The Abdus Salam
International Centre for Theoretical Physics

United Nations
Educational, Scientific and
Cultural Organization

IAEA
International Atomic Energy Agency

2140-12

Workshop on Entrepreneurship for Physicists and Engineers from Developing Countries

3 - 7 May 2010

AREA's Innovation System and Business Intelligence Tools to Support Entrepreneurship

Stephen Taylor
AREA Science Park
Trieste
Italy

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Stephen Taylor
Trieste
May 4th 2010

Friuli Venezia Giulia Region

Area Science Park of Trieste

A First Level National Research Body
Our mission: to provide a national reference point for technology transfer and to enhance competitiveness both regionally and nationally

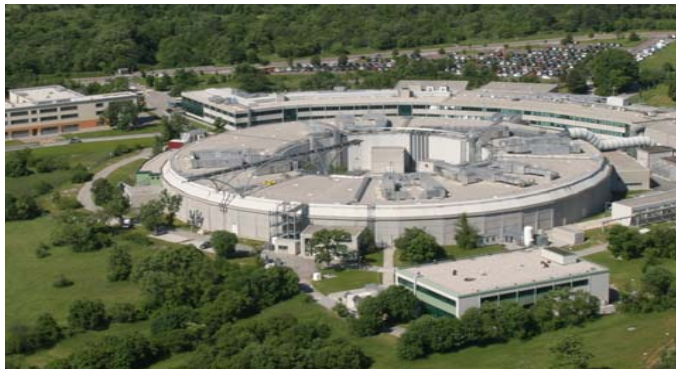
Created in 1978

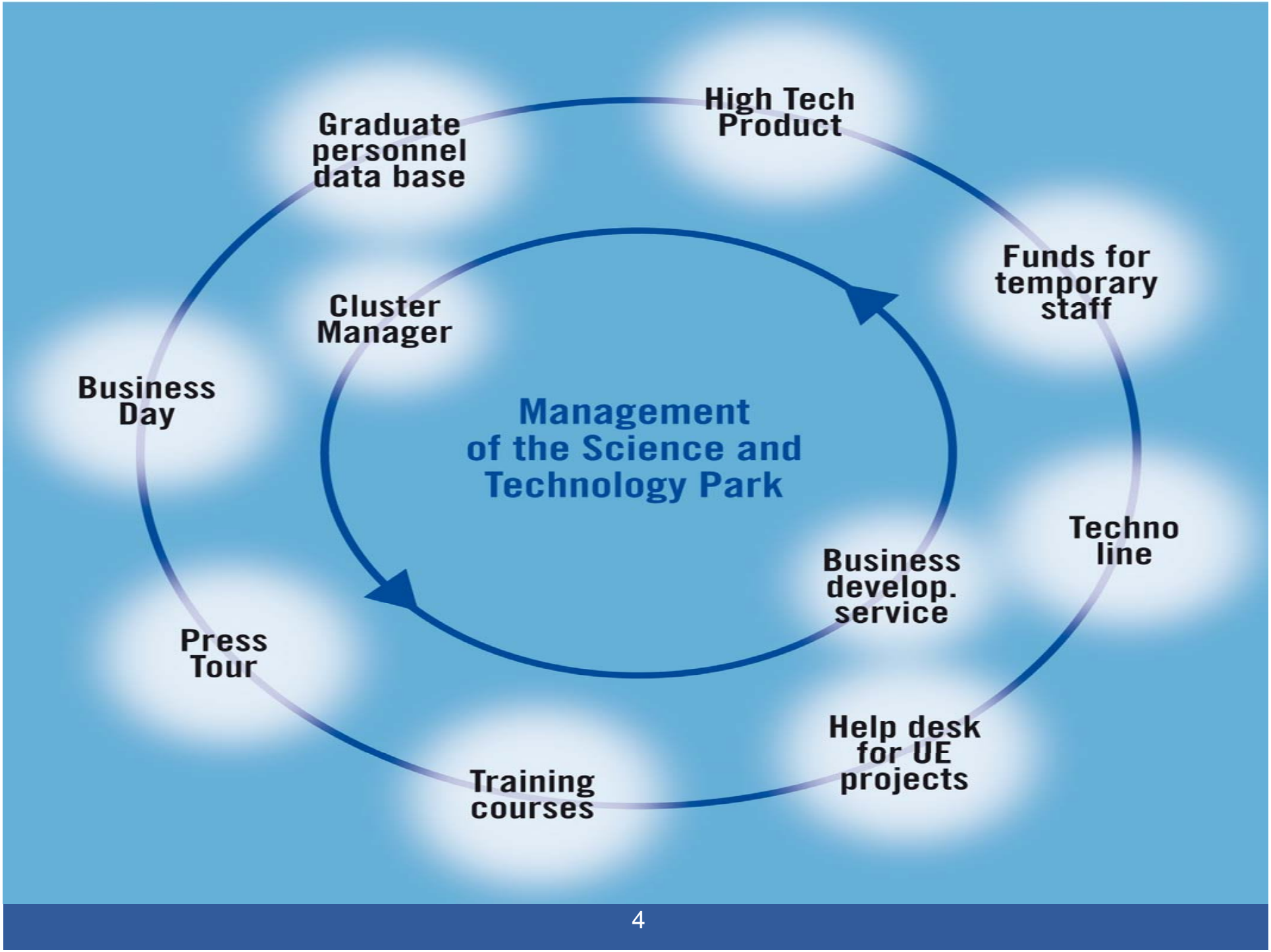
Science and Technology Park

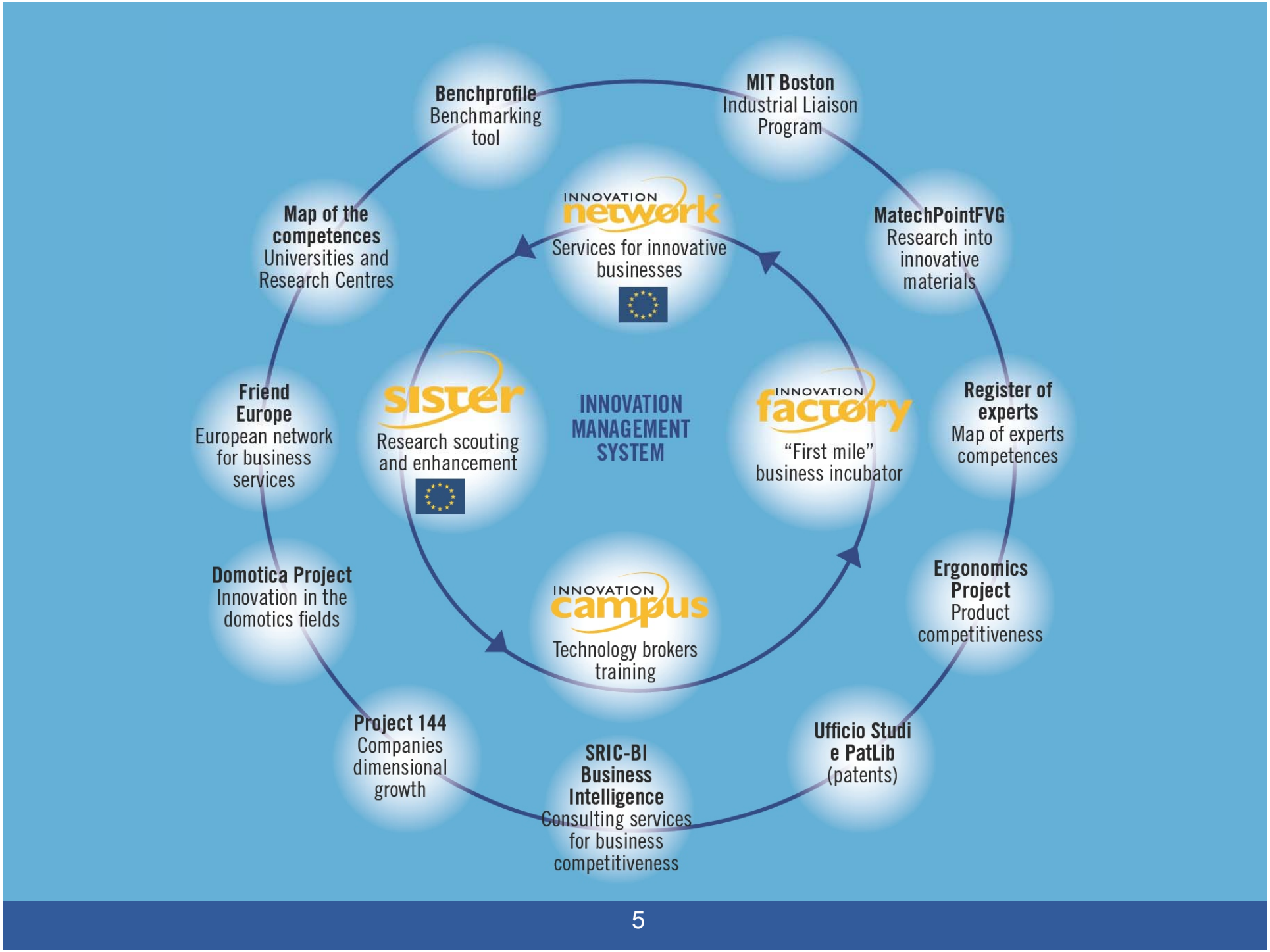
Campus at Padriciano

National Research Body (Ministry of University and Research)

Campus at Basovizza




Graduate personnel data base
High Tech Product
Funds for temporary staff
Techno line
Business develop. service
Help desk for UE projects
Training courses
Press Tour
Business Day
Cluster Manager
