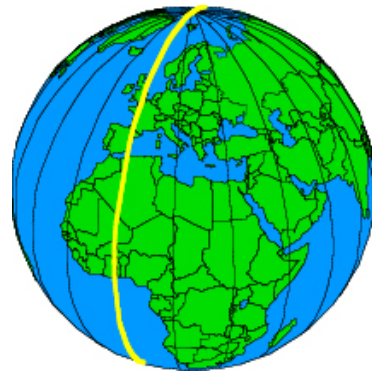
Solving the Toughest Analytics and Innovation Problem More than 300 Years Ago Through “Crowds”



***British Fleet Sinks in 1707
Due to Bad Navigation***



Solving the Toughest Analytics and Innovation Problem More than 300 Years Ago Through “Crowds”



The Longitude Prize
1714 - Up to £20,000
Anyone can enter
Need a working solution



Solving the Toughest Analytics and Innovation Problem More than 300 Years Ago Through “Crowds”



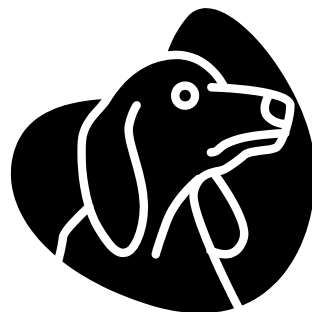
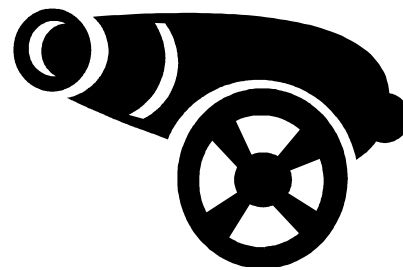
Sir Isaac Newton – Principle Advisor to the Longitude Committee:

*“And I have told you oftener then once that it [the longitude] is not be found by Clock-work alone.....**Nothing but Astronomy is sufficient for this purpose.** And those methods are hitherto only two: one by the motion of the Moon, the other by that of the innermost Satellit of Jupiter.”*

Solving the Toughest Analytics and Innovation Problem More than 300 Years Ago Through “Crowds”



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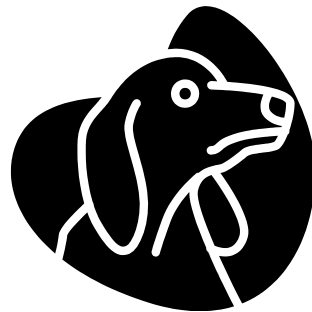
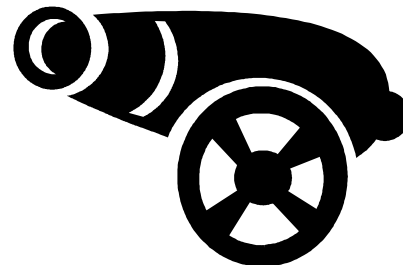
Over 100
Solutions Proposed



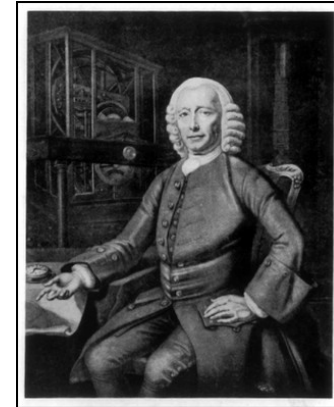
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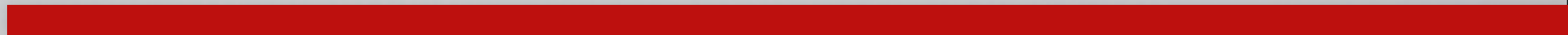
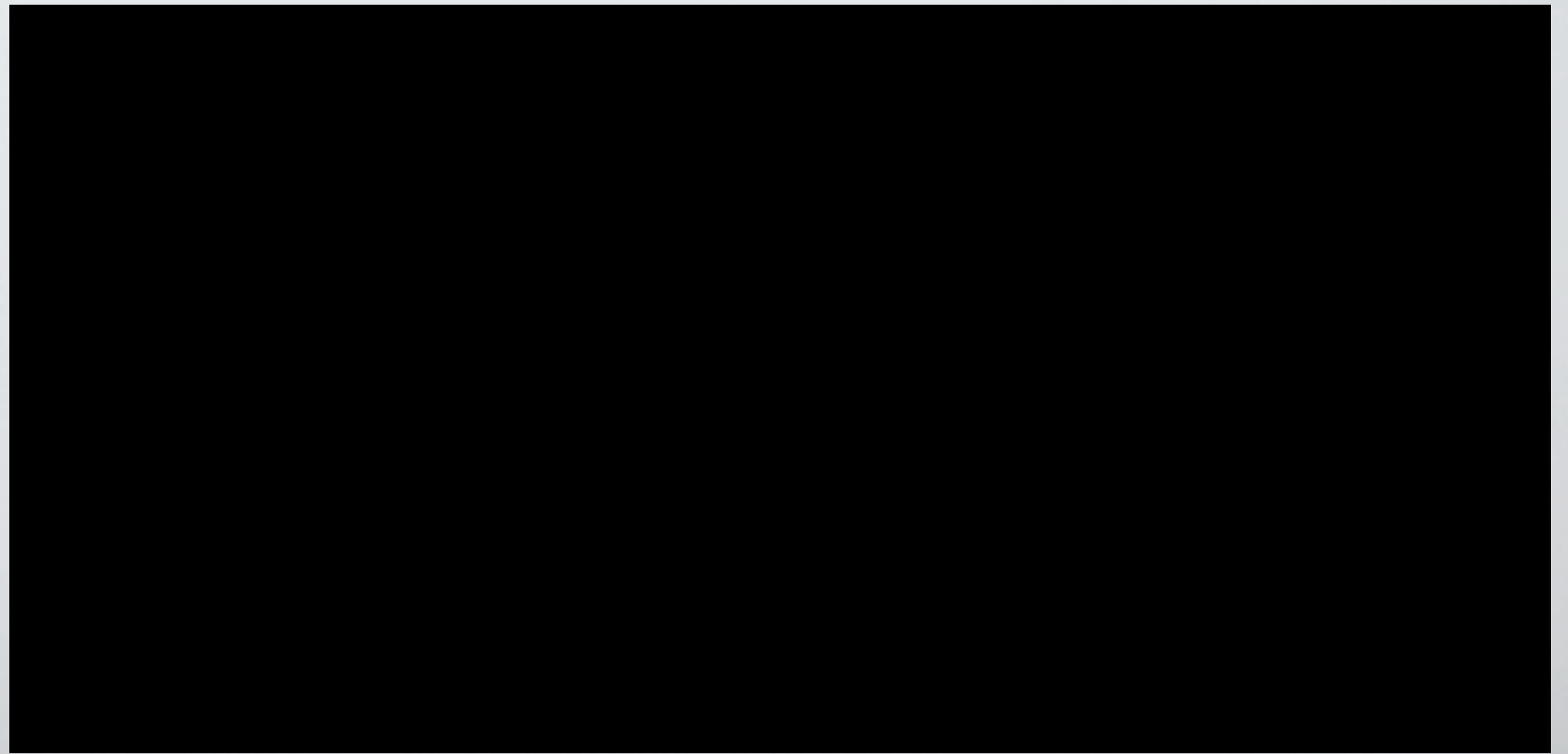


Chronometer Wins
John Harrison
Unknown
Cabinet Maker



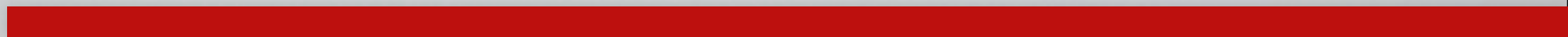
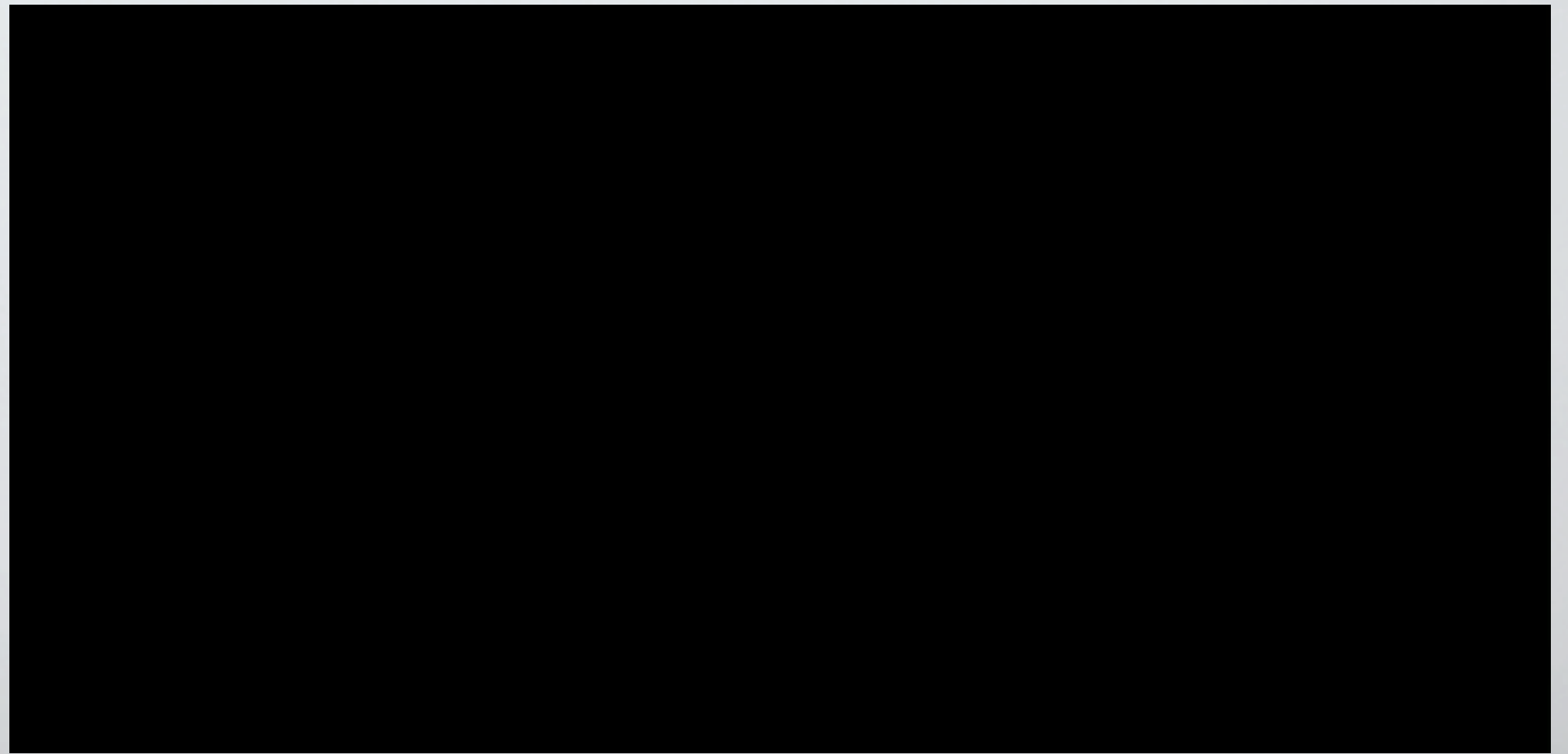


The Top Ranked Super Bowl TV Commercial from 2009





The Top Ranked Super Bowl TV Commercial from 2009





Doritos Ad Beat 51 Big Budget Advertisers



Doritos Ad Beat 51 Big Budget Advertisers

- PepsiCo launched ad contest in 2006 against advise of ad agencies and internal dissent



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Doritos Ad Beat 51 Big Budget Advertisers

- PepsiCo launched ad contest in 2006 against advise of ad agencies and internal dissent
- Contest generated 4000 entries - ads selected by community
- Total spend \$2.5M - free publicity \$36M
- Two brothers from Batesville, Indiana win the contest



Contests and Communities in the Social Media Era



Contests and Communities in the Social Media Era

Contest to Solve Highly Complex Analytics Problem



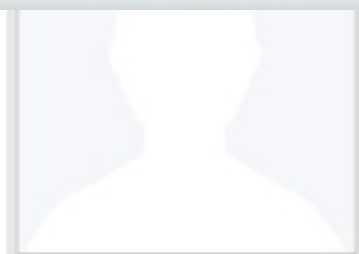
Contest to Solve Highly Complex Analytics Problem





Broad Engagement

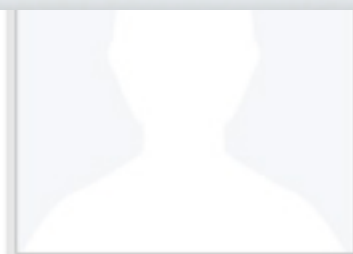
(459 Competitors & 2000 Code Submissions)



\$10,000

carlop

Submission	4
Score	156,811.82



\$5,000

zlfengyi1

Submission	9
Score	156,802.37



\$3,000

nhzp339

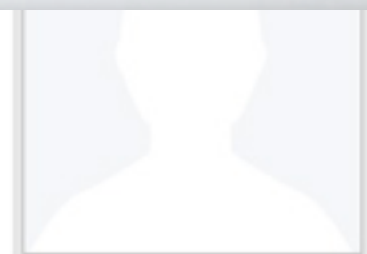
Submission	4
Score	156,741.03



\$1,750

Psyho

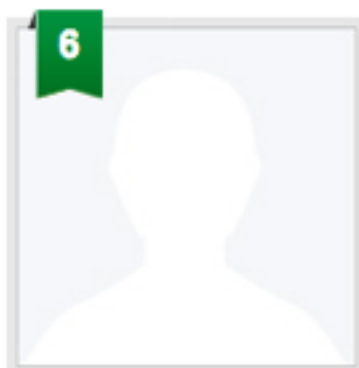
Submission	4
Score	156,691.70



\$1,500

zaq1xsw2tktk

Submission	14
Score	156,667.32



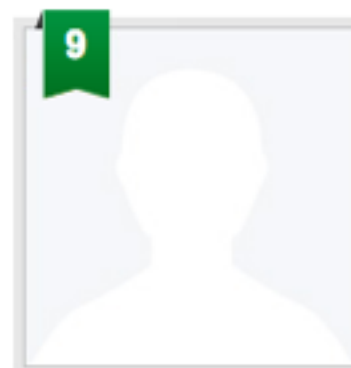
\$1,250



\$1,000



\$750



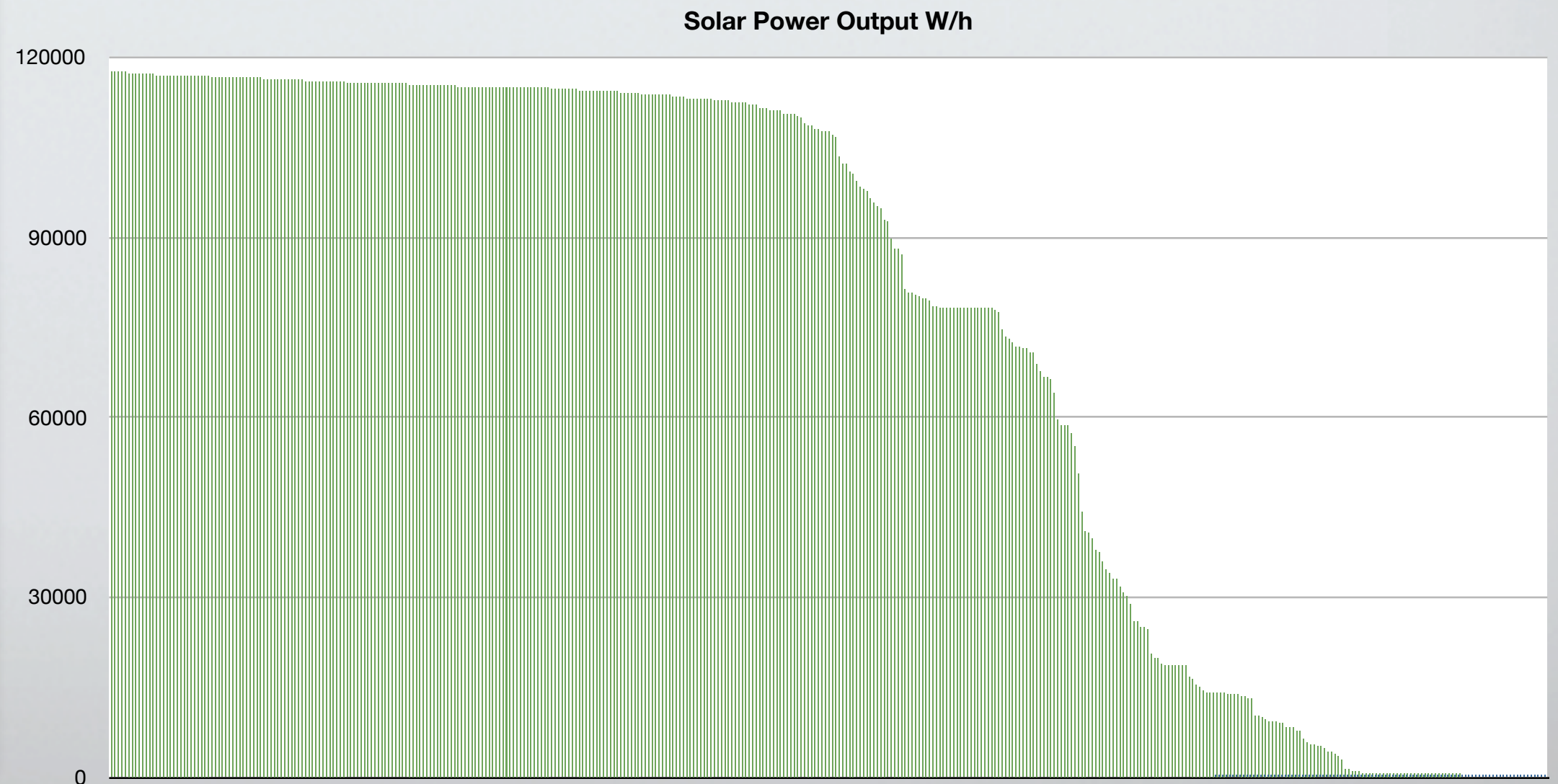
\$500



\$250

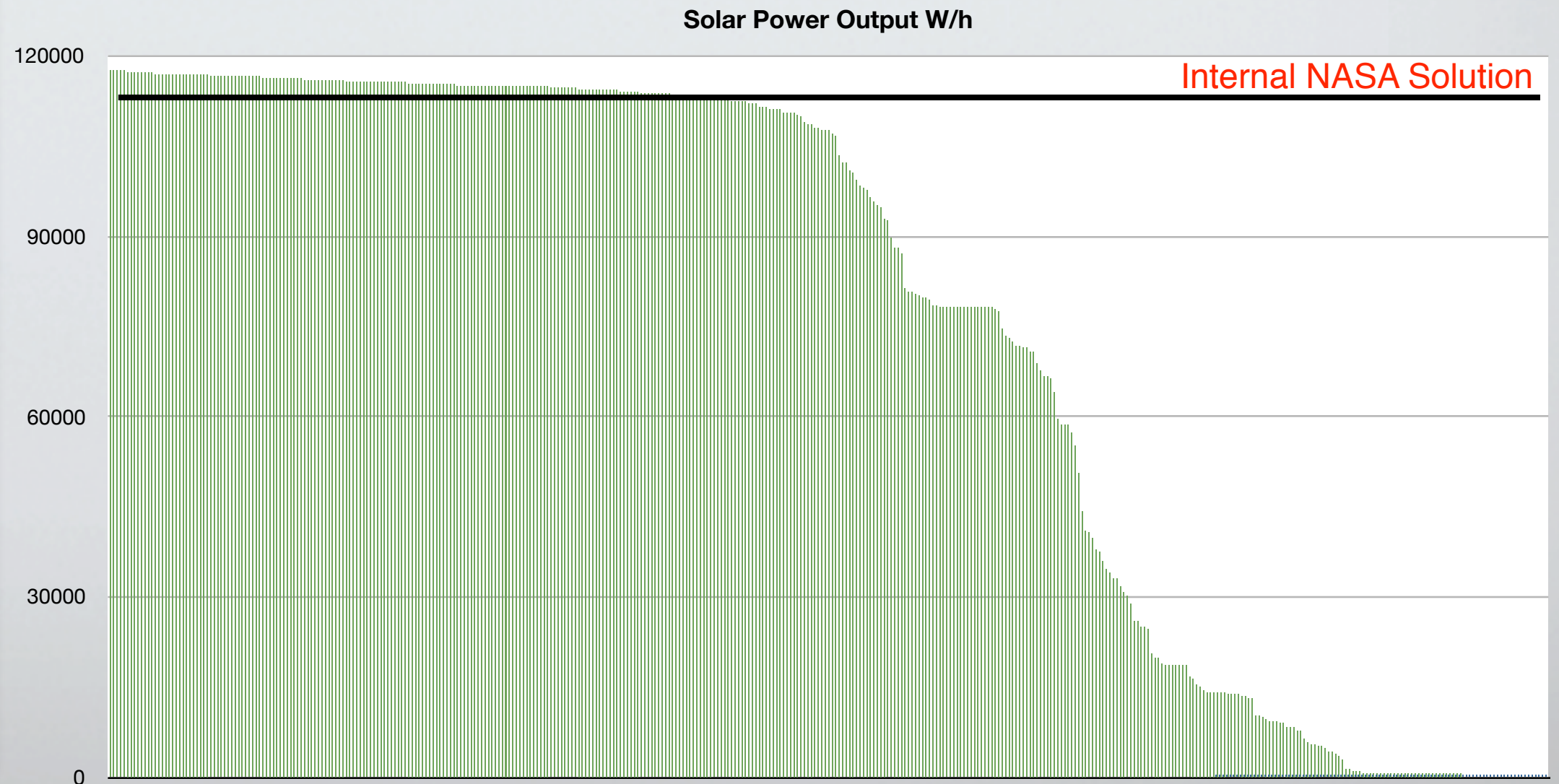


Broad Engagement (459 Competitors & 2000 Code Submissions) & High Performance





Broad Engagement (459 Competitors & 2000 Code Submissions) & High Performance



Uncertainty Haunts Most Research and Innovation Efforts....

