# USC Panel Discussion
# Academic Research Centers & Industry
# Can they work together

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# Definitions (In Defense of Stereotypes)

- Academic: That person with extraordinary ability to think deeply, persistently and productively about a topic and commensurate inability to profit from it.

- Industrialist: That person who's ability to focus on a given topic is exponentially proportional to his potential to profit from it

# Definitions (The Humorless Art of Pedantry)

- Academia is the community of students and scholars engaged in higher education and research [1]
  - Academia: Fully Accredited, Degree Conferring, Tertiary Education Institutions (College, University)
  - Not addressed – Vocational Institutions, Think Tanks, NGO and Government Sponsored Independent Research Institutions, Clinical Trials

- Industry :The production of an economic good or service within an economy.[1] Industry is used to mean a productive activity in any sphere of life. Film industry, communication industry and advertising, etc are examples of industries [1].
  - Industry: US Based Fortune 500 Publicly Traded Companies.
  - Not Addressed: Private institutions, Non-Profits, 501Cs, Philanthropy.

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# Questions before the panel (The Art of Naval Contemplation)
## A Reptilian Quick Guide Book

1. What are the benefits an industry partner would like to get from a research center?

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3. What are the potential conflicts?

4. What are the risks and threats in these partnerships?

5. What are the differences between research in academia and industry, and how they can complement each other?

6. What are the successful collaboration models? Can they be readily copied?

- Carnac the Magnificent

- $$$, Jobs

- Who Owns What

- Academic Illness

- Fame vs Fortune

- KUSA

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# What are the benefits an industry partner would like to get from a research center?

- What benefits should industry derive from university research centers

- (Ray Kurzweil)
  - Vetting Possible from Impossible and Gradation of Probabilities
  - Long Term Development Options Form, Fit, Function (Process, Product)
  - Validation & Expansion of Technology Scope
  - ROI

  - Questions
    - What aspects of Industry are sustainable
    - What are the basis, scope and implications of IP ownership

# What are the benefits a research center would like to get from an industry partner?

- You tell me

- Some Educated Guesses
  - Money
  - Grounding  (Short Term Trends/De-limiters/Value 3-5Y)
  - Realization/Commercialization
  - Career Opportunity

  - Questions
    - Philosophical Imperatives
    - Who drives Who
    - Collaborative Research (Peer to Peer ARC)
    - ARC Structures and Benefits Waterfall

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# What are the potential conflicts?

- Patents - Who Owns What (To P or not to P?)

- Focus (Short Term vs Long Term)

- Confidentiality/Disclosure

- Technology Deployment

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# What are the risks and threats in these partnerships?

- Industry
  - Dilution of IP
  - Leakage
  - Zero ROI/Poor Research
- Academia
  - Loss of Long Term Focus
  - Limitations in Scope & Application

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# What are the differences between research in academia and industry, and how they can complement each other?

- Academia (Speculation)
  - Scope spans all active research areas on/off Campus
  - Opportunity for cross-discipline pollination
  - Publish or Perish

- Industry
  - Scope must compliment Industrial context
  - Focus generally short term/Quantifiable
  - Profit or Perish

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# What are the **successful** collaboration models? Can they be readily copied?

Fundamental Research (Purest)

> Academic Advisory Role

Applied/Dedicated Research (Value)

> w, w/o ownership

> w, w/o Revenue

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# Some points that the Panel presentations and audience discussions

1. What are the collaboration models between ARC and Industry- applicable model elements to IMSC
   1. TBC

2. How satisfactory are the outcomes from industry and academia point of view
   1. One on One, What Not to expect

3. Are there ways to improve innovation and outcomes? Lessons from failures and successful collaborations.
   1. Expression of Challenges
   2. Continuity

