SCALING UP OPEN INNOVATION PROGRAMS

LEARNING FROM NASA'S OPEN INNOVATION PROGRAM

NASA'S CENTER OF EXCELLENCE FOR COLLABORATIVE INNOVATION (COECI)

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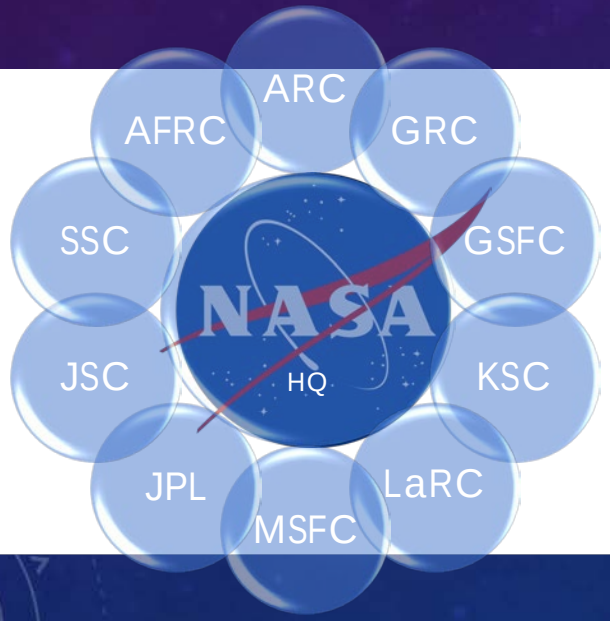
NASA's Center of Excellence for Collaborative Innovation

Center of Excellence for Collaborative Innovation

Educates NASA engineers & scientists on the value of crowdsourcing & challenges.

Makes crowdsourcing & challenges easy to use by removing/reducing barriers.

Across NASA Centers



Public Facing - Worldwide

NTL
NASA Tournament Lab

Across US Federal Agencies

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INNOCENTIVE

hero

LUMINARY LABS

Common Pool

kaggle

tongal

Crowd of 100K film makers and creatives that focus on video challenges

yet2.com

Network of 13K companies, researchers, and individuals providing technology searches

amazon mechanical turk

500K+ worker that can be inexpensively mobilized for micro tasks like training machine learning

freelancer.com

Crowd of 27M freelance workers that provide products via tasks and contests

GRABCAD

Crowd of 4.7M mechanical engineers & designers competing in CAD/Design Challenges

cOutsource

Community of 10K+ software developers/ teams that can build software.

The Center of Excellence for Collaborative Innovation

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HEOMD, NASA Headquarters

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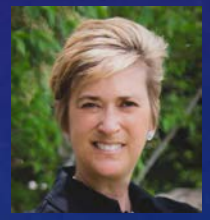

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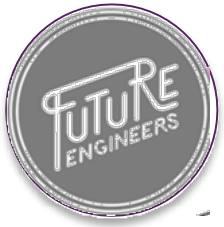
NASA's Open Innovation Landscape