“When you come to research and development you can’t answer any of the questions.. [...].. You don’t know when you are going to get the thing, whether it’s going to work or not and whether it’s going to have any value whatsoever”

Charles Kettering
(VP, General Motors
Inventor: Electrical Starting Motor, Ethyl Gasoline, Freon, 186 Patents)





.....Finding the Right People is also
a Major Challenge

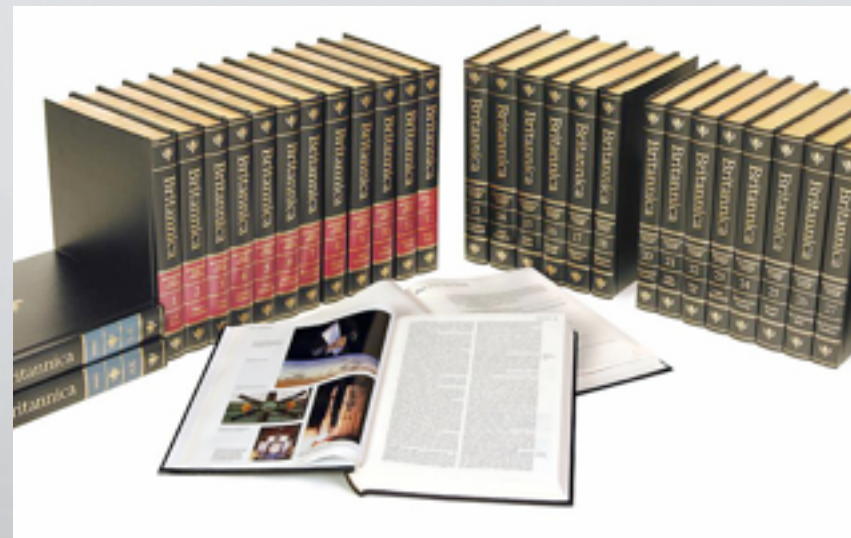
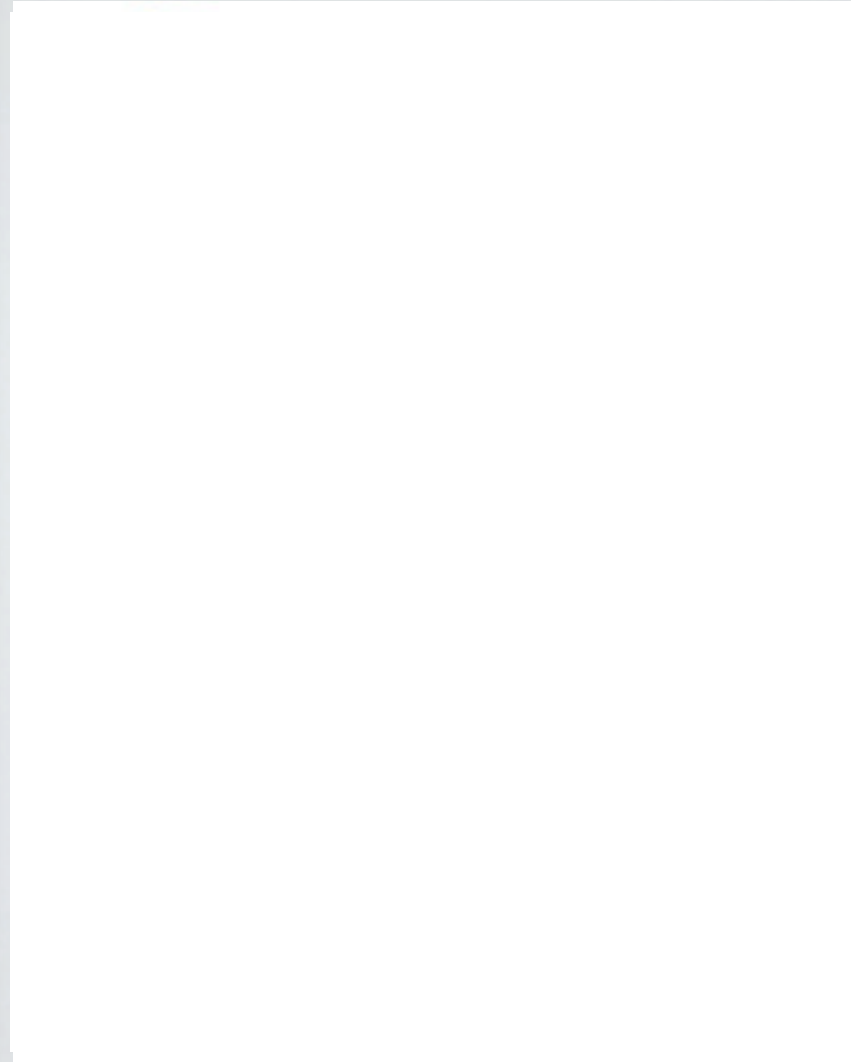
**“No Matter Who You
Are Most of the
Smartest People Work
for Someone Else”**

Bill Joy
(Sun Microsystems, BSD Unix, Java)

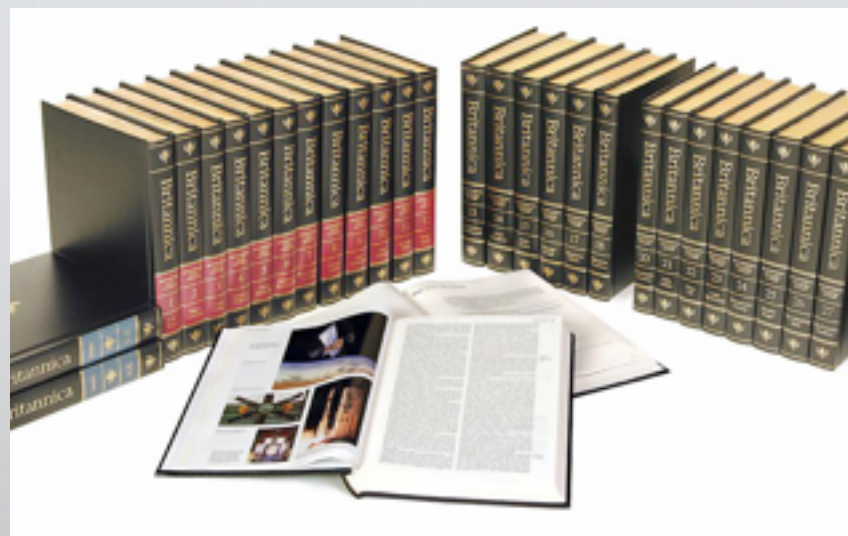
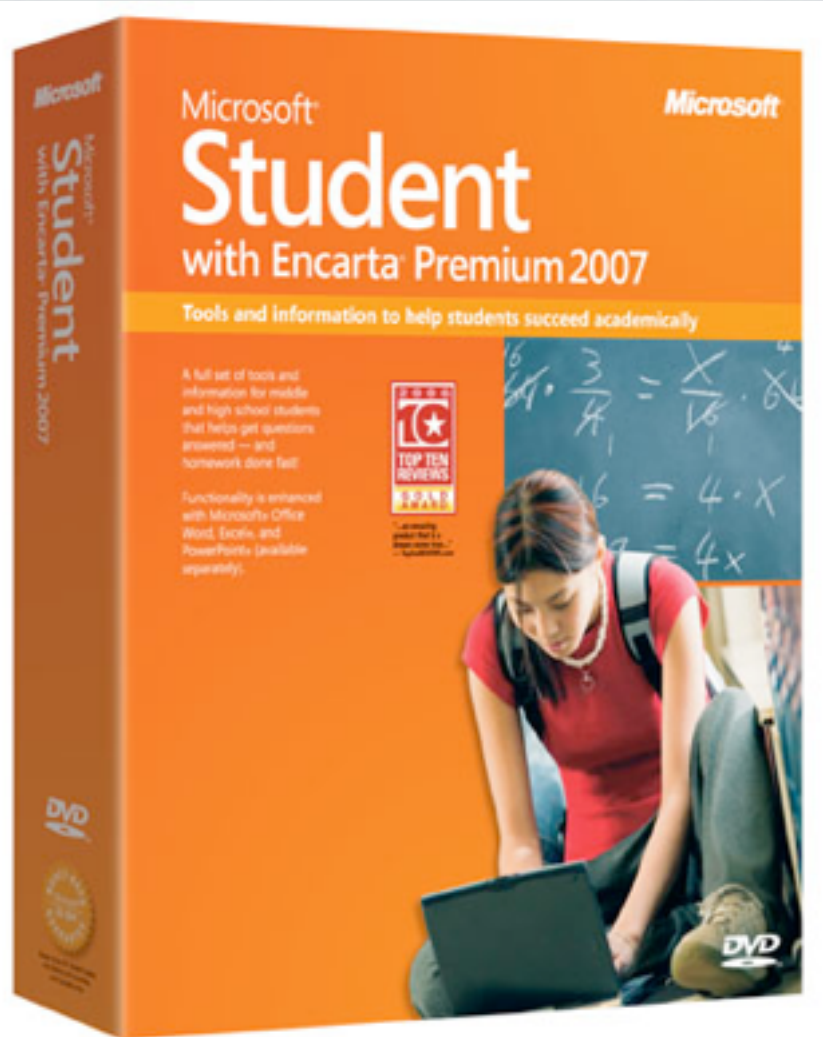




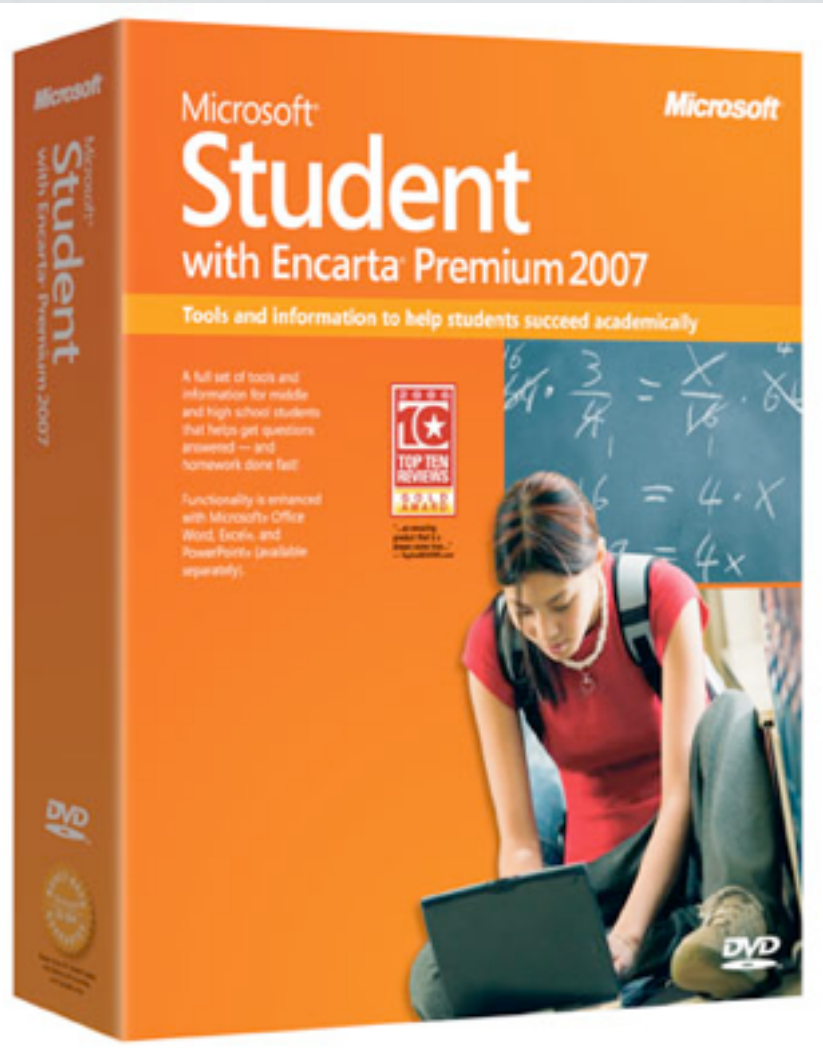
Models for Organizing
Creative Effort are also
Changing



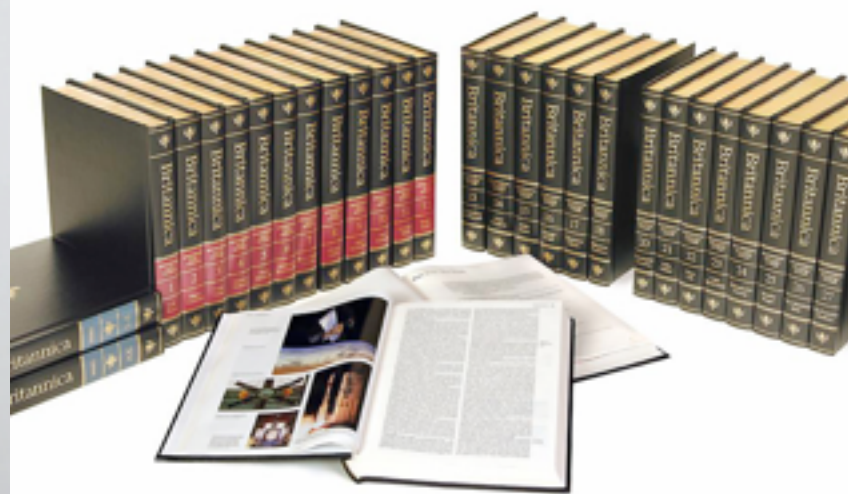
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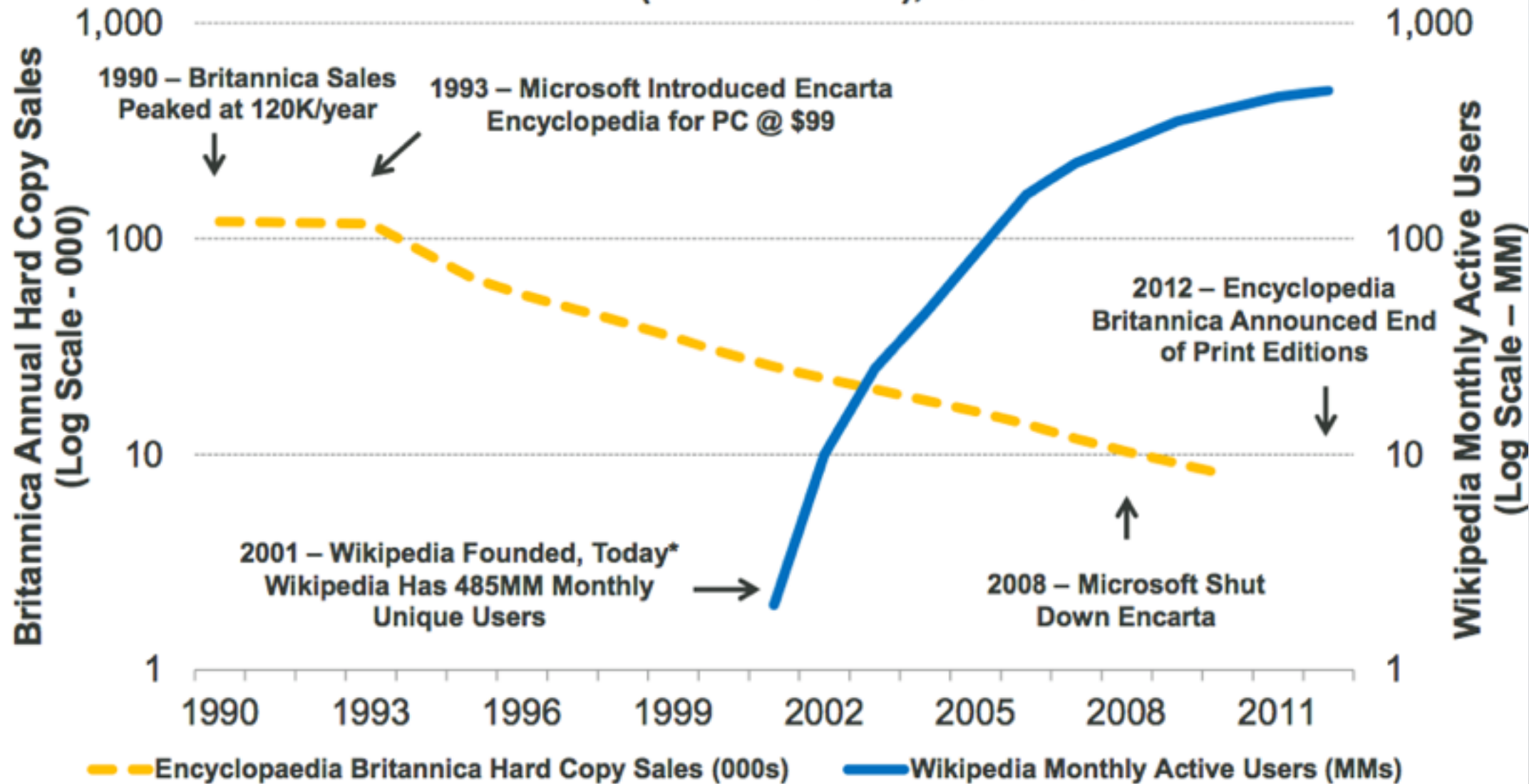
WIKIPEDIA
IS ACCURATE.
(citation needed)



Models for Organizing
Creative Effort are also
Changing

244 Years In, Encyclopedia Britannica Went Out of Print in 2012

Encyclopedia Britannica Hard Copy Sales vs. Wikipedia Monthly Active Users (Different Scale), 1990 – 2012



