Innovation for Conservation: Theodore Roosevelt Genius Prize Competitions

Introduction: The Power of Open Innovation

NASA Tournament Lab

Center of Excellence for Collaborative Innovation

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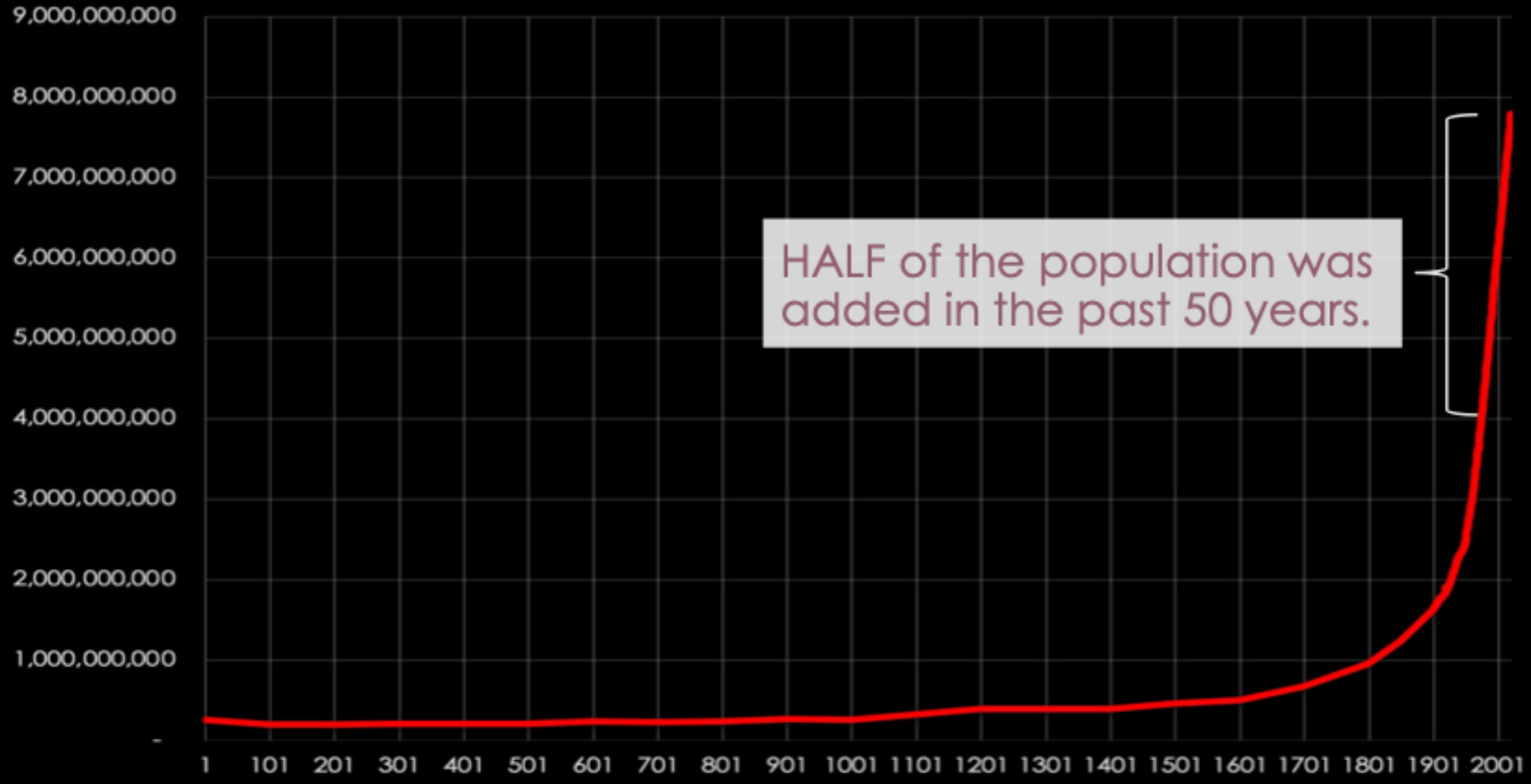
NASA's Center of Excellence for Collaborative Innovation (CoECI)

CoECI works across NASA and other U.S. Federal Government Agencies to assist organizations in understanding and using open innovation tools.

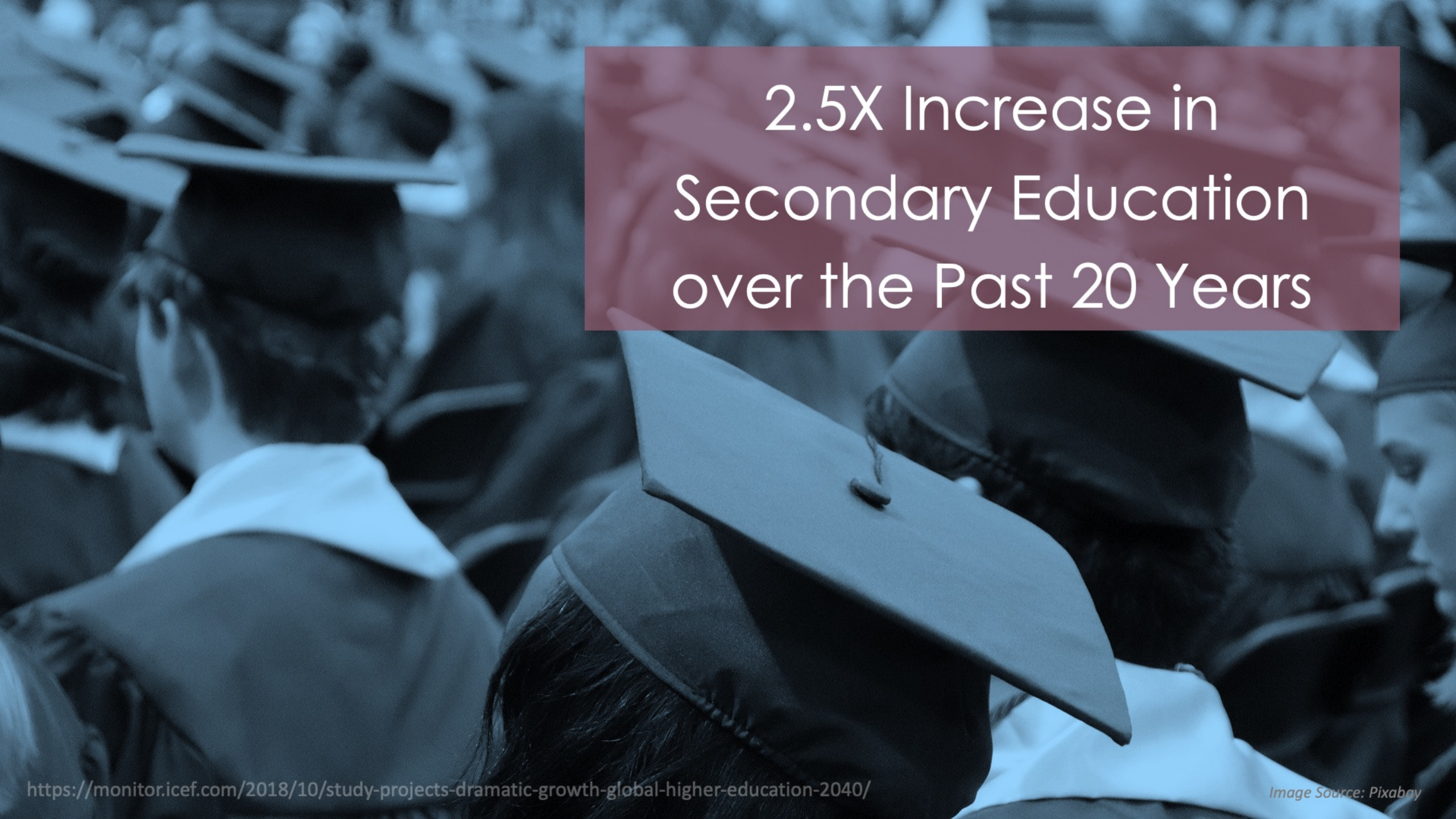
THE WORLD HAS CHANGED

Much of what worked for us in the past
will not work in the future!

