

Comments on Industry Research @CRA Snowbird

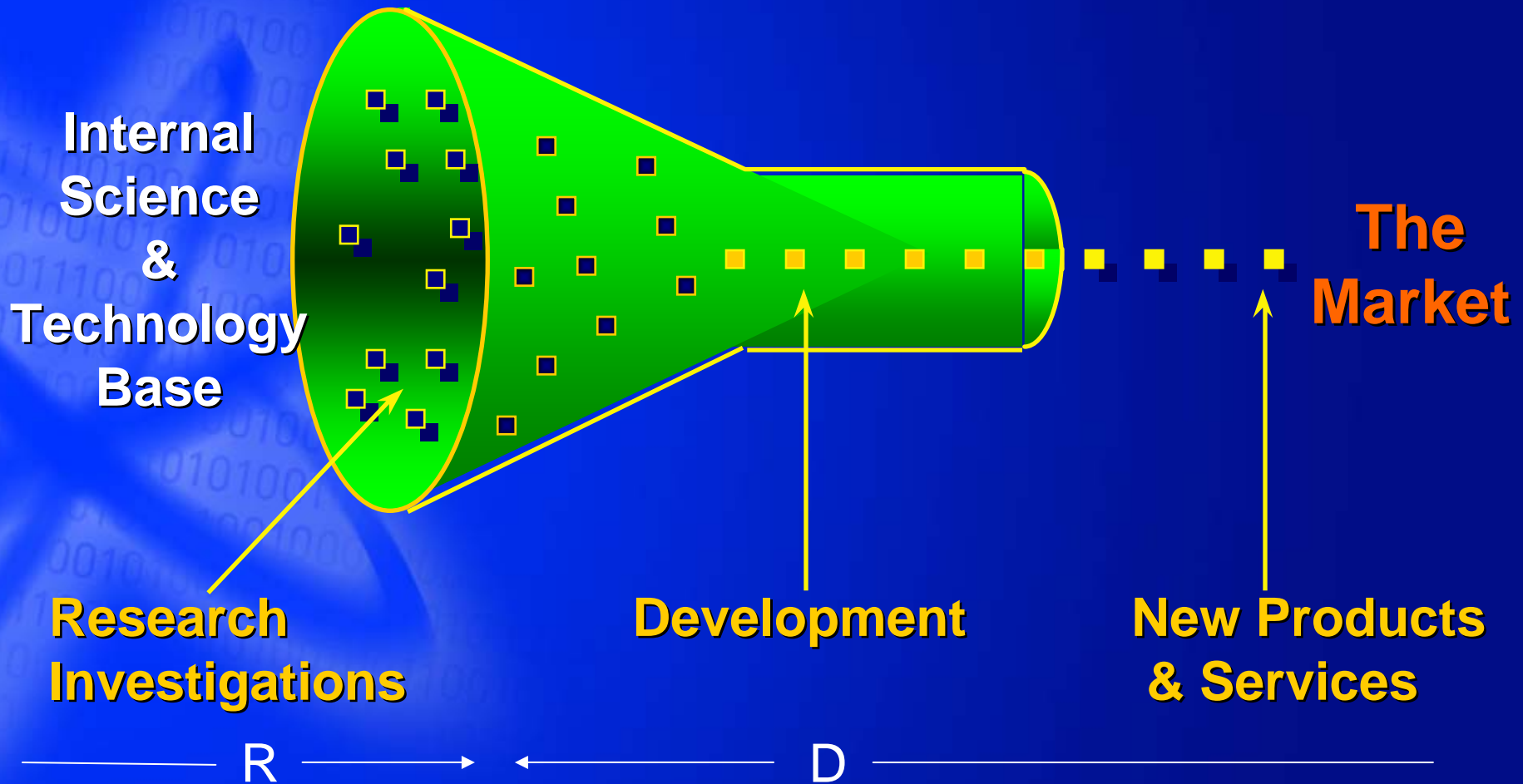
David Tennenhouse

Vice President, Corporate Technology Group

Director of Research, Intel Corporation

July 2004

Past: Closed Innovation



Cracking Open the Funnel

- 1. Universities are the “Radar”**
- 2. Exploratory vs. Roadmap Research**
- 3. “Concurrent Research”**
- 4. The Vision Thing**
- 5. Multiple Paths to Value**

Why was PARC Successful in its Research?