Quantity and Variety of Ideas Critical to Innovation Success

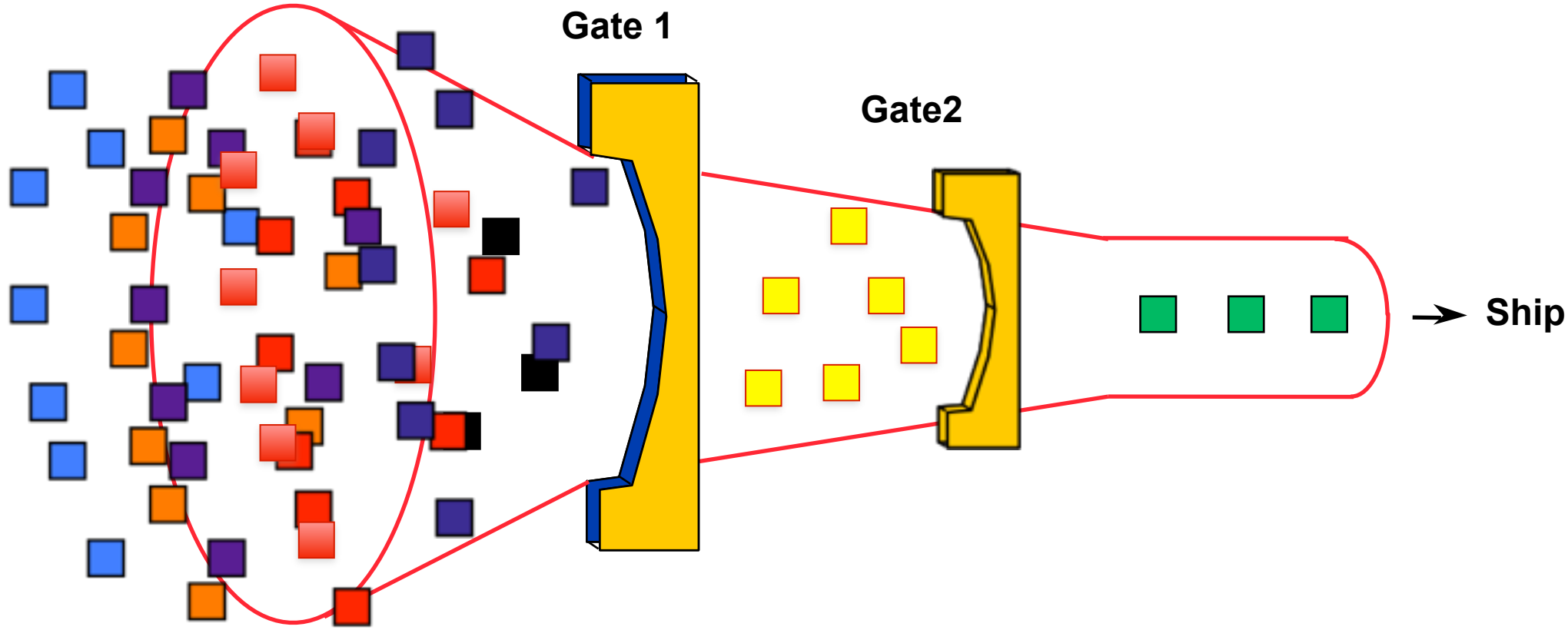
Generation

Selection

Generation

Selection

Implementation

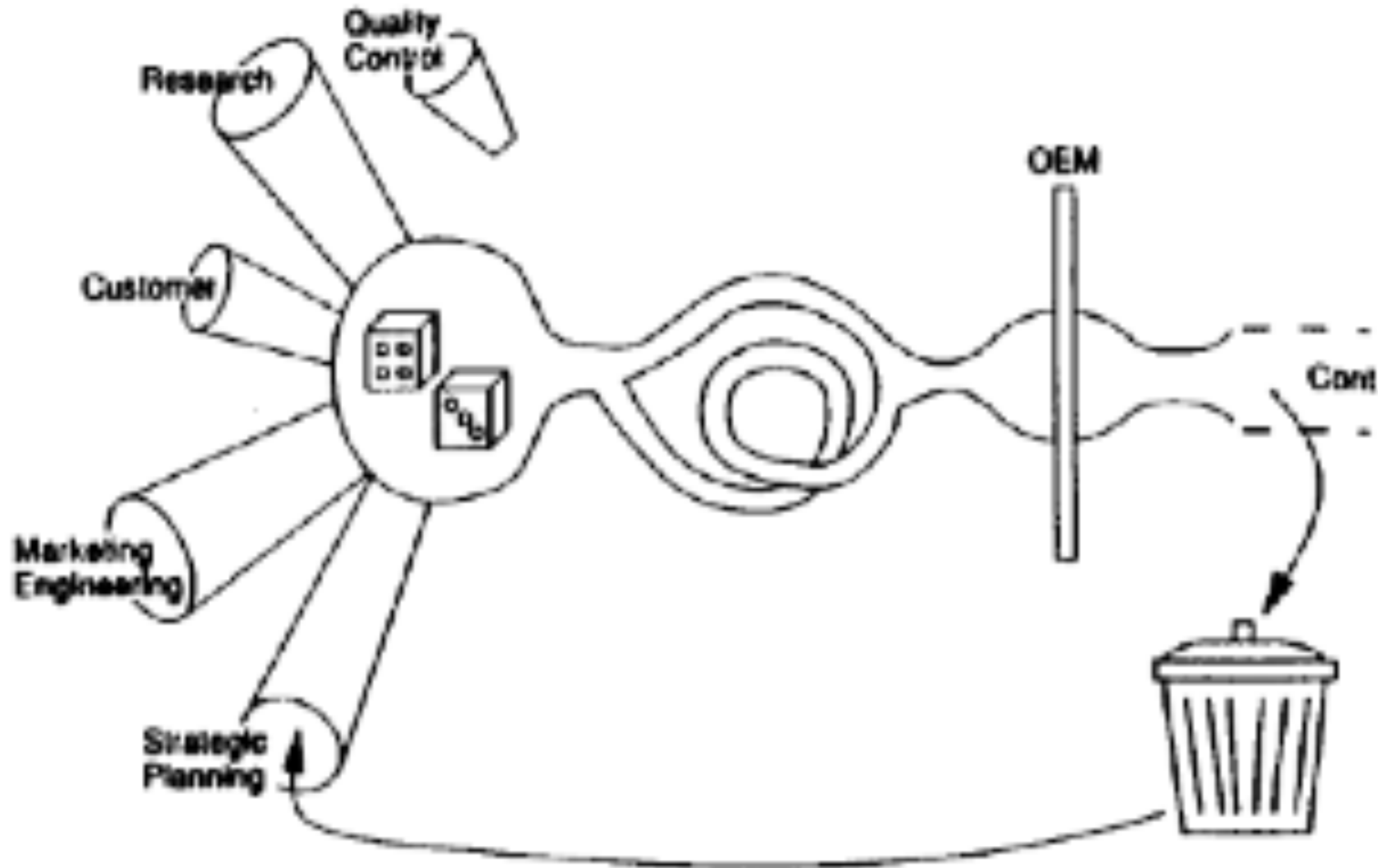


“Real” Idea Funnel is Far from Ideal

EXHIBIT 5-2A

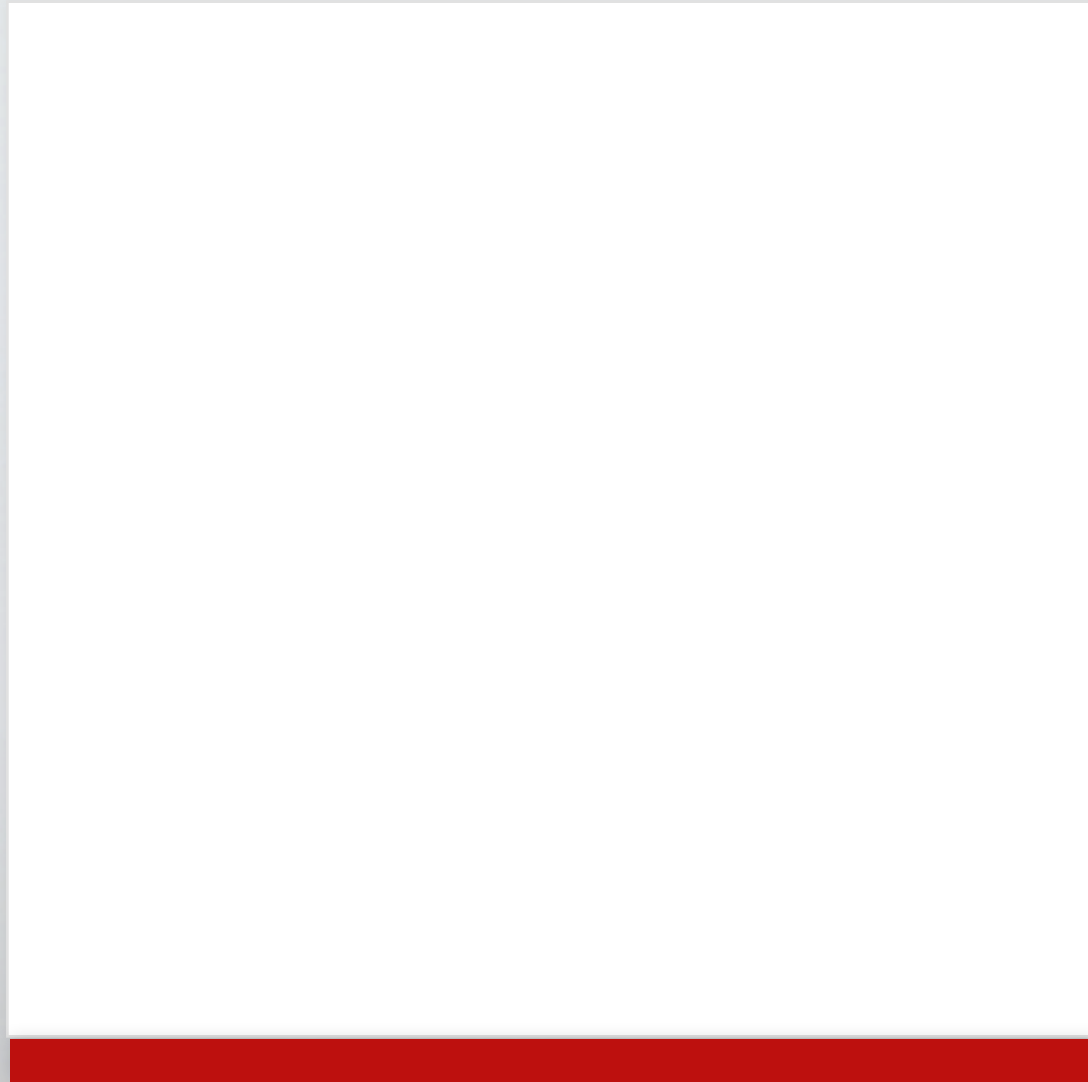
Actual Development Funnel—Medical Electronics Firm*

A. Team 1



“Crowds” Can Be Organized as Contests or Communities

(Boudreau & Lakhani 2013; King and Lakhani 2013)



“Crowds” Can Be Organized as Contests or Communities (Boudreau & Lakhani 2013; King and Lakhani 2013)



Contests/Competition

- Innovation problem requires diversity of approaches and broad experimentation
- Sponsor not sure what combination of skills and approaches might be useful in solution generation
- Clear rules for participation and winning

“Crowds” Can Be Organized as Contests or Communities (Boudreau & Lakhani 2013; King and Lakhani 2013)



Contests/Competition

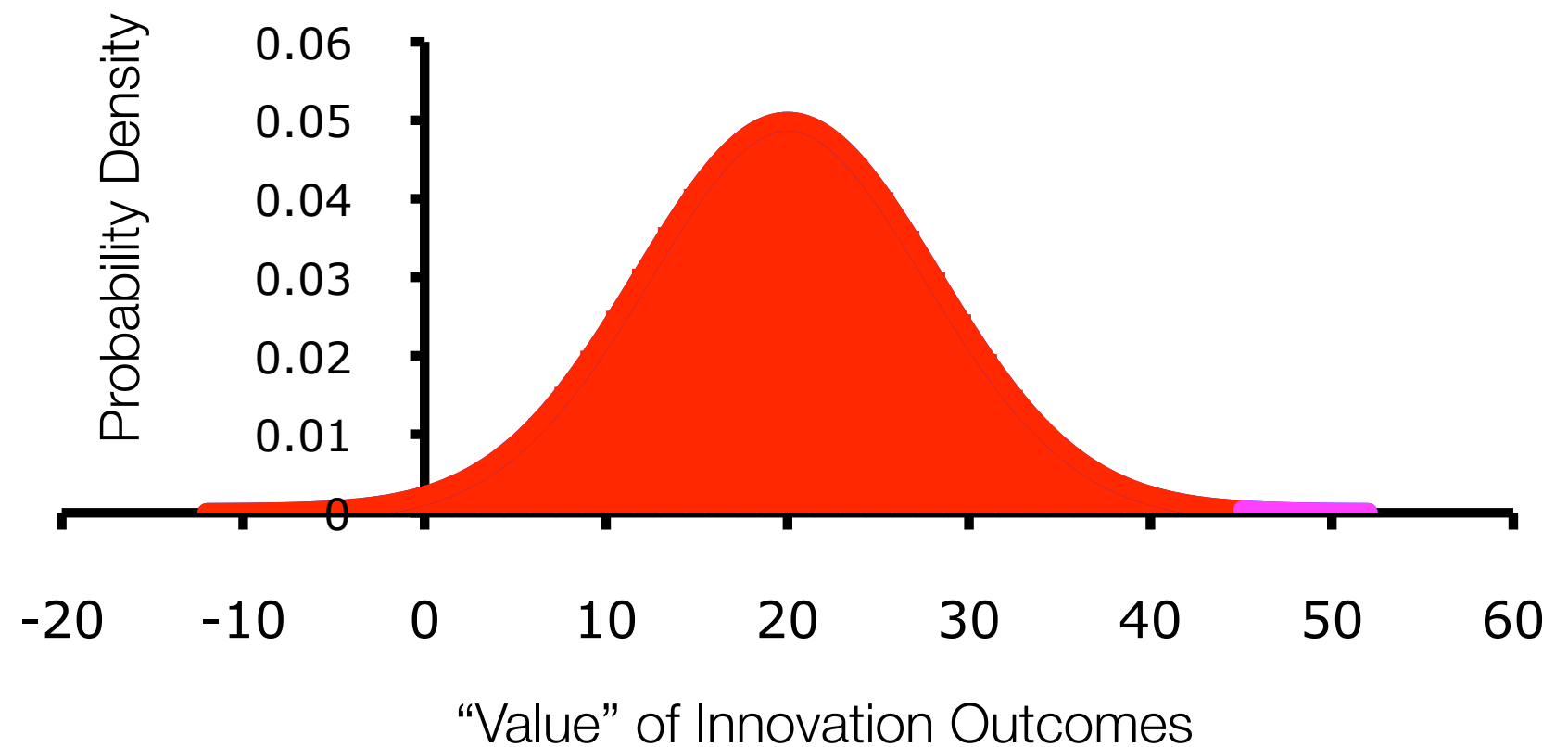
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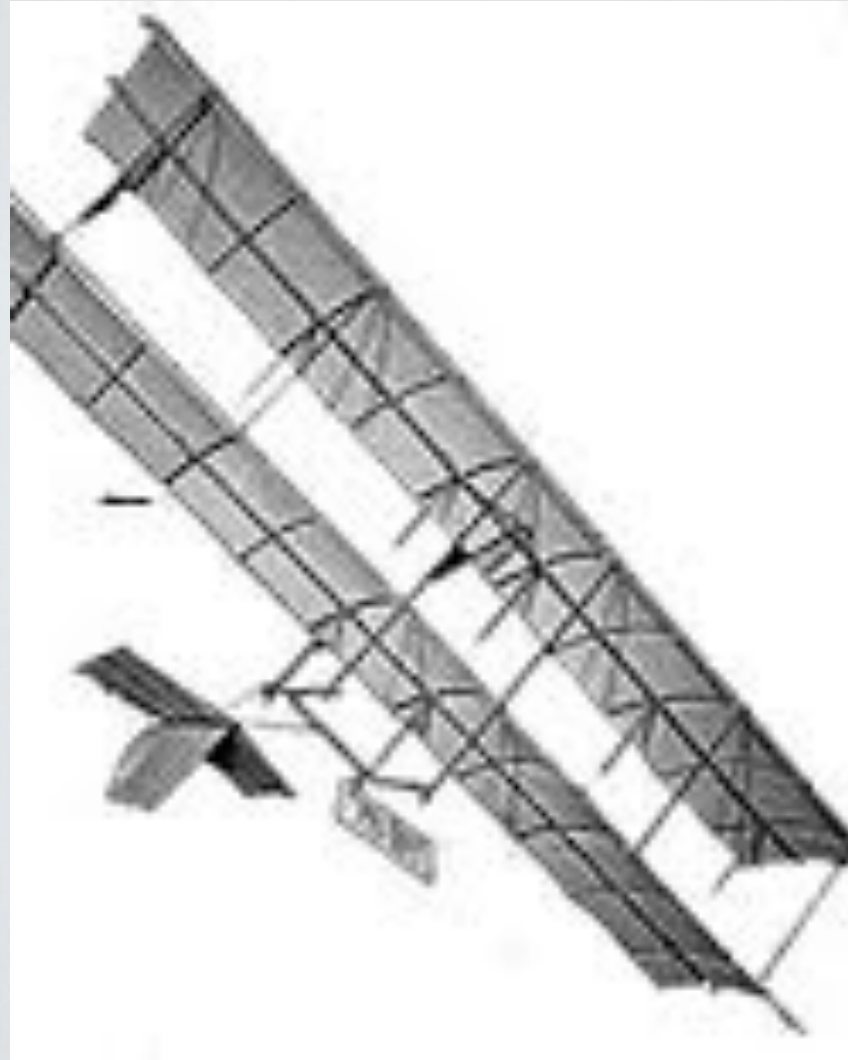


Communities/Collaboration

- Innovation problem requires cumulative knowledge building and aggregation of diverse inputs
- Contributions range from mix & match to co-production with modular tasks and functions
- Informal, norms-based governance

Contests and Communities Enable Discovery of “Extreme Value” Outcomes Through Lots of Entry





“Collaborative Crowds” - Historically Important Source of Technical Progress

Allen (1983) - identifies collective invention as a key driver of innovation for blast furnace technology in 19th Century UK (iron making)

Free flow of technical information and voluntary information spillovers amongst “competing” engineers and firms - no patent protection sought

Nuvolari (2004) argues collective invention as a crucial source of innovation during early phases of industrialization (Cornish Pumping Engines, Bessemer Steel, Silk Production)

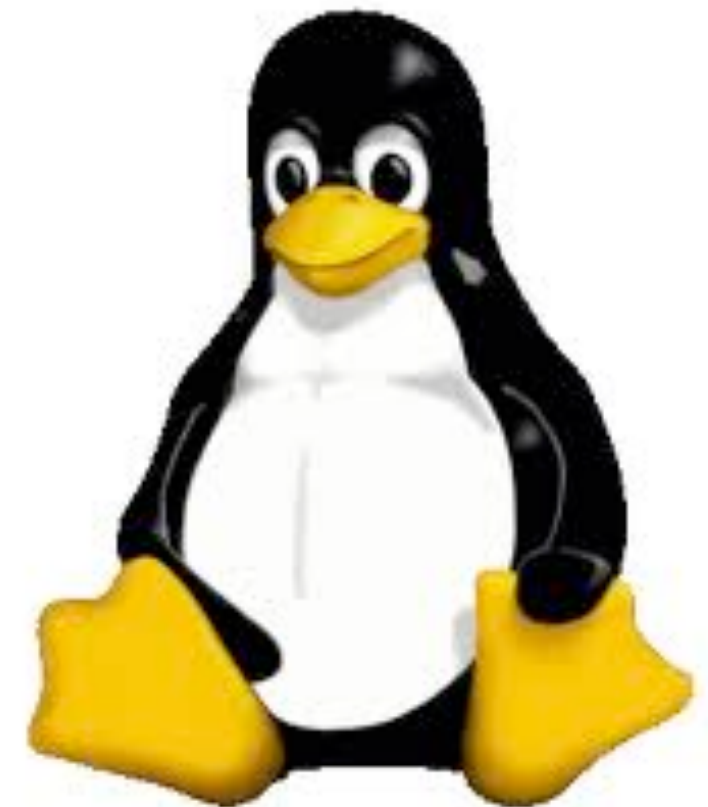
Meyer (2003) shows collective invention’s importance to the development of aircraft - pre-Wright Brother’s Patents

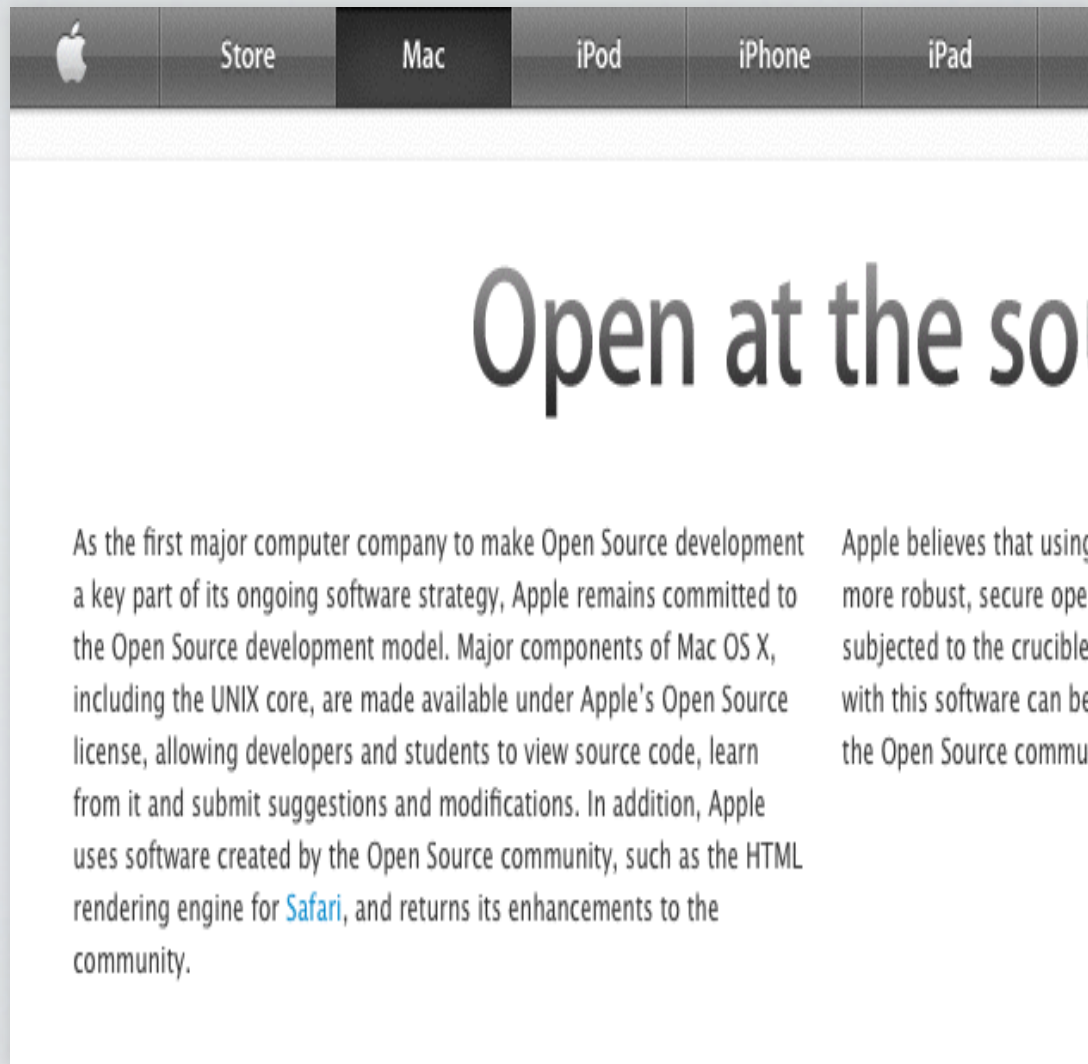




Open Source Software Development Leading Modern Example of Innovation Communities

- UNU - MERIT Study (2006):
- Large footprint in ICT infrastructure applications (web servers, operating systems, embedded systems, email, web browsers)
- 12 billion euro replacement cost
- 131,000 person years of effort
- Open source -related services could represent ~35% of IT services





Community-based Innovation Critical to Apple's Success - > 200 Projects



threadless

dazon
right





SHOP OUR FULL
CATALOG

WHAT'S IN
STOCK?

PHOTO
GALLERY

12 MONTH
CLUB

DESIGNER
INTERVIEWS



e
by Simon Walker



Electromagnetic Spectrum
by Julia Sonmi Heglund



Mermaid, It's What's for
Dinner



Star Light, Star Bright
by Andy Pitts



Everyone Poops
by Chris Lee Jones



Hypotamoose
by Simon Marmorek

SHOP
OUR FULL
CATALOG

Browsing Submissions

Threadless is an ongoing tee shirt design competition. Designs are put into the running to be scored for 7 days. After those 7 days high scoring designs are chosen to be printed and sold from our "[SHOP](#)" section!

WIN FAME, FRIENDS &
\$1,000⁰⁰
 IN CASH & PRIZES

[Show Me](#)
[That I](#)
[With Keyword\(s\)](#)

Designs In The Running

Designs Completed Scoring

Listing 1 - 48 of 196 Results

<< Prev | [1](#) [2](#) [3](#) [4](#) [5](#) | [Next](#) >>



[Everythign is alright](#)
by [tefem™](#)



[Rye Ruff Roo](#)
by [amishtek](#)



[BAD](#)
by [NOPER](#)



[the look of love](#)
by [design love](#)



[Need a helping hand! Anyone?](#)
by [yeohgh](#)



[LOATHE](#)
by the wurst



[diver](#)
by [annlaug](#)



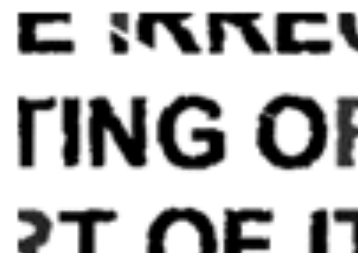
[What's in my mind?](#)
by [niko 4](#)



[God Is Calling...](#)
by [CDK](#)



[FORM4](#)
by [conFORM](#)



[Unique Design](#)
by [katoon](#)



[5000 Year Old Finger Discount](#)

BROWSE
SUBMISSIONS

SUBMIT YOUR
DESIGN

L♥VES
THREADLESS

BLOG
FORUM

JOIN THE
STREETTEAM

Browsing S

Threadless is an ongo
running to be scored
chosen to be printed

BROWSE
SUBMISSIONS

SUBMIT YOUR
DESIGN

L♥VES
THREADLESS

BLOG
FORUM

JOIN THE
STREETTEAM

Need a helping hand! Anyone?, by yeohgh

Scores: 789, Days Left: 6, Comments: 15

TRENDS &

0⁰⁰

PRIZES



List 'Em!

