Management Practices for Breakthrough Innovation: Lessons Learned from a Research Program in Three Phases

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Associate Dean, Academic Affairs

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Observation: Breakthroughs are infrequent

<table>
<thead>
<tr>
<th>Year</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>Mobile Radio</td>
</tr>
<tr>
<td>1960</td>
<td>Portable Radio</td>
</tr>
<tr>
<td>1970</td>
<td>Paging</td>
</tr>
<tr>
<td>1980</td>
<td>Cellular Phones</td>
</tr>
<tr>
<td>1990</td>
<td>Iridium?</td>
</tr>
</tbody>
</table>

Motorola
Breakthroughs are sporadic

1950 - Pyroceram
1960 - TV bulbs
1970 - Safety windshields, Catalytic converter substrates
1980 - Optical fibers
1990 - LCD glass, Glass/plastic composites
2010 - Guerilla Glass
Recent Example: Kodak

- Founded 1880
- Pioneer of film
- ‘Razor & Razorblades’ Business Model
- July 2011 Sells IP
- Jan 2012 Files for bankruptcy
- 47000 jobs lost since 2003 alone


Steve Sassoon
Inventor, Digital Camera, 1975
RPI alumnus & Kodak employee
2009, Obama awards him the National Medal of Technology and Innovation
2010, Inducted into RPI Alumni Hall of Fame
## Why Invest in Breakthrough Innovation?

<table>
<thead>
<tr>
<th>Innovation Type</th>
<th>Investments</th>
<th>Profitability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental Product Development</td>
<td>86%</td>
<td>39%</td>
</tr>
<tr>
<td>Projects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakthrough Innovation Projects</td>
<td>14%</td>
<td>61%</td>
</tr>
</tbody>
</table>
Evidence is Accumulating…


…..Supra-normal returns to investment in BI

- A large Majority of BI’s come from a minority of firms...so a Competency can be developed to do BI. It’s not just luck.
- Original inventing companies introduced 75% of the breakthroughs studied in the pharmaceutical industry (25% were licensed or bought from other firms)....so the argument that fast second is better is not empirically supported.
- Dominant firms in the industry (highest market share, assets and profits...i.e. the largest )commercialized significantly more BI’s than non-dominant firms.
- **Those firms that successfully commercialize BI also are the ones with most incremental innovations.**
- # of patent applications by the firm was NOT correlated with BI success...so technical prowess is not sufficient.
- **Breakthrough innovations achieved more than 3 times the NPV of technological breakthroughs alone..**
Conclusions regarding Impact of Investment in BI

- It’s not the investment in R&D that makes a difference, but the processes or capabilities that leverage R&D to create value in the marketplace
  - Execute for future business platforms
  - Willingness to cannibalize within the current org structure
  - Learning based approaches over Stage Gate
- Results in increased financial performance
- Results in better financial market returns
- Demonstrated across a variety of industries
### Radical Innovation Research Program


- Can we describe management practices for breakthrough innovation?
  - Using traditional NPD processes does not work.
- Twelve projects, 10 co’s.
- Multidisciplinary team (10)
- Prospective, Longitudinal
- 2 Tools
  - Transition Mgmt
  - Learning Plan

#### Phase II (2001-2005)

- How do firms build a sustainable BI capability?
  - Average life expectancy: 4 yrs.
- Twelve + nine companies.
- Corporate level.
- Multidisciplinary team (6)
- Prospective, Longitudinal
- 2 Surveys + 2 Tools
  - Port Eval Tool
  - BICA
Radical Innovation Phase III (2009-2014)

• Talent Mgmt: Roles & Responsibilities for an Innovation Function
  – Three Faculty, several Ph.D students.
  – Eleven companies: Snowball Sample
  – Prospective, Longitudinal (less important)
  – 1 Survey (developed, pretested) 1 Tool (TBD)

• Status:
  – Qualitative project completed
  – Book proposal under development, publisher interested.
Project with a team and a budget, that the company perceives as having the potential for significant strategic impact, via development of:

- new to the world performance features,
- 5-10X (or greater) performance improvement, or
- 30 - 50% (or greater) reduction in cost.

Breakthrough Innovation Capability: Portfolio’s of BI’s. Sustainable pipeline. Over and over.
<table>
<thead>
<tr>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohort I</td>
<td>Cohort II</td>
<td>Cohort III</td>
</tr>
<tr>
<td>1995 to 2000</td>
<td>2001-2005</td>
<td>2004 to 2005</td>
</tr>
<tr>
<td>Phase I</td>
<td>Phase II</td>
<td>Cohort IV</td>
</tr>
<tr>
<td>246 interviews</td>
<td></td>
<td>180 interviews</td>
</tr>
</tbody>
</table>

### Companies in the Study

- **Phase I (1995 to 2000)**
  - GE
  - IBM
  - Air Products
  - DuPont
  - Analog Devices
  - General Motors
  - Nortel Networks
  - Otis Elevator (UTC)
  - Polaroid
  - Texas Instruments
  - 3M
  - Albany Int’l
  - Corning
  - J&J Consumer
  - Kodak
  - Mead-Westvaco
  - Sealed Air
  - Shell Chemicals
  - 186 interviews