World Population Growth Over the Last 2,000+ Years



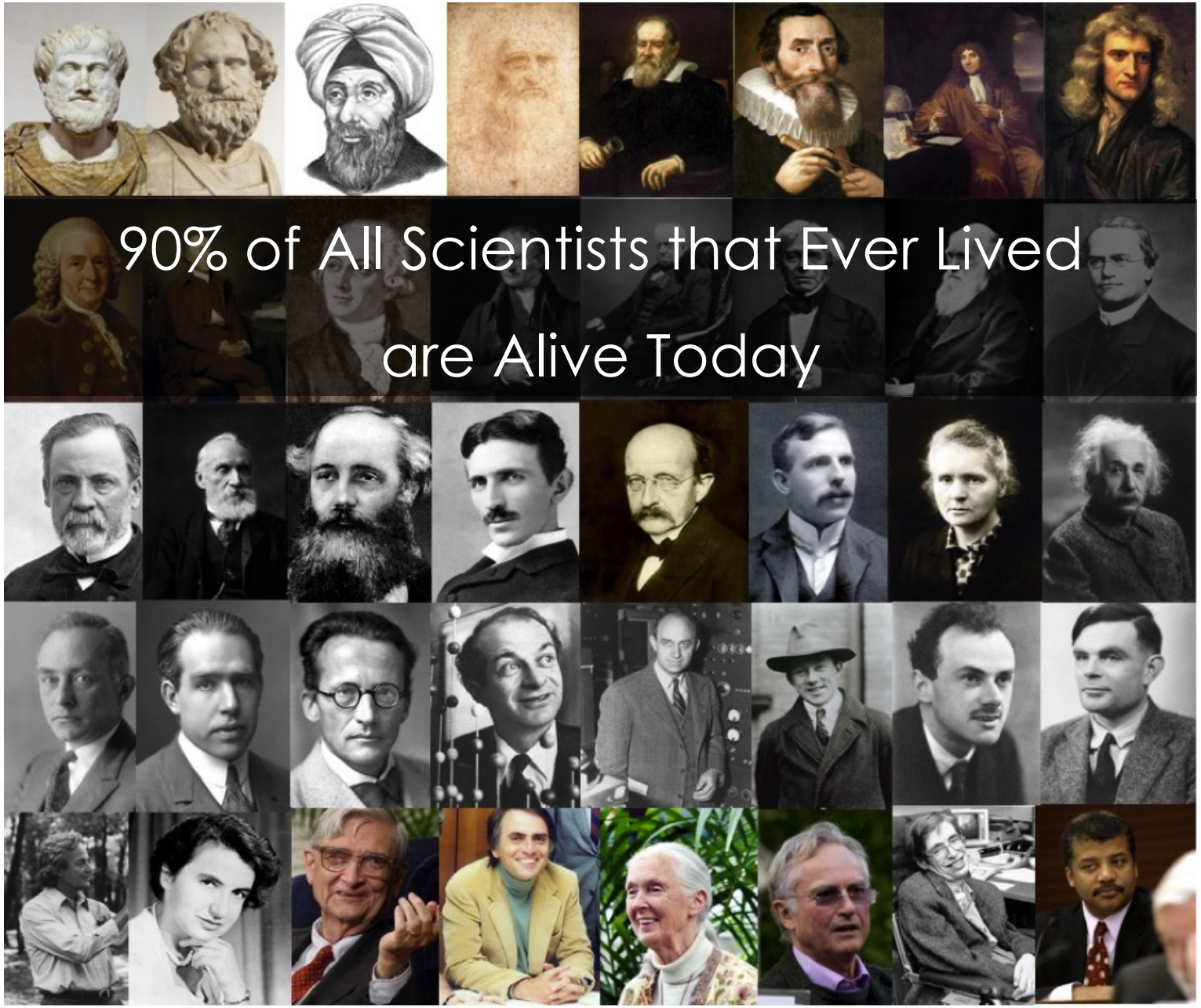
https://ourworldindata.org/grapher/world-population-since-10000-bce-ourworldindata-series

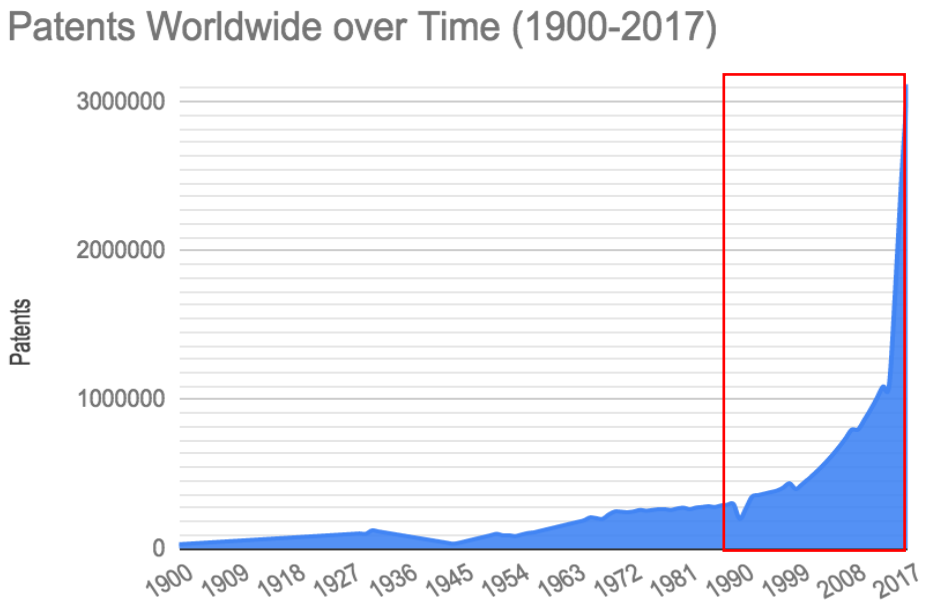


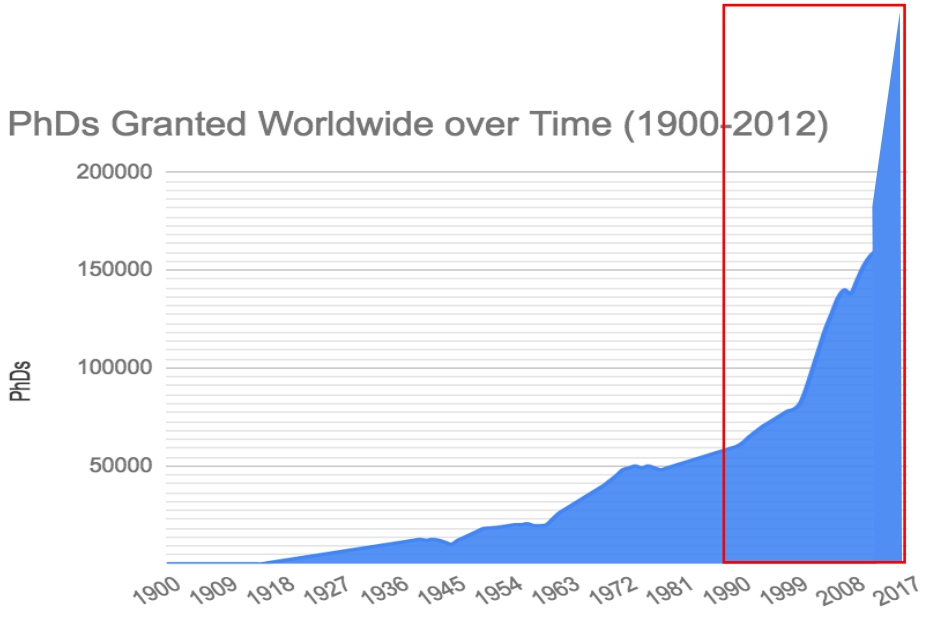
https://monitor.icef.com/2018/10/study-projects-dramatic-growth-global-higher-education-2040/

