

Organizational Design of University-Facing Industry Research Organizations (UFIROs)

UIDPVirtual 2020

Chris Ramming, VMware

Gabriela Cruz Thompson, Intel

March 24, 2020

UIO

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Intel

*Organizational Design of University-Facing
Industry Research Organizations (UFIRO)*

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Strengthening
University-Industry
Partnerships

Organizational Design of University-Facing Industry Research Organizations (UFIROs)

Chris Ramming, VMware

Gabriela Cruz Thompson, Intel

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March 24, 2020

What is a University-Facing Industry Research Organization?

(a.k.a. UFIRO)

A corporate organization specifically chartered to engage with academia on external research collaborations as an element of a broader innovation strategy

When a company begins to recognize external research interactions as a formal part of its innovation strategy, it will often create a research-oriented organization to engage with academia.

This organization is generally distinct from, but may interact with, other university facing company functions, such as recruiting, corporate social responsibility, diversity & inclusion.

This organization is also generally distinct from the internal research group, although it may interact closely with an internal research group to advance its goals.

Discussion goals



- Industry perspective
 - Exchange ideas on how to construct effective UFIROs
 - Build a community of practice
 - Seek university input on design choices
- University perspective
 - Understand how companies are thinking about UFIROs
 - Provide perspective on which organizational structures work best
 - Consider IFUO design principles given industry practices

Create foundations for a UIDP “Quick guide”

Outline



- Intro
- Case study: Intel
- Case Study: VMware
- Review: Key Design Axes
- Discussion

A broad design space for UFIROs



- **Staffing philosophy** Dedicated vs “volunteer”
- **Reporting:** centralized vs BU-embedded
- **Skill set mixture:** program management vs research
- **Research infrastructure:** Company owned vs university-owned
- **Budget ownership:** centralized or BU-driven
- **Funding:** ratio of internal to external
- **Program types:** small scale vs large-scale
- **Leadership:** company-driven vs academia-driven
- **Principals focus:** evangelization vs translation
- **Talent:** program management vs research leads
- **Motivation:** philanthropy vs “float all boats” vs proprietary advantage
- **Portfolio/risk profile:** roadmap-aligned vs off/beyond/alongside roadmap

What are key UFIRO design axes & best practices?

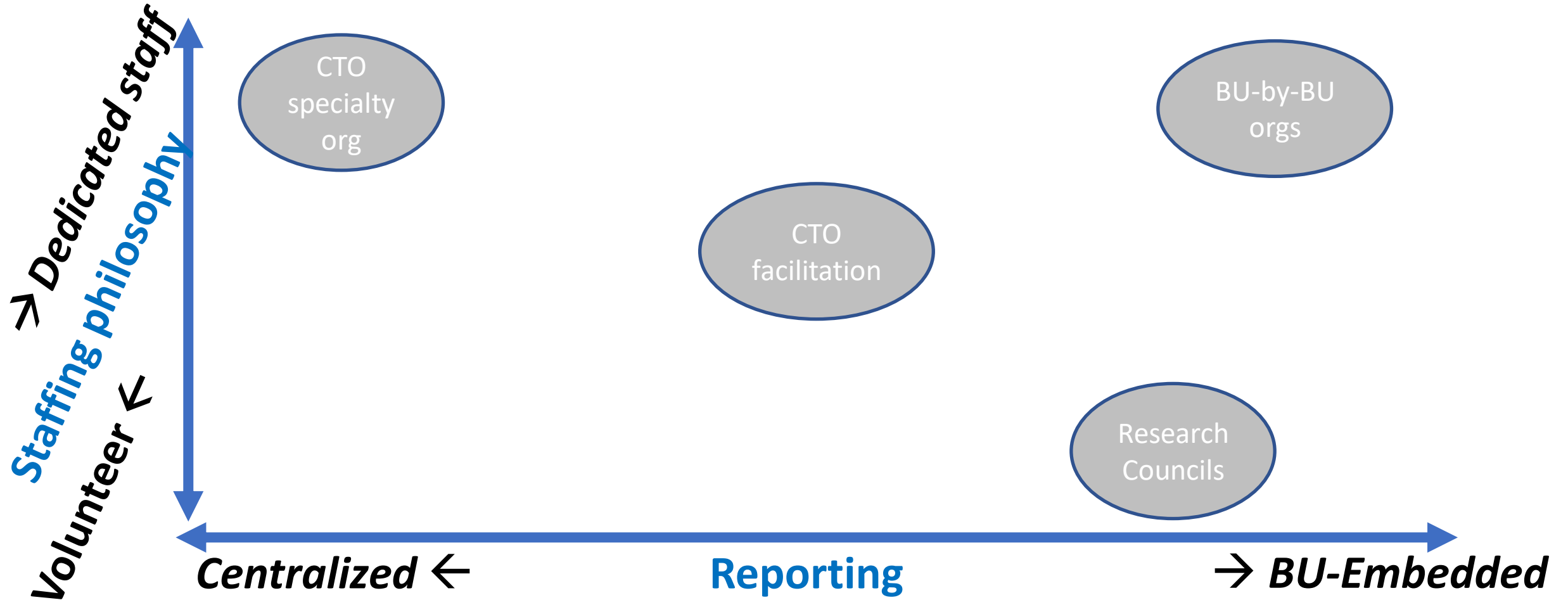
Typical activities and program types



- Research program development
- Individual faculty engagements
- Center/affiliate program engagements
- PhD fellowships
- Intern programs and recruiting
- Early-career and diversity initiatives
- Material transfer
- Training
- Curriculum development
- Project classes
- Conference funding
- Affiliated faculty
- Prizes and awards
- Internal community building
- Etc

Which UIIRO program types are proving most impactful?