- **Phase II (2001-2005)**
  - Bose
  - Dow Corning
  - Guidant
  - H-P
  - Intel
  - P&G
  - PPG
  - Rohm&Haas
  - Xerox
  - 246 interviews

- **Phase III (2010 to 2013)**
  - Bayer Material Sciences
  - Corning
  - DSM
  - DuPont
  - GE
  - Grundfos
  - John Deere
  - Moen
  - Newell Rubbermaid
  - Pepsico
  - Sealed Air
  - 180 interviews
<table>
<thead>
<tr>
<th>Company</th>
<th>Project</th>
</tr>
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<tbody>
<tr>
<td>Air Products</td>
<td>1. Oxygen Separation Technology</td>
</tr>
<tr>
<td>Analog Devices</td>
<td>2. Air Bag Accelerometer</td>
</tr>
<tr>
<td>DuPont</td>
<td>3. Biodegradable Polymer</td>
</tr>
<tr>
<td>DuPont</td>
<td>4. Display Technology</td>
</tr>
<tr>
<td>General Electric</td>
<td>5. Digital X-ray</td>
</tr>
<tr>
<td>General Motors</td>
<td>6. Hybrid Vehicle</td>
</tr>
<tr>
<td>IBM</td>
<td>7. Silicon Germanium Device</td>
</tr>
<tr>
<td>IBM</td>
<td>8. Electronic Book</td>
</tr>
<tr>
<td>Nortel Networks</td>
<td>9. Internet Software Rental</td>
</tr>
<tr>
<td>UTC/ Otis Elevator</td>
<td>10. Bi-directional Elevator</td>
</tr>
<tr>
<td>Polaroid</td>
<td>11. Memory Storage Device</td>
</tr>
<tr>
<td>Texas Instruments</td>
<td>12. Digital Light Processor</td>
</tr>
</tbody>
</table>
Stage-Gate New Product Development Process

Source: Robert G. Cooper, Winning at New Products, Addison-Wesley 1993
The BI Project Lifecycle: DuPont Biomax®

<table>
<thead>
<tr>
<th>1989</th>
<th>90</th>
<th>91</th>
<th>92</th>
<th>93</th>
<th>94</th>
<th>95</th>
<th>96</th>
<th>97</th>
<th>98</th>
<th>99</th>
<th>00</th>
<th>01</th>
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</table>

D1

D2

Diaper tapes

D3

D4

Shell material for disposable diapers

D5

D6

Technology in search of market apps

D7

D8

Project in limbo. Dvlpmnt work suspended.

D9

New flurry of dvpmt activity for agricultural apps.

D10

D11

New apps sought through PR campaign and follow up exploration

D12

Project transferred to business unit. Multiple apps pursued.

D13

New prod. mgr. Apps collapsed to four.

Resins
Phase I: Framework for Managing Radical Innovation

- Technical Uncertainty
- Resource Uncertainty
- Market Uncertainty
- Organization Uncertainty

Challenge 1: Capturing Breakthroughs
Challenge 2: Living with Chaos
Challenge 3: Market Learning
Challenge 4: Business Model
Challenge 5: Resource Acquisition
Challenge 6: Transition Mgt.
Challenge 7: Individual Initiative
The Radical Innovation Hub

RI HUB I

RI Oversight Board

RI HUB II

RI HUB III

RI HUB I

Evaluation Bd.

Project 1

Project 2

Project 3

Project n

Idea Gatherers

Project Advisory Board 1, 2, 3, ..., n

Transition Oversight Bds. 1, 2, 3, ..., n

Idea Hunters
# Early vs. Mature BI Capacity

<table>
<thead>
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<th>Mature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executives act as provocateurs, patrons, and champions to compensate for lack of supportive culture.</td>
<td>The firm’s leadership sets expectations, develops BI culture, establishes facilitating organizational mechanisms (hubs) and develops goals &amp; reward systems.</td>
</tr>
<tr>
<td>Mavericks try to catch the attention of patrons. There is a lack of infrastructure and systematic approach.</td>
<td>BI idea hunters seek opportunities. Hubs establish effective evaluation boards. Non-traditional marketing &amp; business creation personnel work with BI technical teams to develop business models. There is a learning orientation to project management</td>
</tr>
<tr>
<td>Acquisition of resources is ad hoc. Project teams often expect a budget allocation for funding.</td>
<td>Individual managers with authority to provide seed funding and internal VC organizations provide multiple sources of capital for BI. The firm adopts a portfolio approach to funding BI projects.</td>
</tr>
<tr>
<td>Completion of BI tasks, project staffing and champions rely on individual initiative.</td>
<td>BI hubs work with HR to develop a strategy for identifying, selecting, rewarding and retaining BI champions, experts and team members.</td>
</tr>
<tr>
<td>Communication difficulty makes transition difficult, often flounders and relies heavily on intervention of senior management.</td>
<td>Transition team established with funding and senior mgmt support continues development until uncertainty reduced for successful transition.</td>
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Phase I: Framework for Managing Radical Innovation

Technical Uncertainty

Resource Uncertainty

Market Uncertainty

Organization Uncertainty

Challenge 1: Capturing Breakthroughs

Challenge 2: Living with Chaos

Challenge 3: Market Learning

Challenge 4: Business Model

Challenge 5: Resource Acquisition

Challenge 6: Transition Mgt.