All of NASA's Crowd-Based Efforts

NASA
Citizen
Science

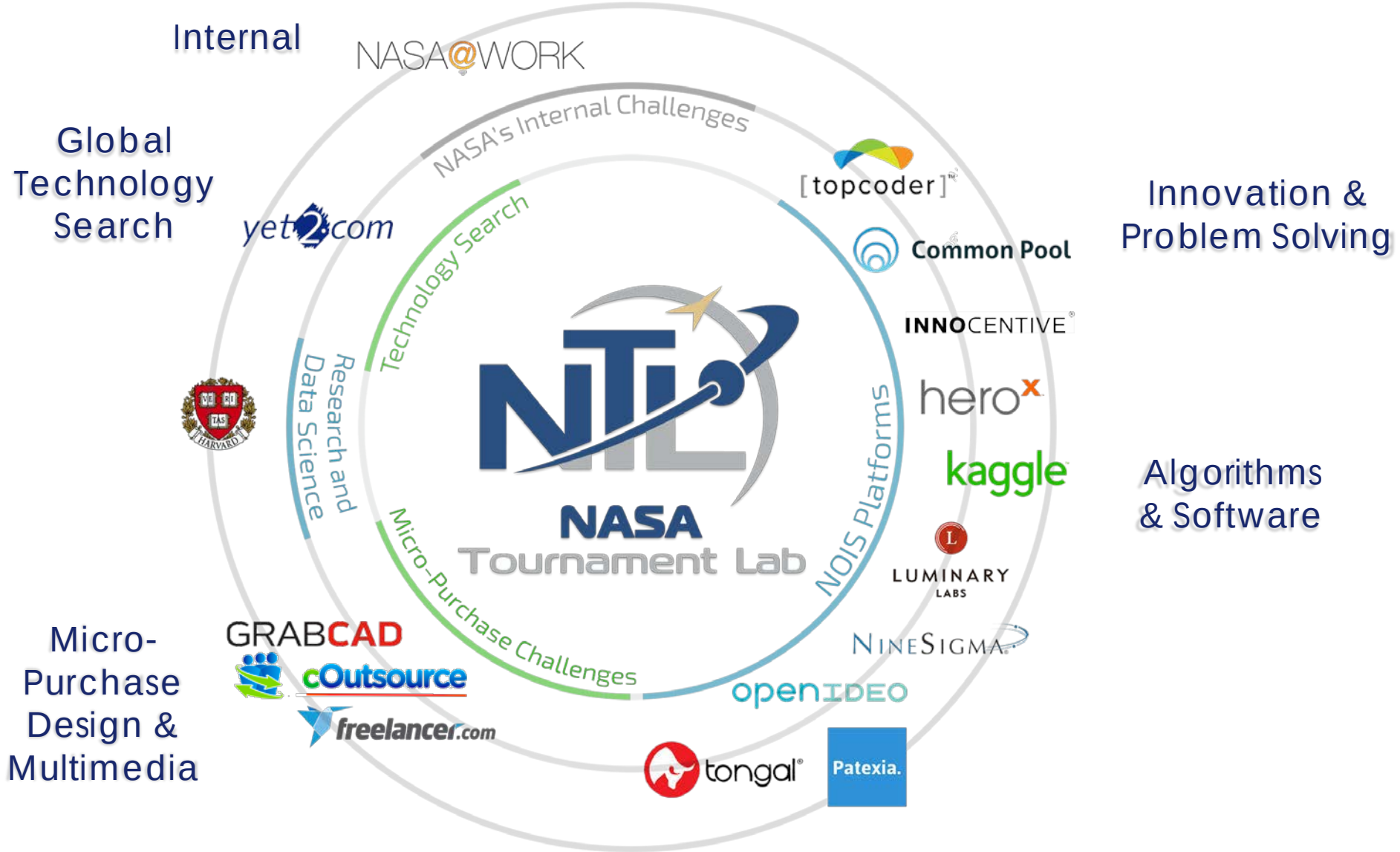
SOLVE



NASA Solve: www.nasa.gov/solve

The CoECI Toolkit

Curated Crowds Available for NASA Challenges & Tasks



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NASA's Center of Excellence for Collaborative Innovation
Open Innovation Challenge Toolkit

NASA@WORK

Enterprise Knowledge Sharing Challenges
Challenges that tap into the expertise, knowledge, and projects around NASA.

GRABCAD freelancer.com

Low-Cost Creative Design Challenges
Graphic, CAD design, idea, design, animation, video, or software.

yet2.com

Technology Searches
Worldwide search for tech. beyond what is publically visible.

NASA Open Innovation Services Contract

NTL NASA Tournament Lab
topcoder
kaggle
hero X
INNOCENTIVE
NINESIGMA
tongal
Common Pool
LUMINARY LABS
open IDEO
Patexia

Ideation Challenges
Innovative ideas on how to approach or solve a problem.

Technical Problem Solving Challenges
Innovative concepts or designs to solve a problem.

Data Science/Algorithm/Software Challenges
Development of a software app or high performance algorithm.

Video/Animation Challenge
Development of a creative promotional or instructional video.

Crowd-Based Challenge Research with Laboratory for Innovation Science at Harvard

LISH Laboratory for Innovation Science at Harvard

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NASA
Tournament Lab
nasa.gov\solve

The CoECI Toolkit

NASA's Internal Crowd

NASA Tournament Lab

NASA@WORK

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NASA@WORK Results from 8

140
Challenges

20,000
NASA employees/ contractors participating

93%
Success Rate

7%
NO Advance

55%
Incremental Advance

24%
Significant Advance

14%
Solved

95%
Would Use Challenge Again

Effective in Enterprise Knowledge Sharing

Outlet for Employees who want to be innovative and make a difference!

NASA@WORK Challenge

Determining Urine Volume in Microgravity

Found an existing prototype saving $1.3M & 3-5 years of development.

Solution already existed in a lab 300m from challenge owner.

The CoECI Toolkit

A Collection of Crowds on Contract

NASA Tournament Lab

Common Pool

hero

kaggle

tongal

INNOCENTIVE

NOIS: NASA Open Innovation Services

LUMINARY LABS

NINESIGMA

topcoder

open IDEO

Patexia.

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THE SPACE POOP CHALLENGE

A $30,000 COMPETITION TO SOURCE A SYSTEM THAT ROUTES AND COLLECTS HUMAN WASTE AWAY FROM THE BODY, HANDS-FREE, FOR FULLY SUITED ASTRONAUTS.

SPONSORED BY

NASA Johnson Space Center

150 TEAMS FROM 130 COUNTRIES

COMMUNITY MEMBERS FROM ALL 7 CONTINENTS AND EVERY COUNTRY

20,000 COMPETITORS

21 FINALISTS

5,000 TOTAL SUBMISSIONS

295,000 UNIQUE PAGE VIEWS

3 WINNERS

46 ACTIVE ASTRONAUTS (who are very relieved)

239 MEDIA PICKUPS

1 WEDDING PROPOSAL

https://herox.com/spacepoop

NASA Tournament Lab

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Secure Key Exchange Challenge

DTN

01000001 01001000

DISRUPTION TOLERANT NETWORKING

MISSION IMPOSSIBLE

topcoder

NASA Tournament Lab

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Strain Measurement of Kevlar Challenge

Challenge to find ways to measure strain in kevlar and vectran webbing used for inflatable space habitats.

$40K Challenge resulting in 3 solutions

"So simple, so elegant how could we NOT have thought of this ourselves" – Challenge Owner