Management of the Science and Technology Park


Benchprofile
Benchmarking tool
MIT Boston
Industrial Liaison Program
Map of the competences
Universities and Research Centres
INNOVATION network
Services for innovative businesses
MatechPointFVG
Research into innovative materials
Friend Europe
European network for business services
SISTER
Research scouting and enhancement
INNOVATION MANAGEMENT SYSTEM
INNOVATION factory
"First mile" business incubator
Register of experts
Map of experts competences
Domotica Project
Innovation in the domotics fields
INNOVATION campus
Technology brokers training
Ergonomics Project
Product competitiveness
Project 144
Companies dimensional growth
SRIC-BI Business Intelligence
Consulting services for business competitiveness
Ufficio Studi e PatLib
(patents)

Final customer

SMEs who lack the resources to acquire and effectively utilize world class business intelligence

Goals

Deliver world-class Business Intelligence from global centres of excellence to our SME clients

Methodology

In partnership with global leader Strategic Business Insights (SBI), we provide our SME clients with access to the very best analysis of opportunities in the commercialization of technology. Using Explorer our SME clients can count on a critical intelligence input into their strategy decision making.

Explorer enables our clients to:

- • Receive global, objective, real-world analysis, not hype
- • Identify new business opportunities
- • Validate internal knowledge and communicate ideas
- • Improve their technology portfolio decisions
- • Provide a bridge between technical and business domains.

Evaluating Business Opportunities Arising from Technology Commercialization

Methodologies used for global business intelligence gathering and filtering, and for technology monitoring and opportunity identification and assessment

Agenda

- **Strategic Business Insights (SBI)**
  - **History of Innovation at SRI International**
- **Business Intelligence Tools**
  - **Explorer**
  - **Scan**

SBI and SRI International

SBI

- Dedicated management-consulting practice:
- Pioneer of scenario planning for strategy development
- Scan: Alerting clients to early signs of change
- Explorer: Commercial opportunities from over 30 technology areas including electronics and IT, process and biotechnologies, energy and materials
- The VALS™ typology for consumer acceptance of technology