Challenge 7: Individual Initiative

Infrastructure
1. What is the right operating home for the radical innovation?
2. Are technical specifications set?
3. Do expectations about market development match reality?
4. How will applications and markets unfold?
5. How do manufacturing challenges impact market entry objectives?
6. How does the project team deal with the SBU’s expectations?
7. How does the project team finalize the business model?
8. How does the project team sustain funding during the transition?
9. Who are the right people for the transition team?
Transition Readiness Tool: Methodology

• Spring ’00: Lally team drafted survey structure and content based on Phase I case learning.
• Summer ’00: Worked with IRI co-chairs to ensure comprehensiveness and correct structure.
• Fall ‘00: Developed long form of survey and pretested with IRI subcommittee. Conducted reliability analysis and shortened the instrument.
• Dec-May 2001: Validated in 7 co’s (does it work?) and one workshop with 16 other participants.
• Created user friendly version (computerized, automatic scoring).
Breakthrough innovation maturity is defined as the degree to which the organization has embedded a system for initiating, supporting and sustaining RI activities.

Average Life Expectancy of a BI system: 4 years
The Problem

Companies challenged in attempts to develop breakthrough/radical innovation capabilities.

- Single projects occur sporadically.
- Maverick champions, air cover by senior sponsors.
- Work against, rather than with the organization.
- Breakthroughs require breaking rules (Stage Gate does not apply).
- No learning across projects, people. No systems developed to leverage organization’s assets.
- Missed opportunities result
- Lack of systematic approach to managing the variety of skill sets needed

Four year average lifespan of internal venturing groups. Why can’t companies be ‘ambidextrous?’
Previous Experiments

- “We have an innovative culture” (3M)
- New Ventures Groups (Nortel, P&G)
- Skunkworks (IBM, Raytheon)
- Incubators (Xerox PARC)
- Shared equity with innovators (Lucent)
- Corporate Venture Capital Funds (JJDC, Intel Capital)

Christensen’s *Innovator’s Dilemma*: Ambidexterity is impossible: leave the breakthroughs to the start ups.
Phase II: Management Systems for BI

Mandate/Scope

Leadership/Culture

Org. Structure/Interfaces

Skills/Talent Development

Processes/Tools

Metrics/Rewards
Participating Companies

- GE
- DuPont
- IBM
- Air Products
- Analog Devices
- General Motors
- Nortel Networks
- Otis Elevator (UTC)
- Polaroid
- Texas Instruments

- Sealed Air
- 3M
- Corning
- 246 interviews
- 186 interviews

Phase II (2000-2008)
- 4 meetings
- 2004 to 2005
- Bose
- Dow Corning
- Guidant
- H-P
- Intel
- P&G
- PPG
- Rohm&Haas
- Xerox

Phase III (2010...2014)
- Cohort IV
- Site Visits F. 2011-13
- Calls 2010 to 2013
- Bayer Material Sci
- DSM
- John Deere
- Grundfos
- Moen
- Newell Rubbermaid
- Pepsico
- 181 interviews
Data Collection: 12 Primary companies

- Interviewed 3 levels:
  - Person(s) responsible for BI mandate
  - Those to whom s/he reported (CEO, CTO, VP Strategy)
  - Those that reported to him/her.

- Initial qualifying interview re: history of BI initiative and current structure

- Site visit to interview all members

- Follow up each 6 months with primary contact and suggested others due to frequency of changes.
Data Analysis

- Coded interview transcripts at three levels of detail for all elements of the management system.
  - Note takers during interviews
  - Word documents coded from transcripts
  - Excel cross case comparison summary
- Drew organization structures and their evolution over three years.
- Developed timelines for each case.
- Annual team meetings off site.
- Two team meetings at RPI with co-chairs present to identify important learning.
- Validated findings with Cohort III companies over 4 sessions.
Phase II Key Insights

- Organization structures for BI.
- The D-I-A model.
- Organizational capacity.
- Orchestration.
- BI capability develops in stages.
Technology Board (Decides)

RI HUB
- Idea Creation
- Idea Development
- Idea Screening
- External Scanning

Case #1

R&D NBD

Case #2

BU’S

BU’S/Divisions
Organization Structure: Idea Manager & Incubation

Growth Board/Corporate Renewal Team (Advisory)

R&D

Venture Board/Business Development Council

- Idea review & elaboration
  - Staffed full time
- External technology acquisition

- Incubation/Development
  - Keep white space businesses through to initial commercialization
  - Oversee incubation of aligned opportunities too far out for BU’s to handle.
Organization Structure: Holistic Sequential Model

CTO - Commercial

Senior Leadership Governance Team

Portfolio Governance Council (Middle Mgmt)

New Business Discovery
- Idea Generation

New Business Incubation
- Project teams
- Project adv boards/RI staff

New Business Accelerator
- Project teams
- Project adv boards RI staff

Other idea sources (R&D, New Ventures, BU’s…)

New SBU

SBU1 (Accel’r)

SBU2 (Accel’r)

... 