INNOCENTIVE®

NASA Tournament Lab

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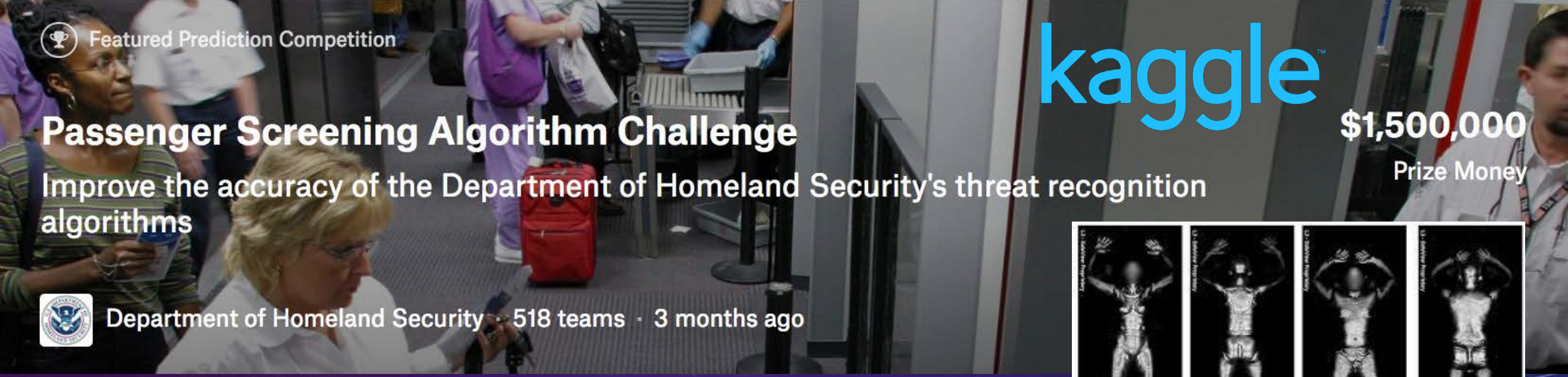
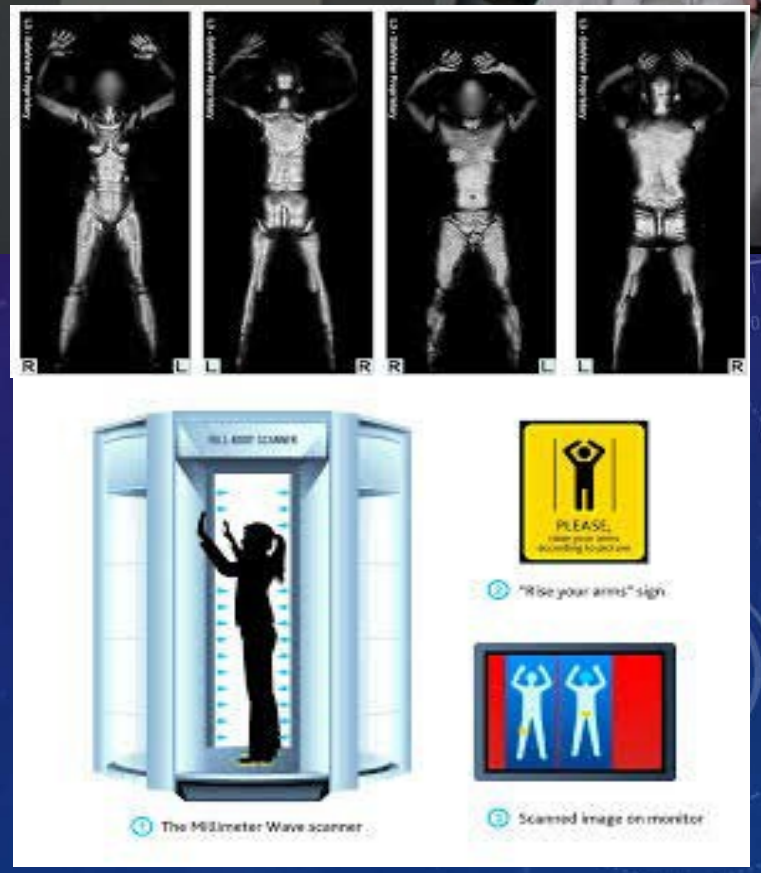


kaggle

$1,500,000
Prize Money



Challenge:

Improve the object detection algorithm for TSA's mm-Wave Scanners using machine learning.

Result:

Winning algorithm performance is estimated 98% detection rate

$1.5M in Prize Money

- 1st Place: $500,000
- 2nd Place: $300,000
- 3rd Place: $200,000
- 4th-8th Place: $100,000 each

DHS Challenge Owner:

"This will be the best $2.5M we've (DHS) spent in a long time."

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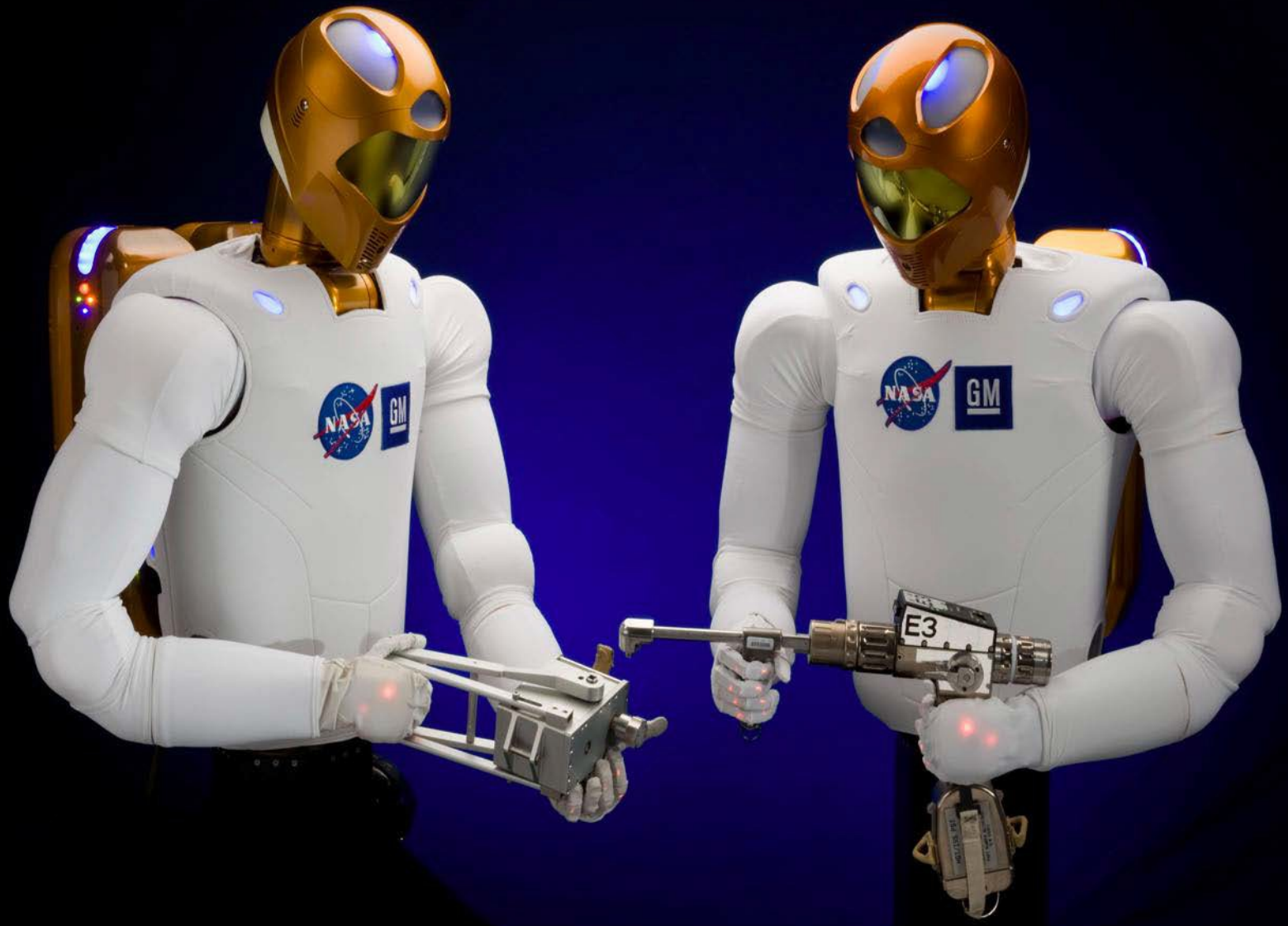
Robonaut Vision Algorithm Challenges