Image Source: Pixabay

The World has Changed Significantly over the Past 20 Years







Technology Building Blocks Accelerating the Rate of Change


Additive Manufacturing

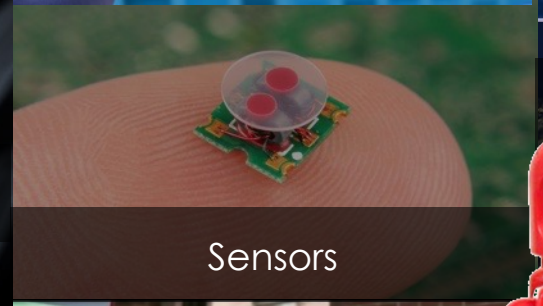
Photo Credit: Betatype


CRISPR


Processors/GPUs

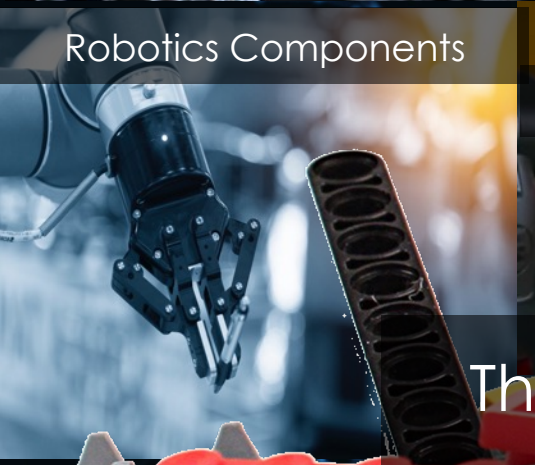

Blockchain


Materials/Nano-Coatings


Sensors

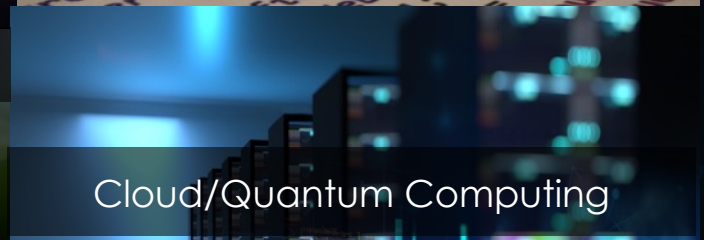

Machine Learning Components

Open Software Components


Robotics Components

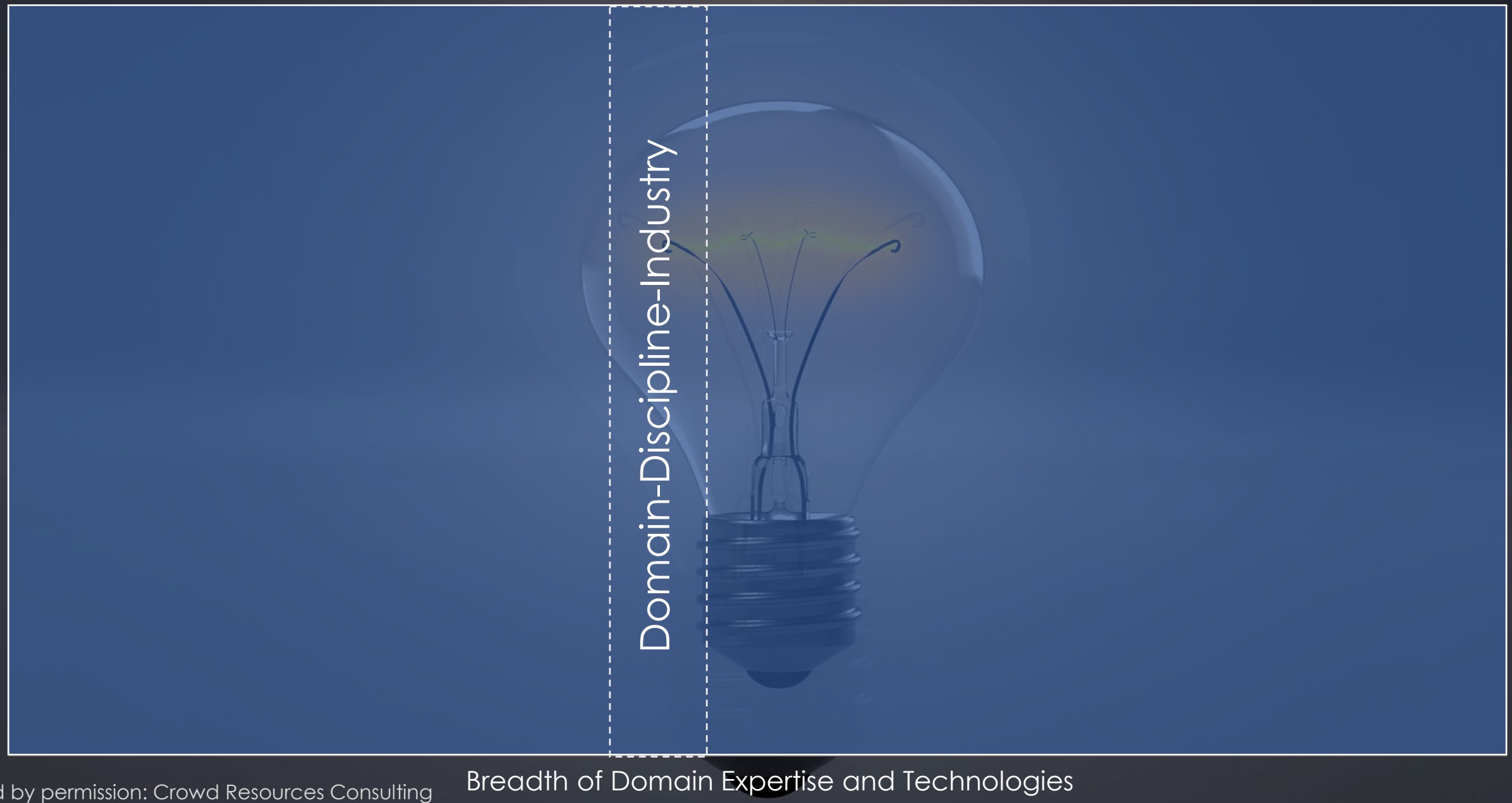

Complex Manufacturing

Autonomous Vehicles


Cloud/Quantum Computing

The accelerating rate of change is driven by low cost access to powerful **technology building blocks** and tools.

The Breadth and Depth of Skills, Expertise, and Technology



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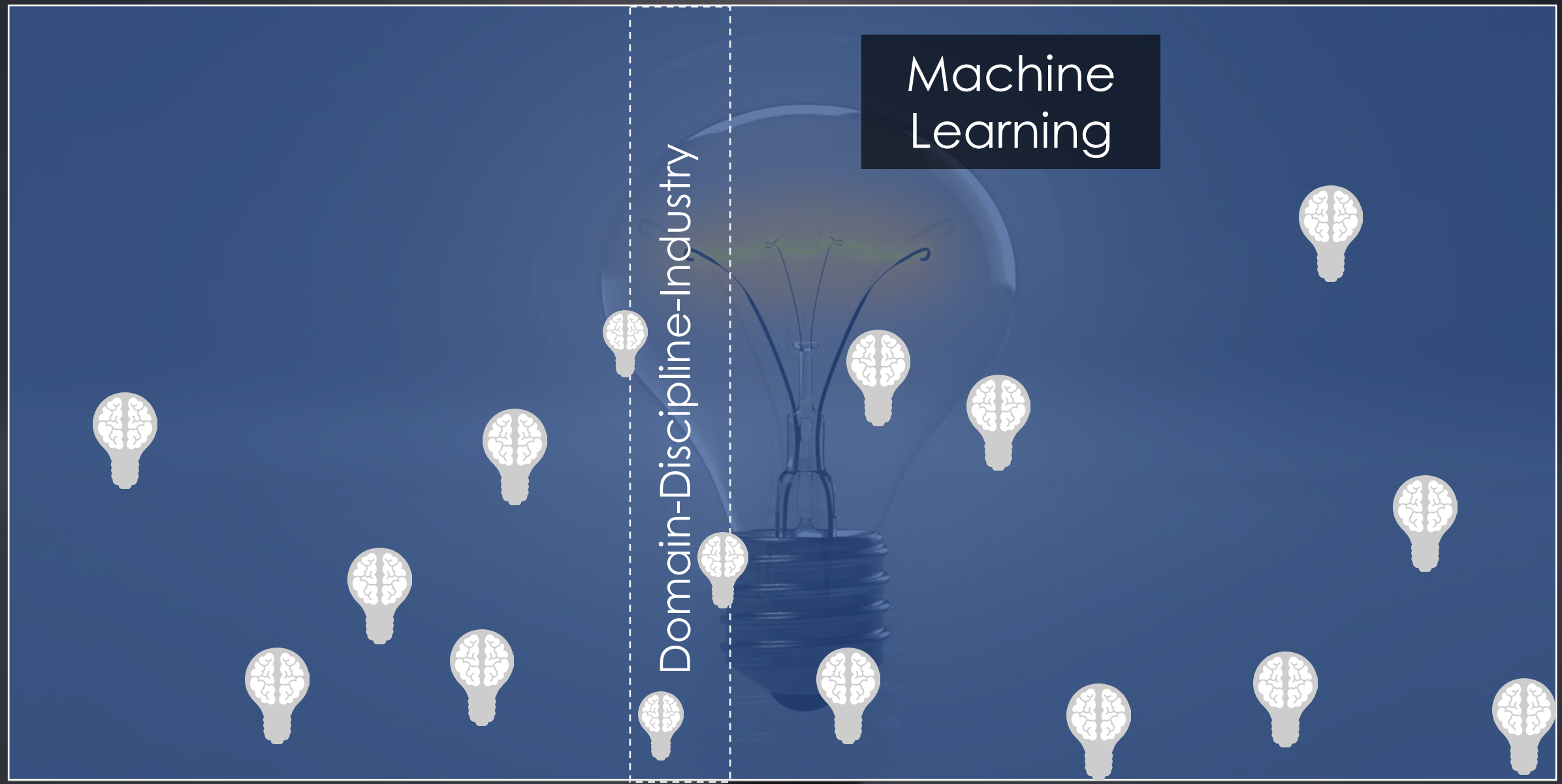

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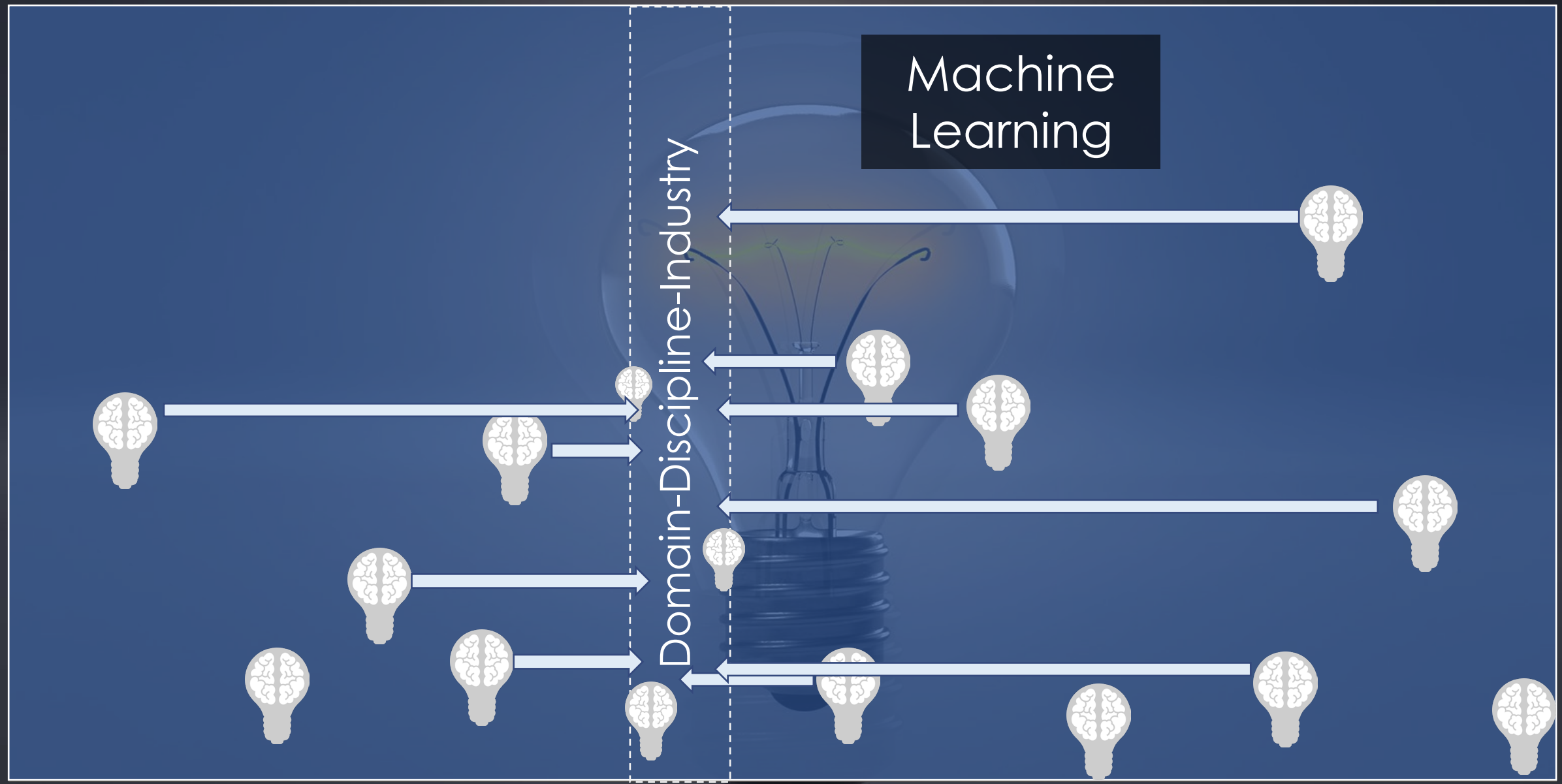