SBU_n (Accel’r)
Organizer Higher Structure: Self Similar Model

Corporate Strategy

Strategy, Technology, Finance

Corporate RI Hub staffed full time (Projects 1….n) – Funded in BUs

Divisional Hub -staffed full time -project 1….n
Divisional Hub -staffed full time -project 1….n
Divisional Hub -staffed full time -project 1….n
Org. Structure: Mirrored Model

- CEO
- CTO
- R&D Staff (Ops, funding, personnel mgmt.)
  - RI Program 1 & Team
    - BU1 Acceleration activity mirror
  - RI Program 2 & Team
    - BU2 Acceleration activity mirror
  - RI Program 3 & Team
    - BU3 Acceleration activity mirror
  - RI Program 6 & Team
    - Planned Acceleration activity mirror
Phase II Key Insights

- Organization structures for BI.
  - The D-I-A model.
- Organizational capacity.
- Orchestration.
- BI capability develops in stages.
Not just one competency….but 3

Discovery
Creation, recognition, elaboration, articulation of opportunities.

Incubation
Evolving the opportunity into a business proposition

Acceleration
Ramping up the business to stand on its own

Oversee Transitions/Interfaces

Conceptualization
- Basic Research
- Internal Hunting
- External Hunting / License / Purchase / Invest

Experimentation
- Technical
- Market Learning
- Market Creation
- Strategic domains

Commercialization
- Focus
- Respond
- Invest
DIA isn’t Linear

Three RI Competencies

- Incubation
  - Leadership/Culture
  - Governance
  - Processes/Tools
  - Skills
  - Structure
  - Metrics

- Discovery
  - Leadership/Culture
  - Governance
  - Processes/Tools
  - Skills
  - Structure
  - Metrics

- Acceleration
  - Leadership/Culture
  - Governance
  - Processes/Tools
  - Skills
  - Structure
  - Metrics
The Discovery Competency

Discovery Incubation Acceleration
Describing Discovery

- The creation and identification of opportunities that may have major impact in the marketplace, either through the delivery of new to the world performance benefits or greatly improved performance.

- Discovery ≠ Invention
- Discovery ≠ R&D
Companies desire Breakthrough Innovation but do not have deep scientific expertise, not organized to leverage it.

- Open innovation not the complete answer.

Discovery generates a wealth of opportunities… many of which the company will never invest in.

BI is about new domains yet companies tend to tighten link to BUs over time.

BI ↔ Strategic intent reciprocal influence not happening.

Companies confuse Breakthrough innovation with Diversification or NPD efforts..
Management System Elements: Discovery

**Mandate/Scope:** Explore; Create business concepts in alignment with strategic intent.

**Metrics/Rewards:** Quantity of ideas, richness/robustness of concepts.

**Leadership/Culture:** Owned by CTO. Fluid, imaginative culture.

**Org. Structure/Interfaces:** Centralized yet diverse, tightly linked to R&D.

**Processes/Tools:** External & internal scanning, open sourcing of ideas, networking. Opportunity elaboration & socialization. Able to combine disparate bits of info.

**Governance/Decision Making:** Connections to strategic intent. Able to see possibilities, to enlarge opportunities.

**Skills/Talent Development:** Creative, inductive reasoners w/ penchant for strategic thinking.
The Incubation Competency
A Long & Winding Road
Incubation Defined

- A competency of experimentation. The ability to experiment with technology and business concepts/models simultaneously to arrive at a demonstrated model of a new business that brings breakthrough value to the market and consequently to the firm.
  - Allowances for failures, but expectations of continued pursuit of new frontiers.
  - Creation and pursuit of options.
  - Movement in multiple directions simultaneously.
  - Focus on learning and redirecting.
  - Focus on enriching and extending internal and external networks to enlarge scope of the company’s knowledge base and commercial opportunity space….in big ways.
Incubation Competency

Brokering

Coaching

Thinning & Enriching

Nurturing
Efforts to develop a truly practical degradable material are reaching fruition. DuPont scientists have created an inexpensive polymer that decomposes without harming the soil or the environment.

By now, the problems associated with overloaded landfills are widely recognized. Although recycling is the preferred solution, degradable materials can also play an important role. Yet, cost barriers and other issues have consistently blocked their widespread adoption in major consumer applications.

To meet this challenge, DuPont scientists have created a new family of highly versatile polymers based on polyethylene terephthalate (PET) technology, a proven, commercially available DuPont Biomax® hydrolyzable degradeable polymer. Depending on the application, up to 92% of the polymer can be removed by microorganisms found in soil and water.

Raised on a diet of plastic cups, snack bags and gum wrappers.

These proprietary biodegradable molecules are incorporated into the polymer. The biomolecules create weak spots in the polymer's chains, thereby making the material susceptible to degradation through hydrolysis. The large polymer molecules are broken down into smaller molecules, which are then consumed by naturally occurring microorganisms and converted to carbon dioxide and water.

A polymer that microbes find tasty. Biomax® can be processed, moulded or extruded, but is intended mainly for disposal by composting and in-field degradation.

Researchers performed a series of tests to determine environmental impact, including plant germination and seedling emergence, earthworm weight gain and mortality, and microbial population density. In all tests, the materials were found to be harmless to the environment at every stage in the decomposition process. They are virtually undetectable to the unaided eye in about eight weeks.

Because Biomax® is a modified PET polymer, it can be manufactured with existing equipment using existing bulk monomers. This means that it is only marginally more expensive to produce than PET itself. Currently available degradable materials, on the other hand, cost two to three times as much.