topcoder

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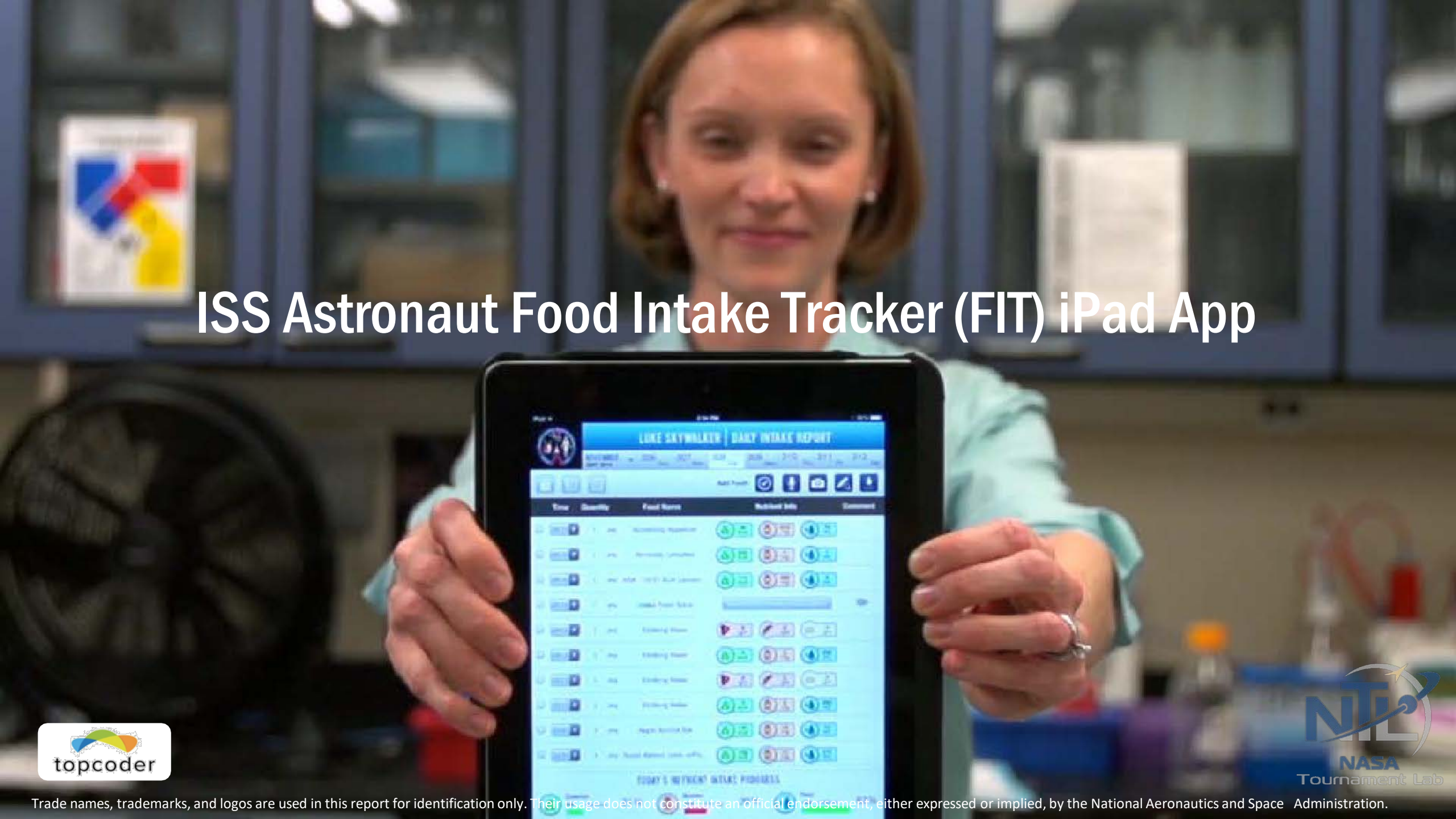
ISS Astronaut Food Intake Tracker (FIT) iPad App



topcoder

NASA Tournament Lab

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The CoECI Toolkit

Challenges on a Government Credit Card (< $10,000)