Example UFIRO design choices



Many UFIRO structures are possible even in 2 dims

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Intel Corporate University research

Gaby Cruz Thompson

University Research and Collaborations

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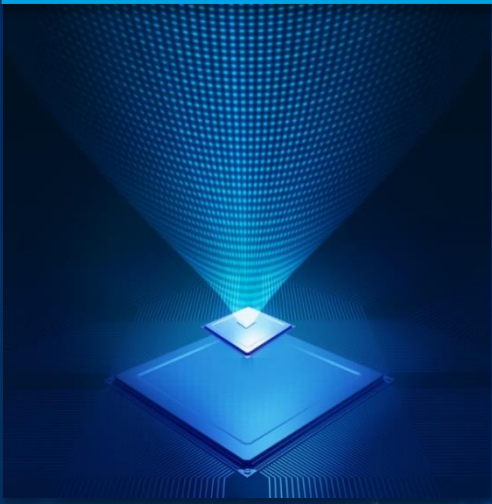
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Intel's Research capabilities

COMPONENTS

ENABLING
MOORE'S LAW



DEVELOPING
NOVEL
INTEGRATION



INTEL LABS

ENABLING
FUTURE
PRODUCT
CAPABILITIES



ANTICIPATING
FUTURE INTEL



UNIVERSITY RESEARCH

Expanding the Frontier, Future Intel Collaborators

Intel Labs Research SCOPE

Trust
security
privacy

Novel Sensing
technologies

New
compute
models

Future
memory
& storage

Efficiency in
Programm
ing
&
Design

Future of connectivity

Future of Software

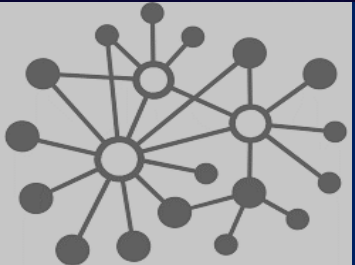
INTEL LABS Methodology



Corporate University research



Focused Problem-Solving



Multi-disciplinary Community



Solving Industry Scale Problems

Corporate Research Council

Intel's Strategic University Investment

Filling the technology pipeline with new promising ideas and future talent.

Process

Driven

Materials & Patterning

Devices

Manufacturing

Software & Security

Architecture & CAD Circuits

Market

Driven

Systems Integration

Memory

Connectivity

Programmable Systems

Artificial Intelligence

Cryogenic Computing

Opportunity

Driven

Emerging Technologies

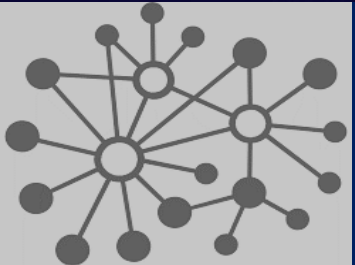
Talent Development

Business Development

Corporate University research



Focused Problem-Solving



Multi-disciplinary Community



Solving Industry Scale Problems

Seeking global perspectives

Context Aware Wireless
Autonomous Systems (WAS)

U Penn & MIT

Networking Edge Computing
(NEC)

UC Berkeley

Backend CMOS

NTU, U of Michigan

Mapping the Mind

Princeton

Autonomous & Resilient
Systems (CARS)

TU Darmstadt, +

Systems approach to AI (DSAIL)

MIT

Network on Intelligent Systems
(NIS)

Multiple

PMOS Solutions enable 5G

Cornell & MIT

Continuous Edge Learning &
Intelligence

Harvard, +

Intelligent Automated
Connected Vehicles (IACV)

Tsinghua U, others

Probabilistic Computing

6 Institutions

IA Side Channel Attacks
& Defenses

20+ PIs

Functional materials and
devices beyond 3 nm CMOS

UC Berkeley, CIC Nanogune, CNRS

Intel Neuromorphic Research
Community

80+

Safe Automated Vehicles (SAVe)

Fortis (TUM)

...and may other communities

Partnerships with NSF

Graduation YR

2019 Cyber-Physical Systems Security & Privacy –CPS

2018 Visual & Experiential Computing –VEC
AR/VR Program

2020 Computer Assisted Programming for Heterogeneous Architectures - CAPA

2020 Information-Centric Networking in Wireless Edge Networks - ICN-WEN

2022 Foundational CPU Microarchitecture –FoMR

2022 Machine Learning for Wireless Networking -MLWiNs

2020 New centers

Processing Data

- New Materials to Continue Technological Progress
- Next-Generation Lithographic Patterning to Enable Better, Faster Chips
- 3D FPGA Technologies to Bring Efficient Data Processing to the Edge