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PRO

Amazing new technologies that could result in significant gains towards solving hard problems

CON

Finding these technologies & solutions across the growing number of possible sources is hard

The Rate of Change for Knowledge and Technology is Increasing

Hard to Find Skills and Expertise

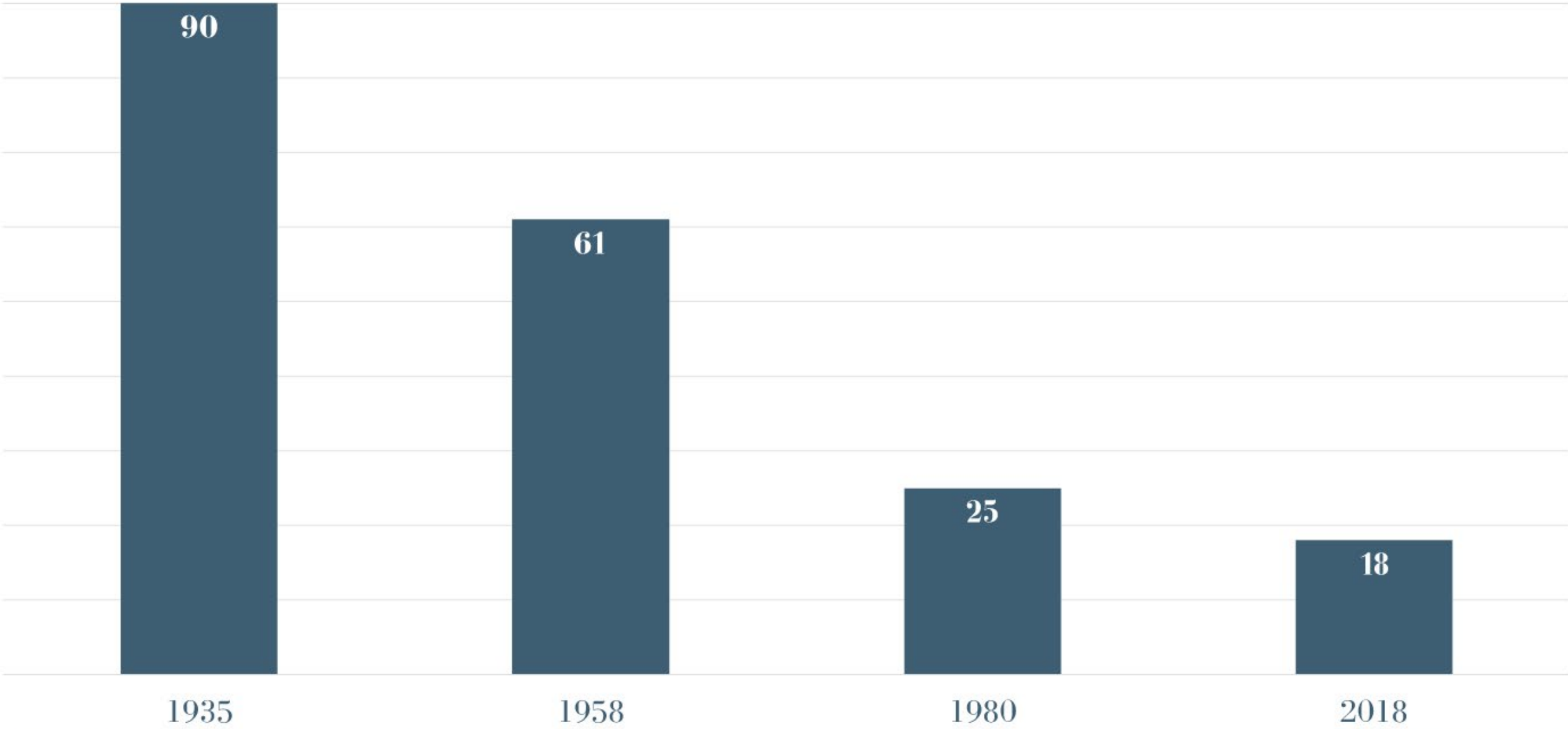
Hard to Keep Up with Tech Advances

High Risk to Remaining Competitive/Relevant

IN THE LAST 15 YEARS, 52% OF THE FORTUNE 500 COMPANIES HAVE GONE EXTINCT

Source: Innosight

Average Lifespan of S&P 500 Listed Companies in Years



Source: U.S. Bureau of Labor Statistics | Innovative Securities

IS Innovative Securities

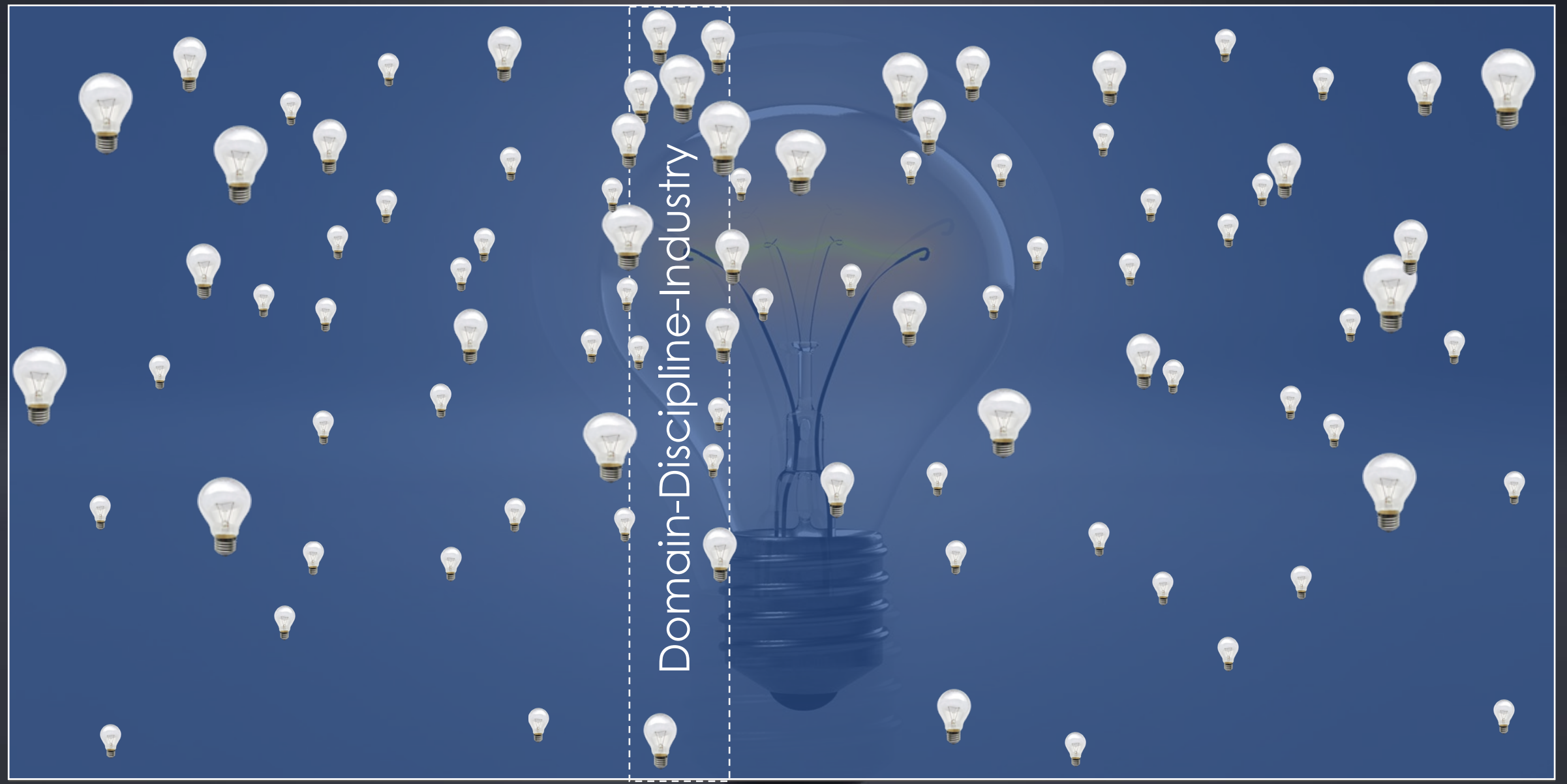
Improving Pipeline Bundle Inspection

Subsea7 was seeking to improve pipeline inspections.

Result: Found a technology a fraction of the size that performs inspections over **100x faster** that will be much less expensive to operate.

This new technology was poised to transform the industry.