2 3 4 5 | Next >>



LOATHE

by the wurst



5000 Year Old

Finger Discount

Show Me

Designs In The Ru

Designs Completed

Listing 1 - 48 of 196



Everythign is

alright

by tefem™



diver

by annlaug



What's in my mind?

by niko 4



God Is Calling...

by CDK



FORM4

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Unique Design

by katoon

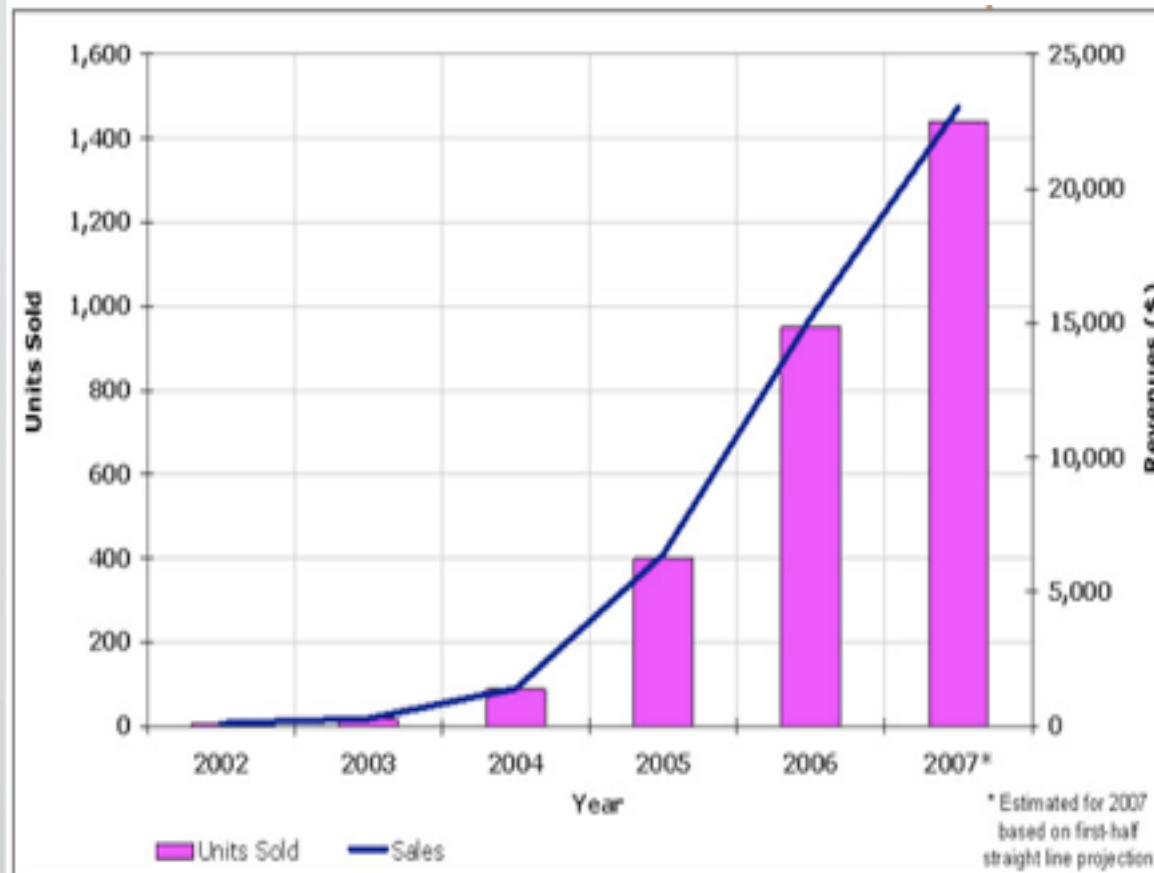


I'd buy it!



SKIP THIS
SUBMISSION
WITHOUT SCORING

Threadless by the Numbers



- Over 500,000 community members

- 800 designs per week are submitted

- 134,000 designs from 55,000 individuals

- Each design gets over 600 votes – total 80M votes have been cast!

The Threadless Business Model



The Threadless Business Model



Learning from the Community



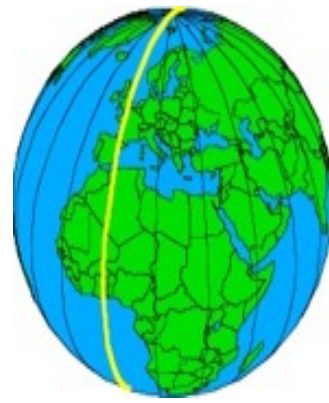
Learning from the Community



Contests are a Historically Important **Alternative** Institution for Driving Innovation....



The Duomo - Florence
1418 - Up to 2,000 Florins



The Longitude Prize
1714 - Up to £20,000



Invention of Food Canning
1800 - Up to 12,000 Francs



....Currently Popular as Well.....



**Ansari X-Prize – Space Travel
1996 – \$10,000,000**



**Netflix Prize - Movie Rec.
2006 - 2009
Over 5000 Teams - \$1M**



**Local Motors – Car Design
2008 – Over 35000 Submits**





the WHITE HOUSE PRESIDENT BARACK OBAMA

BRIEFING ROOM | ISSUES | THE ADMINISTRATION | PARTICIPATE

Home • The Administration • Open Government Initiative

Open Government Initiative

TRANSPARENCY + PARTICIPATION + COLLABORATION

About Open Government | Open Gov Blog | Open Government Partnership | Participation

Congress Grants Broad Prize Authority to All Federal Agencies

Posted by Tom Kallil and Robynn Sturm on December 21, 2010 at 05:24 PM EDT

E-Mail | Tweet | Share | +

The America COMPETES Act passed by Congress today provides all agencies with broad authority to conduct prize competitions as called for by President Obama in his 2009 *Strategy for American Innovation*. By giving agencies a simple and clear legal path, the America COMPETES Act will make it dramatically easier for agencies use prizes and challenges to spur innovation, solve tough problems, and advance their core missions.

In a world of widely dispersed knowledge, prizes and challenges are an essential tool for every agency's toolkit. As the co-founder of Sun Microsystems Bill Joy once famously said, "No matter who you are, most of the smartest people work for someone else." This fact calls for a fundamental shift in the way an institution solves problems. Prizes and challenges are part of the solution.


INNOVATION INDUCEMENT PRIZES

AT THE NATIONAL SCIENCE FOUNDATION

Committee on the Design of an NSF Innovation Prize
Board on Science, Technology, and Economic Policy
Policy and Global Affairs

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

Legislative and Policy Interest in
Encouraging Prize-based Contests to
Elicit Innovation



Optimal Design of Research Contests

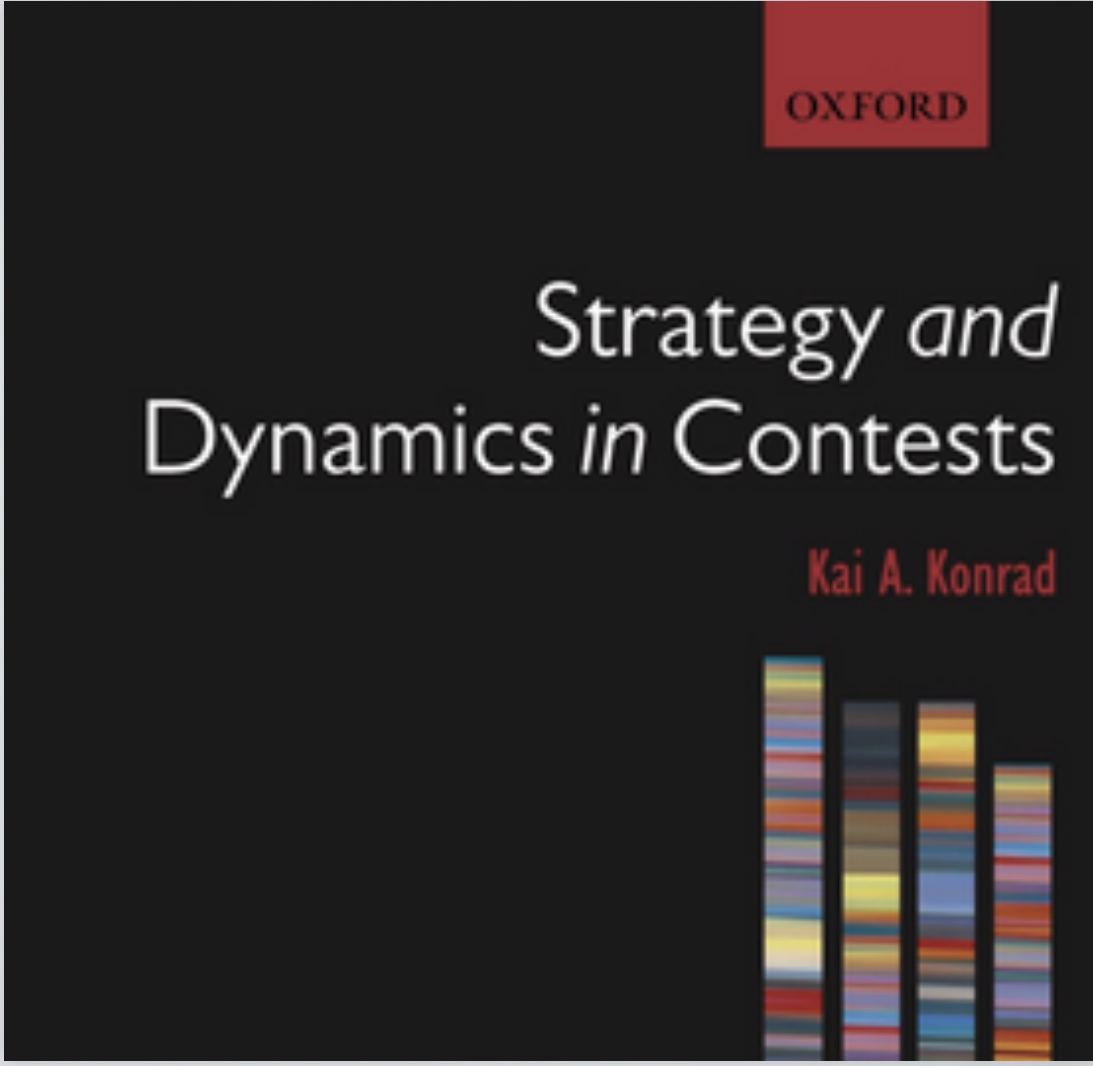
By Yeon-Koo Che and Ian Gale*

Digging for Golden Carrots:
An Analysis of Research Tournaments

By CURTIS R. TAYLOR*

The Optimal Allocation of Prizes in Contests

By BENNY MOLDOVANU AND ANER SELA*



OXFORD

Strategy and
Dynamics *in* Contests

Kai A. Konrad

Well Established Theoretical
Foundations for Contest Design



Empirical Evidence Lags Theory

- “Owing to the limited experience with innovation prizes, relatively little is known about how they work in practice or how effective they may be as compared with, for example, R&D grants and contracts, or tax incentives.”
- Similar concerns by scholars (Brunt, Lerner and Nicholas 2011; Murray, Stern, Campbell and MacCormack 2012; Williams 2012)

INNOVATION INDUCEMENT PRIZES

THE NATIONAL SCIENCE FOUNDATION

Committee on the Design of an NSF Innovation Prize
Board on Science, Technology, and Economic Policy
Policy and Global Affairs



Mission for Crowd Innovation Lab

Lab partners: NASA, Harvard Medical School & TopCoder + additional partners

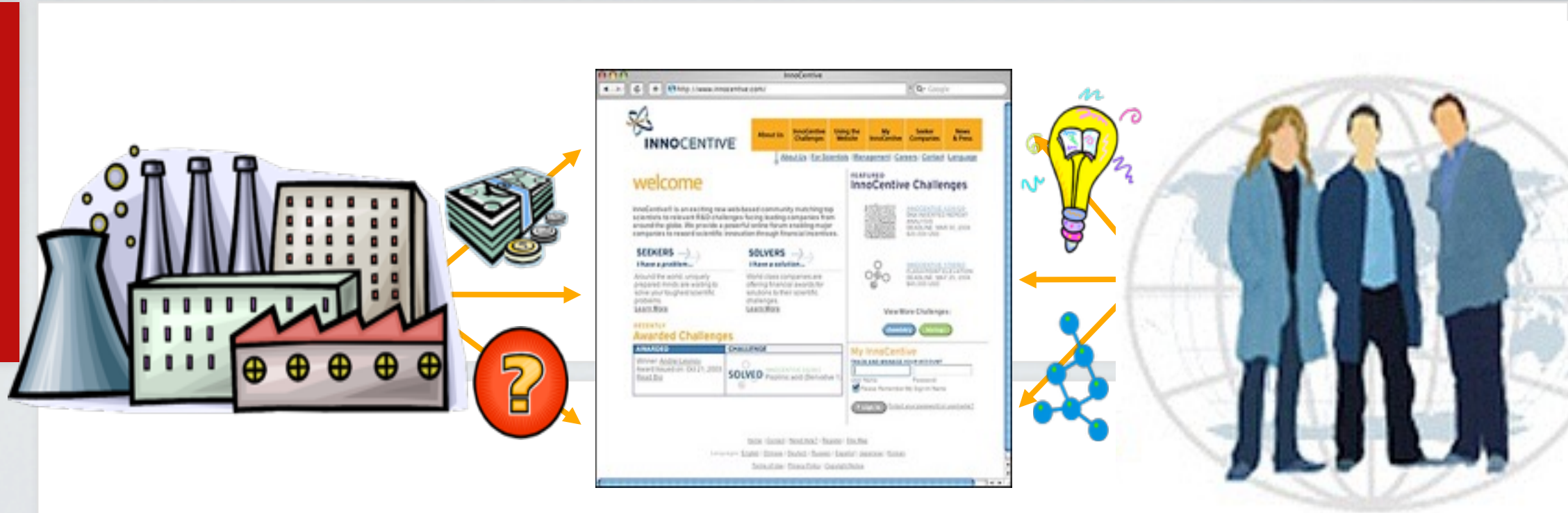
Over 650 contests completed - for a variety of software applications.

Executed 17 computational algorithm development challenges (14 exceed benchmarks): Computational biology, space sciences and advanced analytics

Managed four large-scale HMS grant funding processes (\$25,000 to \$800,000)

Dual objectives - solve innovation problems & drive causal inference

InnoCentive as a Modern Implementation of Innovation Contests



R&D Labs

Knowledge Broker

110,000 independent
scientists

Context:

1. R&D Labs inside of major multinationals are not able to solve certain scientific problems
 - Their own internal and external experts cannot obtain solutions
2. Hope to get solution by going to distributed scientists that they do not know who may have an answer

Example Problem from InnoCentive.com



INNOCENTIVE 3109

R4-(4-HYDROXYPHENYL) BUTANOIC ACID

POSTED: June 26, 2001

DEADLINE: Nov 30, 2001

\$25,000USD

Solution Criteria:

Synthesize following chemical:

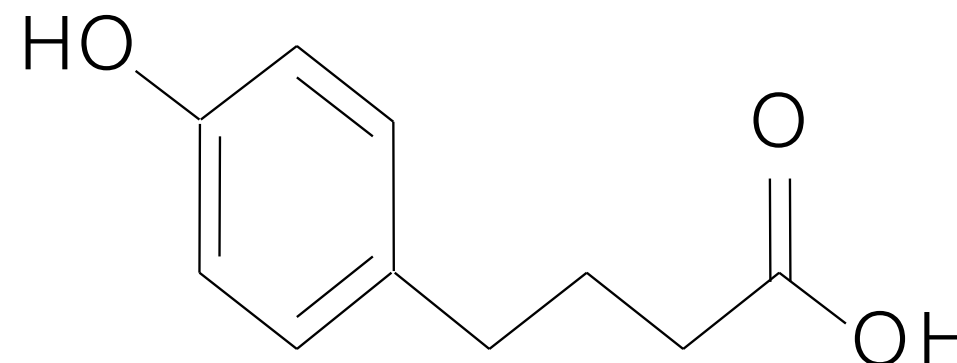
2 steps or fewer

>80% overall yield

>95% purity

<\$100/Kg

2.0g white to off-white solid





Solution to Problem



Solution to Problem

- 221 individuals express interest in solving problem and create project rooms on InnoCentive.com site



Solution to Problem

- 221 individuals express interest in solving problem and create project rooms on InnoCentive.com site



Solution to Problem

- 221 individuals express interest in solving problem and create project rooms on InnoCentive.com site
- 10 individuals from 7 countries submit chemicals for analysis

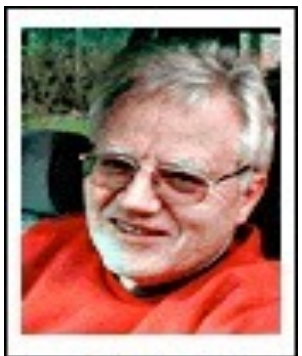


Solution to Problem

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- 10 individuals from 7 countries submit chemicals for analysis

Solution to Problem

- 221 individuals express interest in solving problem and create project rooms on InnoCentive.com site
- 10 individuals from 7 countries submit chemicals for analysis
- Retired scientist with wet lab in his backyard wins



InnoCentive Solver
Dr. Werner Mueller

Unconventional Individuals Win in Innovation Contests

- Study of 166 problems involving over 12000 scientists from InnoCentive
- Focus on what predicts winners
- **What explains who creates a winning solution?**
 - Technical Marginality: Increasing distance between solver's own field of expertise and the problem field
 - Social Marginality: Women scientists, when they enter, more likely to win

Organization Science

Vol. 21, No. 5, September–October 2010, pp. 1016–1033
ISSN 1047-7039 | ISSN 1526-5455 | 10 | 2105 | 1016

Marginality and Problem-Solving Effectiveness in Broadcast Search

Lars Bo Jeppesen

Department of Innovation and Organizational Economics, Copenhagen Business School, 2000 Frederiksberg

Karim R. Lakhani

Technology and Operations Management Unit, Harvard Business School, Boston, Massachusetts 021

We examine who the winners are in science problem-solving contests characterized by open innovation, self-selection of external solvers to discrete problems from the laboratories of large intensive companies, and blind review of solution submissions. Analyzing a unique data set involving over 12,000 scientists revealed that technical and social marginality, being a source of ideas and heuristics, plays an important role in explaining individual success in problem solving. The solution was positively related to increasing distance between the solver's field of technical expertise and the problem. Female solvers—known to be in the “outer circle” of the scientific establishment—were better than men in developing successful solutions. Our findings contribute to the emerging literature on distributed innovation by demonstrating the value of openness, at least narrowly defined by disclosure of ideas, to overcome barriers to entry to nonobvious individuals. We also contribute to the knowledge-based theory of innovation by demonstrating the effectiveness of a market mechanism to draw out knowledge from diverse external sources to solve problems.

Key words: open innovation; problem solving; marginality; gender; broadcast search

History: Published online in *Articles in Advance* February 22, 2010.



Innovation Contests Well Suited for High Uncertainty Problems - TopCoder Data > 800 contests ~5000 coders

MANAGEMENT SCIENCE

Articles in Advance, pp. 1-21
ISSN 0025-1909 | EISSN 1526-5501

DOI 10.1287/mnsc.2014.2211

Incentives and Problem Uncertainty in Innovation Contests: An Empirical Analysis

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Karim R. Lakhani

Harvard Business School, Boston, Massachusetts 02163, k@hbs.edu



Innovation Contests Well Suited for High Uncertainty Problems - TopCoder Data > 800 contests ~5000 coders

- Key question in contest design is about how many competitors should enter?

MANAGEMENT SCIENCE

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Incentives and Problem Uncertainty in Innovation Contests: An Empirical Analysis

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Innovation Contests Well Suited for High Uncertainty Problems - TopCoder Data > 800 contests ~5000 coders

- Key question in contest design is about how many competitors should enter?
- Lots of entry means lower probability of winning - less incentives to work hard