SRI Worldwide Locations

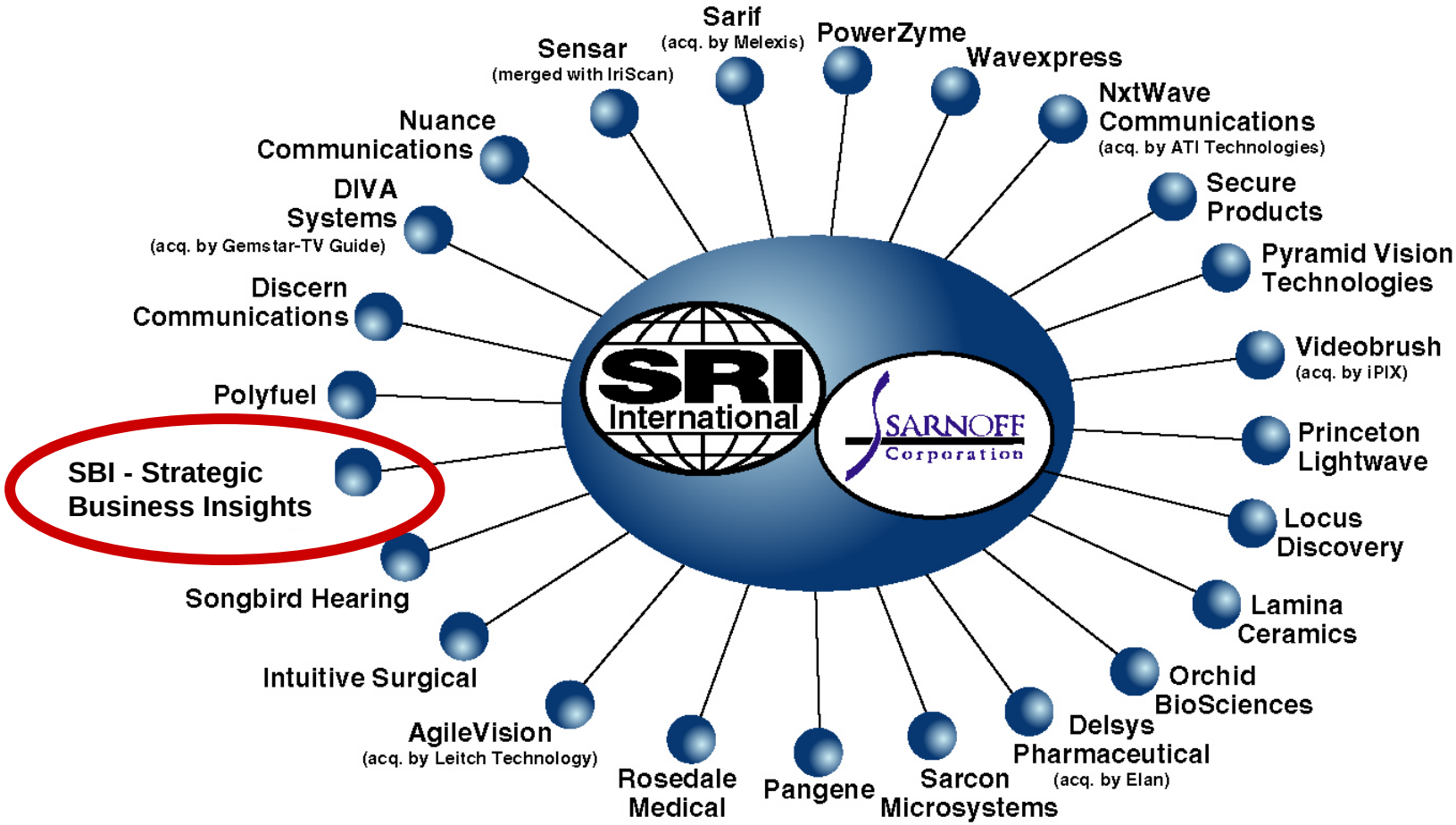
SRI International

- More than 1800 scientists, technologists, engineers, and futurists worldwide
- More than 100 disciplines
- More than 1000 active research and consulting projects at any time
- Service to more than 2000 client companies every year
- Outsourcing of R&D

New Technology Spin-Off Companies

- Firms like Nuance that provide commercial applications for SRI-developed technologies