Securing Information

- Securing Edge Ecosystems to Ensure Data Privacy
- Frontiers of Cryptography to Secure Computing in the Quantum Era

Programming Efficiency

- Machine Programming to Automate Software Development

Desire Outcomes

Proof of performance metrics



1 pts

- Publications
- Patents
- Policies / Standards
- New Alliances
- Ecosystem Development

Beneficial



2 pts

- Internships
- Identified Showstoppers
- Intel awareness/ Collaborations

Valuable



3 pts

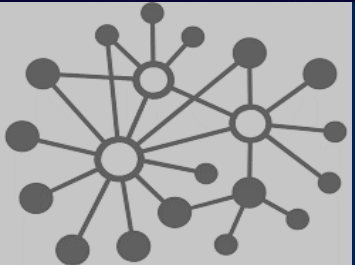
- Full-Time Hires
- Demonstrated Viability
- Setting a New Direction
- Tech Transfer into Intel
- Tech transfer into Academia

Worthwhile

Corporate University research



Focused Problem-Solving



Multi-disciplinary Community



Solving Industry Scale Problems

15 JUMP + nCORE Sponsors

Communications, Memory, Computing, Sensing & Actuation

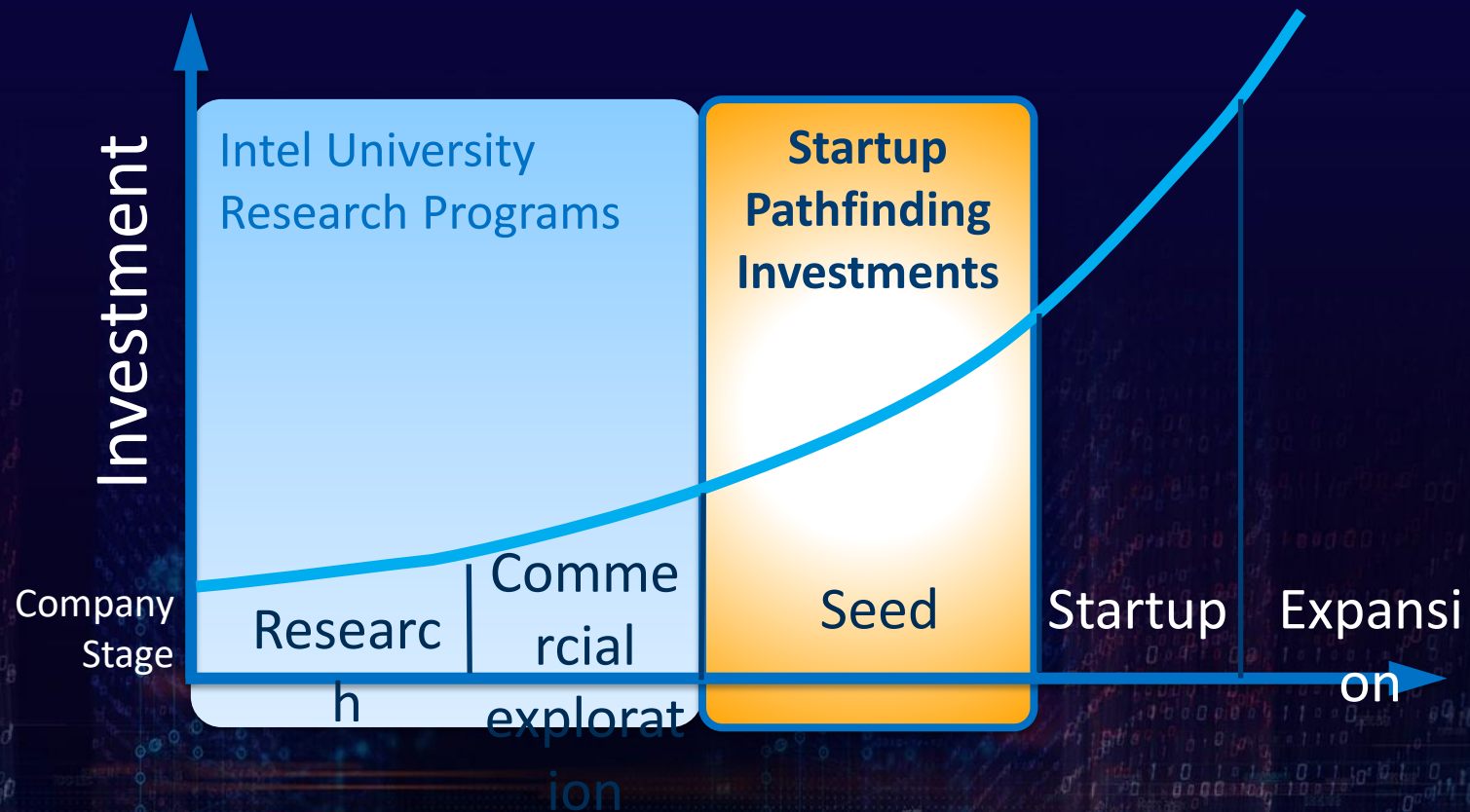


Faculty and industry making new connections. Sharing insight and perspectives.