Micro-Purchase Challenges

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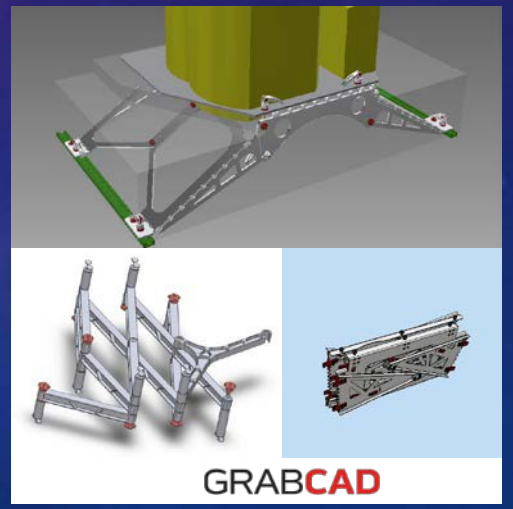
Clamp 3D Print Design Challenge
GRABCAD
492 Designs Received
$2000 in Prizes to 5 Winners
3.2M Mechanical Engineers and

Micro-Purchase Challenge Case Studies

REALM Project Video
$1500 storyboard challenge followed by a $3000 video production challenge developed a 3 minute fully CGI explanation of REALM.

Robonaut Sim Tools 3D Modeling
Developed 14 photorealistic CAD models for $1100 (est. $12,000 savings). 300 submissions across 14 10 day challenges.

Astronaut Smartwatch App
$1500 User Interface challenge resulted in 245 UI submissions. $3000 SW Development Task implemented functional prototype.



Experiment Attachment System
$3500 challenge resulted in 50 submissions. 5 winning designs provided novel and innovative approaches to meeting design constraints.

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The CoECI Toolkit

Network Technology Search Contract

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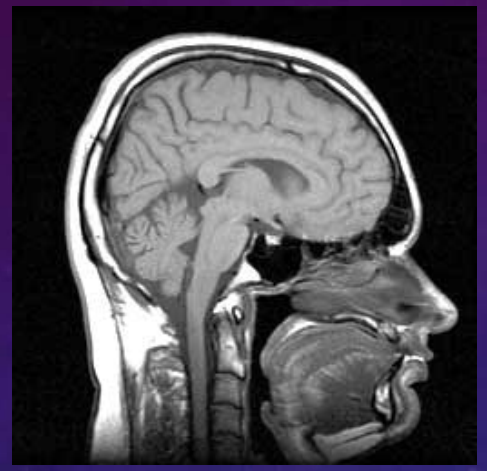
Technology Search Case Studies

Intracranial Pressure Monitor

Found 3 solutions (1 resulting in a partnership). "Very pleasantly surprised that this process exposed so many potential solutions with such wide breadth and depth."



Radiation Tolerant Graphics Processing

Identified 50 targets and resulted in 5 high interest targets. Expanded new/ relevant info about vendors that were already known.

Lander LIDAR Terrain Mapping

Identified 50+ leads Provided both a more complete understanding of the technology landscape and 8 high interest targets that may be leveraged.

Monitoring Water and Biocides

Identified 61 leads (over 2000 hits) – Resulted in 8 active leads. Owner found this method more affordable than SBIR effort and as valuable.

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CoECI's Challenge Experience

304 Challenges Total Completed or in Progress (with 15 more in formulation)

63 Technical Solutions

40 NASA@WORK
13 INNOCENTIVE
4 NineSigma
1 Common Pool
1 hero
1 Luminary Labs
1 topcoder
1 freelancer.com

57 Ideation

40 NASA@WORK
7 INNOCENTIVE
5 topcoder
3 hero
1 Luminary Labs
1 freelancer.com

2 Consulting Services

1 NineSigma
1 Common Pool

44 Software/Apps

31 topcoder
APPLAUSE
7 NASA@WORK
3 freelancer.com
2 cOutsource
1 INNOCENTIVE

20 Algorithms

16 topcoder
1 kaggle
1 INNOCENTIVE
1 NASA@WORK
1 Luminary Labs

20 CAD Modeling/ Mechanical Design

17 freelancer.com
2 GRABCAD
1 NASA@WORK

27 Technology Survey

23 yet2.com
4 NASA@WORK

26 Graphics/Designs

13 freelancer.com
9 NASA@WORK
4 topcoder

15 Videos

6 tongal
5 NASA@WORK
2 freelancer.com
1 INNOCENTIVE
1 hero

30 Other

29 NASA@WORK
2 freelancer.com

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NASA Tournament Lab Challenges by the Numbers

300+ Challenges

90+% Successful

80+% Result in Cost Savings

Scaling Up an Open Innovation Program

NASA Prizes and Challenges Program Overview

A Brief History of Program Creation

Scaling Up CoECI's NASA Tournament Lab (NTL)