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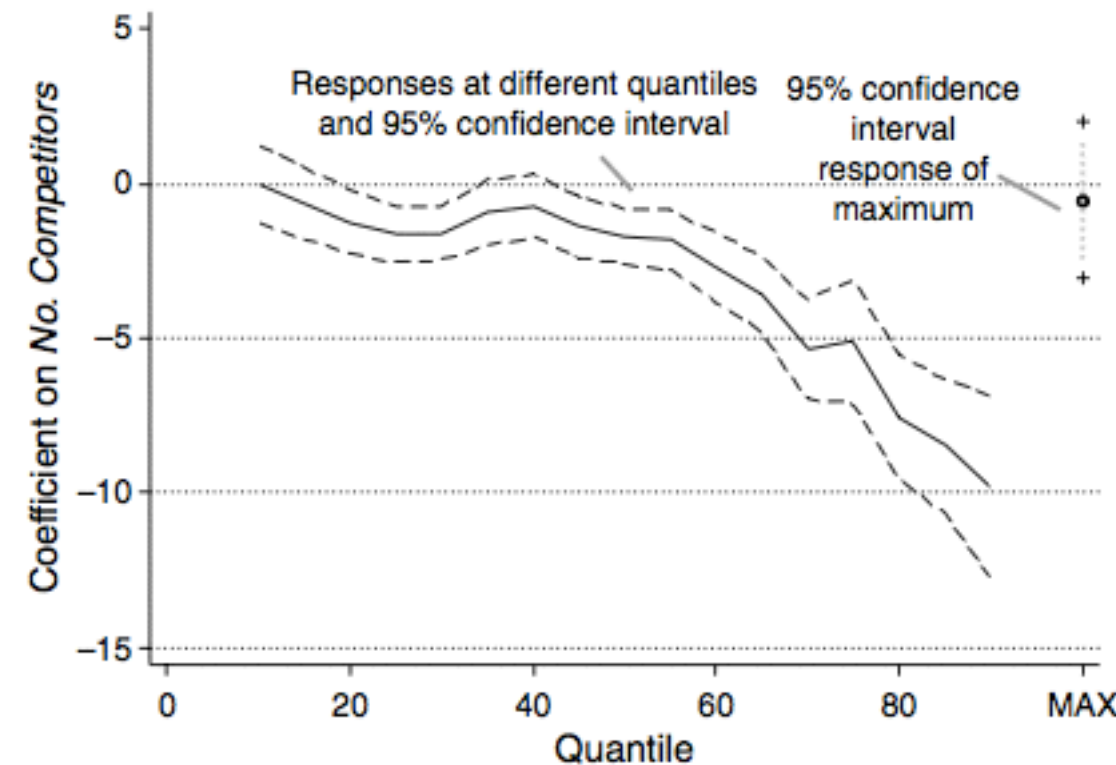
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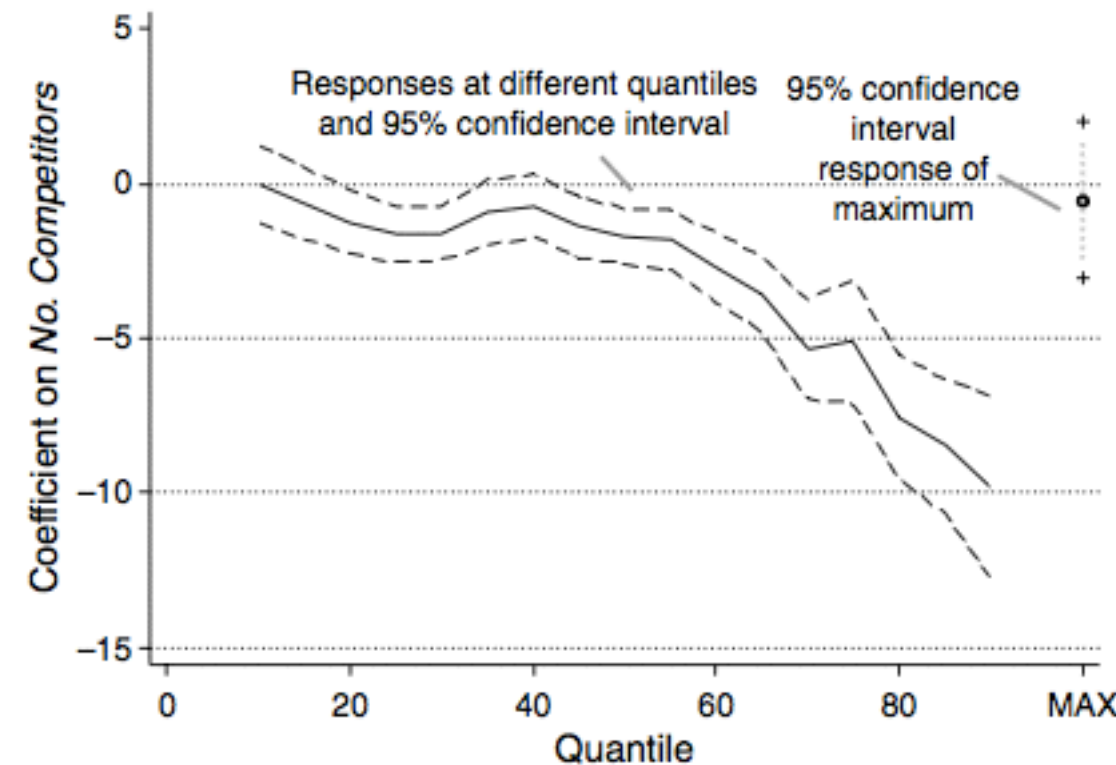
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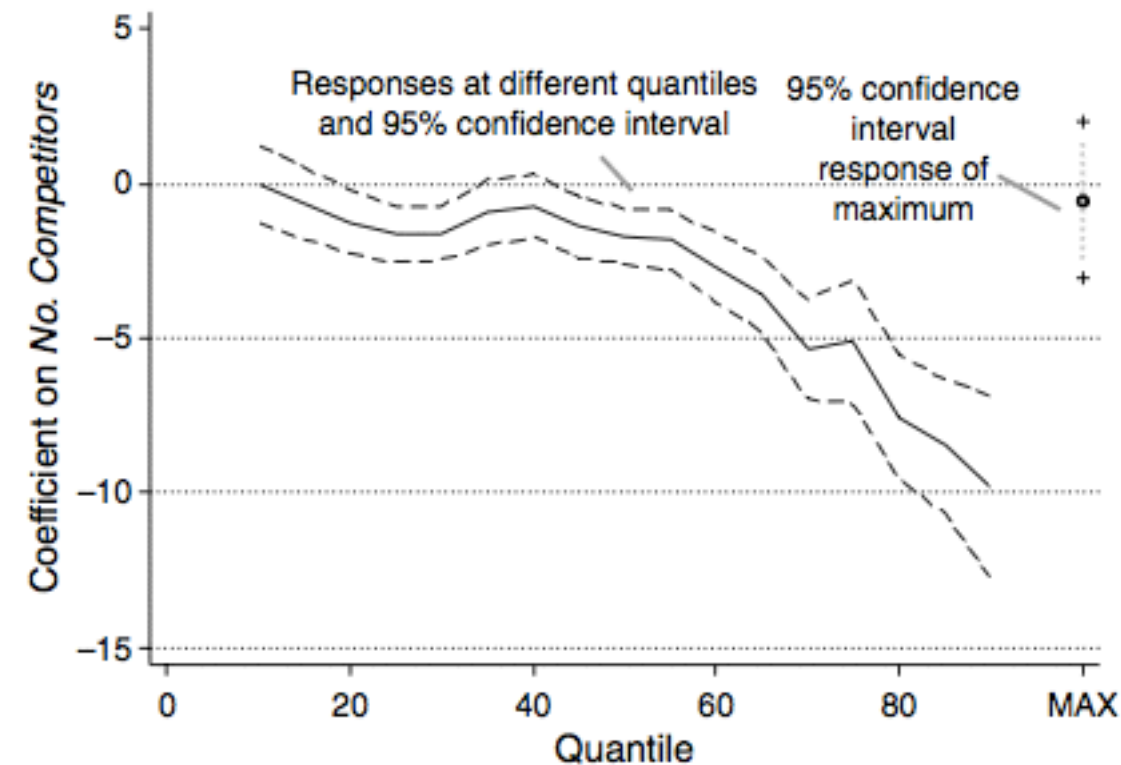
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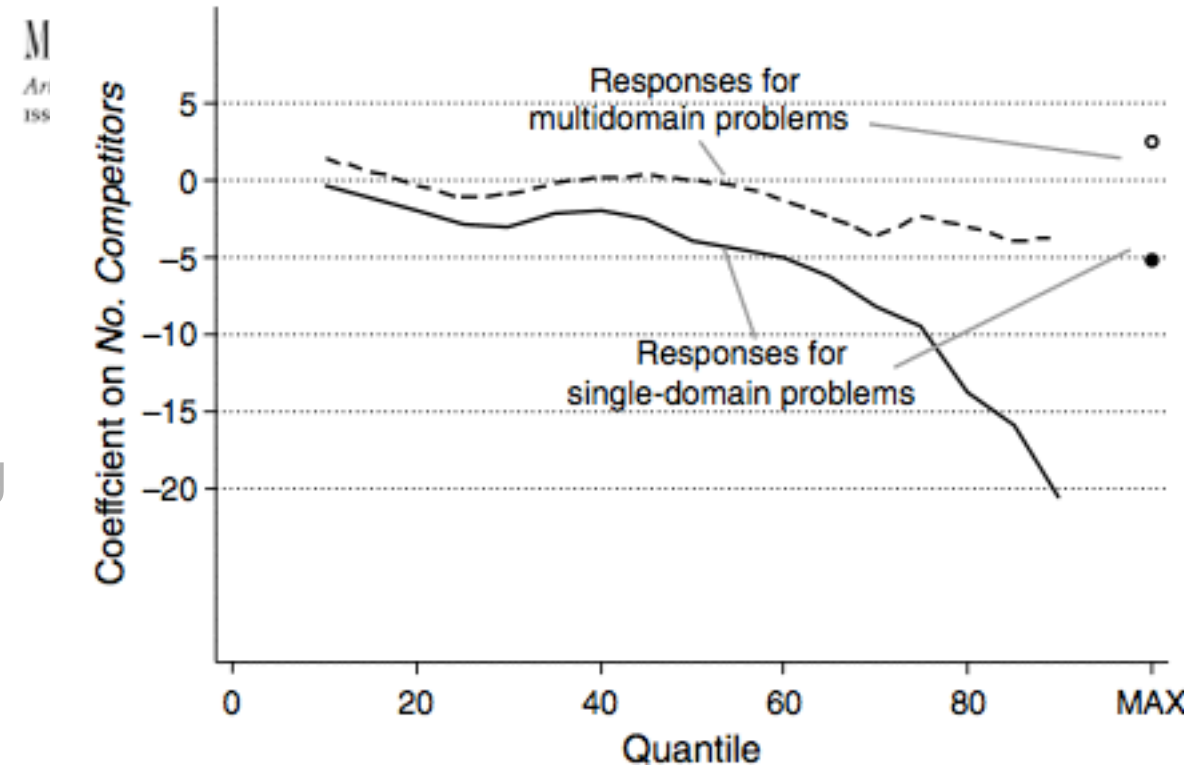
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Can the Crowd Beat Harvard Medical School?

- Objective: Improve on NIH MegaBlast algorithm for nucleotide sequence alignment for immunogenomics
- Experiment: Generate and evaluate external solver participation in development of gene-sequencing tools applied to immunoglobulin and antibody genomics
- Two week long competition - \$2000 prize pot x 3 on TopCoder.com

Contest Results Shows the
Discovery of Extreme Value
Outcomes Relatively Quickly



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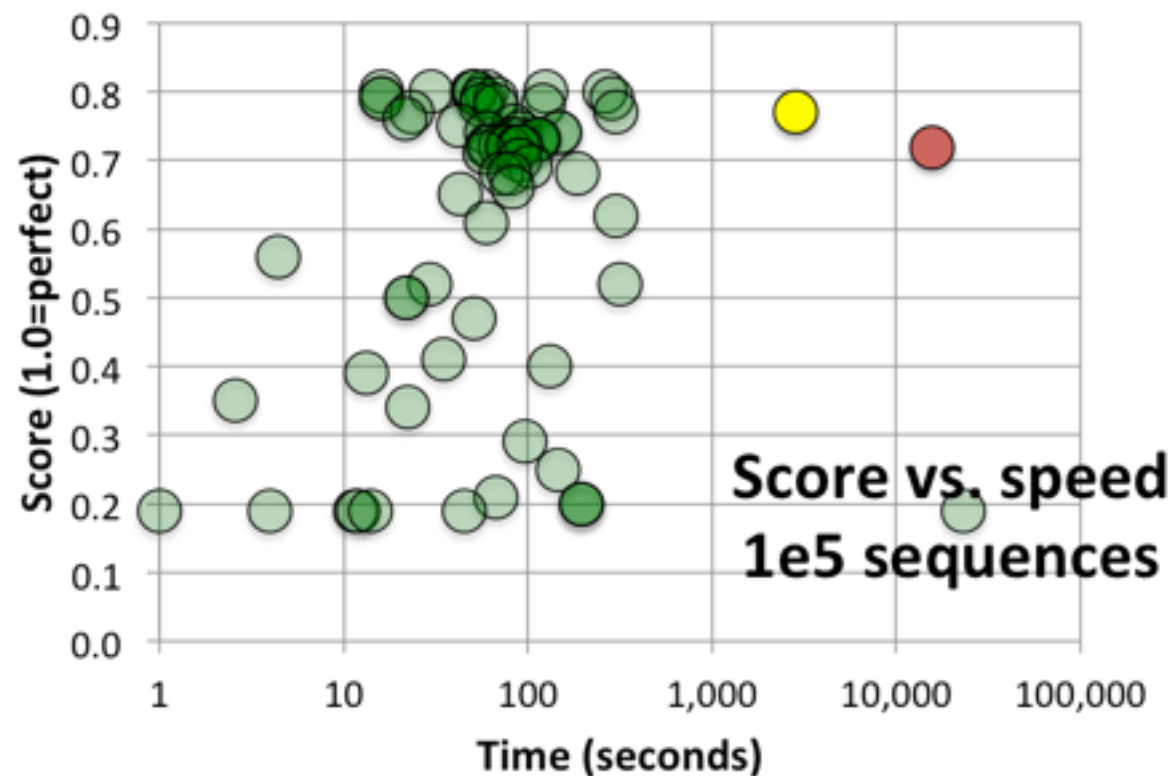


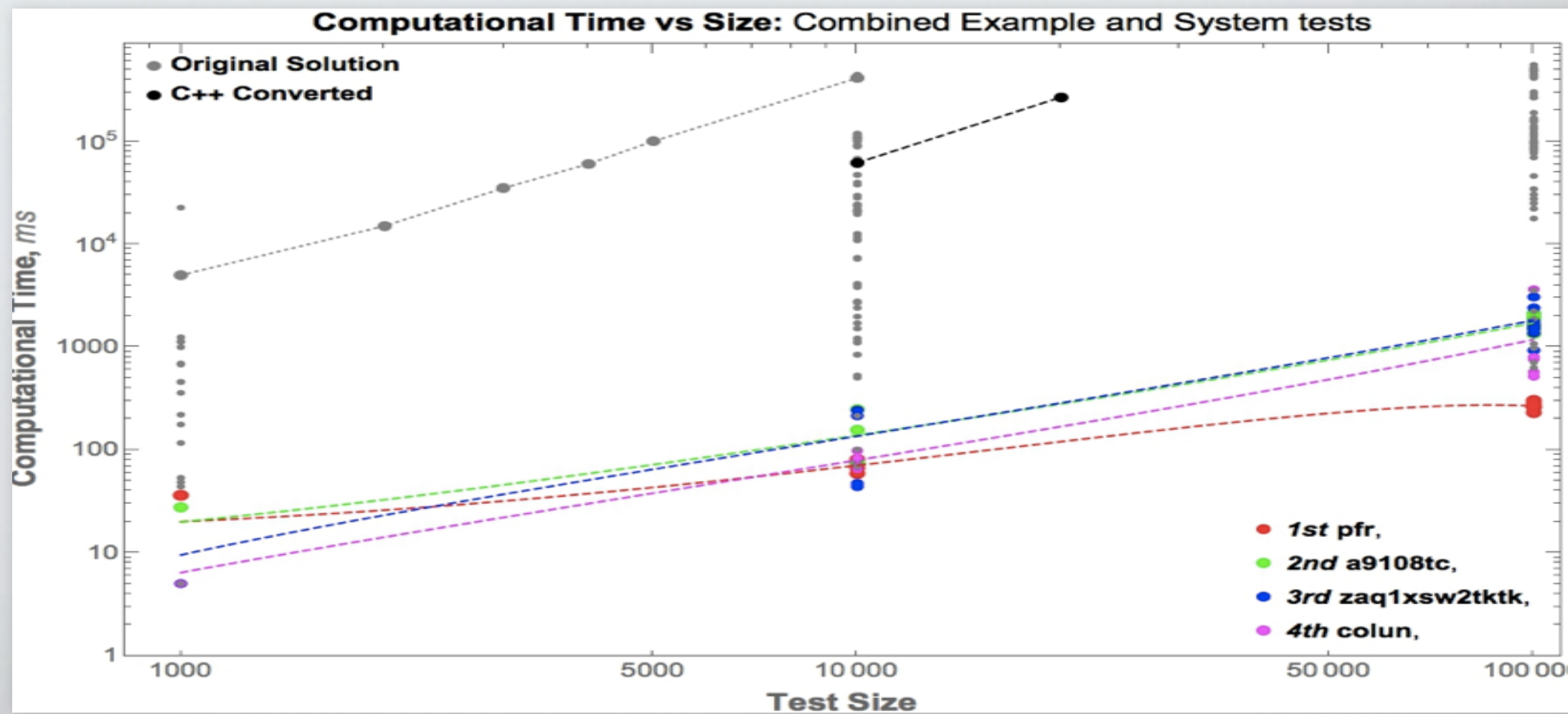
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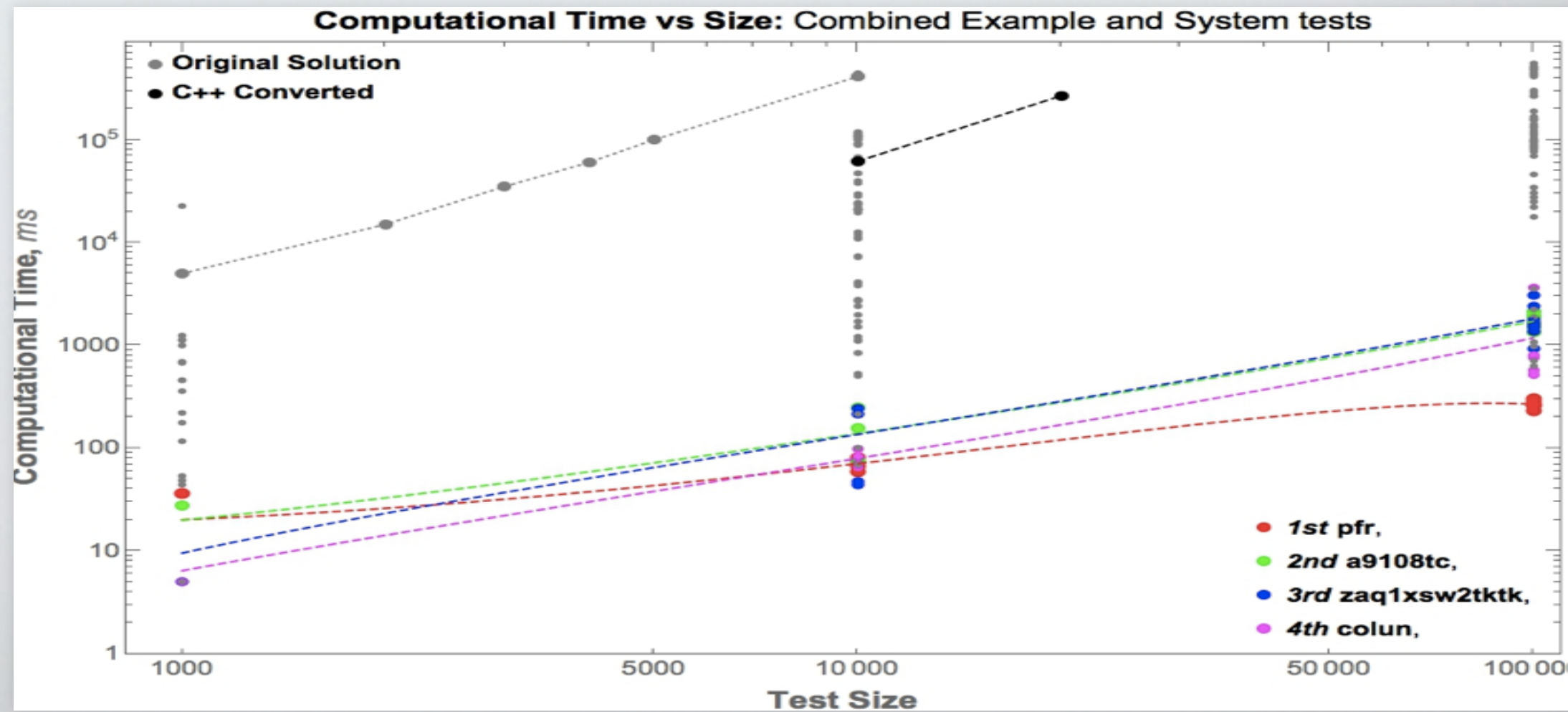


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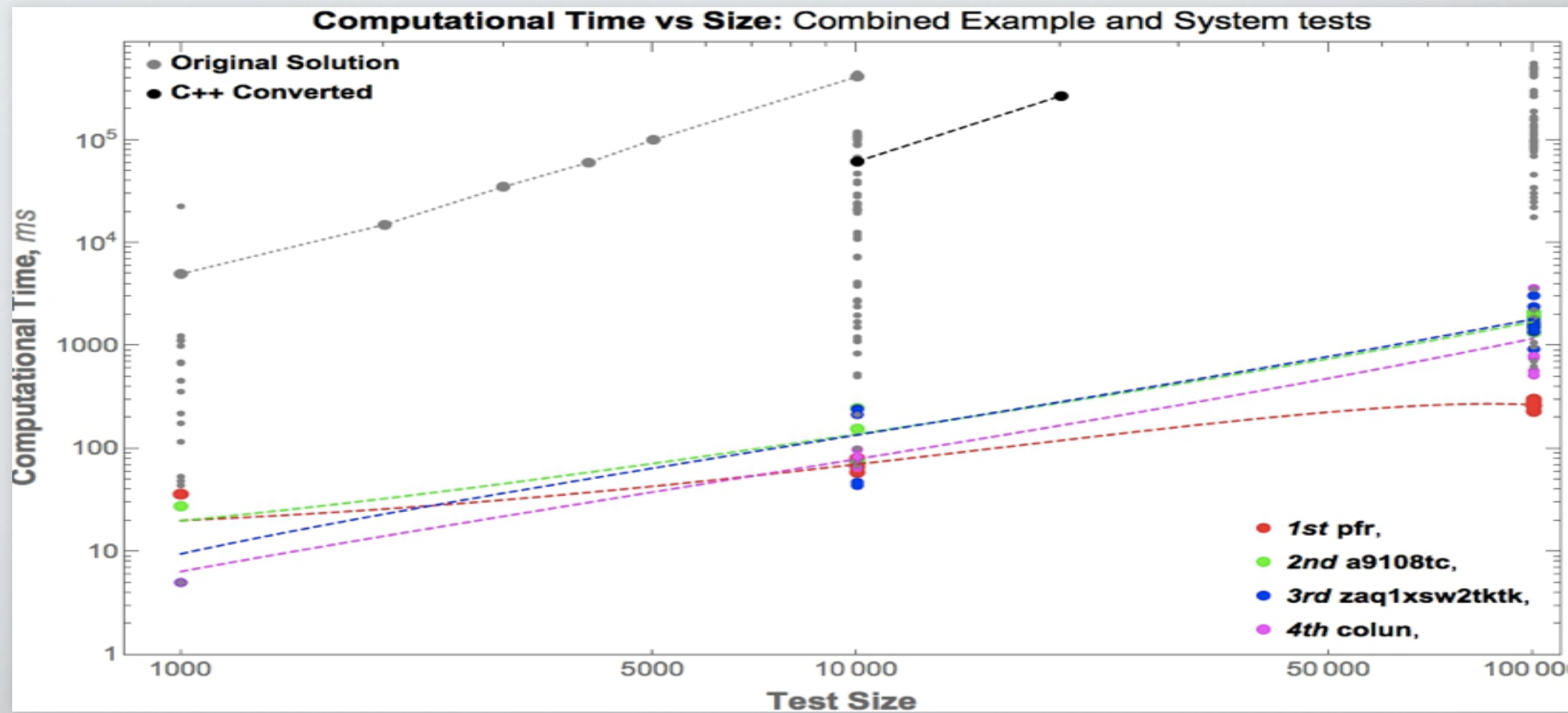


Antibody Sequence Clustering - Scripps Research Institute (\$7500 - 10 Days - 40 People)



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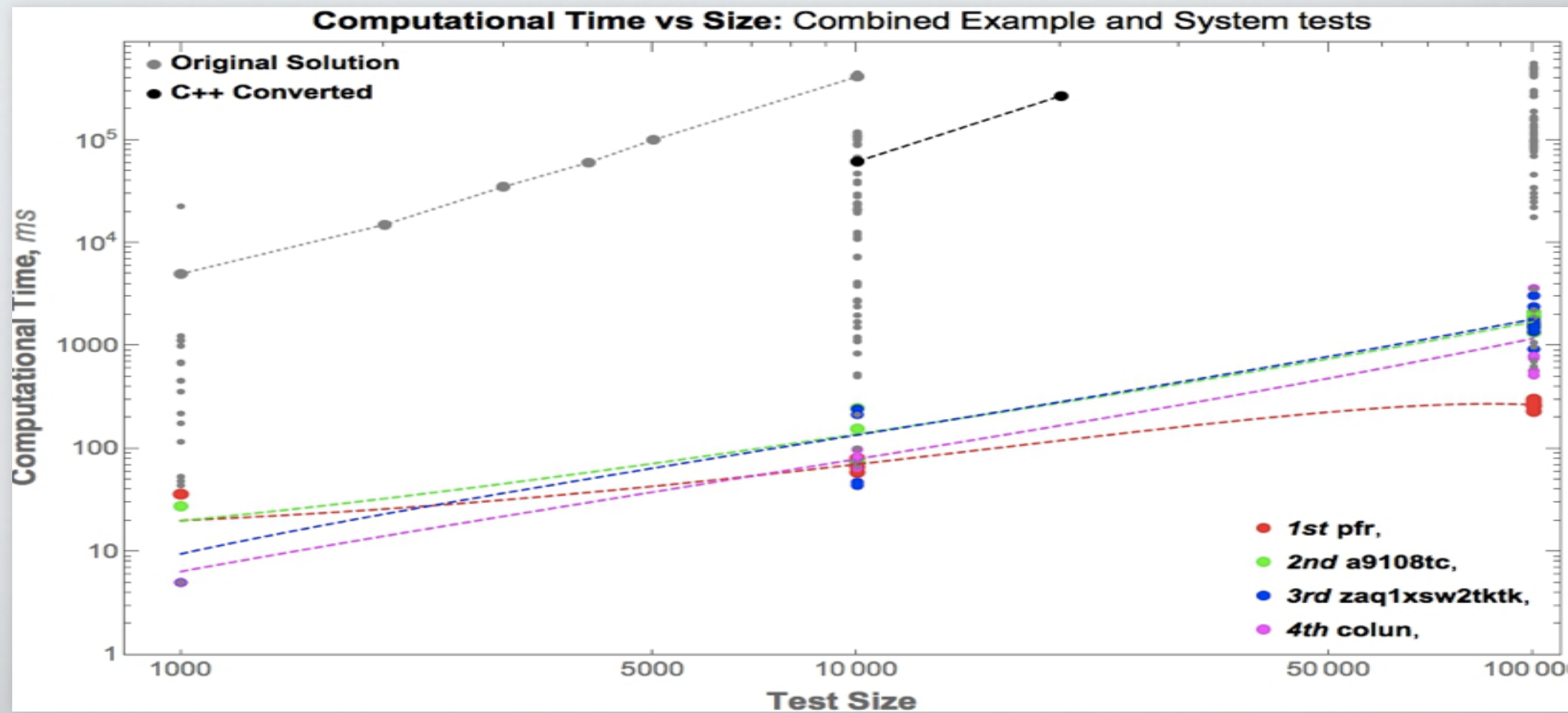
Scripps Solution: 100K sequences, 170GB RAM Server, 1.7 hrs