4. How best to manage detractors while building on Synergy and Goodwill?
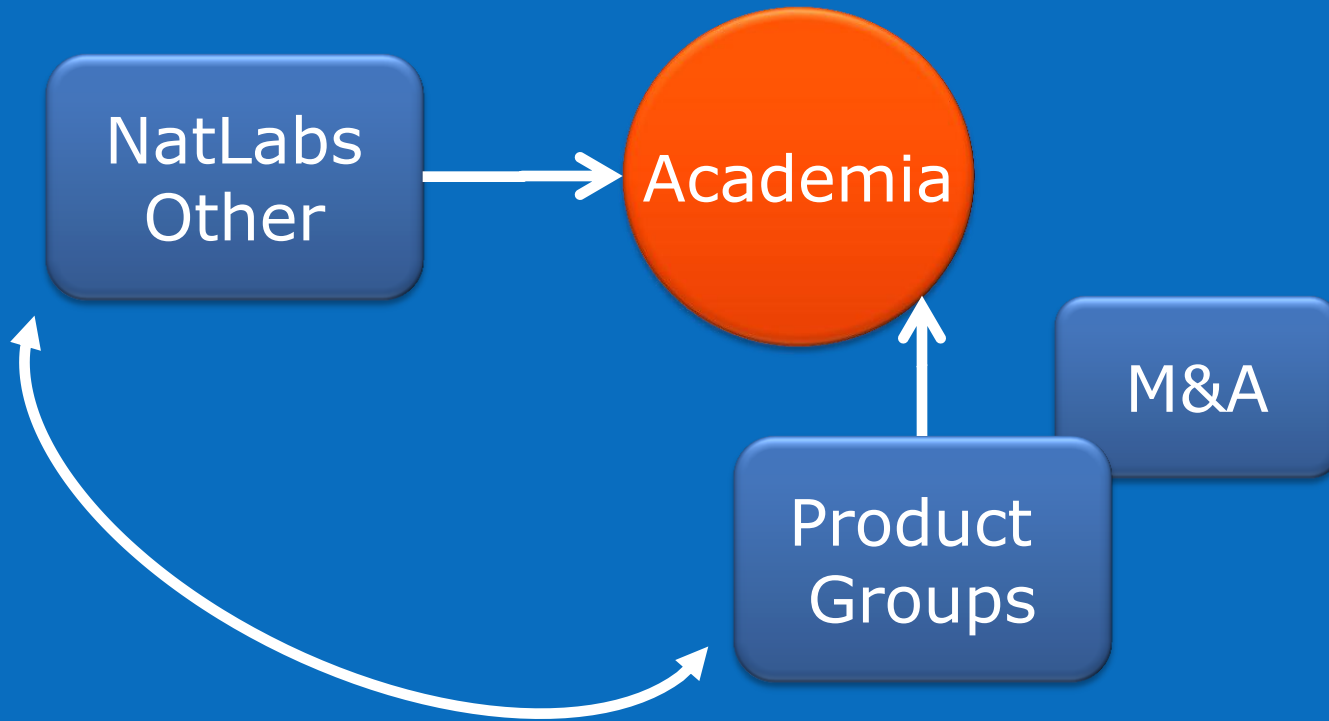   1.

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