2008 NASA Human Health and Performance Industry Benchmarking

2009 NASA Human Health and Performance Conducts Pilot Challenges (Innocentive & Yet2 Contracts)

2009 NASA@work launched (Innocentive contract)

2010 NTL Contract with Harvard Begins (Subcontract to Topcoder)

2011 Contract with Yet2 for Tech Search

2011 NASA CoECI Launched

2014 NASA SOLVE Launched

2014 Re-Brand of NTL to include all of CoECI toolkit

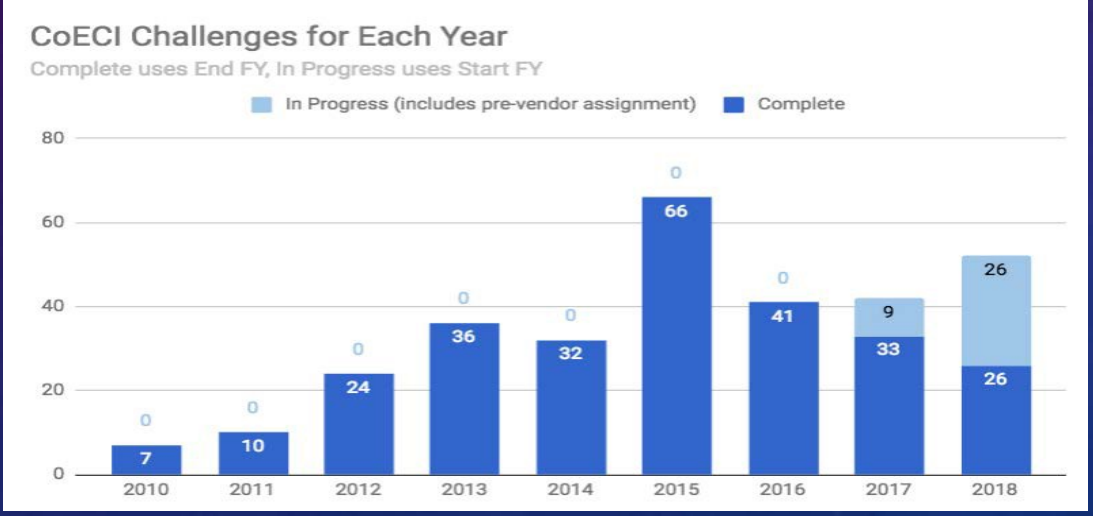
2015 NOIS Contract Awarded to 10 Vendors

2015 Micro-Purchase Challenges Pilot

2017 OITS contract to Yet2 for Tech Search

2018 NIICE Contract for NASA@work (TBD)

2020 NOIS2 Contract Planned



Understand and Focus the Goals for Open Innovation

Get and Maintain a Senior Leadership Champions

Agree on Specific Goals with Leadership

- ❑ Solve problems and bring innovative solutions that are valuable to the organization
- ❑ Make workforce more innovative
- ❑ Find incremental improvements
- ❑ Find new products, markets, or opportunities

Know the Customer

Problem owner vs solution owner vs innovator

Consider their world

Heads down, no time for disruption, limited resources

Is external innovation a threat?

Build an OI Team with the Right Skills

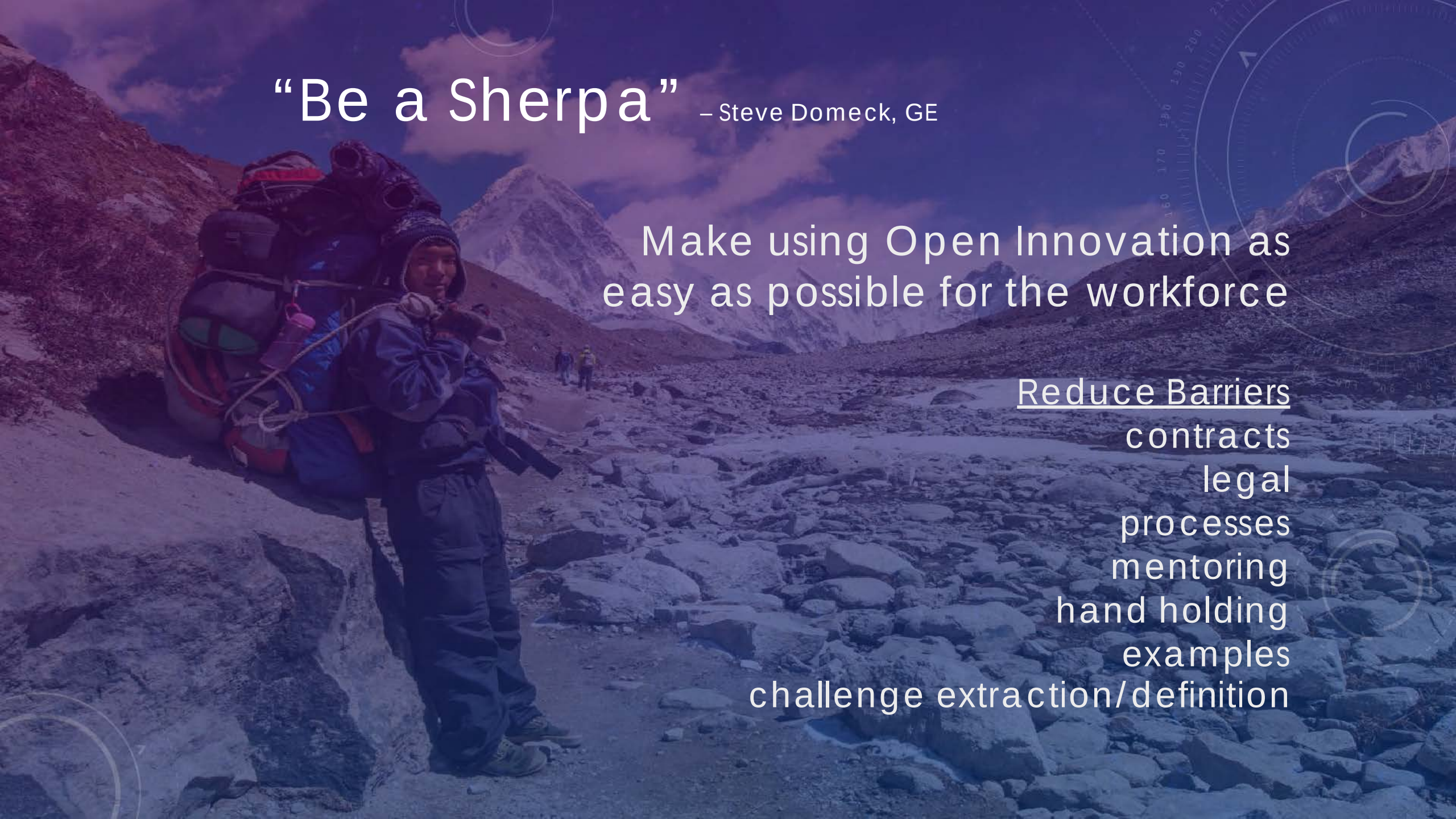
Knowledge & Passion for OI

Customer Domain Expertise

Broadly Connected

Specific Skills

- facilitation
- contracting
- legal/IP
- marketing/sales
- metrics/data analytics