Helps to focus on and solve the right problems for the future of computing.

Collaboration beyond research

Intel Labs + Intel Capital





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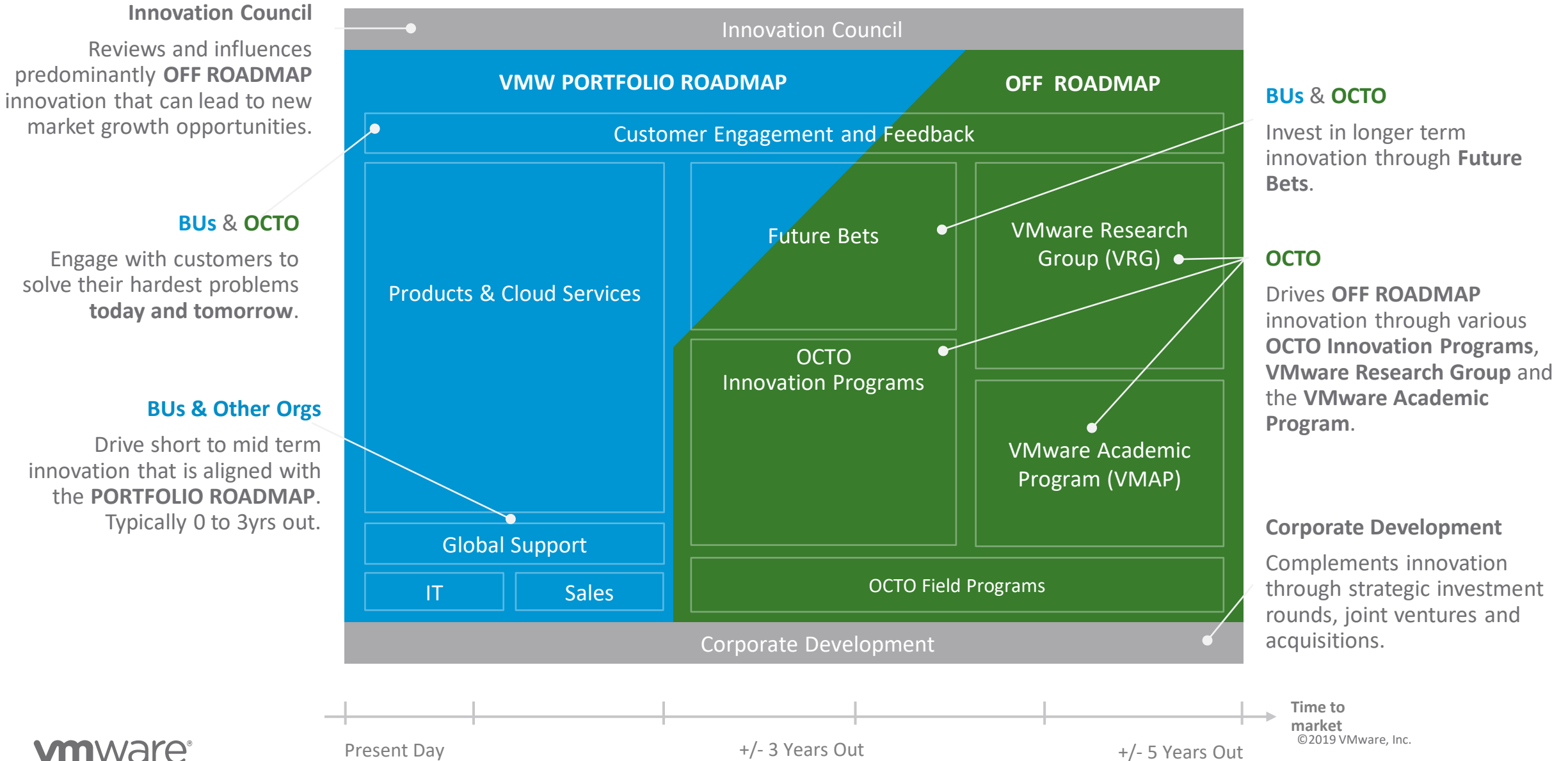
VMware External Research