Antibody Sequence Clustering - Scripps Research Institute (\$7500 - 10 Days - 40 People)

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Contest Solution: 2.3M sequences, 1.1GB RAM, ~30s

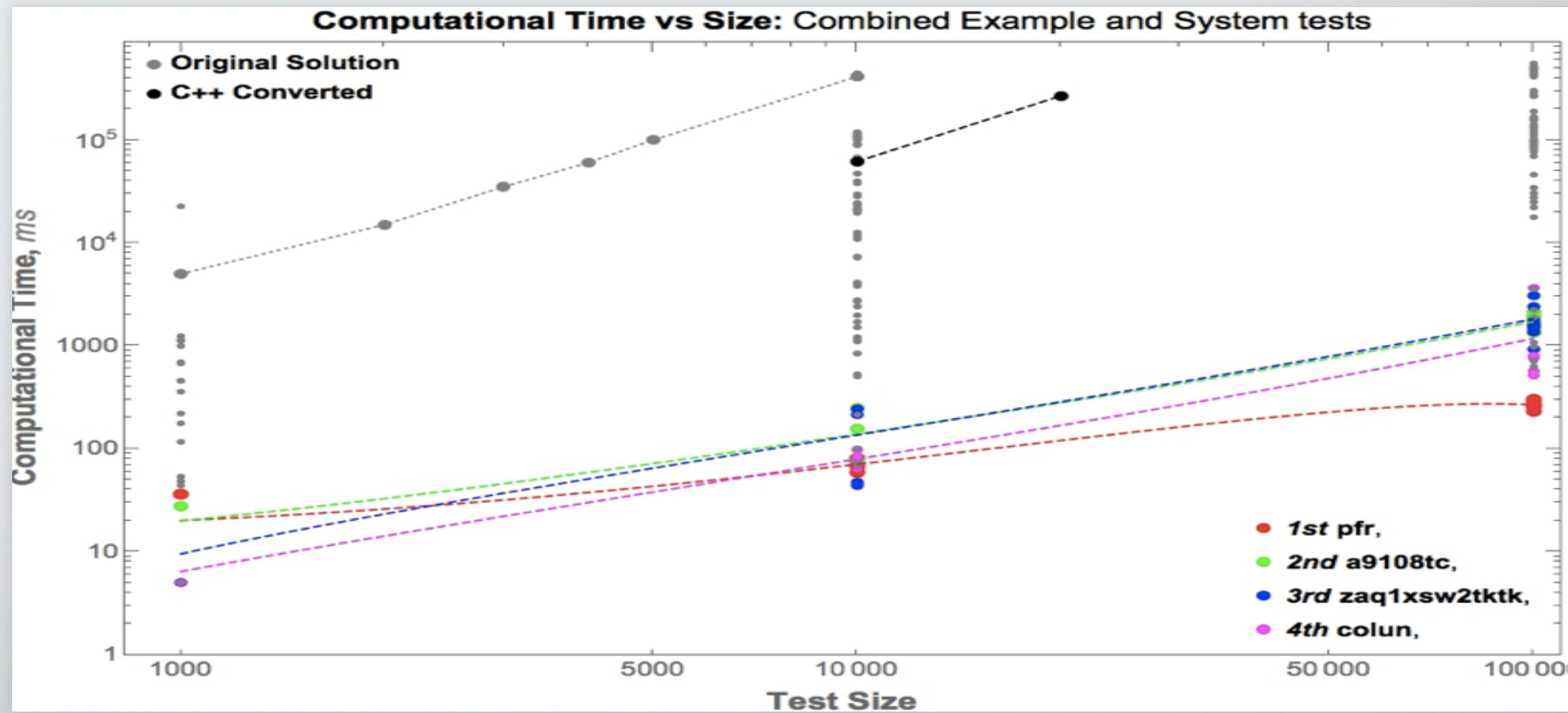


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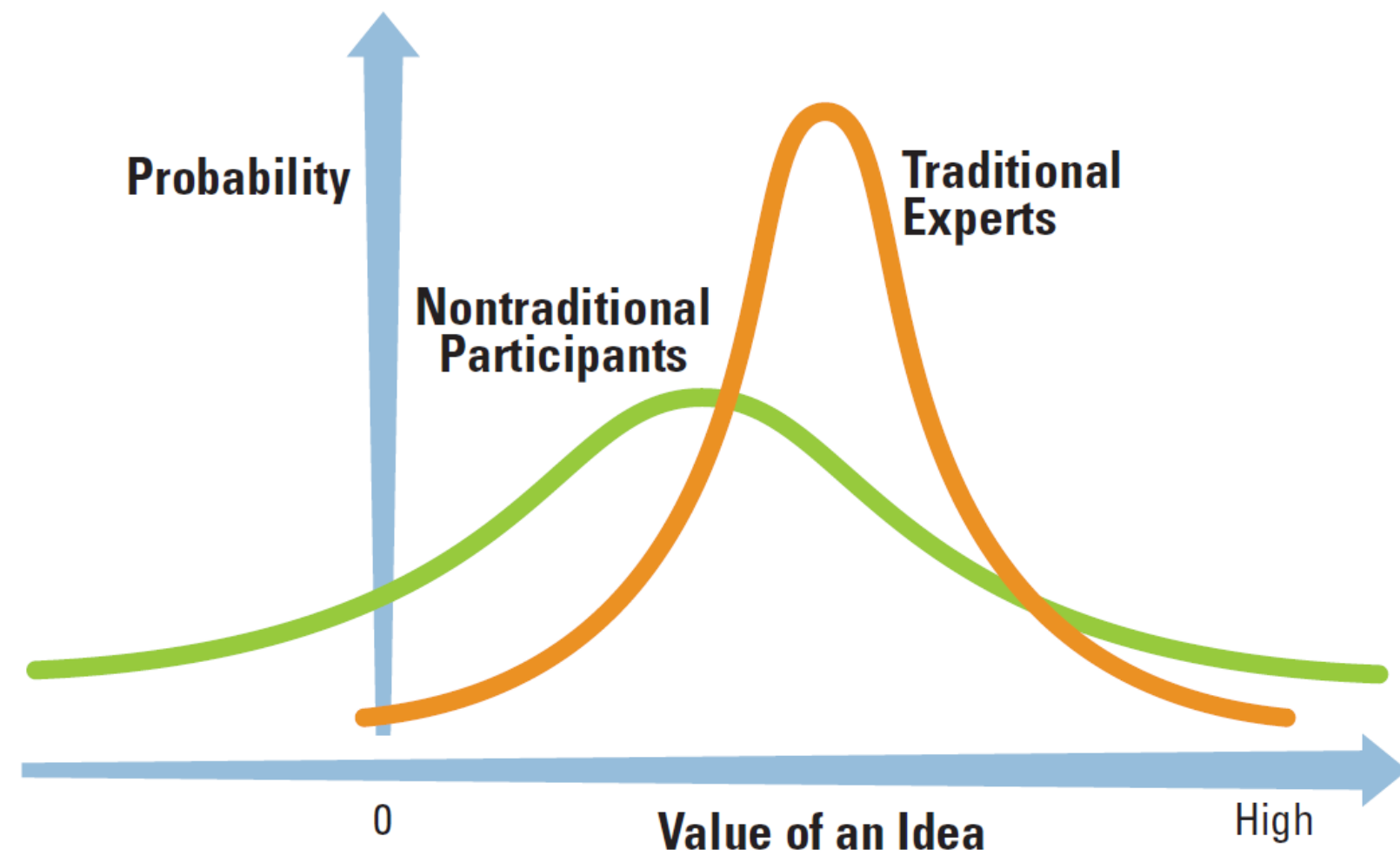
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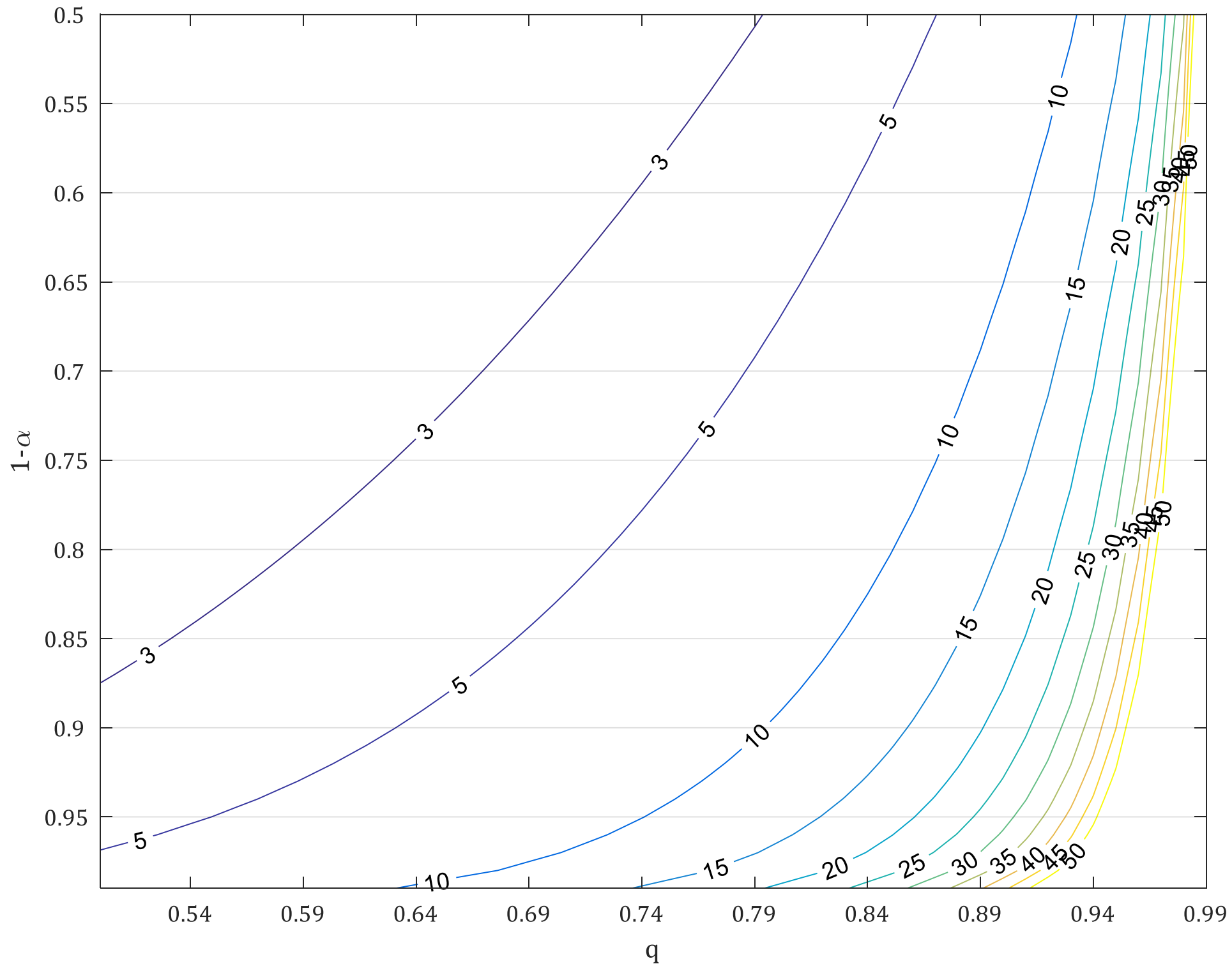
20X Capacity, 10,000X speed, 10X Memory Efficiency



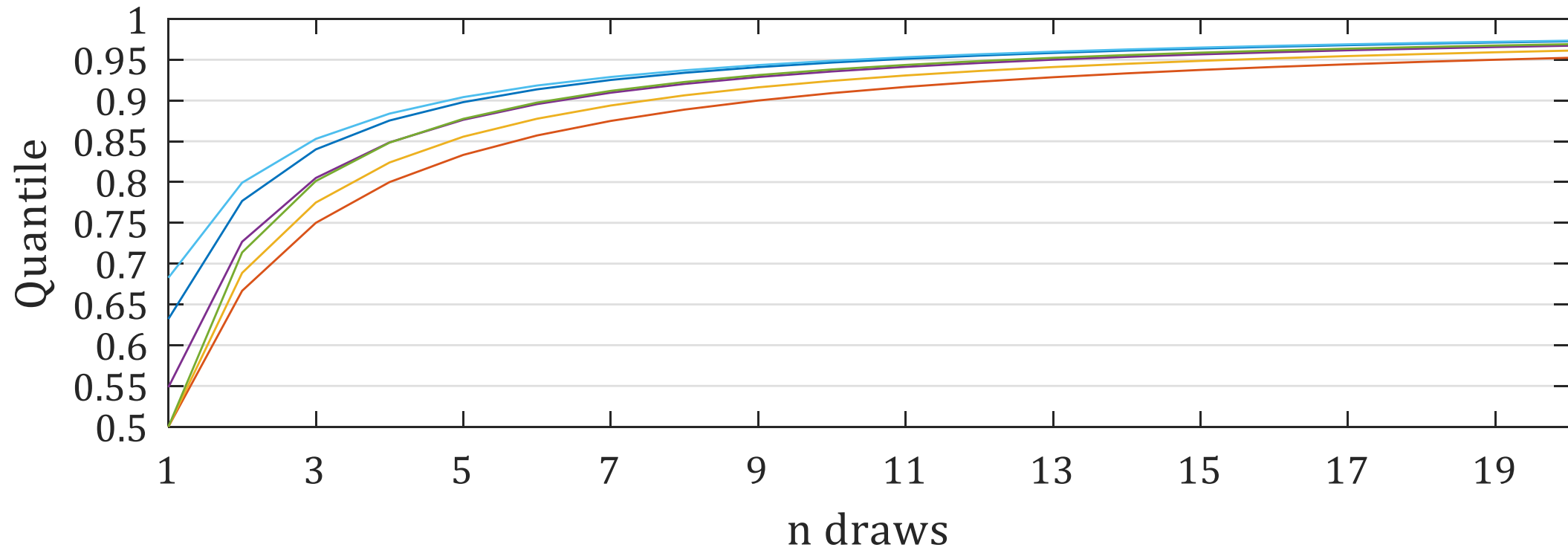
Crowds Enable Discovery of Extreme Values Through Lots of Entry and Diversity in Participation Pool



For **Any** Distribution F - We Can Calculate Number of Draws Needed to Achieve a Quality Objective