The Breadth and Depth of Skills, Expertise, and Technology



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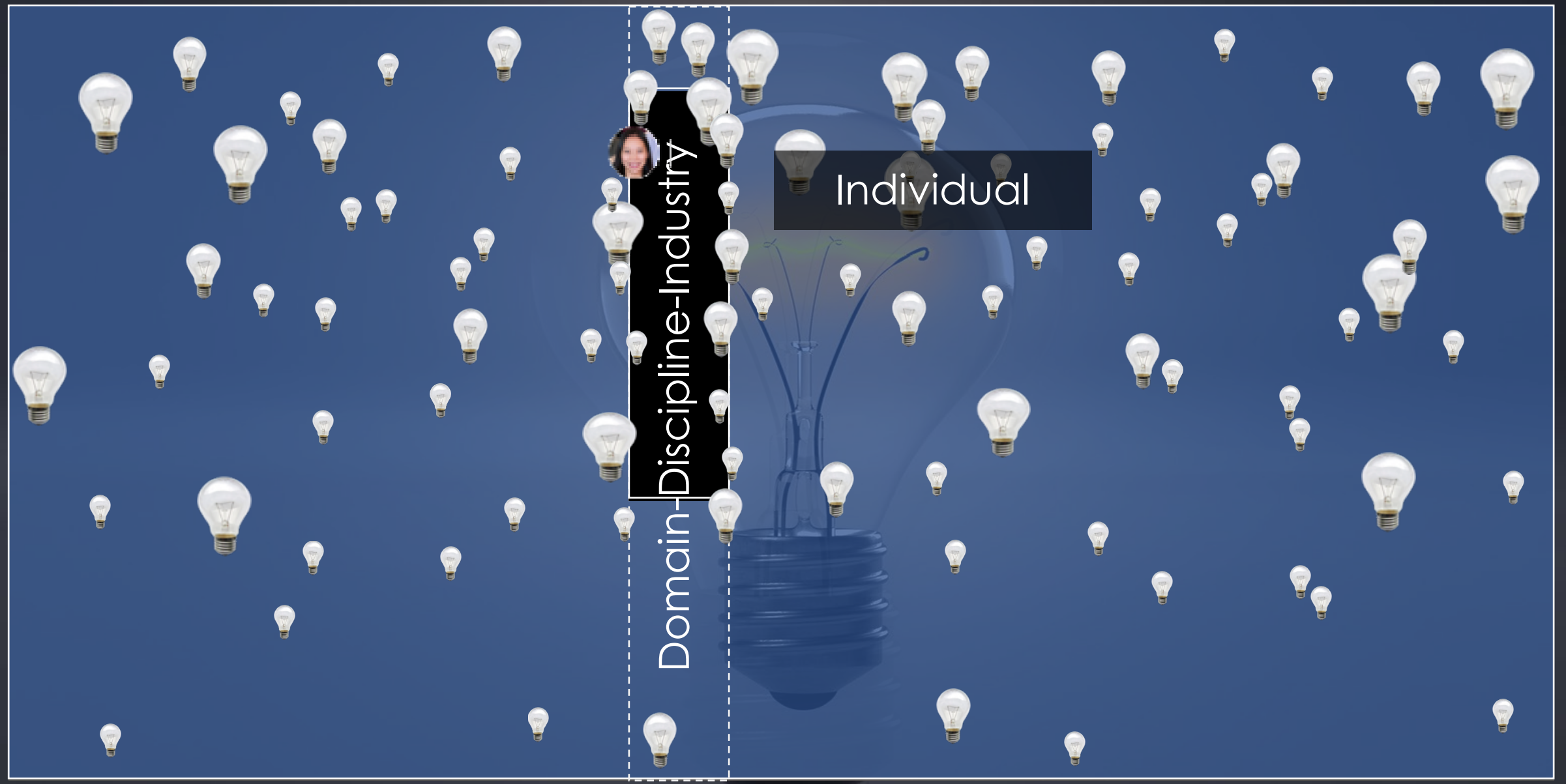

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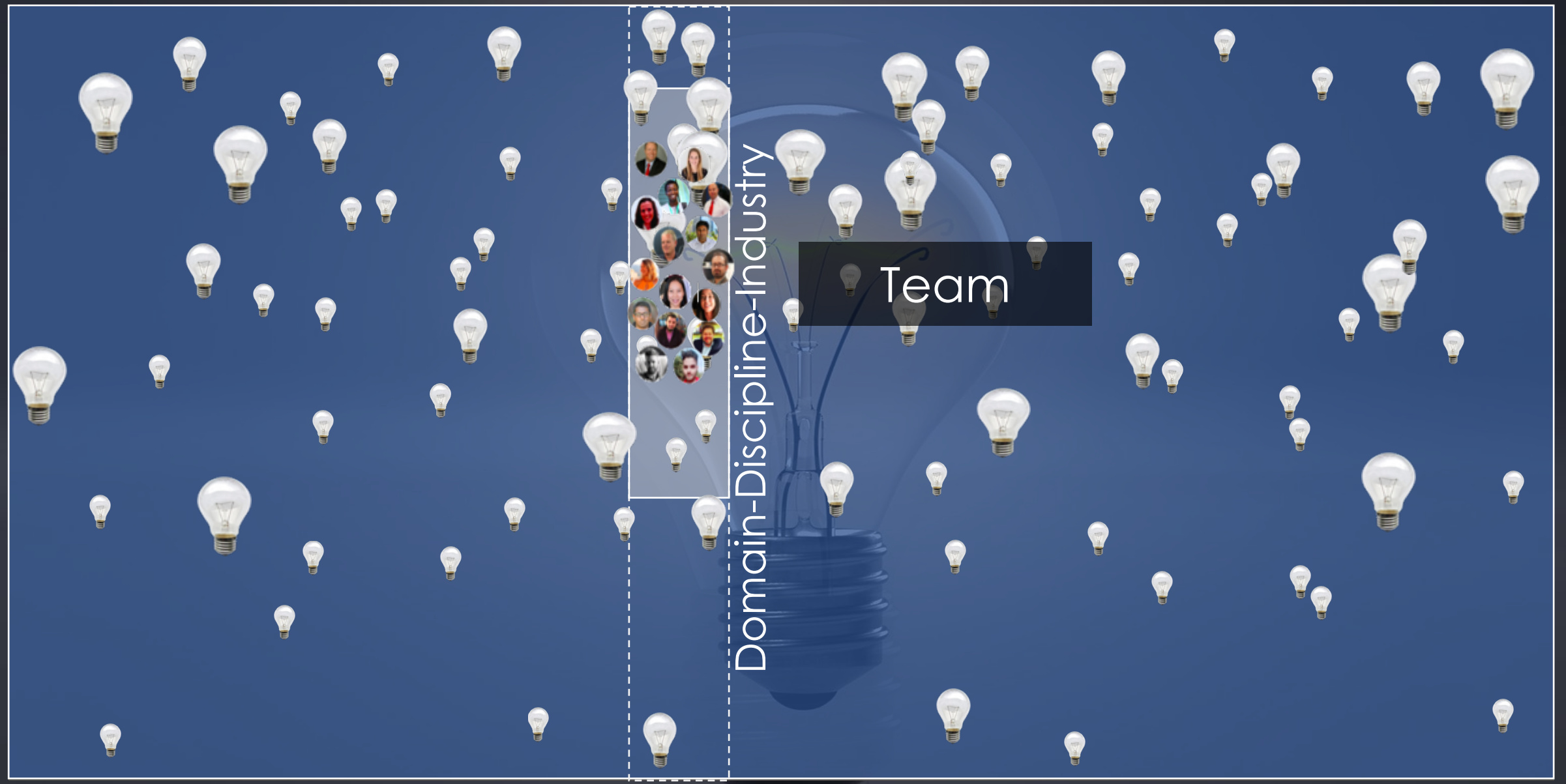

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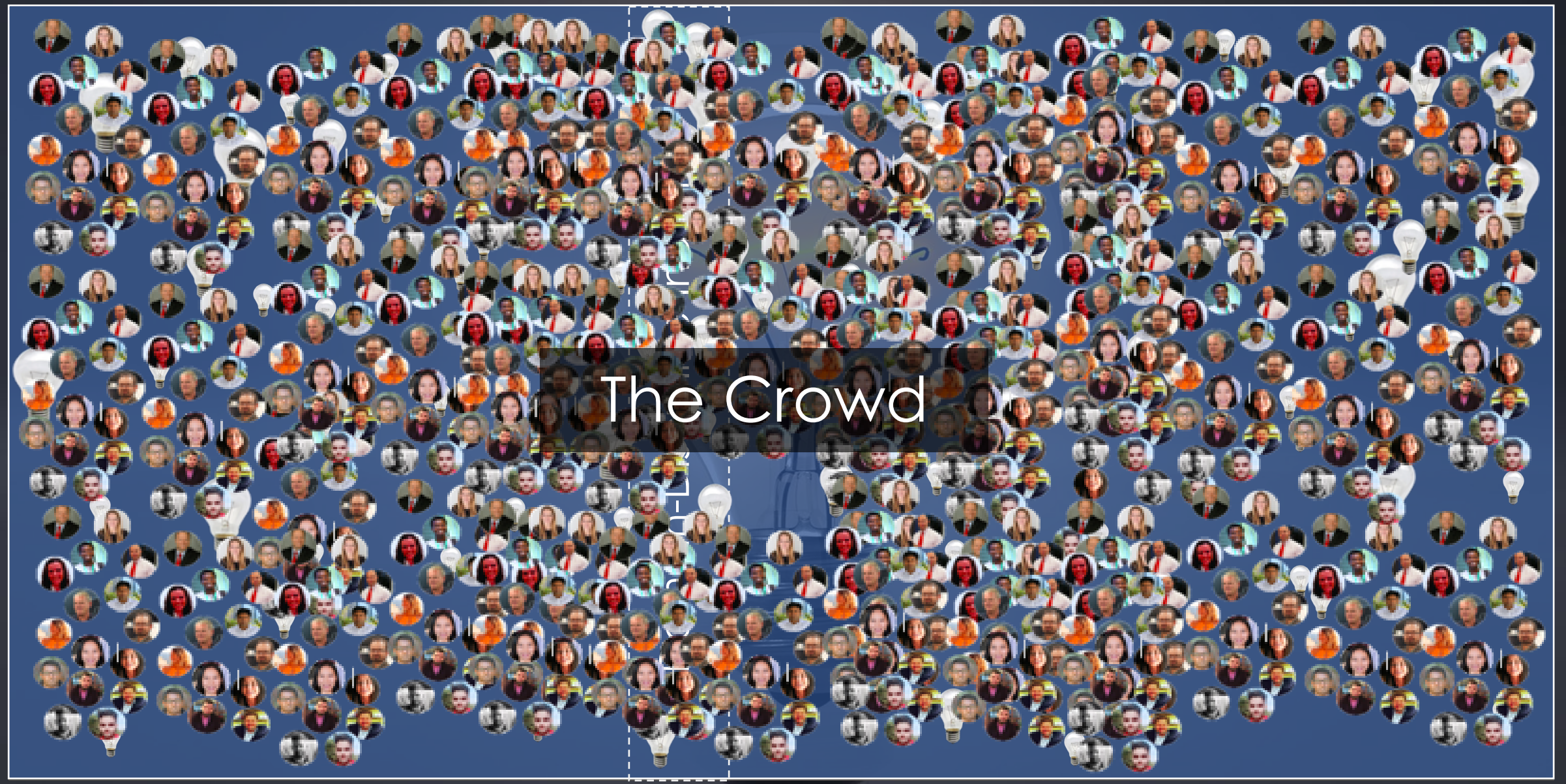