- In the 1970's it was possible to corral a significant fraction of the world's best "computer systems" researchers
 - ⇒ Everyone else came to visit
 - ⇒ PARC was the "packet switch" for new ideas; they were positioned to jump on all the good ideas & hybridize them with their own

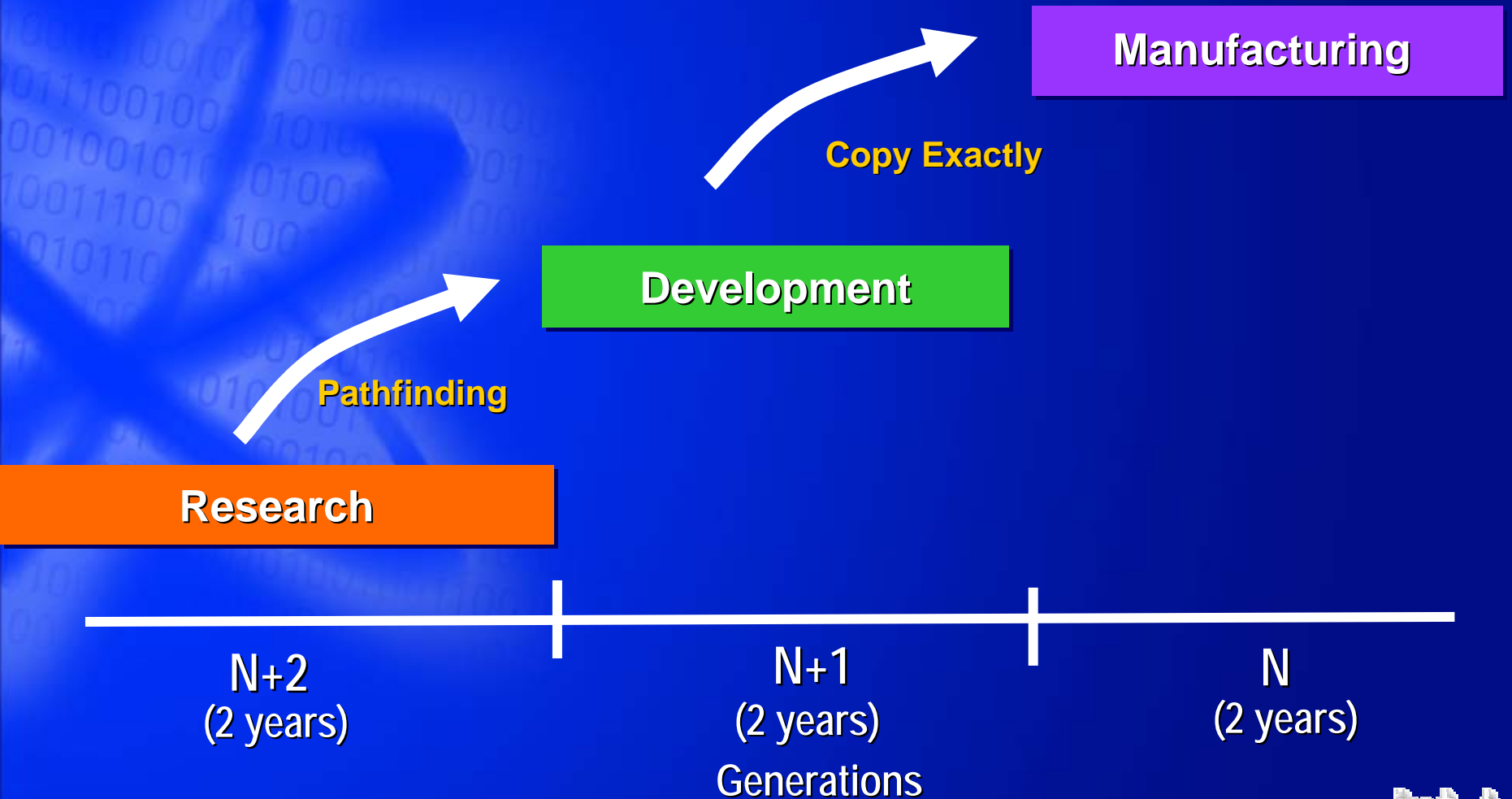
Why Can't PARC be Done Today?