Key organizational design aspects

Chris Ramming

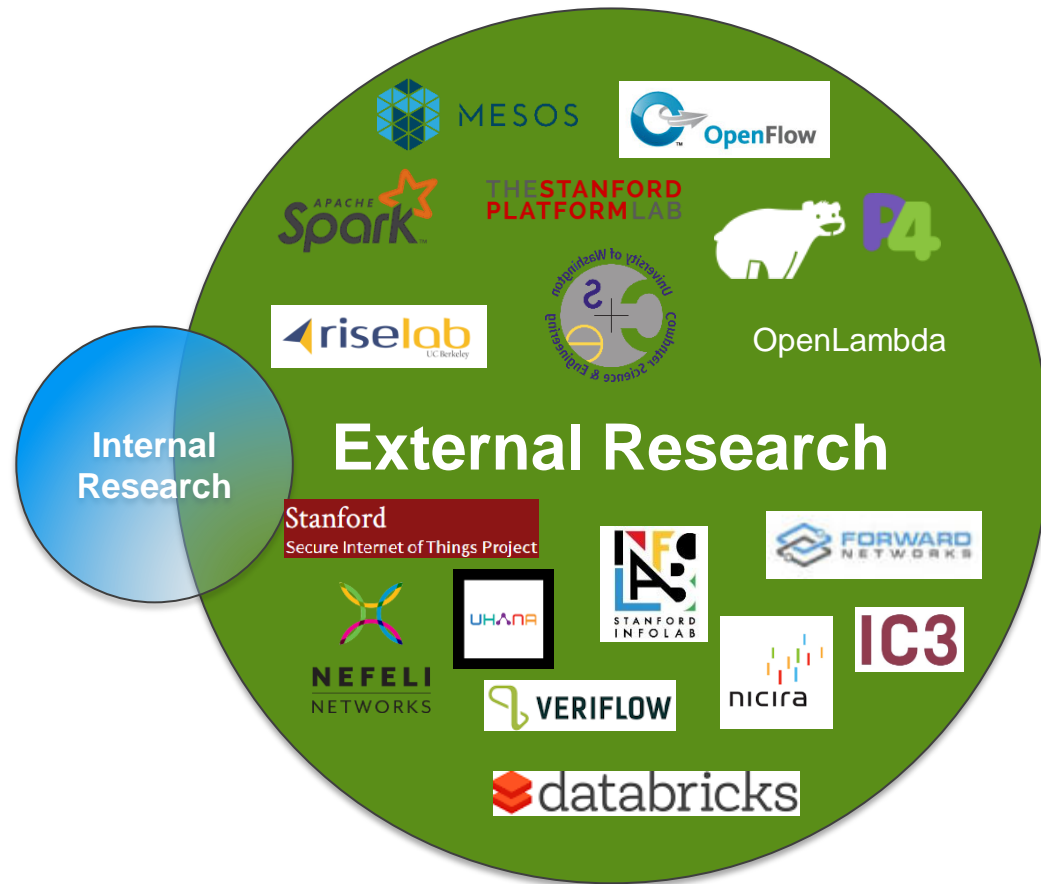
Senior Director, Research & Innovation

VMware Innovation Programs



VMware Academic Program (VMAP)

Focused on External Research: *What's the Next Disruption?*



Scout

external thought leaders and leading research centers.

Connect

understand technical gaps and opportunities.

Accelerate and transfer

key ideas.

Influence

Through thought leadership.

VMware Academic Program (VMAP)