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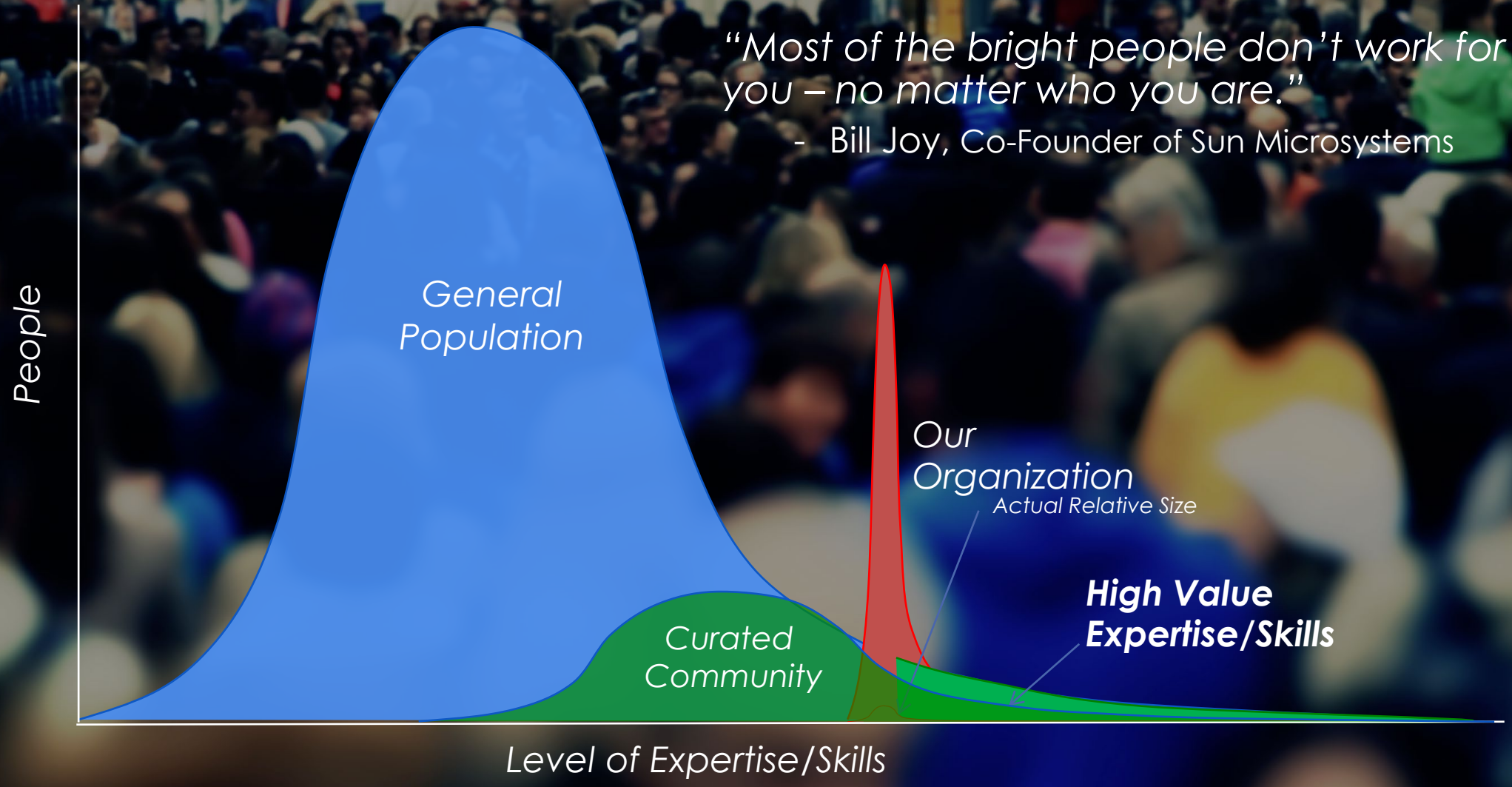
“Open Innovation” is an Effective Tool to Keep Pace with Accelerating Change

Open Innovation or crowdsourcing platforms are bringing together and curating large numbers of people from all over the world with all types of backgrounds, skills, and expertise to provide valuable products and services.

Crowds Provide Access to High Value Expertise/Skills

"Most of the bright people don't work for you – no matter who you are."

- Bill Joy, Co-Founder of Sun Microsystems



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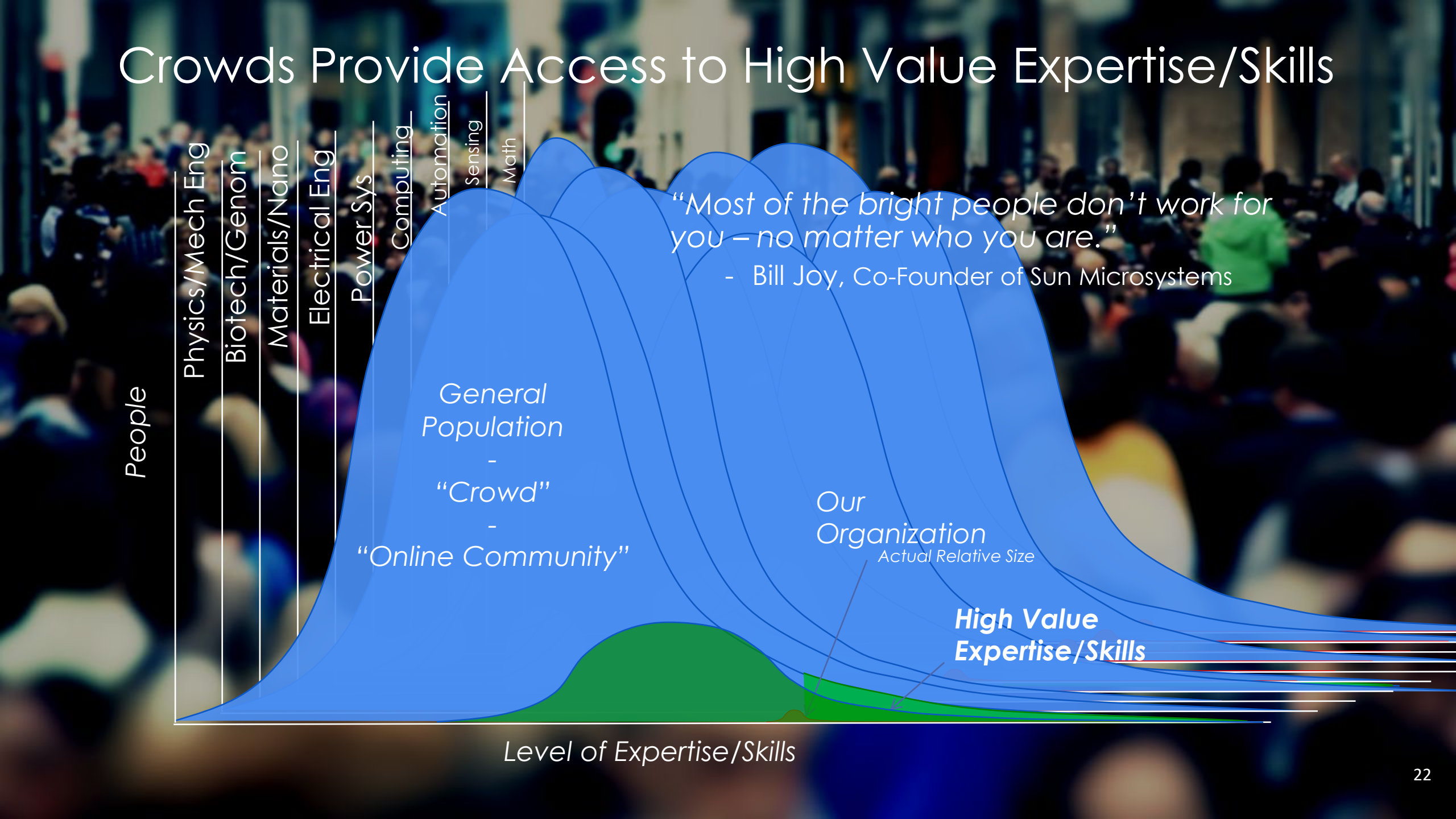
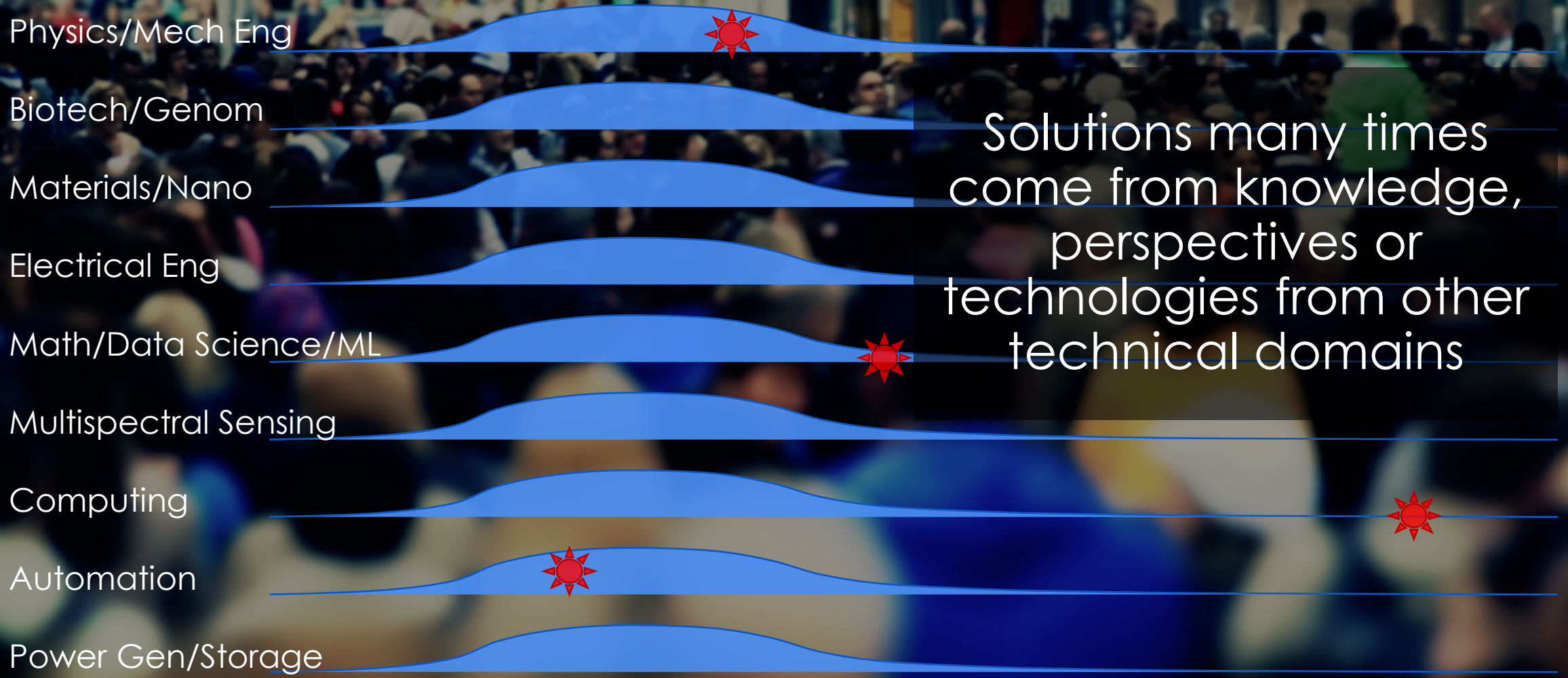