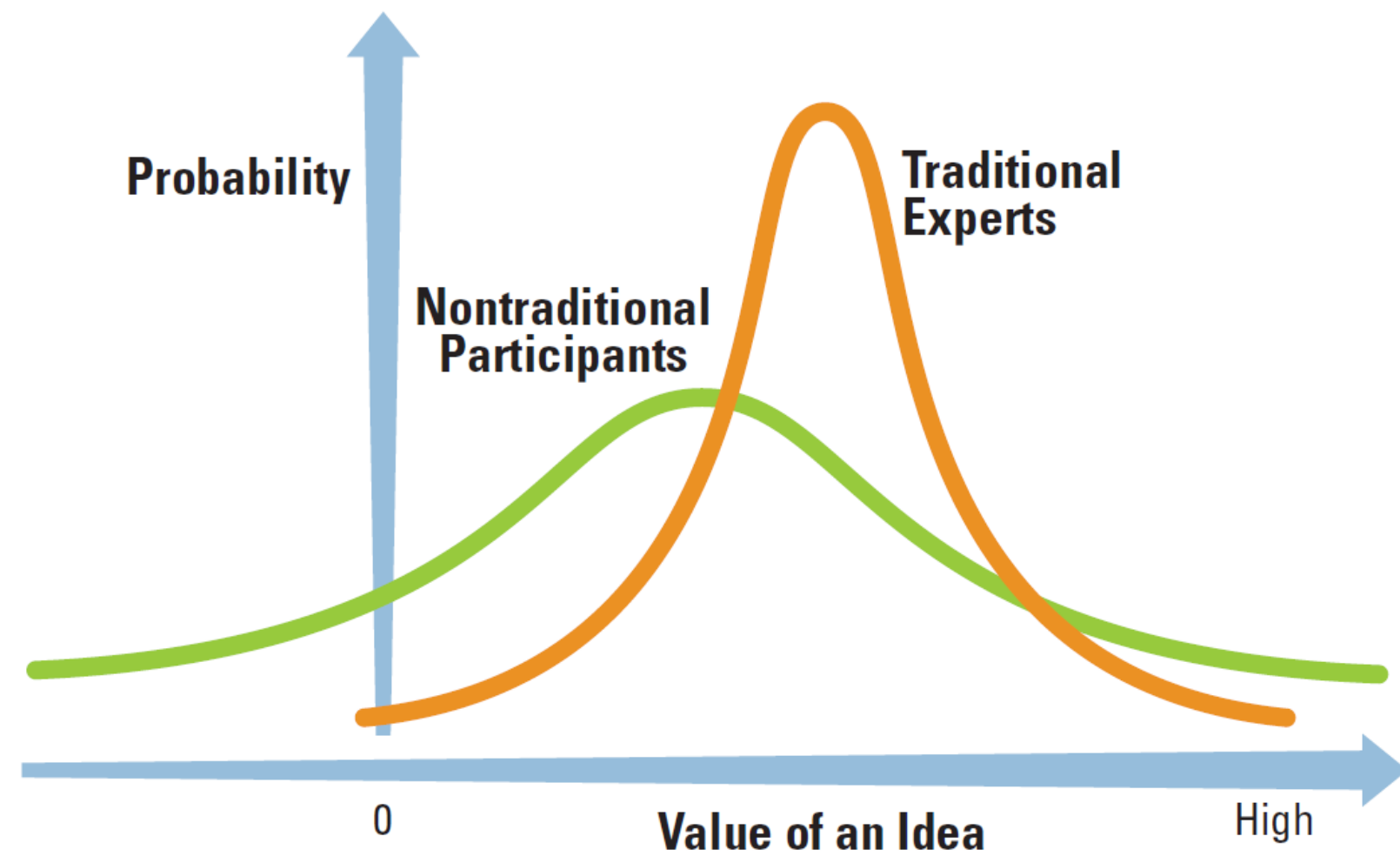


The Quantile of Expected Value of **n** Draws from Several Distributions

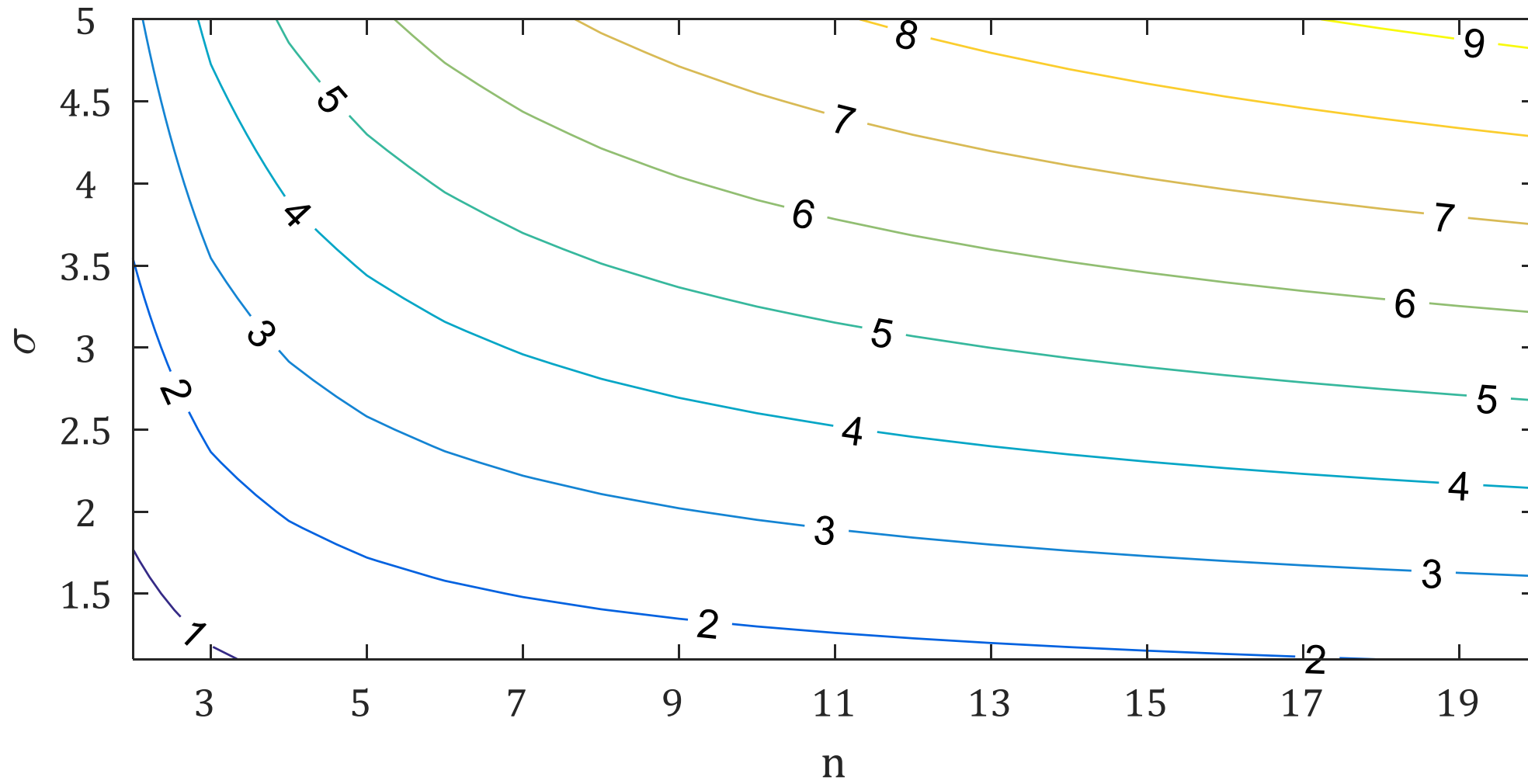


Exponential — U(0,1) — Beta(2,2) — Beta(2,5) — N(0,1) — $\chi^2(1)$

But Internal Experts May Still on Average Be Smarter than the Crowd



Expected Value of Max Under Normal Distribution



Diversity of Approaches in Solving the X-Prize Automotive Challenge



TW4XP Germany
1 wheel at front 2 wheels at back



KWAY MOTORS Italy
2 wheels at front 1 wheels at back



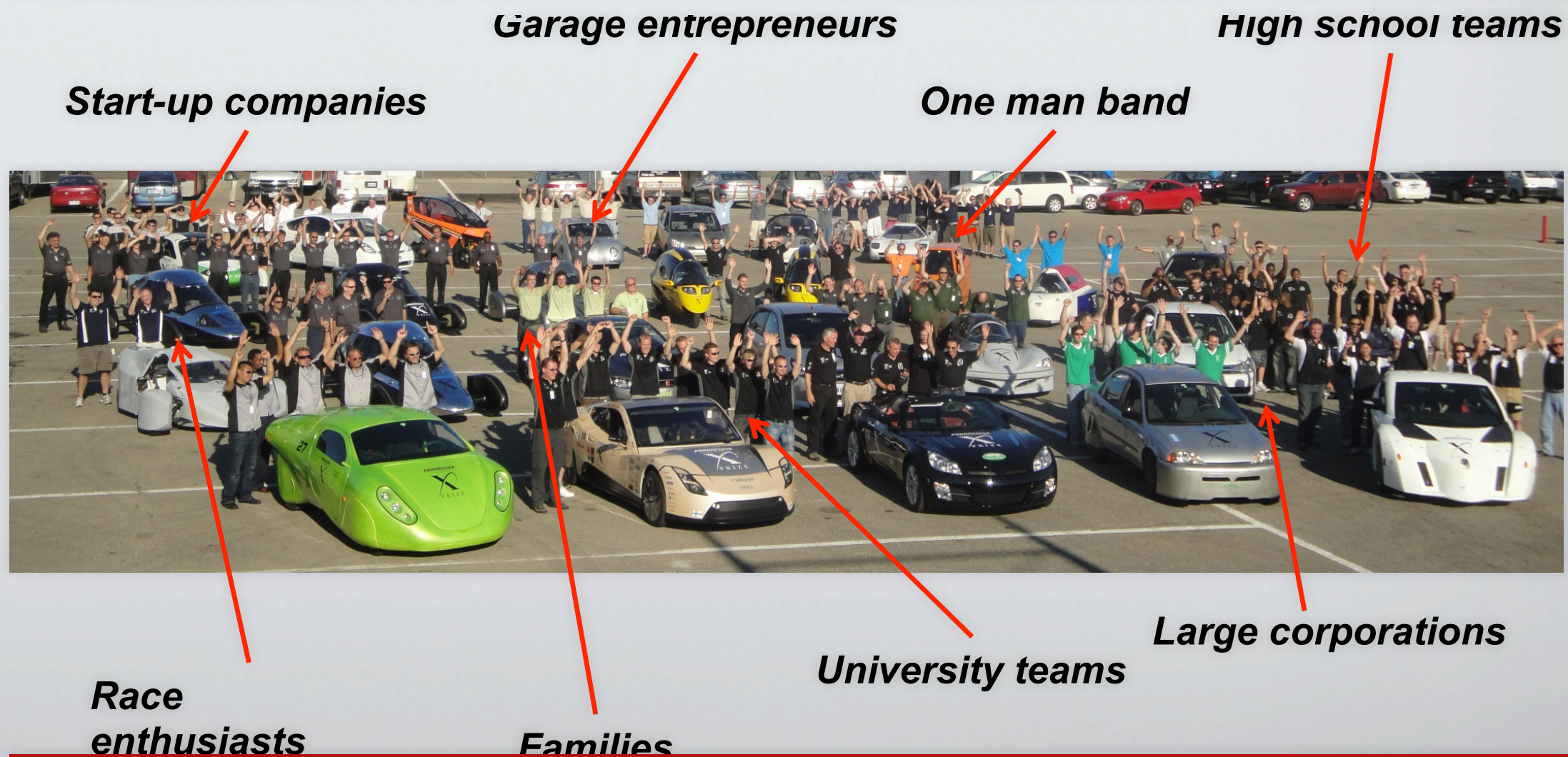
APTERA California
2 wheels at front 1 wheel at back



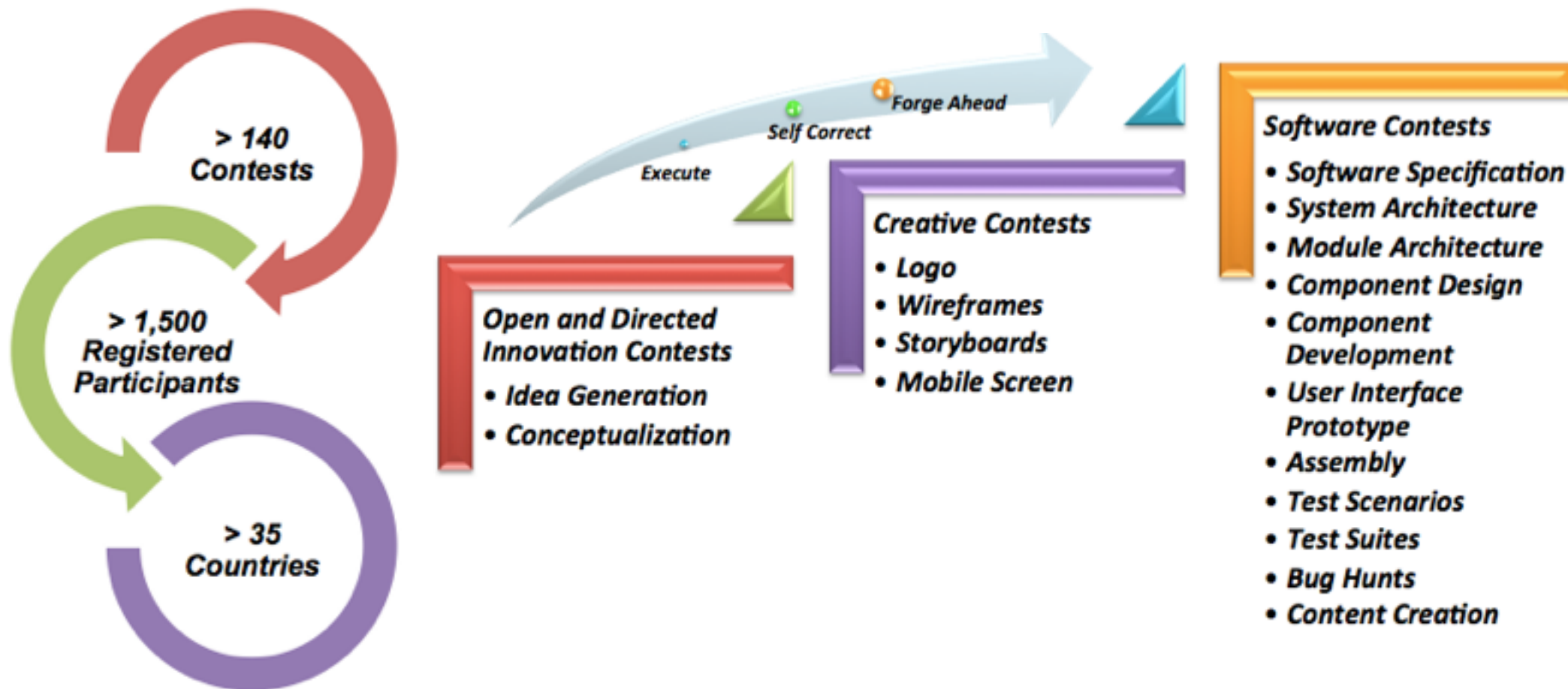
X-TRACER Switzerland
1 wheel at front 1 wheel at back



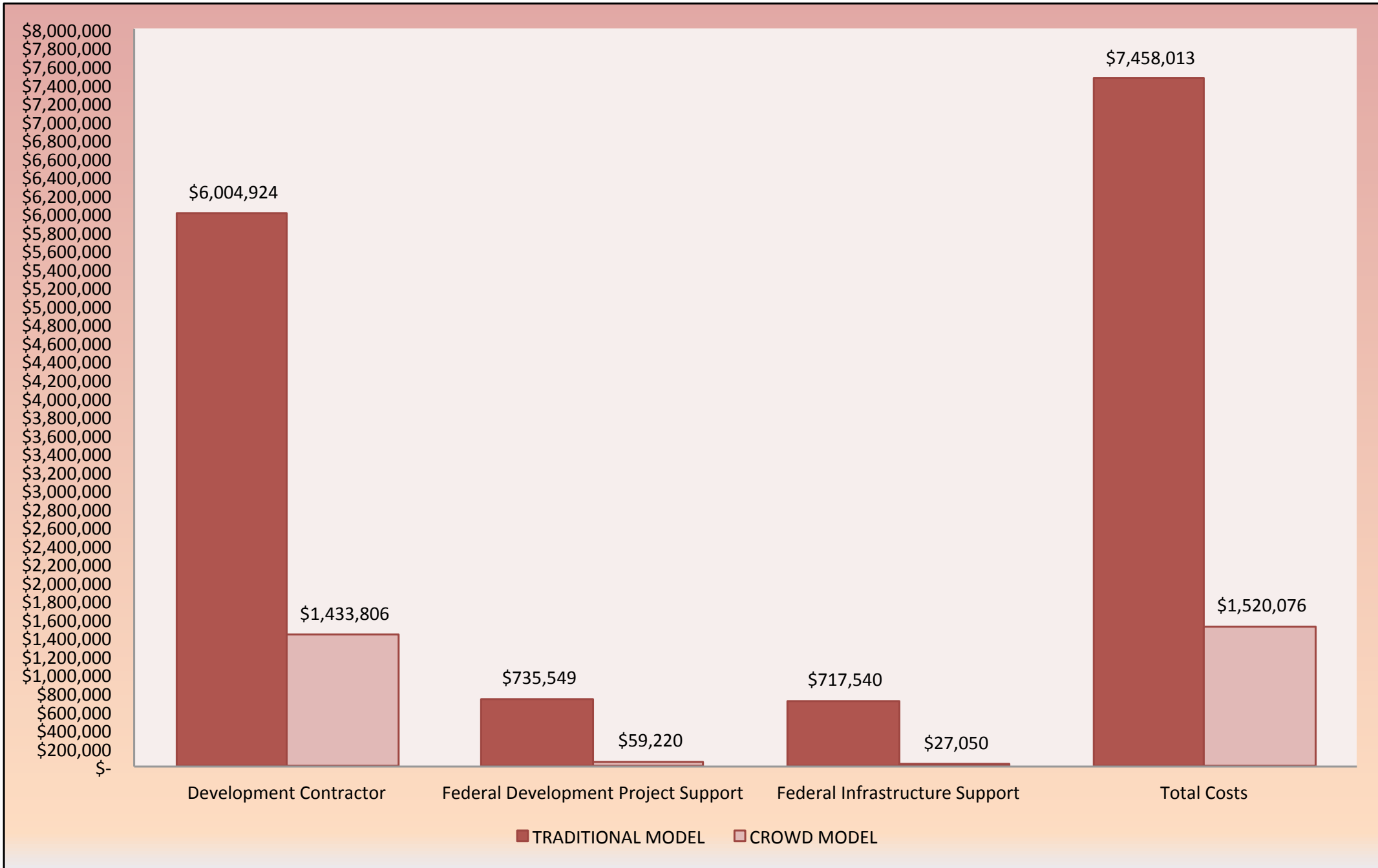
Diversity of Participants in X-Prize Automotive Challenge



Provider Screening System for Medicaid Management Information System Built Through Contests (12 Months)



Provider Screening System for Medicaid Management Information System





HBS Experiments with Open Communities and Contests

Clay Christensen engages over 200 alumni to understand the Capitalist's Dilemma

- Produced a Harvard Business Review article w/ all collaborators listed as co-authors - a 1st for HBR
- Created an innovation assessment quiz for organizations to avoid the Capitalist's Dilemma trap

HBS/HMS Health Acceleration Challenge to identify proven health care innovations ready to scale for impact

- Yielded almost 500 applications and thousands of comments

Competing Logics - How Do We Resolve Them?



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Internal Development

Competing Logics - How Do We Resolve Them?



Internal Development

Define the Problem

Competing Logics - How Do We Resolve Them?



Internal Development

Define the Problem
Find the “Right” Workers

Competing Logics - How Do We Resolve Them?



Internal Development

Define the Problem
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Incentivize Effort

Competing Logics - How Do We Resolve Them?



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Incentivize Effort
Monitor Effort

Competing Logics - How Do We Resolve Them?



Internal Development

Define the Problem
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Monitor Effort
Motivate and Energize Workers

Competing Logics - How Do We Resolve Them?



Internal Development

Define the Problem
Find the "Right" Workers
Incentivize Effort
Monitor Effort
Motivate and Energize Workers
Redefine the Problem

Competing Logics - How Do We Resolve Them?



Internal Development

Define the Problem
Find the "Right" Workers
Incentivize Effort
Monitor Effort
Motivate and Energize Workers
Redefine the Problem
Develop Criteria for Evaluation

Competing Logics - How Do We Resolve Them?



Internal Development

Define the Problem
Find the “Right” Workers
Incentivize Effort
Monitor Effort
Motivate and Energize Workers
Redefine the Problem
Develop Criteria for Evaluation
Pray for Performance

Competing Logics - How Do We Resolve Them?



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Competing Logics - How Do We Resolve Them?



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Contest

Define the Problem
Develop Criteria for Evaluation
Set Prize

Competing Logics - How Do We Resolve Them?



Internal Development

Define the Problem
Find the “Right” Workers
Incentivize Effort
Monitor Effort
Motivate and Energize Workers
Redefine the Problem
Develop Criteria for Evaluation
Pray for Performance

Contest

Define the Problem
Develop Criteria for Evaluation
Set Prize
Attract Solvers

Competing Logics - How Do We Resolve Them?



Internal Development

Define the Problem
Find the “Right” Workers
Incentivize Effort
Monitor Effort
Motivate and Energize Workers
Redefine the Problem
Develop Criteria for Evaluation
Pray for Performance

Contest

Define the Problem
Develop Criteria for Evaluation
Set Prize
Attract Solvers
Test Solutions

Competing Logics - How Do We Resolve Them?



Internal Development

Define the Problem
Find the “Right” Workers
Incentivize Effort
Monitor Effort
Motivate and Energize Workers
Redefine the Problem
Develop Criteria for Evaluation
Pray for Performance

Contest

Define the Problem
Develop Criteria for Evaluation
Set Prize
Attract Solvers
Test Solutions
Pay for Performance

What Motivates People to Participate in Crowd Work?







Extrinsic

Cash, Job Market Signals,
Community Prestige



Extrinsic

Cash, Job Market Signals,
Community Prestige



Intrinsic

Fun, Enjoyment, Learning,
Autonomy, Taste



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Intrinsic

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Autonomy, Taste



Prosocial

Community Belonging, Identity



Extrinsic

Cash, Job Market Signals,
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Intrinsic

Fun, Enjoyment, Learning,
Autonomy, Taste



Prosocial

Community Belonging, Identity

Recall: Most People Lose in Contests



When Do Crowds Don't Work?







Missing Governance



Crowdsourcing or witch hunt? Reddit and 4chan users attempt to solve Boston bombing case

17 Comments / [f](#) Shares / [t](#) 85 Tweets / [Stumble](#) / [@](#) Email

More +



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Incentives Mismatch



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ARCHON
GENOMICS

XPRIZE

PRESENTED BY
 EXPRESS SCRIPTS



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Task Interdependence



Local Motors: A “Born Open” Firm





Local Motors: A “Born Open” Firm





TOP ENTRIES

Challenge Stats

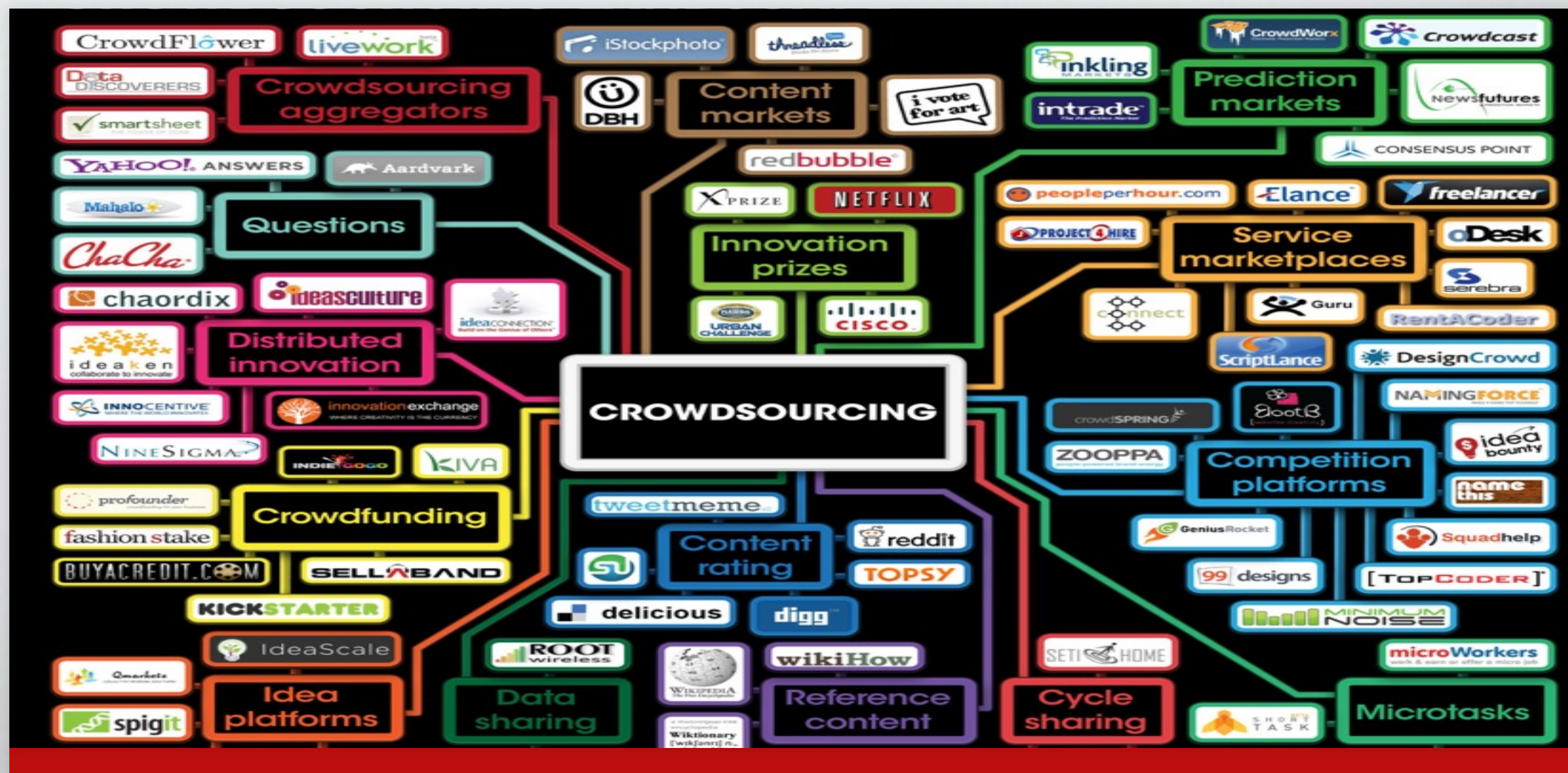
- 4 weeks
- 207 Projects
- 30 Countries Represented