“Be a Sherpa” – Steve Domeck, GE

Make using Open Innovation as easy as possible for the workforce

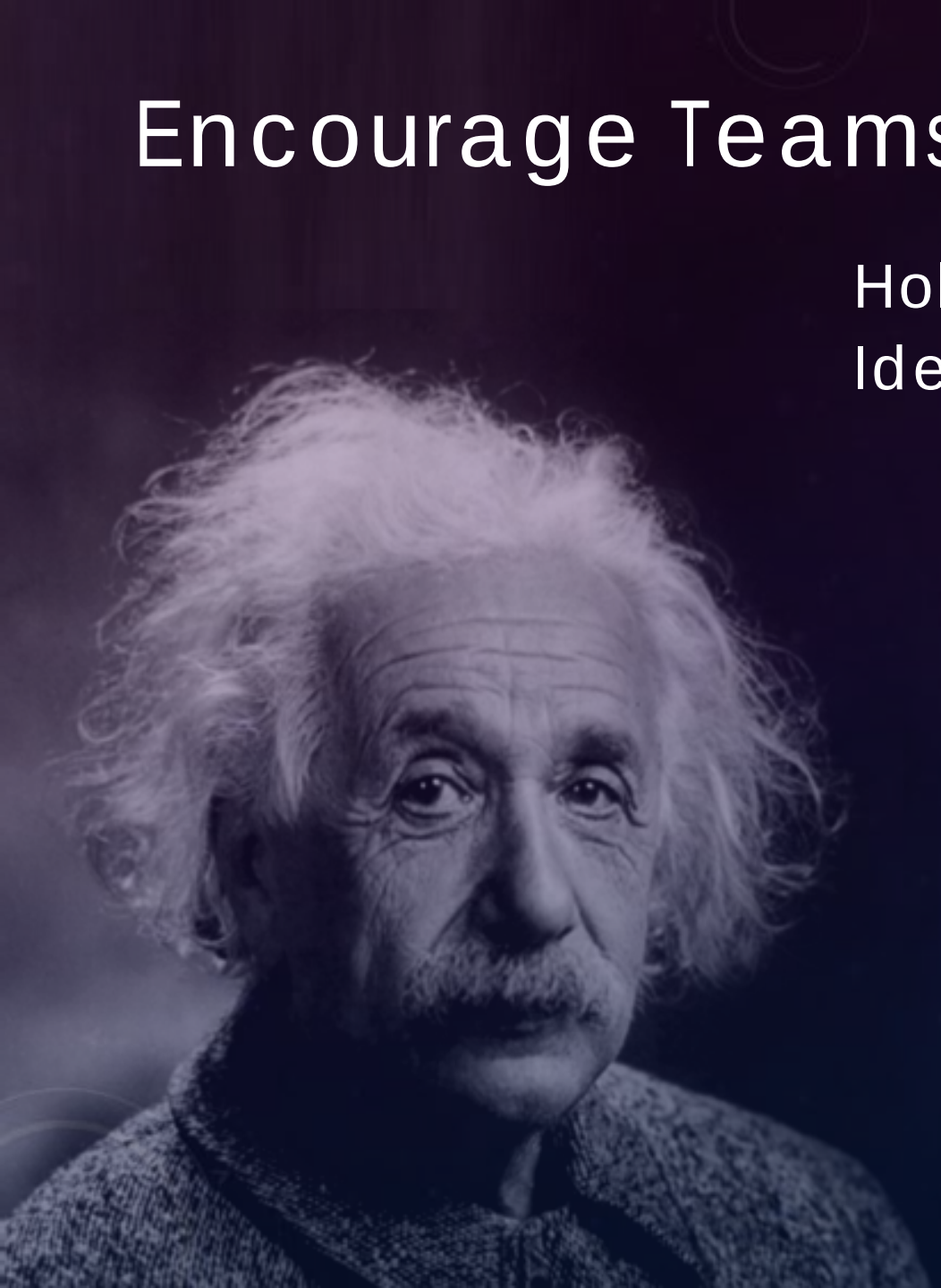
<u>Reduce Barriers</u>

contracts
legal
processes
mentoring
hand holding
examples
challenge extraction/definition

You Have to Sell It

- Marketing is NOT Sales
  - Marketing is important
    message out and raise
  - Sales is required to get
    - Show them how it app
    - Provide affordable op
      funding
    - Let them “Test Drive” i

Encourage Teams to Own the Problem



Hold Workshops to Facilitate Problem Identification & Decomposition

Strategic goal setting to create bold gaps

Decompose problems to find most valuable challenges suited for OI.

“If I were given one hour to save the world, I would spend 59 minutes defining the problem and one minute solving it.”