Key components



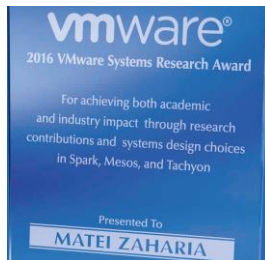
Large-scale research center engagements



*Individual faculty engagements;
PE grant program*



*Government engagement;
Association participation*



*VMware Systems Research Award;
Early career faculty grants*



*Conference and workshop sponsorships;
Events and workshops*

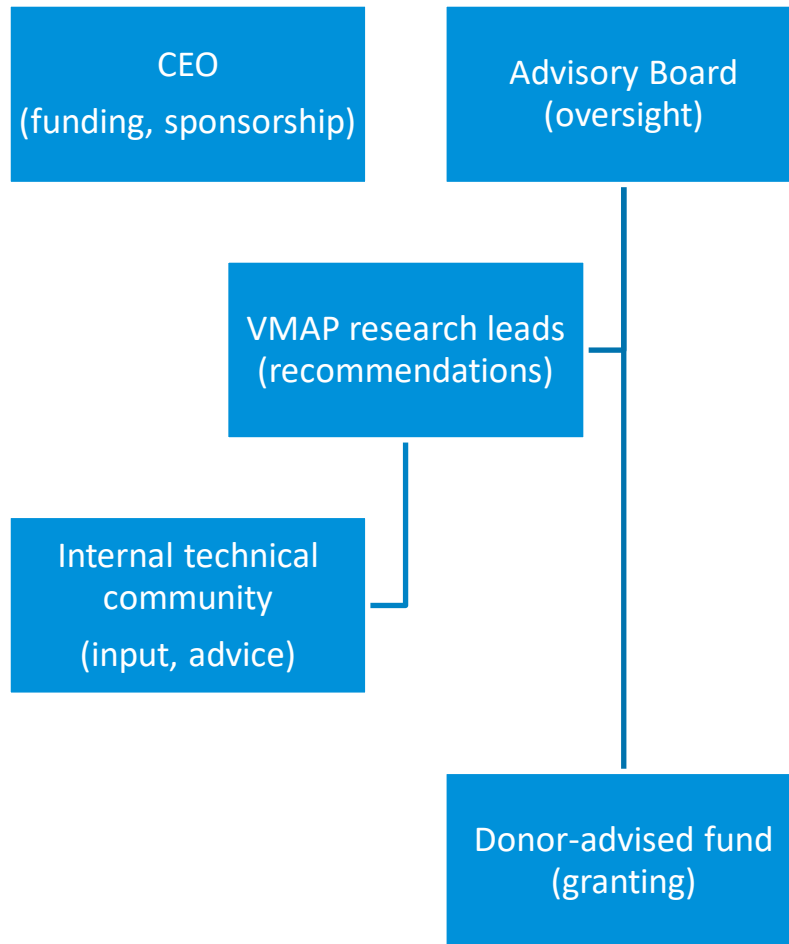


Academic software licensing program

A full-spectrum interface to the external research community

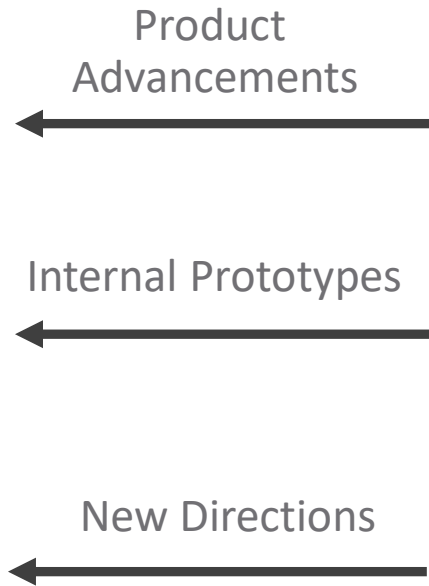
Governance & Funding

A centralized model

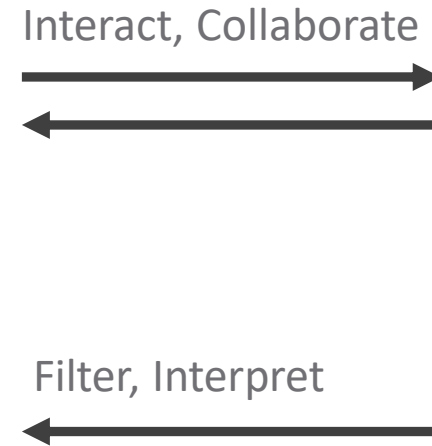


- Budget originates with CEO office
- Quarterly program reviews with CEO
- Advisory board oversees recommendations (quarterly)
- Granting via Donor Advised Fund