Direct Digital Manufacturing Challenge





Crowds are Available on Demand to Solve a Range of Tasks



Quantity and Variety of Ideas Critical to Innovation Success

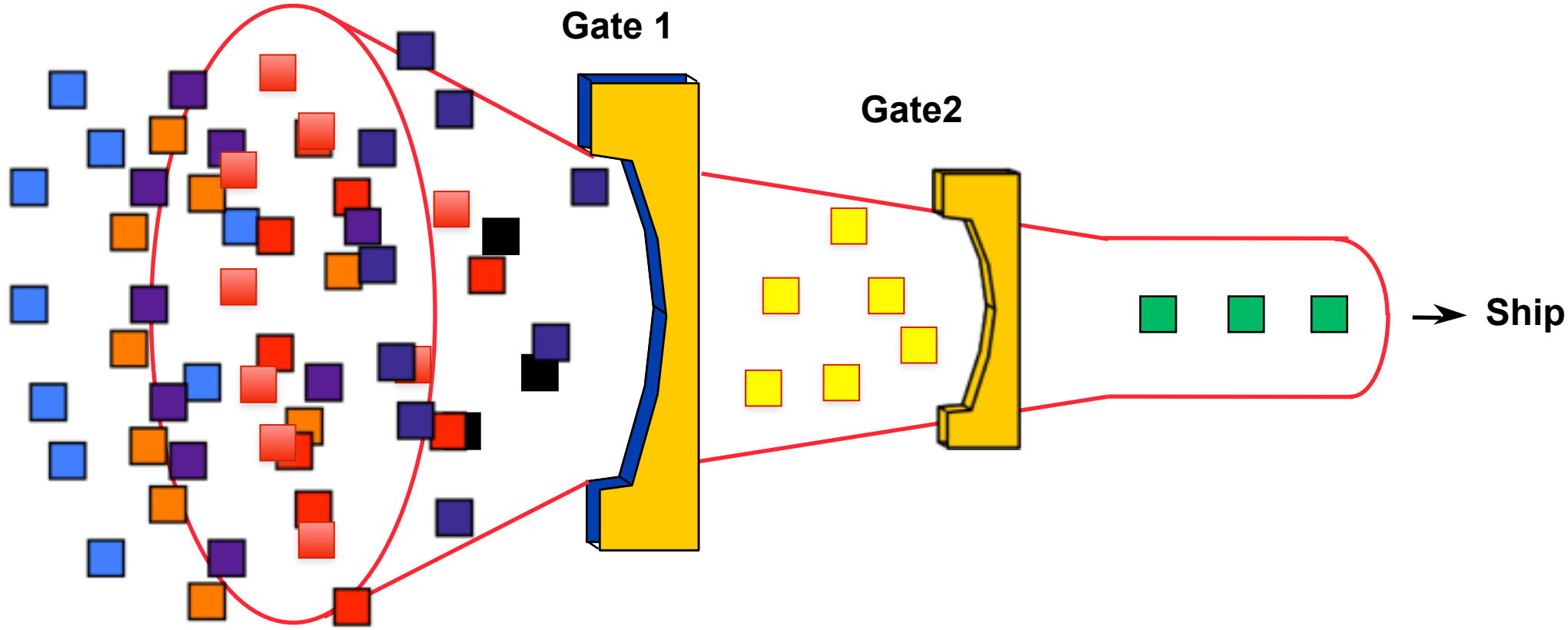
Generation

Selection

Generation

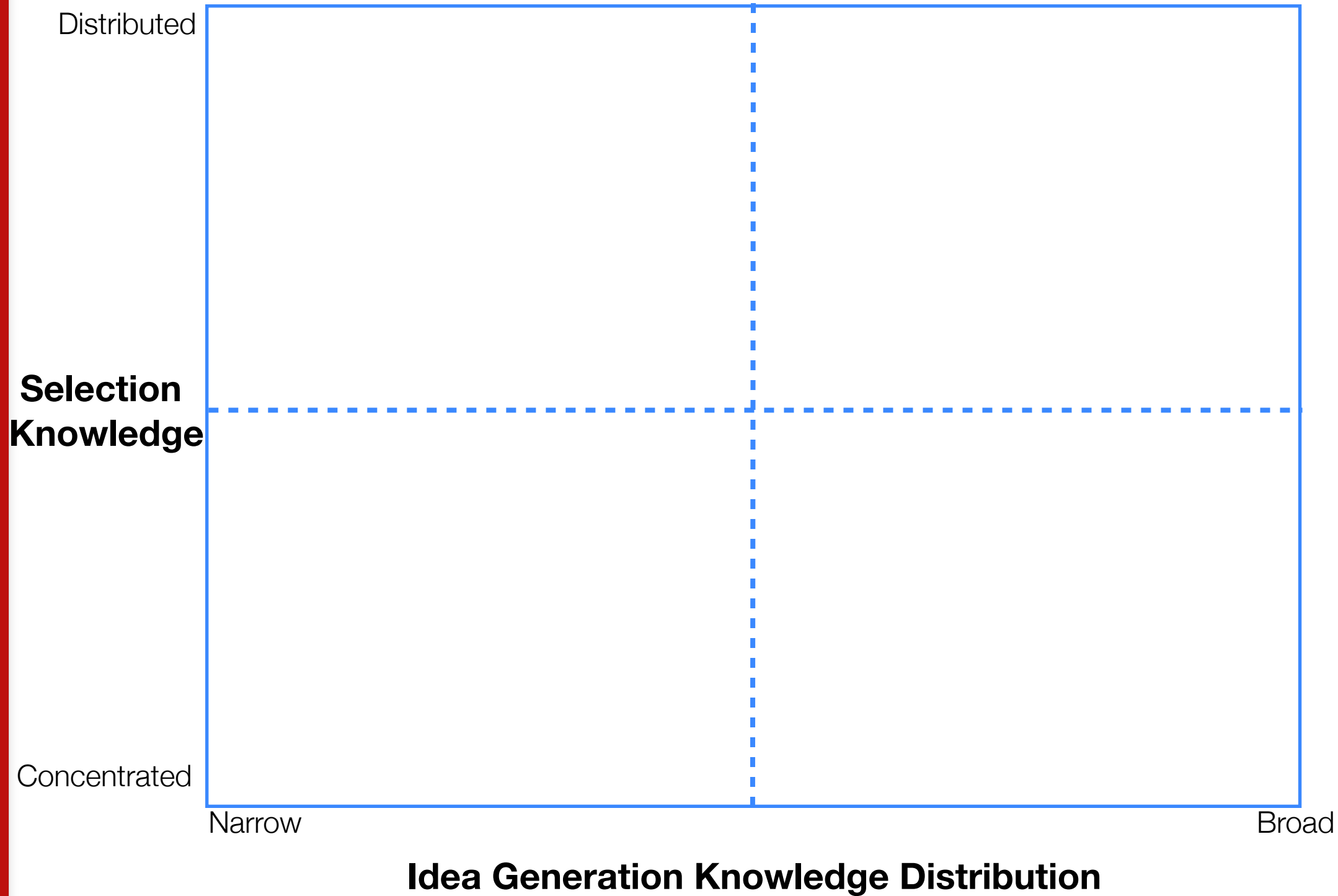
Selection

Implementation



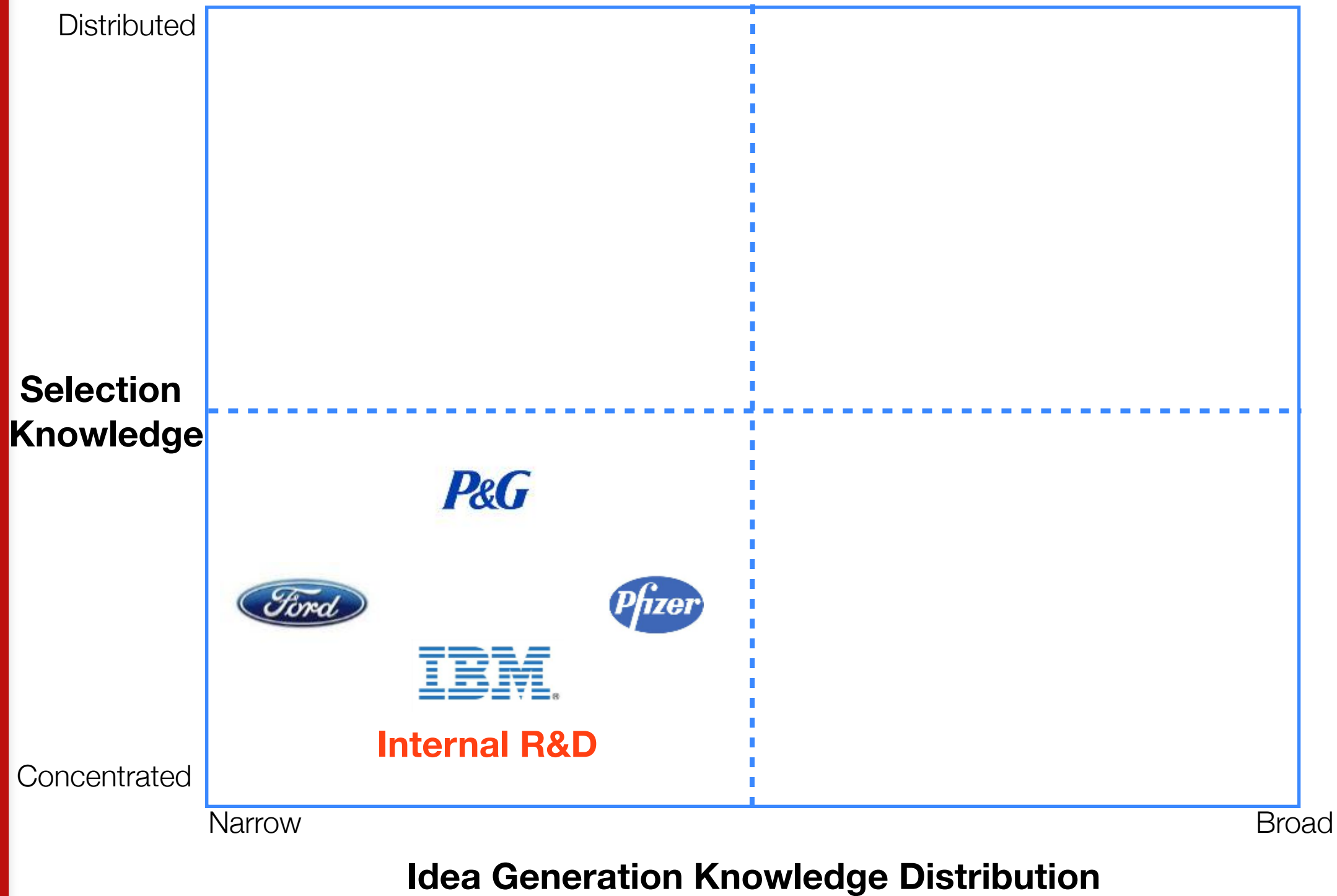
A Framework for Organizing Crowds

(King & Lakhani 2013)



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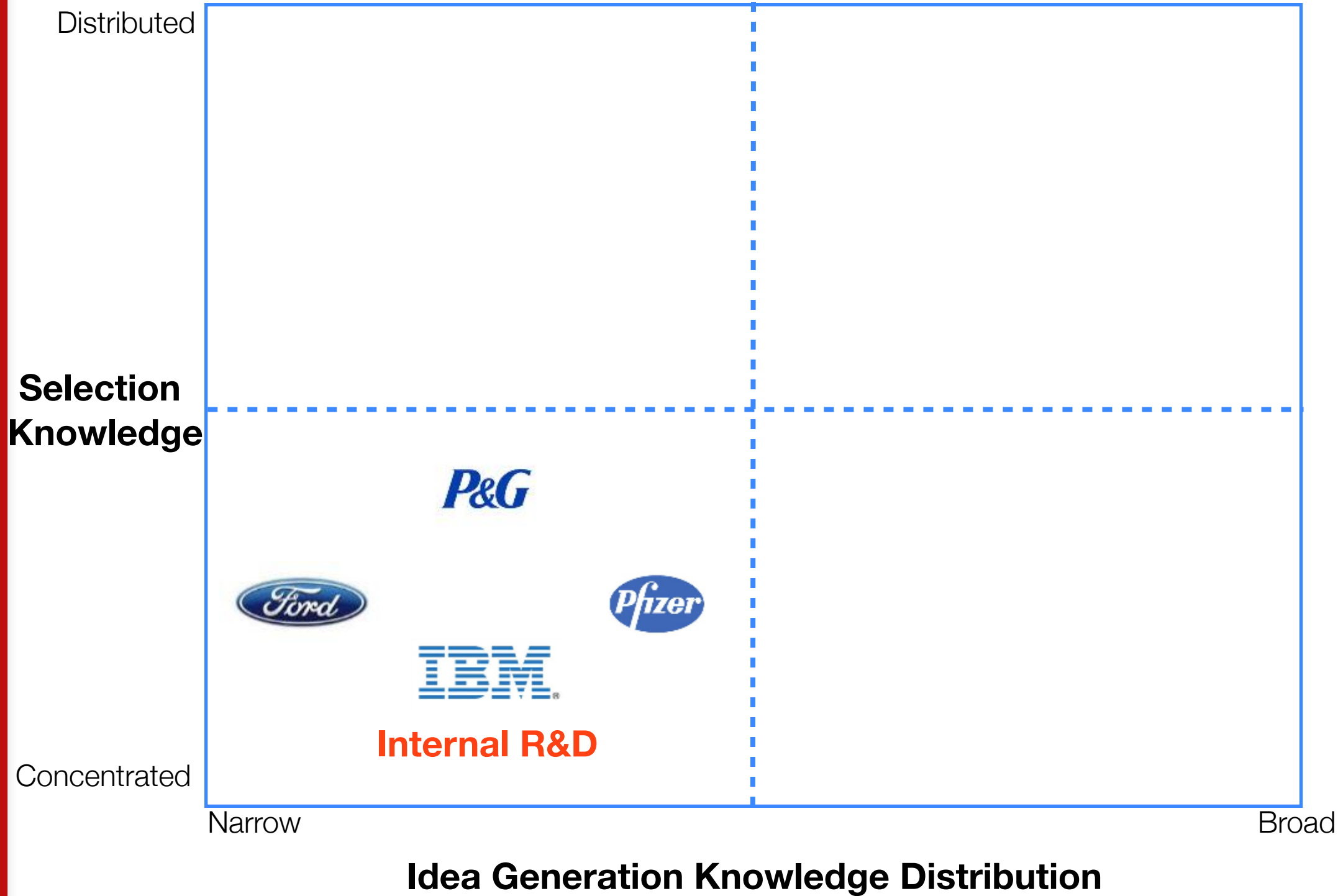
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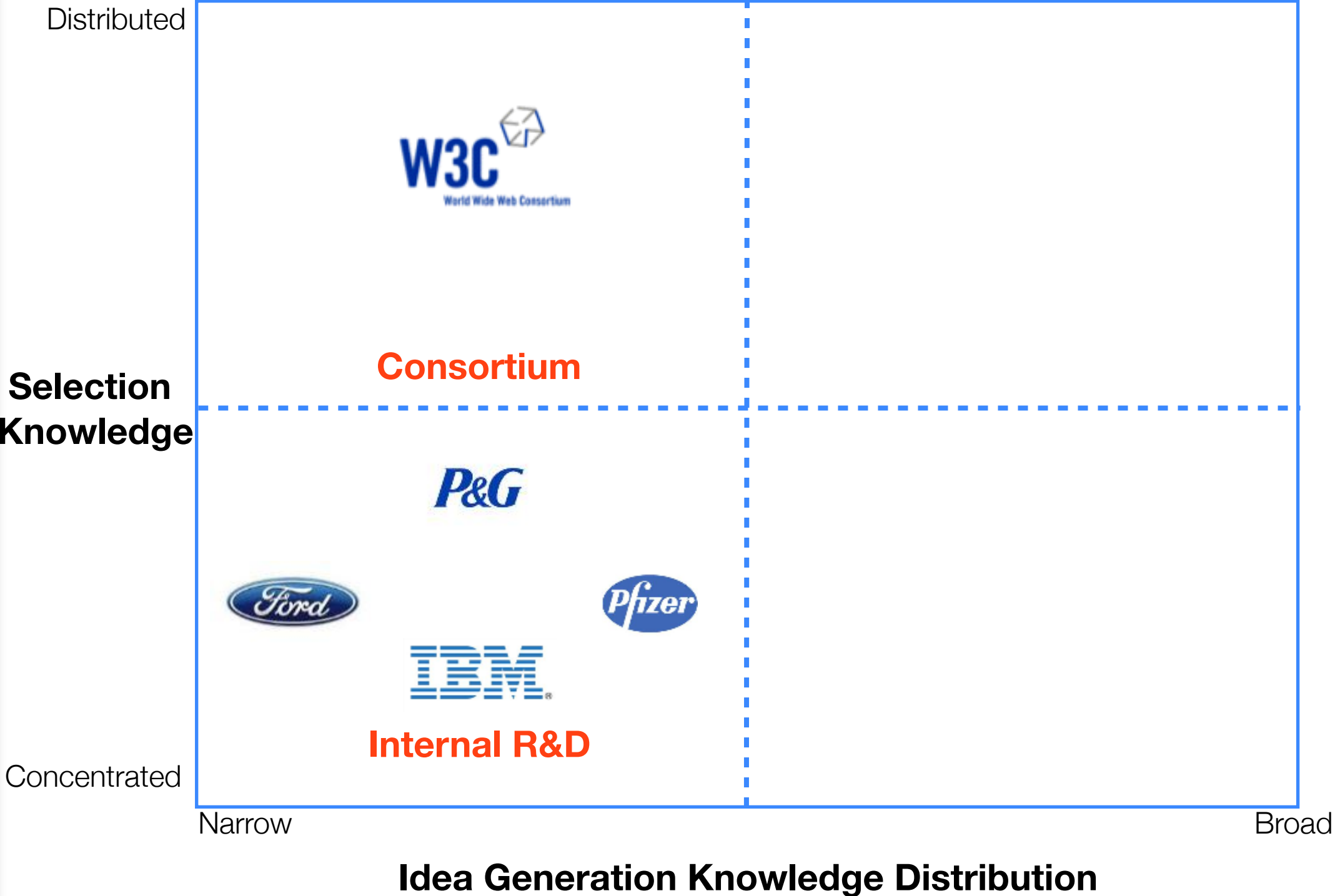
Declining Communication Costs & Modularity



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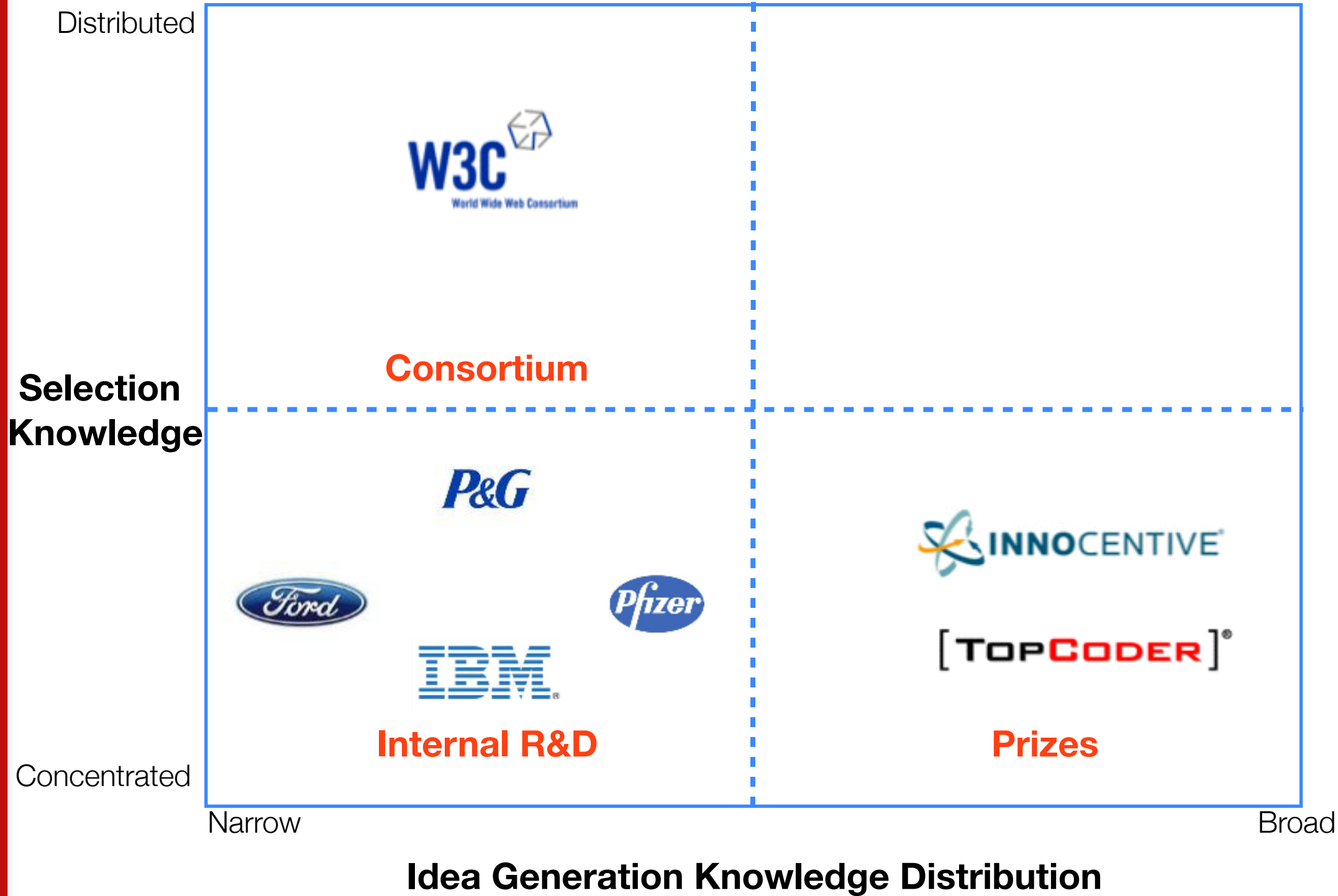
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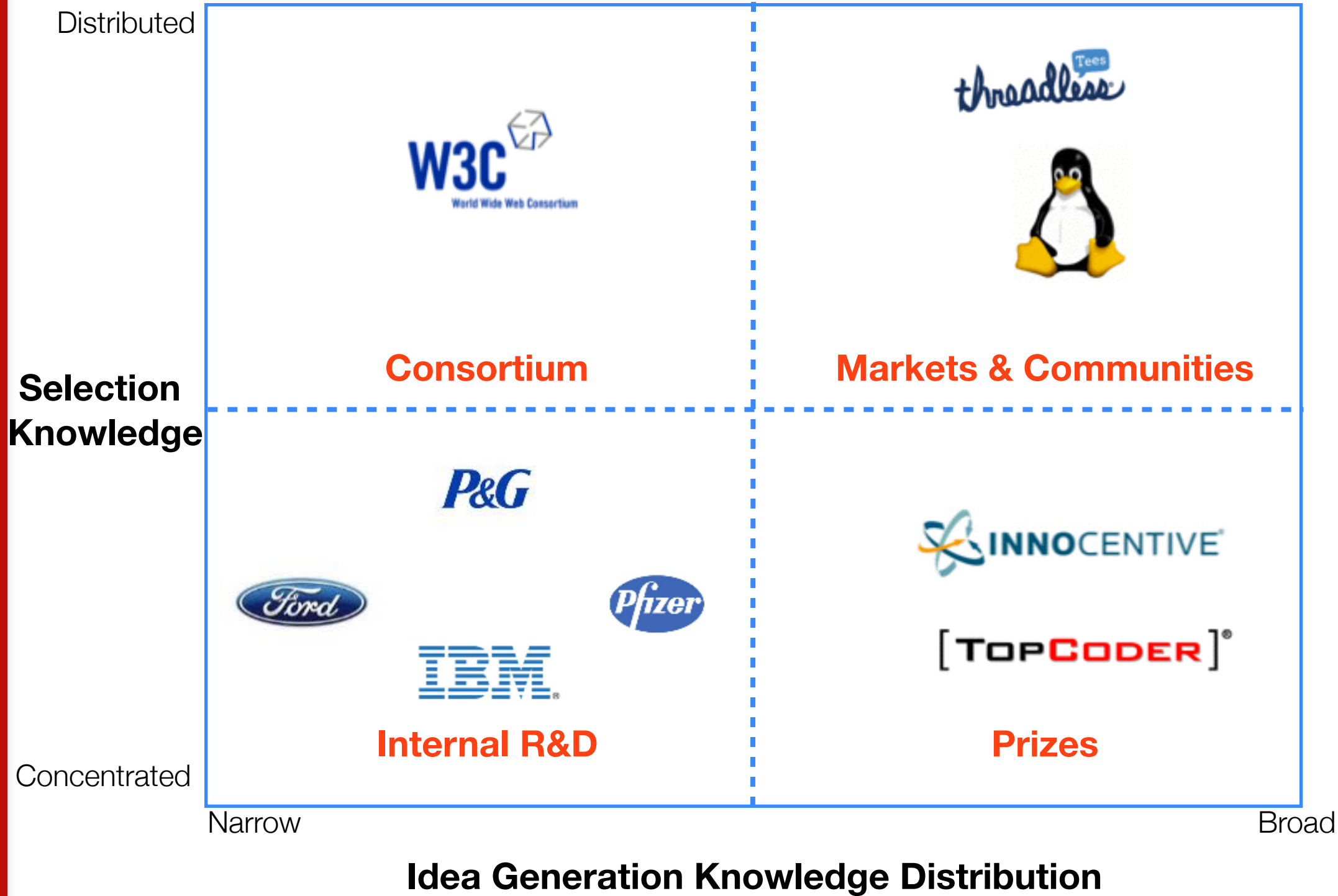
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Declining Communication Costs & Modularity





The Future Is Already Here, Its Just Not
Very Evenly Distributed - William Gibson





Thanks!

k@hbs.edu | @klakhani