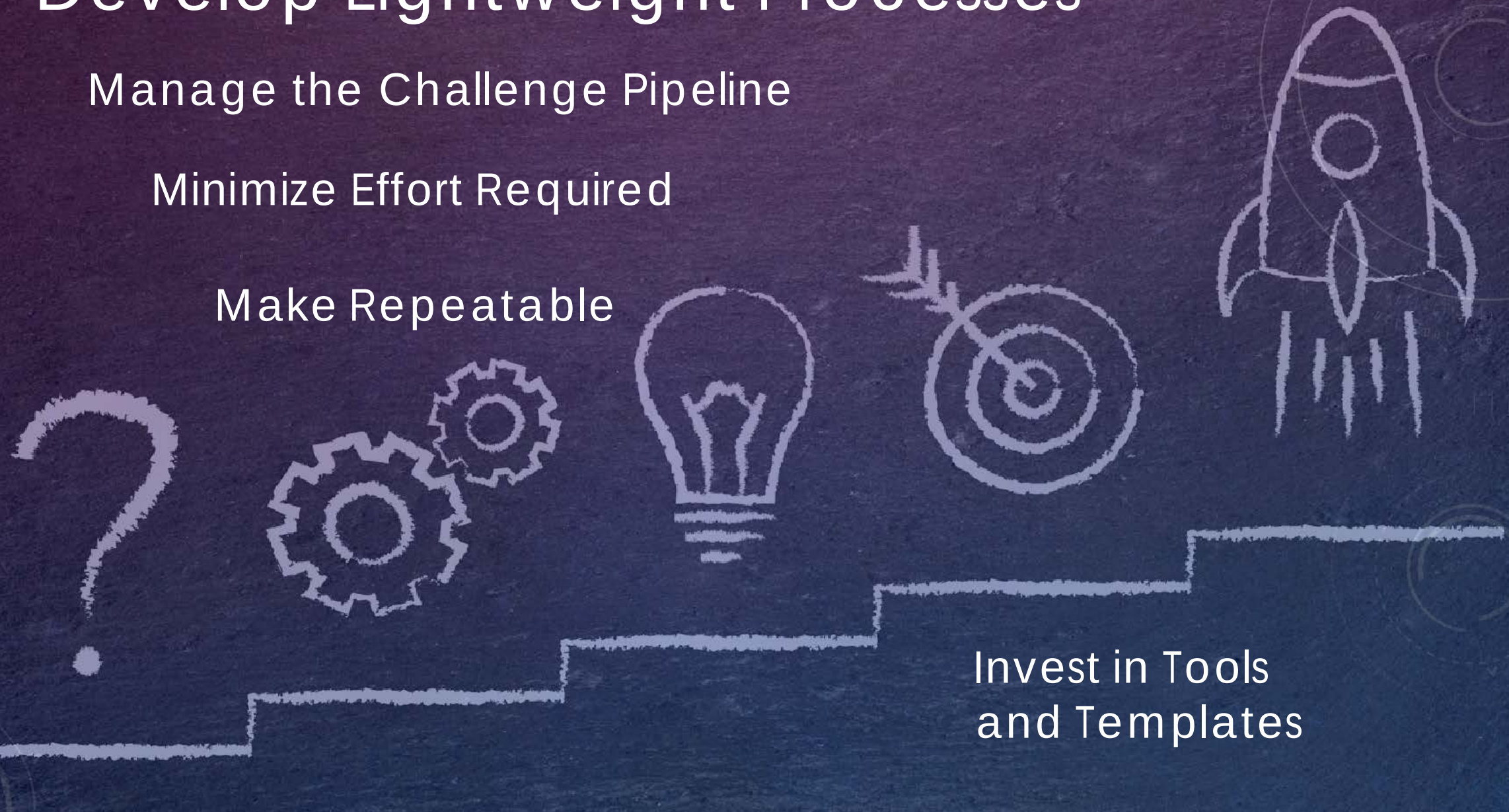
Albert Einstein

Develop Lightweight Processes

Manage the Challenge Pipeline

Minimize Effort Required

Make Repeatable



Invest in Tools
and Templates

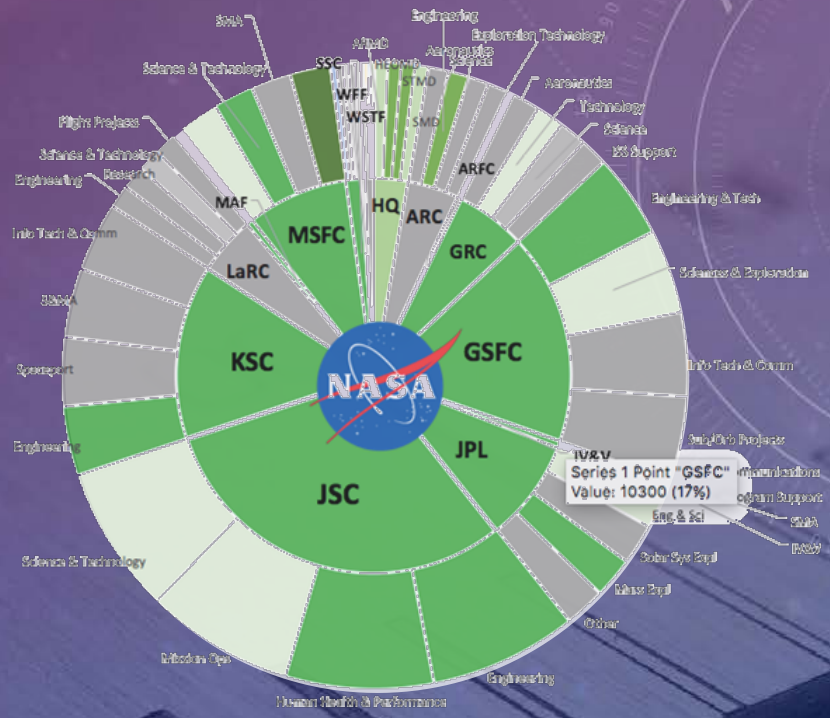
Track and Measure

Track

Organizational Infusion

Leads/Engagements

Challenge Lifecycle



Measure Value and Impact

Savings Over Est. Cost Using Traditional Methods

Calculated Lifecycle Cost Savings

Value of Work Performed in Challenge

ROI

Return on Investment

Invest in Curating an Internal Community

Provides a bulkhead for innovation culture change

Signals organization is open to new ideas

Leverage the passion already in the organization

Provides a framework for the innovation process

Beware of “suggestion box” ask for new ideas

Keep Up with What is Possible

Open Innovation landscape is still evolving

Lots of emerging lessons and best practices

New communities, tools, and vendors

Experiment or Pilot New Offerings

Discussion & Collaboration