Flow to make your products disappear. The sheer number of potential applications for Biomax® is astronomical. Because it can be made into fibers, films, or resins, it is suitable for a range of single-use products, including domestic waste, yard waste bags, the top and back sheets of disposable diapers, trash bags and disposable eating utensils. It can be used to create plastic cups, agricultural films, seed mats, plant pots and bags that cover ripening fruit. It can find applications in coated paper products such as disposable plates and cups, laminated films for food packaging and hot-melt adhesives. It is also suitable for thermoformed packaging, blown bottles and injection-molded objects.

Product properties are diverse and customisable, but are generally tailored to mimic polyethylene or polystyrene. Biomax® is soft, pliable, low in noise and has a good hand. Melting points are high for a degradable material, generally around 300°C, which opens up a range of processing options. It can be formulated to be as low as 10% strength to low-density polyethylene or as high as half the strength of DuPont Mylar® polyester film. Elongation can range from 50 to 900 percent.

A world with less trash. Share the dream.

Throughout DuPont's history, many of our most important contributions have only come to market through collaboration with other companies. If the substance of this article sounds too good to be true, that's because it is. The development opportunity might exist between your company and DuPont, but you'll have to do the research to find out. For more information, call DuPont at 800-655-9990 or visit your local office.

Better things for better living.
Incubation Mismatches

- Incubation is about experimentation and generation of options, but
  - metrics frequently drive for targeting and financial results.

- Who is responsible for Incubation??? Everyone needs it and no one staffs it.
  - Project managers ≠ Incubation experts necessarily.

- Early market participation and early harvesting may violate company culture
  - Cultures of ‘executional excellence’ cringe at the thought of klugey prototypes or informal launches.

- Aligned opportunities are strategically more comfortable, but tactically more difficult.
  - BI teams alienate functional leads and cannot get next jobs.
Mandate/Scope: Experiment; Vet projects through T, M, R, O issues to determine biz potential. Manage portfolio.

Metrics/Rewards: Learning based milestones (project), churn rate (portfolio), magnitude of opps, learning spillover.

Leadership/Culture: CSO, CNO or VP NBD. Inquisitive, learning oriented culture. No ‘failure.’


Org. Structure/Interfaces: Dedicated group at Corporate level, tightly linked to R&D.

Processes/Tools: Inventory of projects to make killing easier. Learning plan. Strategic Coaching.

The Acceleration Competency
or
Gathering Steam & Building Critical Mass
Acceleration: Gathering Steam

- Activities: Scale nascent businesses so they can compete with mature businesses in their ultimate home (existing BU, new division) for resources, attention.
  - Build critical mass of sales, operational infrastructure.
  - Establish market presence.
  - Develop management team.
  - Prepare to blend into fabric of the rest of the organization.

- Objectives
  - Predictable sales forecasts.
  - Acceptable yields.
  - A path forward to profitability.

- Challenge
  - Neither the BU’s job nor R&D’s
Management System Elements: Acceleration

**Mandate/Scope:** Escalate. Mature high impact businesses to predictability and acceptability to operating unit culture.

**Metrics/Rewards:** Growth in sales/inquiries of portfolio businesses: identification of migration path, uplift and spillover opps. NOT margins

**Leadership/Culture:** General manager orientation. Hard driving, urgent culture.

**Org. Structure/ Interfaces:** Separate structure, even for aligned opps, unless BU’s use acceleration metrics.

**Skills/Talent Development:** Acumen in nurturing high growth businesses. Ability to interface with mainstream

**Processes/Tools:** Manage for high growth. Focus, respond to market inquiries, invest in demonstrating path to profitability.

**Governance/Decision-Making:** Sr. Ldshp team with powerful networks, respect, political clout.
The DIA System

The set of activities that manage the links and interfaces within DIA, oversee its health in terms of the RI mandate, it’s perceived role in the firm, and its portfolio of businesses.

- Monitor /manage system imbalance in conjunction with org’l capacity.
- Attend to portfolio health and diversity (Churn? Size? Pacing?)
- Assembling and re-assembling Project Teams
- Providing & enabling project infrastructure
- Barrier removal
- Broker external and internal liaisons
- Strategic alignment activities
- Providing help for project resource acquisition
- Education about role of Radical Innovation in the company viz a viz rest of innovation system and ongoing operations.
- Oversee transitions from D→I→A→ landing zone
System Imbalances

- Can't get heard
- Big Ideas, Incrementally Executed
- Failure to leverage learning
- No Courage to continue
- Open Innovation at the Extreme
Phase II Key Insights

- Organization structures for BI.
- The D-I-A model.
- Organizational capacity.
- Orchestration.
- BI capability develops in stages.
Orchestrating to Get Things Done

External Influences
- strained stock market
- economic expansion
- new competition

Internal Influences
- Sr. leadership declares need for more innovation
- financial stress of company
- lawsuit

TIME
- culture, history of innovation
- CEO change refocus on innovation

External Influences
- pace of technological change
- global economic expansion

Internal Influences
- Sr. leadership declares need for more innovation
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Internal Influences
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External Influences
- pace of technological change
- global economic expansion
Stages of Capability Development

Call to Action

Initiation → Evolving → Sustaining

Call to Action
Call to Action: Challenges

Purpose and Scope: Objectives not clarified across the organization resulting in misinterpretation of the initiative both inside & outside innovation community.