VMware Technical Champions Model

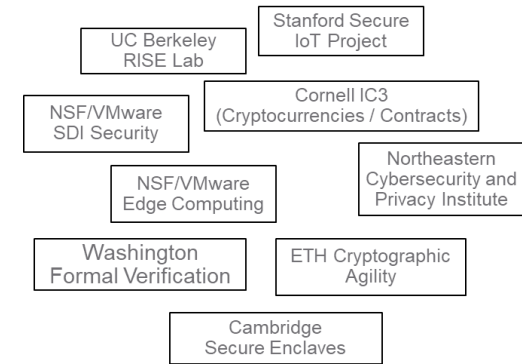


Internal



External

Research Centers



University Professors

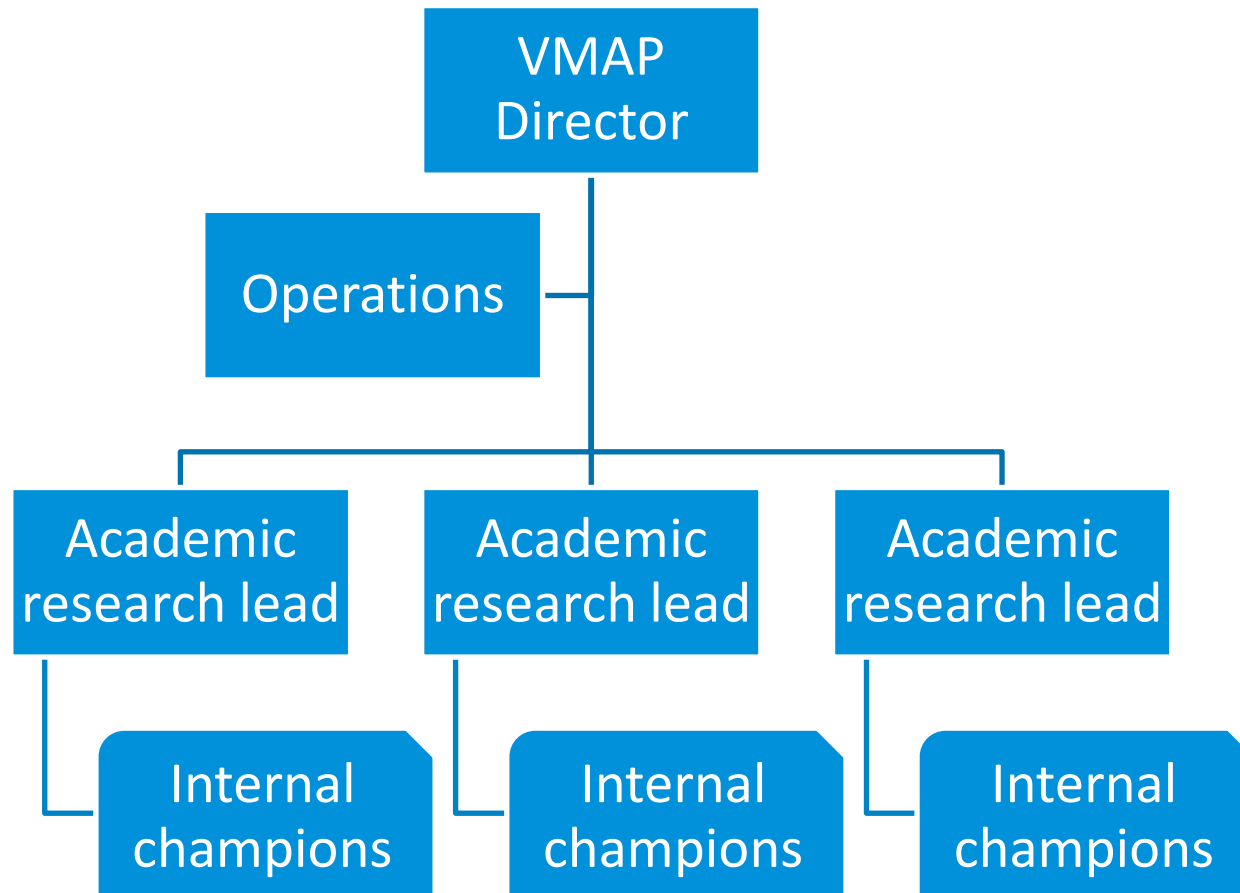


Academic Outcomes



Staffing philosophy

Portfolio partitioned across academic research leads



- Each ARL “owns” areas of the portfolio, including portfolio creation, community building, strategic initiatives, and impact
- Operations drive programmatic
- Champions engage with faculty & students

Academic Research Lead Role

A challenging role to fill

Responsibilities

Identify key disruptive early research ideas and thought leaders around the world

Inspire VMware's technical community to engage with those leaders and projects

Accelerate and help transfer key ideas to and from VMware; help to shape the computing industry in exciting new directions

Articulate new research frontiers to the external community and build energy around new opportunities

Skills / requirements

Advanced degree/experience in relevant systems research area

Direct experience organizing and leading impactful U-I collaborations

Willingness to travel

Demonstrated talent and social/organizational acumen in creating links across organizations and operating as a "connector"

Excellent written and verbal communication skills

Diplomacy and the ability to influence people at all levels across a broad variety of job functions

Excellent organizational skills to juggle many tasks without losing sight of the highest priority tasks

Strong presentation skills

Key organizational metrics

Portfolio discipline and execution

- As measured by engagement maturity and coverage
- Engagement maturity model (logarithmic difficulty scale!)
 - 0: Identification
 - 1: Exposure
 - 2: Interaction
 - 3: Collaboration
 - 4: Impact