- Success: Many more researchers & good ideas!
 - ⇒ Today....Universities are the "idea switches"

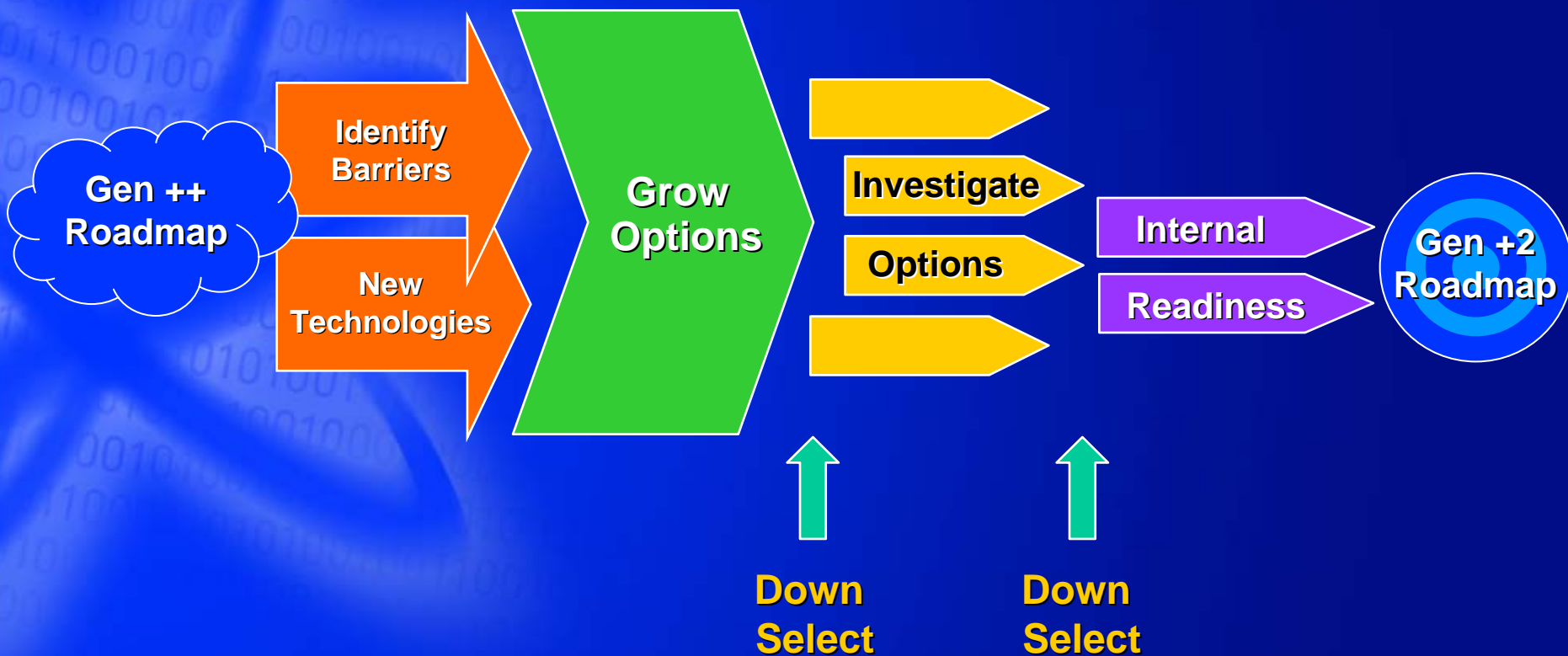