Expectations: Senior and middle management non-alignment of expectations.

Commitment: Objectives are often short-term, but building a growth capability is a long-term investment.

Performance Objectives: Misalignment of expectations regarding business focus, timing, risk and revenue requirements.
Getting Started: Challenges

**Leadership Experience:** Most NBD leaders lack entrepreneurial experience as they came up through conventional system.

**Idea Flow Yields High Volume, Low Quality Ideas:** Tension re how tightly to specify strategic growth areas and manage risk.

**Positioning:** Announcing is helpful to build awareness...but heightened visibility increases expectations.

**New Business Creation Skills:** Severe shortage of expertise results in mismatches of capabilities and requirements.

**Process Tension:** Understanding that conventional processes and skill sets are inadequate for NBD.

**Mission Retrenchment:** Initial (lofty) mission comes under pressure as innovation group recognizes need for education and culture change. Pressure to “get one out the door”.
Evolving: Challenges

**Failure:** Building new business is much riskier career path than growing current businesses. Fear of failure reigns.

**Idea Generation:** Innovation/NBD groups begin to focus less on ideation and more on collecting and tilting up new businesses…So where will the new ideas come from?

**System Interfaces:** As complexity of innovation system evolves, or elements of it experience change in leadership, lack of interfaces for a period of time.

**Mandate Creep:** Tightening link to aligned opportunities/BU’s can diminish opportunity search for more innovative ideas. How evolve Strategic Intent?

**Restrictive Governance Boards:** Composed mostly of people who rose through operations system.

**Organizational Readiness:** Difficult to transition new businesses when BU’s not willing to receive them.

**Focus:** How keep eye on long term prize while harvesting small wins along the way within each project?

**Leadership Demands:** Innovation leaders are challenged to manage inward, outward and upward simultaneously.
Sustaining: Challenges

Capacity Changes: How power down but not completely shutter the capability?

Succession Planning: How select and develop next CNO and innovation staff given volunteerism mentality and view of role as temporary development rotation?

Over Achievement: More projects generated and nurtured than the organization can absorb.

Performance Objectives: Misalignment of expectations regarding scale of impact on bottom line. BI helps initiates new growth, but not enough to account sum total of the co’s net growth requirements.
## BI Capability Roadmap: Architecting for Success

| Strategic Innovation Agenda | • Strategic Intent  
|                           | • Entrepreneurial and Operations Cultures  
<table>
<thead>
<tr>
<th></th>
<th>• Education and Expectations Management</th>
</tr>
</thead>
</table>
| Portfolio Innovation System and Talent Management | • Right Type and Level of Resource Commitment  
|                                                        | • Portfolio Flow, Pacing and Transitions  
|                                                        | • Appropriate Evaluation Criteria and Metrics  
|                                                        | • Internal and External Interface Management |
| Project Team Learning and Uncertainty Management | • Uncertainty Reduction  
|                                                   | • Staged Learning  
|                                                   | • Rewards and Recognition |
Radical Innovation Phase II

Longitudinal Study:
Org’l Approaches to Building, Nurturing and Sustaining RI

12 Firms

RI Maturity Assessment Tool: SIS Nov 2005

RI System Success Survey: SIS May 2004

Nov 2005

RI Portfolio Evaluation Tool: May 2006
Longitudinal Study:
Org’l Approaches to Building,
Nurturing and Sustaining RI

12 Firms

RI Maturity Assessment Tool: SIS
Nov 2005 Grabbing Lightning Appendix

RI System Success Survey: SIS
May 2004

RI Portfolio Evaluation Tool: May 2006

Nov 2005

Radical Innovation Phase II
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Longitudinal Study:
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12 Firms
Nov 2005

RI Maturity Assessment Tool: SIS Nov 2005
RI System Success Survey: SIS May 2004
RI Portfolio Evaluation Tool: May 2006
Conceptual Model: Operationalizations

**Leadership**
- Leadership Commitment to Innovation

**Structure**
- Personnel Policies
  - BI Talent Development
  - Career Risk (-)
  - Rewards
- Controls
  - Interim Performance Metrics
  - Output Performance Metrics

**Processes**
- Incubation Processes
  - Options Mentality
  - Learning Based Project Management
  - Harvest Strategy
  - Resource Fluidity
- Comm’n Processes
  - Organizational Flexibility
  - Transition Resources
  - Transition Oversight

**Output**
- BI Success
  - Competency
  - Comm’l Output
- Controls
  - Size (Revenue)
  - R&D Budget
  - BI Budget
Phase II: Management Systems

Mandate/Scope

Metrics/Rewards

Leadership/Culture

Skills/Talent Development

Org. Structure/Interfaces

Processes/Tools

Governance/Decision Making
Talent Development for Innovation

• New Roles emerging, across all levels
  – Chief iNnovation Officer (CNO); Sr VP Strategic Growth, EBO Czar; VP, Strategic Innovation;
  – Exploratory/Inbound marketing group (Corning/DuPont)
  – VP, New Business Development/Creation (Sealed Air)
  – Commercial Development Officer (Air Products)
  – Director of New Growth (Ashland)
  – Director, Gamechangers (Royal Dutch Shell)
  – Idea hunter (MeadWestvaco)
  – Accelerator team (Kodak)……..

But …..No career paths.