Crowds Cut Across a Broad Set of Technical Disciplines



Solutions many times come from knowledge, perspectives or technologies from other technical domains

The Value Provided by Diverse Crowds

Study data of successful InnoCentive challenge solutions showed…

70% of successful challenge solutions are solved by individuals outside of the challenge's specific technical domain.

"75% of successful solvers already knew the solution to the problem."
*Dr. Karim Lakhani **

- *Jeppesen, Lars Bo and Karim R. Lakhani. Forthcoming. Marginality and problem solving effectiveness in broadcast search. Organization Science 20. Published Version http://orgsci.journal.informs.

Using Crowds to Solve Problems

Used by permission: Crowd Resources Consulting

Accessing Crowd VALUE Using Challenges

Formulate the Problem Statement

A well formulated problem statement (with good success criteria)

Design the Challenge

A well designed challenge (including setting the right prize amount)

Execute the Challenge

Solution Filtering (optional)

Solution filtering mechanisms are offered by some platforms

Pick the Winner(s)
Evaluating

Get Your Solution
IP licensing and/or transfer

Well designed challenges posed to a curated community have proven very effective for discovering new and existing (but unknown) solutions and technologies.

The Problem

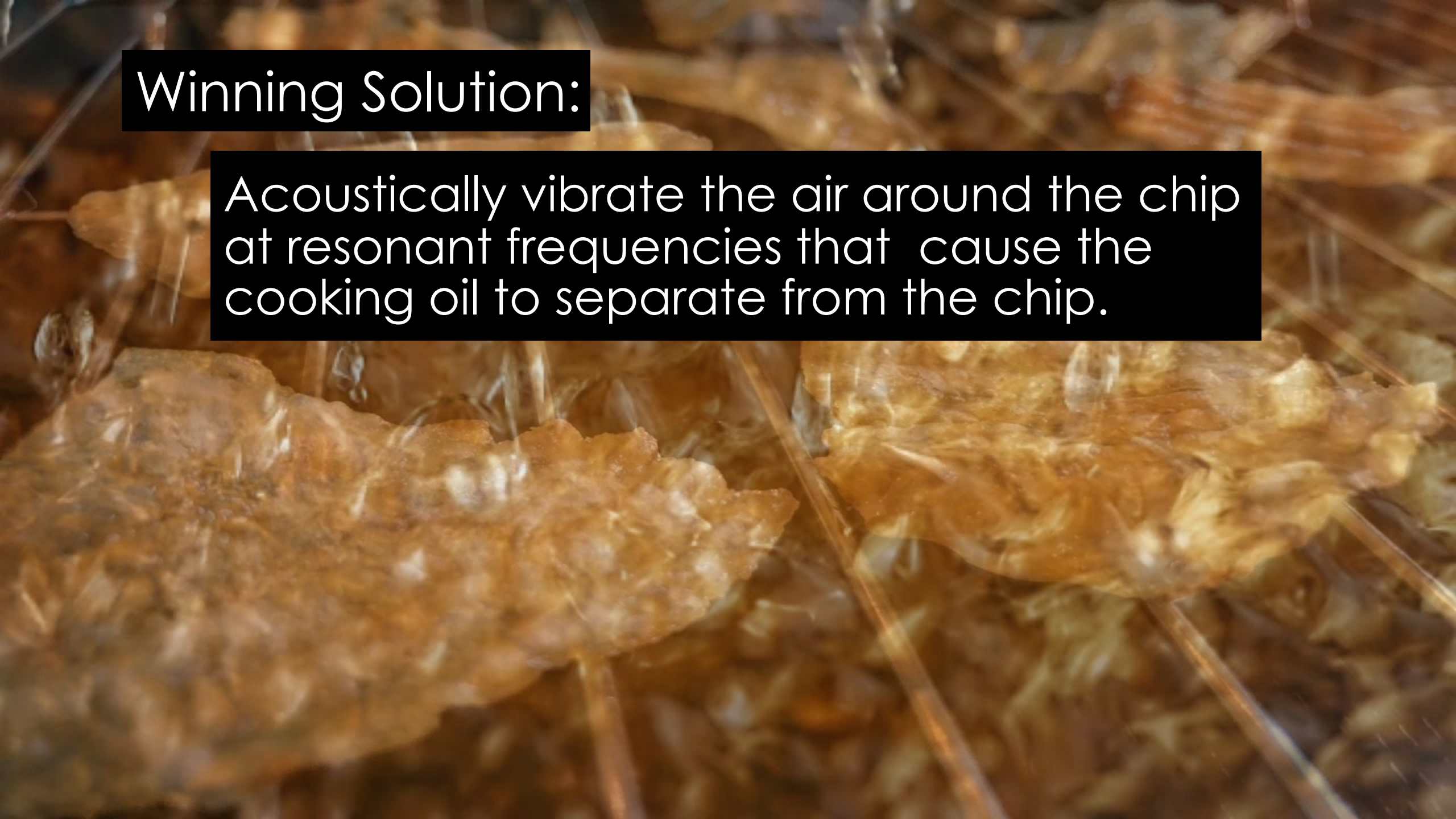
Remove grease
from potato chips

Existing Solution

Mechanically vibrate the chips to shake off the cooking oil.

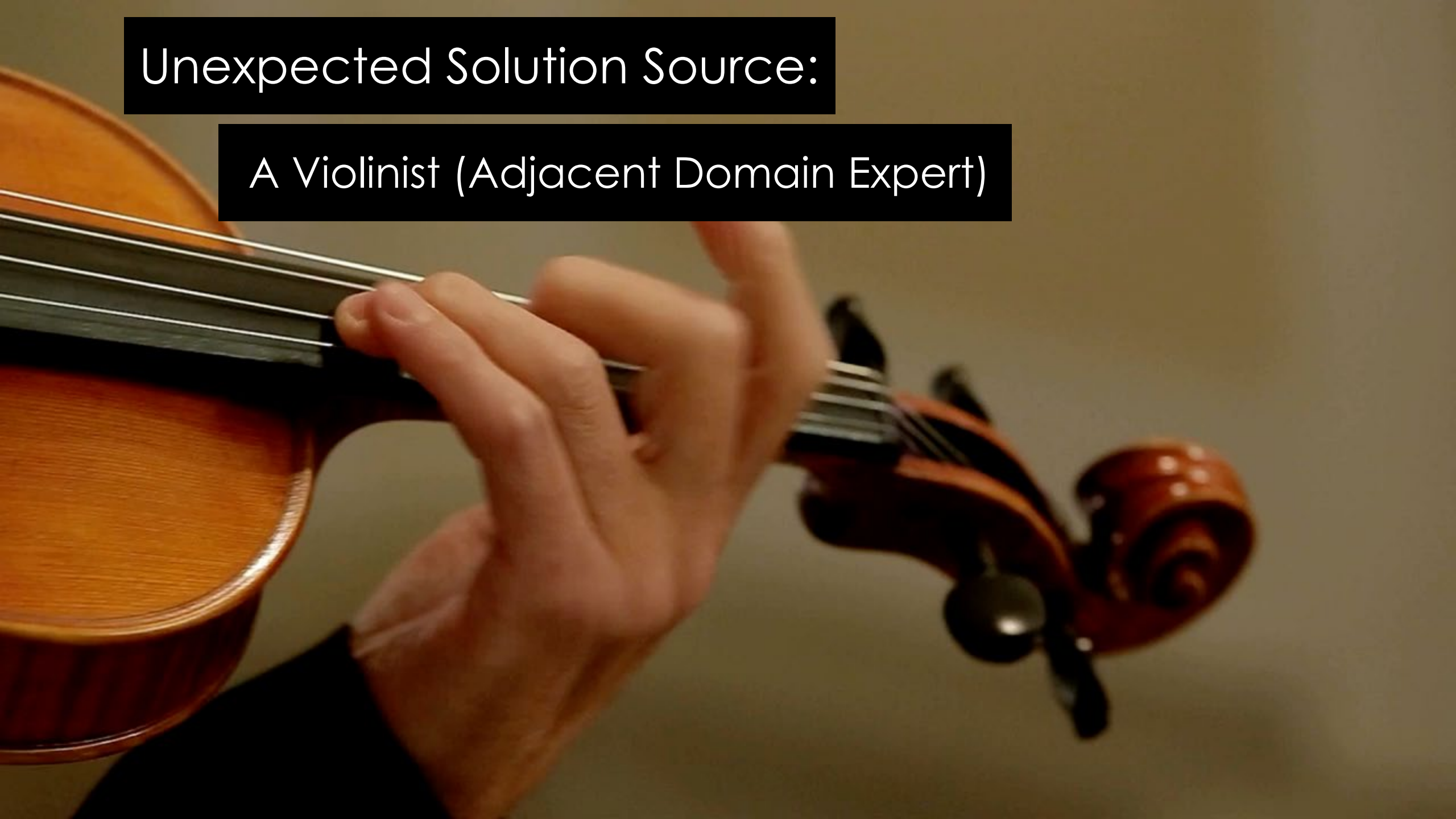
The Problem - Generalized For a Broader Crowd