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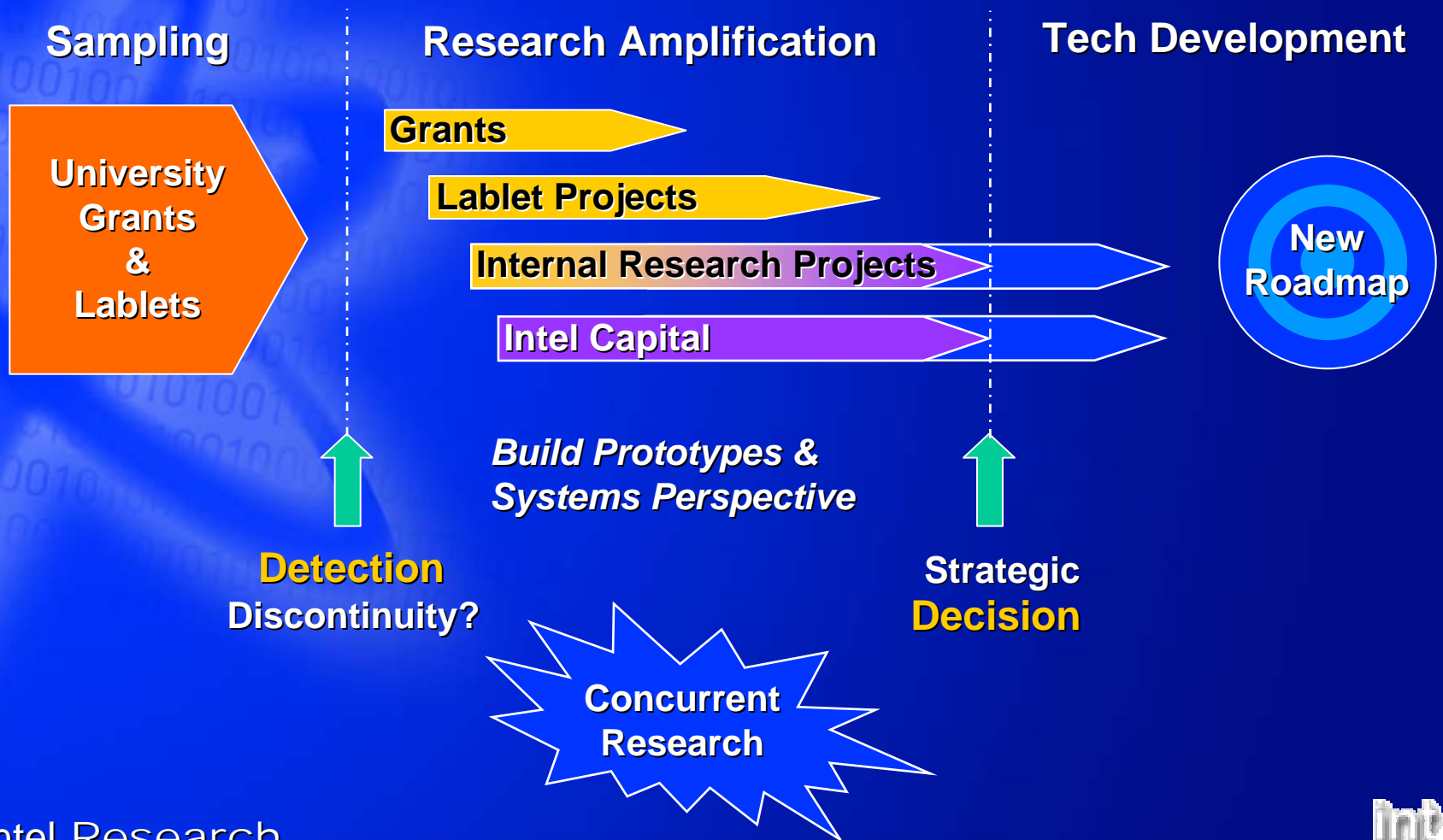
Roadmap Driven Semiconductor R&D