# Industry Sources of Technology Generic Model
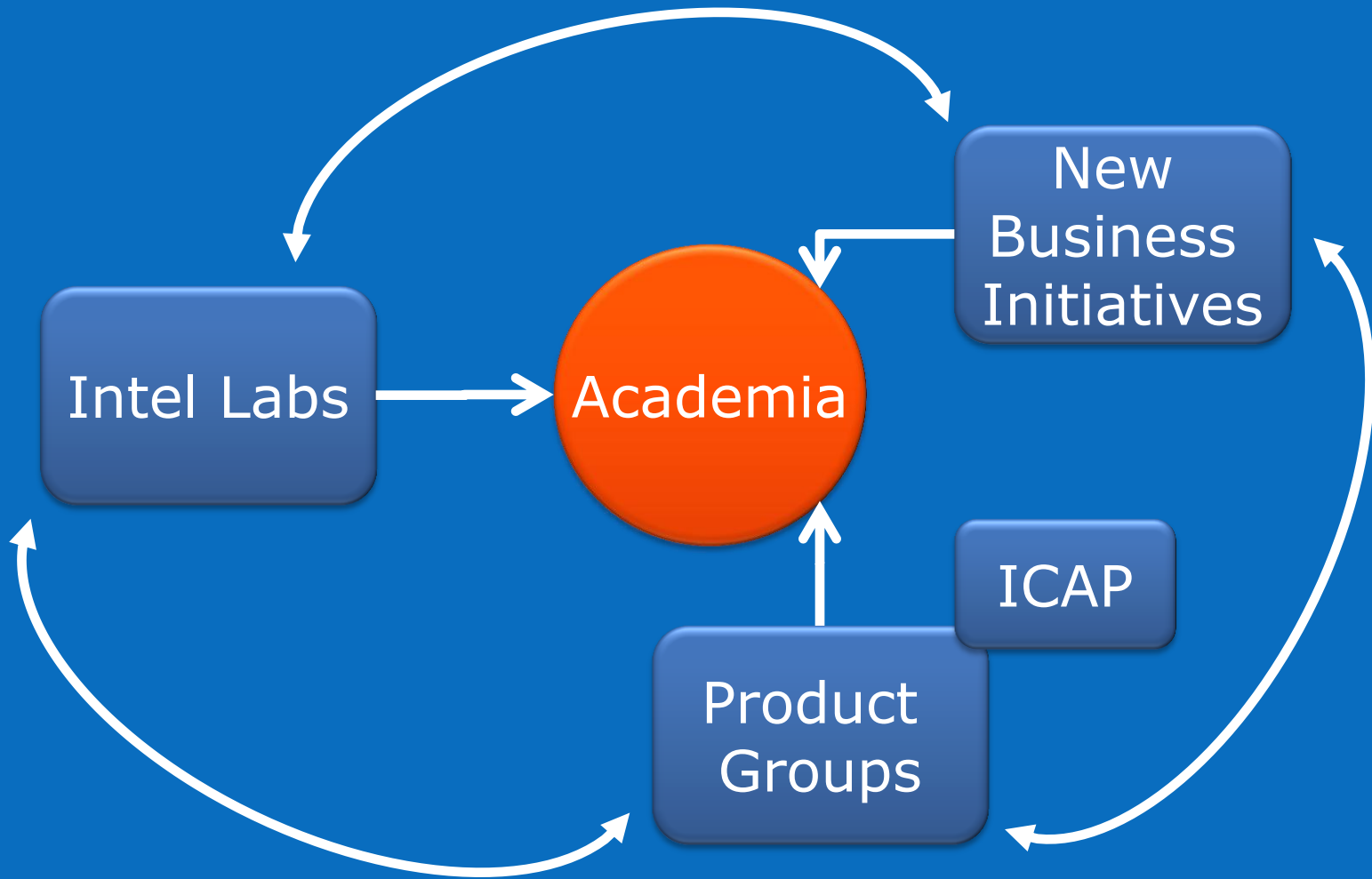
Effectiveness of Home Grown R&D