Remove a viscous fluid
from a delicate wafer



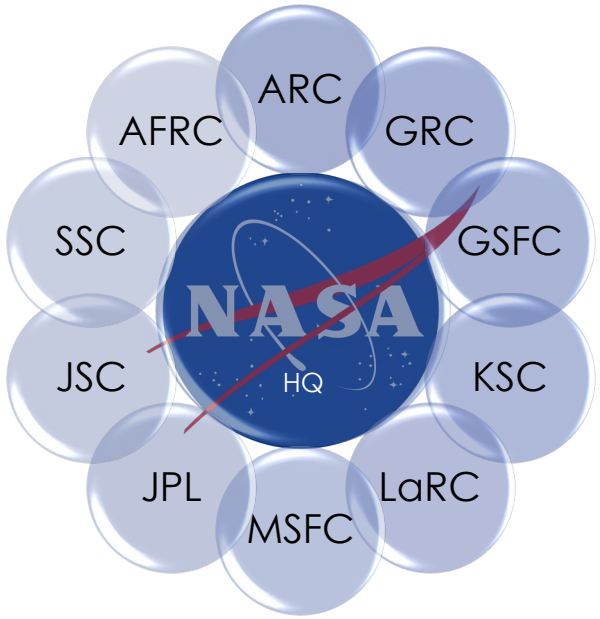
Winning Solution:

Acoustically vibrate the air around the chip at resonant frequencies that cause the cooking oil to separate from the chip.


Unexpected Solution Source:
A Violinist (Adjacent Domain Expert)

NASA's Center of Excellence for Collaborative Innovation

Across NASA Centers & Programs



Public Facing - Worldwide

NTL
NASA
Tournament Lab

Across US Federal Agencies

27 Organizations across
15 Agencies To Date

Provides Access to Open Innovation (OI) Platforms Worldwide
- Contracts/Mechanisms
- Processes/Support
- Education/Outreach
- Research

Part of NASA's Space Technology Mission Directorate (STMD) Prizes and Challenges Program

Provides services across NASA & other Federal Agencies

Virtual Office hosted within Johnson Space Center Director's Business Development and Technical Integration Office

NASA Open Innovation

Products and Services Provided by:

Crowd-Based Prize Competitions/Challenges | Freelance Experts/Workers | Micro-Tasking | OI Program Support



Technical Solutions

Ideas	Conceptual Designs	System Designs	Demos/ Prototypes	Engineering Models	Software	Algorithms/ Data Science
130	**120**	**17**	**5**	**28**	**60**	**45**

Multimedia

Graphics	Video	Crowd Prog Engagement	Technology Search	Technology Catalyst
50	**25**	**59**	**98**	**16**

675+ Projects

94% Were Successful

75% Have Cost Savings

49% Average Cost Savings

$74M+ Estimated Cost Savings

Department of Interior Challenges on NTL

BUREAU OF RECLAMATION

BOEM Bureau of Ocean Energy Management

- Divide and Conquer: Modeling Large-Scale Hydraulics Faster
- Rodeo II: Sub-Seasonal Climate Forecasting Streamflow Forecasting
- Imperfection Detection Challenge: Detect Me If You Can
- Counting Every Drop Challenge
- Water America's Crops Challenge
- More Water Less Concentrate
- Rust Busters Challenge
- Canal Safety Challenge
- Automated Maintenance of Protection Systems Challenge (AMPS)
- Detecting Leaks and Flaws in Water Pipelines
- Reservoir Sediment Collection and Removal Techniques
- Temperature Control Devices/Management at High Head Dams
- Arsenic Sensors
- Nondestructive Testing of Composite Materials for Hydraulic Structures
- Canal Seepage Reduction Technology
- Self Contained Carriable Water Treatment System
- Liquefaction Mitigation Technology
- Debris Removal and Mitigation
- Photogrammetric Data Sets and Crack Mapping
- Data Anomaly Software
- USBR Mussel Scent Detection Technology
- USBR Next Generation Power Supply
- USBR Aquatic Vegetation Control in Canals
- Snowcast Showdown
- Guardians of the Reservoir
- Better Call Trawl Challenge
- Where's Whale-do?

38 Challenges Total
28 Complete
10 In-Progress

1 Ideation
7 Algorithm
10 Technical Solutions
7 Hardware/Prototype
13 Tech surveys

Methods for Protecting Sensitive Challenges: Contextual Obscuration

A challenge was posted to find a way to track a specific bison in Yellowstone National Park using only images posted on social media.

The challenge owner was the CIA who needed to find a way of tracking Russian actors in Crimea but needed to keep the actual problem secret.

An innovative solution was found and deployed without detection.

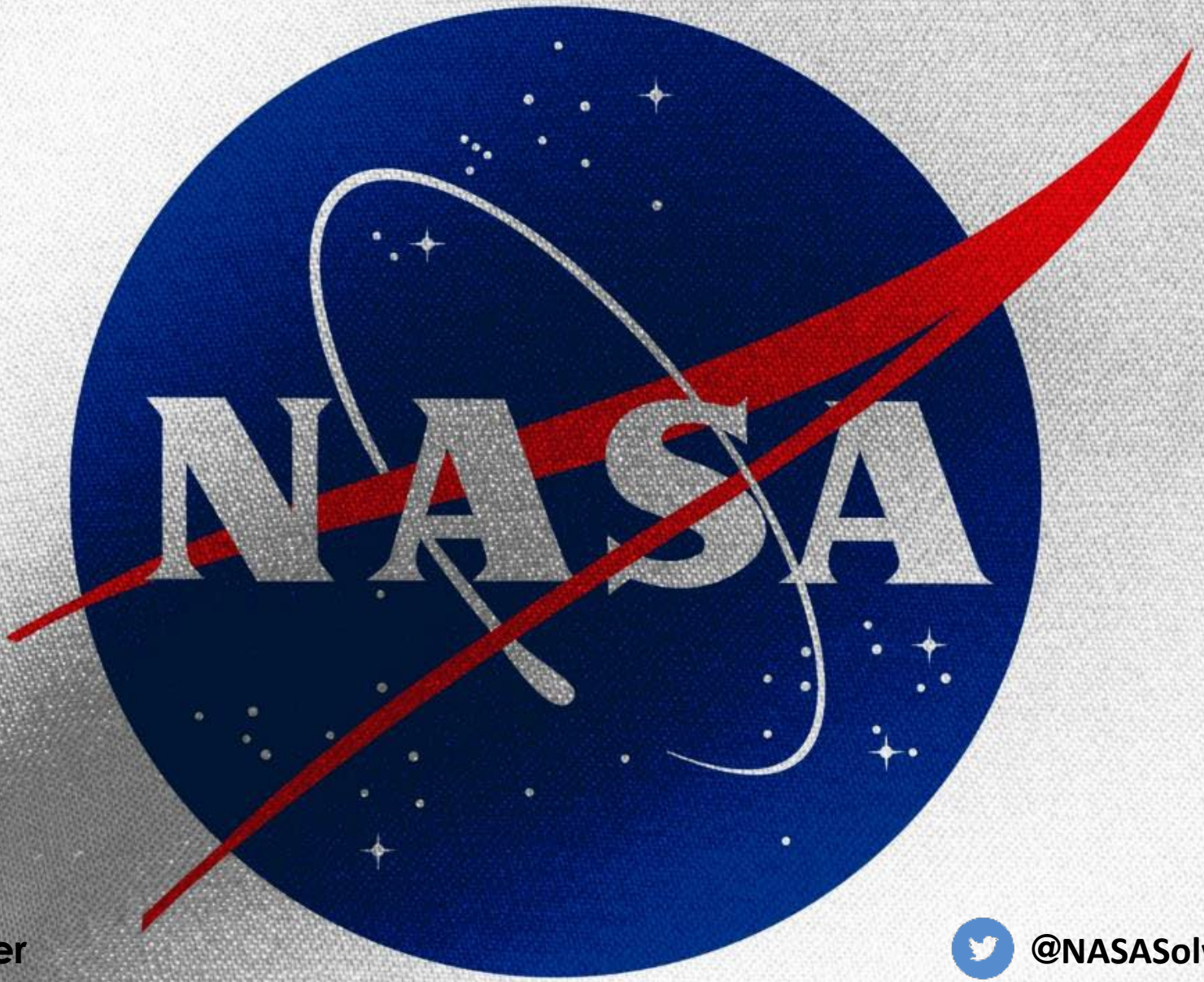
“OPEN” is the Future and “INNOVATION” is No Longer Optional

Crowds, gig-workers, freelancers are a rapidly growing resource with **increasing capabilities**

Curated communities are attracting **passion** and building **expertise** and **skills**

Open methods are **extremely effective** for accessing valuable innovations

Those that fail to innovate will be **left behind**



@SteveRader

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