*I’ll never become a VP in this group. I have to rotate back out to the business units.*
Phase III

Current Study:

Institutionalizing an Innovation Competency through People: Career Paths for the Innovation Function
What roles, talent development and talent management practices contribute to institutionalizing breakthrough innovation?

- Maximizing individual career satisfaction
- Maximizing a company’s breakthrough innovation capability
Risks for BI Innovation Experts

1. Project Failure puts Jobs at Risk:
   - *It’s difficult for the teams to let us know that the project isn’t making headway or gaining traction. If it gets killed, they may very well get the pink slip.*

2. Unpredictability: Cannot provide sales forecasts and budgets for planning purposes with any confidence.

3. Scale: Projects initially have few people, small budget.
   - *I thought I was being demoted!*

4. Career Atrophy/Unclear Career Path
   - *Our group was perceived as a “timeout” in your career. Some internal networks were concerned that moving to (our group) was a dead end that will hurt your career.*

5. Recognition Discount…innovation teams given little credit once the new business begins to take off:
   - *Everyone remembers the failures, but no one remembers who came up with the successes.*
The Seemingly Obvious Path: 3M
A More Logical Approach?
BI Phase III Program Structure

Longitudinal Study: Institutionalizing Breakthrough Innovation through People

11 Firms 3.5 Years

Talent Assessment Tools for D, I, A

Interviews in (6 mo. intervals) ...NO! site visits+ snowball sample

Survey associating HR/Talent Mgmt Issues with Institutionalizing Innovation Outcomes
BI Phase III Program Structure

Longitudinal Study:
Institutionalizing Breakthrough Innovation through People

11 Firms
3.5 Years

Talent Assessment Tools for D, I, A

Interviews in (6 mo. intervals)
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Survey associating HR/Talent Mgmt Issues with Institutionalizing Innovation Outcomes
Interview Respondents

• Began with person responsible for BI.
  – Asked interview questions about the BI org structure, staffing, talent management issues.

• Did not do site visit at the outset. Mistake!

• Followed up in 6 months. Not enough change in personnel to make a difference.

• Lack of site visit compromised relationships with companies.

• Conducted site visits and learned of others not in the BI group but important to success.

• Began requesting interviews. Moved to snowball sampling technique.
Phase III Project Time-line

2010 Fall IRI Meeting: Program Launch

First Interviews Begun

Completed First Interviews June 2011

Analysis & Team meetings

Final Report Field Study Sp & Fall ‘14 IRI Meetings

9 site visits completed 181 interviews across 11 companies.
Survived 4 leader/sponsor changeovers, failed 2.
Discovery
Creation, recognition, elaboration, articulation of opportunities.

Incubation
Evolving the opportunity into a business proposition

Acceleration
Ramping up the business to stand on its own

Hierarchy?

Conceptualization

• CTO Champions connection to strategic intent
• Portfolio Lead for cross portfolio synergies
• Project analysts scope opportunities; unbiased assessment.

Experimentation

• SVP Biz Dev, Strat. Innov manages interfaces, connects to strategic intent, oversees portfolio
• Program/platform Managers evolve business strategy
• Team members conduct learning experiments

Commercialization

• Growth Council /BU lead Funds, monitors business health
• General Mgr and leadership team for the new business
• Functional contributors within the new business

Other innovation infrastructure staff and leadership
## An Innovation Function

<table>
<thead>
<tr>
<th>Level 3 Portfolio</th>
<th>Discovery</th>
<th>Incubation</th>
<th>Acceleration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D-3</td>
<td>I-3</td>
<td>A-3</td>
</tr>
<tr>
<td>Level 2 Platform</td>
<td>D-2</td>
<td>I-2</td>
<td>A-2</td>
</tr>
<tr>
<td>Level 1 Project</td>
<td>D-1</td>
<td>I-1</td>
<td>A-1</td>
</tr>
</tbody>
</table>
“We’re putting them in monstrous roles”

<table>
<thead>
<tr>
<th>Portfolio Level</th>
<th>Discovery</th>
<th>Incubation</th>
<th>Acceleration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Sr VP-New Business and Platforms</td>
<td>Chief Marketing Officer for one Biz Unit</td>
<td>Group Sr VP-New Business and Platforms</td>
<td>Chief Marketing Officer for one Biz Unit</td>
</tr>
<tr>
<td>Director, Enterprise Adv Mktg</td>
<td>Director, Enterprise Adv Mktg</td>
<td>Director, Enterprise Adv Mktg</td>
<td>Director, Enterprise Adv Mktg</td>
</tr>
<tr>
<td>Platform Level</td>
<td>Discovery: RDWT</td>
<td>Incubation: RDWT</td>
<td>Acceleration: RDWT</td>
</tr>
<tr>
<td>Dir: Rethinking Decentralized Water Treatment</td>
<td>Discovery: RDWT</td>
<td>Incubation: RDWT</td>
<td>Acceleration: RDWT</td>
</tr>
<tr>
<td>Director, Strategic Marketing for one Biz Unit</td>
<td>Director, Strategic Marketing for one Biz Unit</td>
<td>Director, Strategic Marketing for one Biz Unit</td>
<td>Director, Strategic Marketing for one Biz Unit</td>
</tr>
<tr>
<td>Project Level</td>
<td>Strategic Innovator</td>
<td>Prog Mgr + R&amp;D team</td>
<td>Innovation Opp’y Mgrs (5)</td>
</tr>
<tr>
<td>Discovery: RDWT</td>
<td>Incubation: RDWT</td>
<td>Acceleration: RDWT</td>
<td>Growth &amp; Innovation Group (this role modified)</td>
</tr>
</tbody>
</table>
## Interviews per category (n=134)