Transformation in the Jack Welch Era
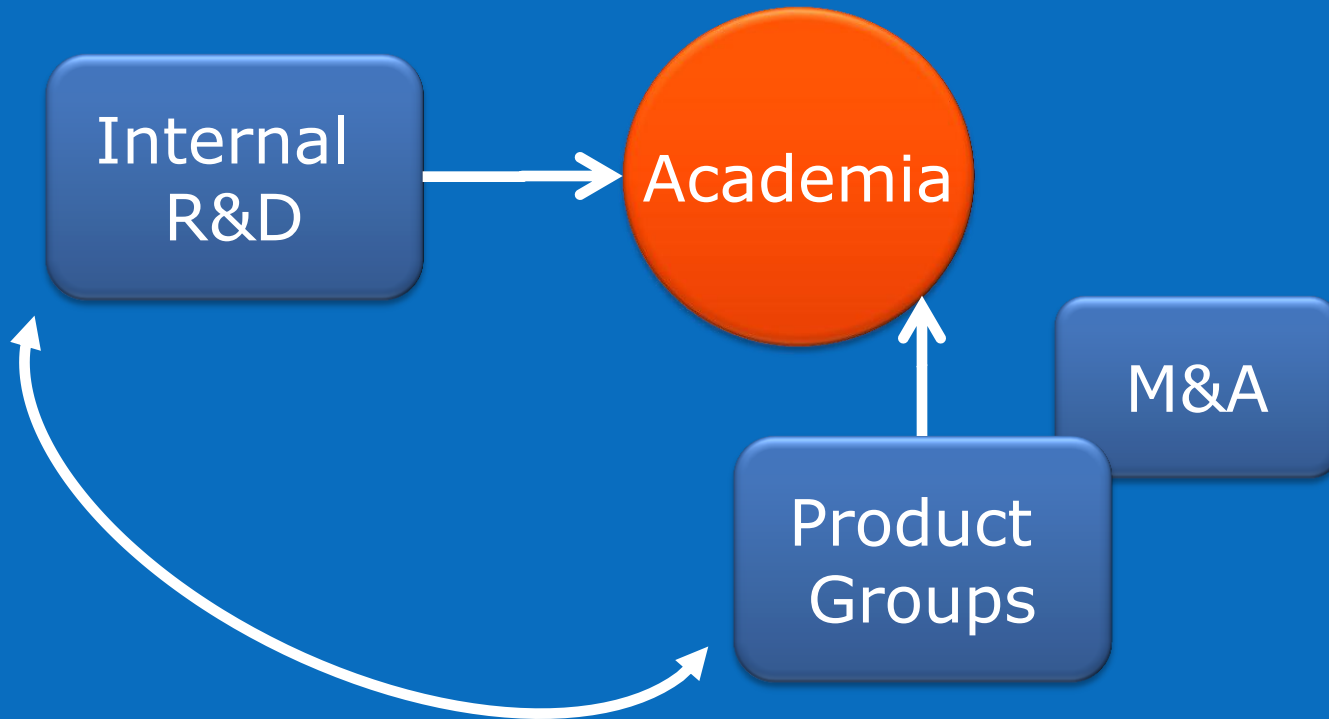
# Philips Technology Sources

# Intel Technology Sources/Contact Points



Intel Labs → Academia

New Business Initiatives

Product Groups

ICAP

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# Intel Labs (Academic Programs & Research)

Mission: Drive high-impact exploratory research vital to Intel with our academic partners.

About: APR funds university researchers, and actively participates with Intel "lablets", to drive exploratory research that is vital to Intel, the ecosystem, and the community. The Academic Research Office funds research with grants of various sizes. The academic programs office manages academic relationships with focus schools and proliferates Intel technologies on the campuses. The lablets, staffed by Intel employees, conduct research with close partnership with the university researchers and students, primarily in the areas of Connected Systems for Communities (with University of California at Berkeley); Cloud Computing Systems and Embedded Real-time Intelligent Systems (with Carnegie Melon University in Pittsburgh); Sensor driven Computing Systems (with University of Washington, Seattle).

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# New Business Initiative (NBI)

Corporate Subsidy Program (Intel Capital)

Corporate Technology Incubator (halfway house)