Roadmap Driven Research (Semiconductor & Microprocessor Design)



Exploratory Research



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University Open Collaborative Labs

Focus: Extreme interconnected infosystems

- **Sensor Networks**
- **Internet-Scale Services**
- **IT for Developing Regions**



Joe Hellerstein
Director



Focus: Networks & distributed systems

- **Optical Networking**
- **Virtual IO**
- **Statistics**



Derek McAuley
Director



Focus: Software for widely distributed systems

- **Internet Suspend / Resume**
- **Diamond**
- **IRISNet**
- **Open Hash**



Todd Mowry
Director



Focus: New usage models for ubiquitous computing

- **Digital Home**
- **Healthcare**
- **Activity Inferencing**
- **Location**



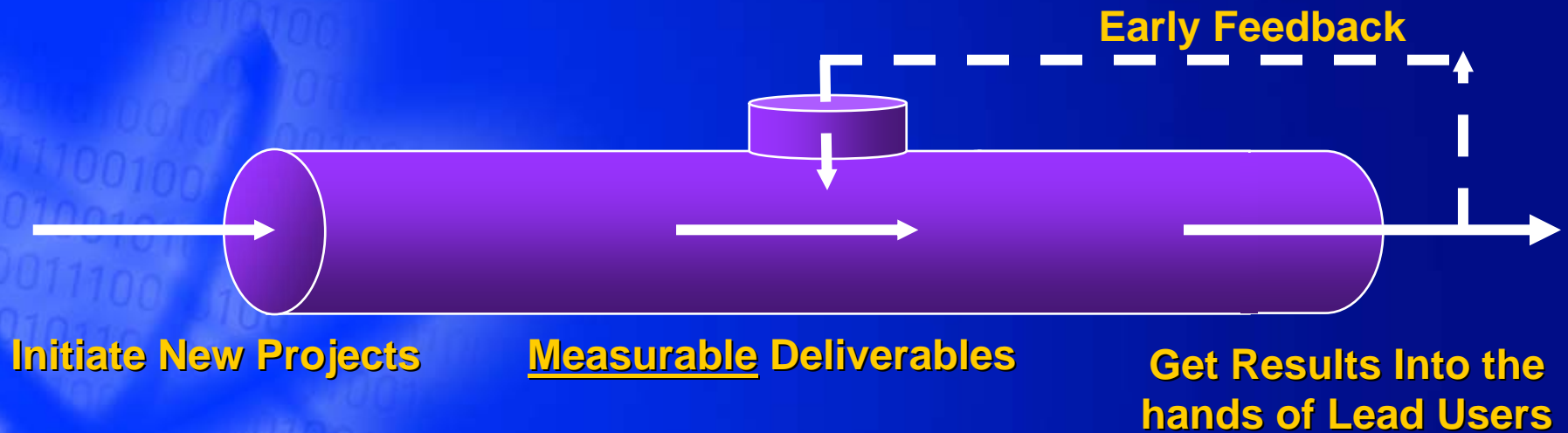
James Landay
Director



Internal Research Projects DARPA Approach

- **Directed research (vs. curiosity)**
- **No excuses technology transfer**
 - Tech transfer \approx People transfer
- **Coopetition: Competition & hybridization**
 - Strategies drive grants, lablets and Intel Capital investments

Tech Transfer: Learn Early & Shape "Pull"



Examples:

- RF MEMS (Samples)
- Precision Biology (Proxy)
- Bayesian Networks (Manufacturing)
- Nanovision (Manufacturing)
- Mesh Networking (Manufacturing & Ecologists)
- PlanetLab (Reverse Transfer)

Upside Surprises

- **Lablets (sometimes) function as a network**
- **Researchers value their lead users**
- **Reputation for building research communities & infrastructure**

⇒ **New notion of “reverse transfer”**

Examples: **Sensor Net Toolkit**
PlanetLab
Robotics Platform
Machine Vision / Learning Libraries
Place Lab

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Proactive Computing

Today: Computers are interactive

- We are always waiting for them or vice-versa

Tomorrow: Computers will be Proactive

- They will anticipate our needs and act on our behalf

Make it Personal

Empowering individuals and addressing their concerns over security and privacy

Closing the Loop

Bridging the gap between anticipating and acting on needs – predictably, and under human supervision

Anticipation

Creating proactive software that anticipates our needs and produces answers before they are required

Dealing with Uncertainty

Using statistical modeling to deal with uncertainty inherent in the physical world

Planetary Scale Systems

Developing software that works across a wide range of diverse platforms and networks

Deep Networking

Locally networking billions of embedded nodes; driving computing deeper into the infrastructure that surrounds us

Getting Physical

Connecting computers directly to the physical world around them

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Paths to Value

- PR: technology leadership
- New channels for existing products
- New products for existing businesses
- **New businesses**
- **New corporate strategies**

Radio Free Intel

3.5 Years ago

- Started 3 “inexpensive RF” internal projects
- Intent of creating an RF competency

2.5 Years ago

- “precipitated” a new corporate technology lab

~ 24 Months ago

- CTO announces Radio Free Intel R&D initiative

Today

- Intel perceives itself differently

Push vs. Pull

- **Tech Push: Exploratory**
 - Central funding / Disruptive (vs. Long term)
 - Strategy (vs. topics) framed by external “radar” (vs. curiosity)
 - Challenge: loosely aligning small teams to achieve strategic goals
 - Substantial tech transfer barriers!
- **Demand Pull: Roadmap**
 - \$\$ From business technologists / Linear (vs. Short term)
 - Topics developed with business units
 - Has a ready customer (?)
- **Market Shaping / +ve Feedback**
 - Create awareness amongst corp market strategists