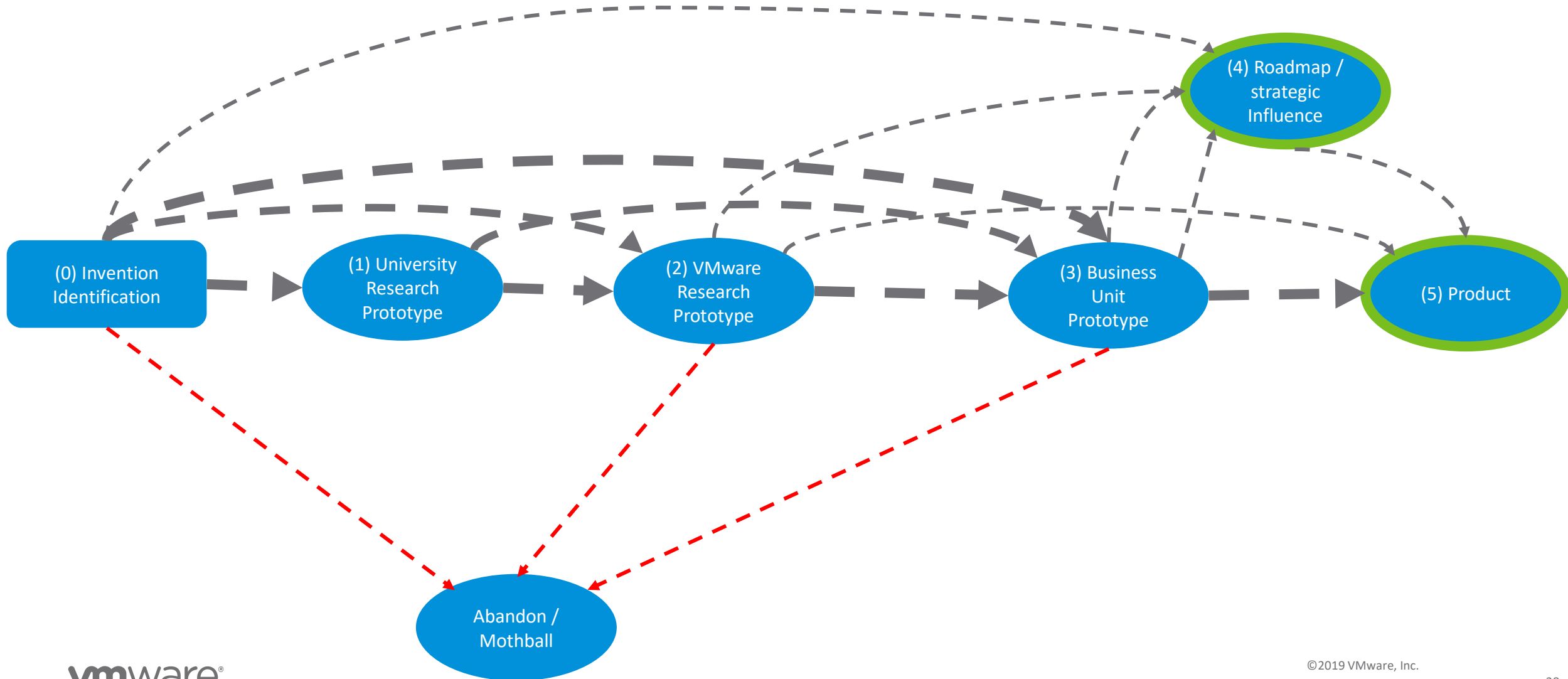
Community building

Execution of strategic initiatives

Research translation

VMAP Model of Research Translation

A dashboard of emerging opportunities



Discussion

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Design axis: metrics and measurement



Measures of Effectiveness

- Meaningful inventions / IP?
- Technology translation?
- Evangelization?
- Employee engagement?
- Internal awareness of R&D advances?
- Hiring?
- Joint publications?
- Surprise avoidance?
- Coverage completeness/depth?
- PR?

Measures of Performance

- Funding amplification?
- G&A overhead as a % of R&D?
- Tax efficiency?

Metrics and measurement help drive & justify UFIROs

Design axis: governance



Program governance

- Strategic direction
 - Advisory boards – internal/external
 - Research leads
- Internal coordination
 - BU representation / Sponsorship
 - Internal research groups
- Spending decisions
 - Centralized
 - BU-driven
 - Co-funding
- Accounting and finance
 - Spending authorities
 - Checks and balances

Engagement governance

- Proposals
 - RFPs vs inbound proposals
 - Topic selection
 - Recipient selection
- Research leadership
 - University PI vs Industry PI vs Joint
 - Investigators + program managers
- Strategic direction
 - Advisory boards
- Engagement processes
 - Reporting
 - Renewals

Governance and responsibility are intertwined

Design influence: theory of tech. translation



From universities to companies

- Joint R&D
- People transfer
- Traditional technology transfer (IP)
- Corporate development / M&A
- Internal incubation

From companies to universities

- Strategic perspective
- Problem formulation
- Product donation
- Data sources
- Concept evangelization

Design is heavily influenced by translation approach

Design Axis: Funding mechanism



Internal funding

- Centrally budget
- Decentralized (BU-driven) budget
- Hybrid

External funding

- Government partnerships
- Direct government funding

Tax and R&D credit efficiencies

- Opex funding
- Donor-advised funds

Granting options

- Gift funding
- Contracts

Funding approach can influence organizational design

Approaches and implementation:
toward a maturity model of UFIROs

Should UIDP launch an effort to provide best practices and guidance to companies (what about the university side?)

Starting a UFIRO

For companies that do not yet have one: help with first steps

Growing a UFIRO

For companies that already have a UFIRO: taking it to the next level

Improving a UFIRO

For companies with well established U-I organizations: fine-tuning

Discussion



- What are your design choices & best practices?
- What are your open challenges and issues?
- What could/should UIDP do to help?

Design Axis: Synergies across U-I interfaces



- UFIRO (research focus)
- HR (recruiting / talent focus)
- Corporate social responsibility (education, diversity focus)
- Consulting, co-employment (talent focus)
- Government engagement (technology strategy focus)
- University relations (coordination focus)

Are there useful overall design patterns and practices?

Interested in U-I Partnerships?

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Strengthening
University-Industry
Partnerships

Member
Webinar

WEDNESDAY,

APRIL 8, 2020

12 to 1 p.m. EDT



Jim Bray
Northwestern
University
Moderator



How Companies Approach Academic Research Engagement in these Disruptive Times

[Join us](#) to learn how our industry members, in diverse sectors, are evaluating and reframing their current approaches to academic collaborations.

Panelists



Gaylene Anderson
Boehringer Ingelheim
Pharmaceuticals, Inc



Kent Foster
Microsoft



Austin Kozman
PepsiCo