<table>
<thead>
<tr>
<th>Category</th>
<th>Discovery</th>
<th>Incubation</th>
<th>Acceleration</th>
<th>Innovation Infrastructure &amp; Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Portfolio Level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>10</td>
<td>0+6</td>
<td>[• Strategy Developers (2)]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[• Process Facilitators/coaches (16)]</td>
</tr>
<tr>
<td><strong>Platform Level</strong></td>
<td>26</td>
<td>18</td>
<td>2</td>
<td>[• Strategic Partnerships (2)]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[• OD (2)]</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>[• HR (9)]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[• R&amp;D (2)]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[• Procurement (1)]</td>
</tr>
<tr>
<td><strong>Project Level</strong></td>
<td>19</td>
<td>8</td>
<td>5</td>
<td>Total = 34</td>
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</table>
### An Innovation Function

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<tbody>
<tr>
<td>Director Discovery</td>
<td>CNO</td>
<td>Innovation Council</td>
<td></td>
</tr>
<tr>
<td>Opp’y Domain Leader</td>
<td>New Biz Program Owner</td>
<td>General Mgr., New Biz</td>
<td></td>
</tr>
<tr>
<td>Opportunity Developer</td>
<td>Project Leader</td>
<td>Functional Mgr</td>
<td></td>
</tr>
</tbody>
</table>
For each role we studied:

1. Responsibilities
2. Tasks/Activities
3. Performance Excellence metrics
4. Personal Characteristics
5. Skills/Expertise
6. Critical Experiences
BI Phase III Program Structure

Longitudinal Study: Institutionalizing Breakthrough Innovation through People

11 Firms

3.5 Years

Interviews in (6 mo. intervals)

...NO! site visits+ snowball sample

Talent Assessment Tools for D, I, A

Survey associating HR/Talent Mgmt Issues with Institutionalizing Innovation Outcomes
Conceptual Model:
Survey developed & Pretested

Organizational Context
- Sr Mgmt Commitment
- Talent Pool Characteristics
- Technology Intensity

Industry context
- Dynamism
- Turbulence

Individual Level Talent Mgmt Practices
- BI Leader Selection
- Member selection
- Member flexibility
- Evaluative Metrics
- Expertise Dvlpmnt approach
- Career Risk/Reward/Progression

Talent Support
- HR
- Org’l Slack
- Bridges

Group Level
- Mission
- Structure (FT/PT, Comp’n)
- Task coverage
- Task Variety
- Role specificity
- Average tenure
- Member capabilities

Human Capital Outcomes
- BI Expertise Dvlpt
- Career Satisfaction

BI system success
- Legitimacy
- Institutionalization
- Activity
- Competency
- Output

Technology

Mission

Structure (FT/PT, Comp’n)
- Task coverage
- Task Variety
- Role specificity
- Average tenure
- Member capabilities

Dynamism

Turbulence
Reflections on Building a Research Platform

• Each research study drives the next.
• Stay close to industrial sponsors, but don’t let them drive your agenda. Lead them by articulating latent issues.
• Have multiple objectives. This is too consuming and too difficult for simplistic goals. Setbacks in one set of goals are compensated with gains in another.
• Cannot expect immediate outcomes, but interim outcomes are crucial to ensuring progress.
  – Conference papers and presentations.
  – Team meetings.
  – Reports to industry sponsors.
• One person cannot drive a research program alone. Need at least 2 passionate, committed people.
Innovation: an Emerging Management Discipline

- Amazing progress among most of our companies in the 4 year observation period.
- New roles emerging. Career paths for NBC a concern.
- Not a program, but a constant (budget, people)
- Discipline and rigor, but not process.
- Metrics focused on portfolio rather than project level.
- But….very new yet. Most feel as if they’re on the track, but wish they had better direction.
Research Output

Phase I published papers

- RI hubs (AME)
- Project mgmt processes (J Ops.Mgmt, SMR)
- RI Mgmt Strategy (JPIM*, RTM)
- Market Learning (4 JPIM)
- Transitioning project to BU’s (IEEE*, RTM)
- People Issues (JET-M)
- Opp’y Rec. (CMR*, R&D Mgmt)
- Research Methods (Org Sci)
- CVC Models (JMTP)
- New Market Creation (JPIM)
- Nature of Uncertainty (JPIM)

Phase II published papers

- Management Systems for Innovation (Book Chapter, JPIM)
- Org. Structures and Innovation Competencies (JPIM*, RTM)
- Open, Radical Innovation (Bk Ch)
- Management Approaches (Book Ch, IJTech Mgmt)
- Corp Entrepr’l cognition (ETP)
- Embeddedness vs isolation (JPIM)
- Intra-Org’l networks (JBV)
- Risk Mgmt. (IJHTMgmt Research)
- RI Portfolios (RTM)
- RI Governance (JET-M)
- Routines for BI (R&R)

- Survey data…….
THANK YOU—QUESTIONS & DISCUSSION?