Technology Migration to Product Group
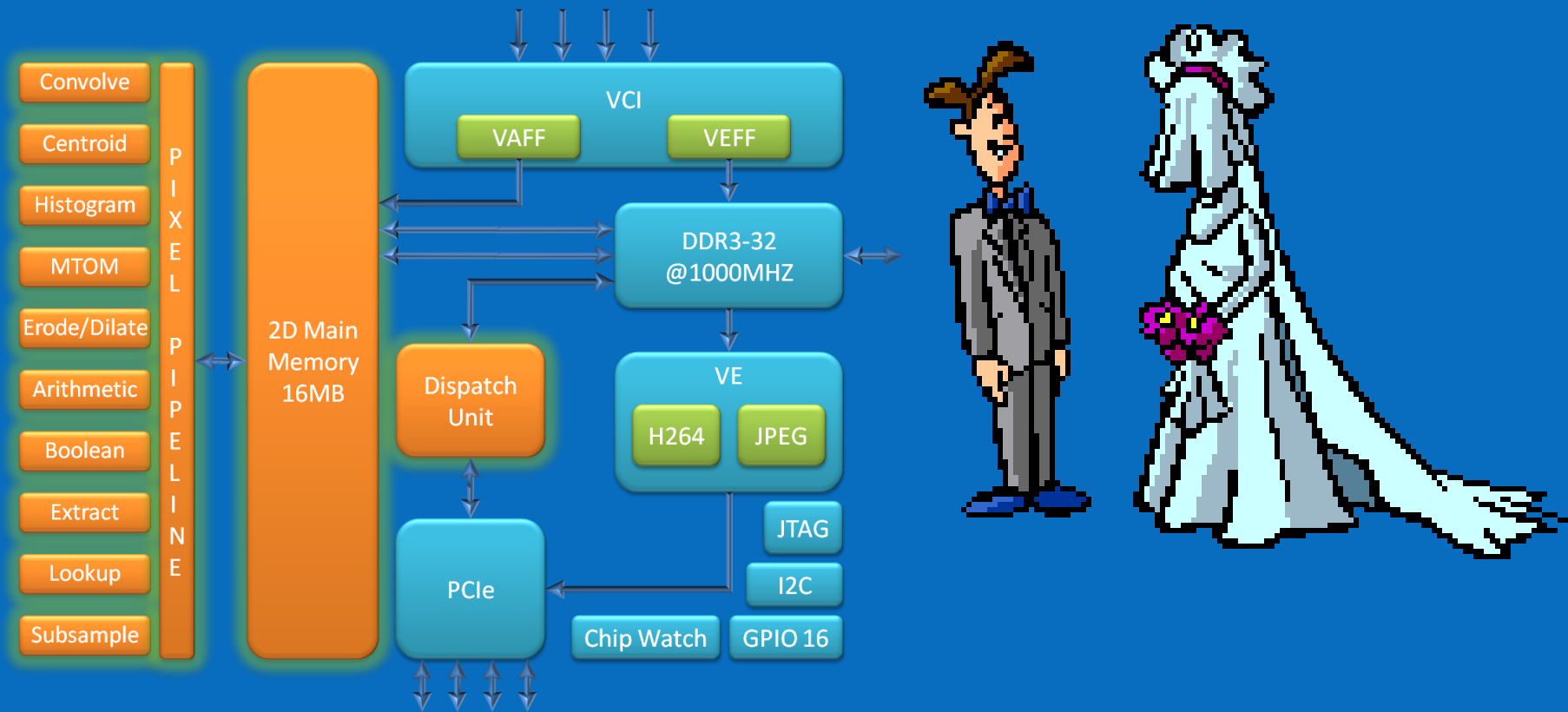
Product Specific Research

# Product Groups

Opportunistic

Very short term

Guns for hire

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# Current Engagements

- Video Analytics Engagement Intel-IMSC
  - Compute Acceleration (Number Crunching)

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# Algorithms and Partitioning



Increasing Abstraction

**Techniques**

*Image Video Preprocessing*
- Video stabalization
- Image denoising
- Image deblurring

VACP acceleration

*Object Detection*
- Background differencing
- Edge differencing
- Motion detection

*Object Tracking*

IA compute

- Histogram Matching
- Image Template Matching
- Kalman filtering
- Feature Tracking

*Object and Event Classification*
- Hidden Markov Model

…

**Algorithms**

Template Matching
Correlation (Normalized)

Edge/Gradient
Pyramids
Wavelet

Image Diffusion/ PDE

**Operations**

Convolution

Iteratively use the same primitives at different levels of abstraction in the image processing chain

CPU (MHz)

1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0

Change Detector | Motion Detector | Blobizer | Target Tracker | Classifier | Scene Change | View Monitor | Meta-Data

Complex logic and complex analyses needed for robust video content analysis remain on IA CPU.

Low-level analytics are partitioned to the VACP for efficient (speed and power) execution.

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