Selected SRI International Spin-offs



SRI International: Extending a History of Innovation

1950 1960 1970 1980 1990 2000

ERMA Banking Computer Prototype

MICR Encoding for Checks

All Magnetic Logic

Optical Disk Reading

Ink Jet Printing

Mouse Input Device

Hypertext

Modem Acoustic Coupler

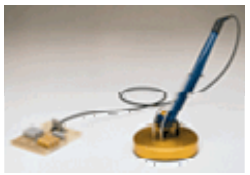
ARPA net

Scenario-Based Planning

Halofantrine
Falciparum malaria treatment marketed by SmithKline and the WHO

CBOT, CME Hand-Held Computer

Multimedia Electronic Mail



Pen-Input Computing

HDTV

Continuous Speech Recognition for Telephone Transactions

i4

Information Security

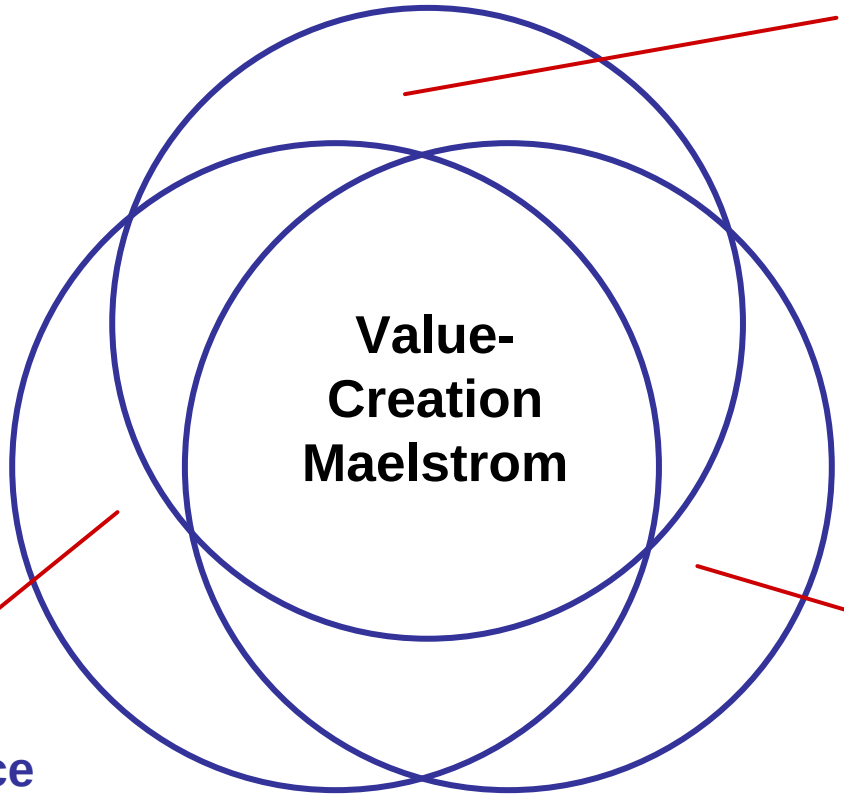
Hirudin
Small protein that inhibits major blood-clotting, used in the treatment of cardiovascular disease and cancer

Telepresence Surgery
A new method of performing surgery using computer-mediated surgical tools that provide improved accuracy and flexibility, especially in minimally invasive procedures, and provide a future technology platform for remotely performing surgical procedures

Identifying Opportunities

- **High-value opportunities emerge from arenas of great change**
  - **Technology developments**
  - **New ideas and paradigms**
  - **Imperfect market structures.**

Provide a Balanced View



Culture

- The Attention Economy/
- The Experience Industry
- Health Care
- Privacy/Security

Technology

- Wireless Technologies
- Speech Technologies
- Biotechnology
- Nanotechnology
- Pervasive Computing

Commerce

- Knowledge Management
- Intellectual Property
- E-Commerce
- Globalization

Successful Entrepreneurs Understand Change

- **They:**
  - **Are aware of developments beyond their own domain**

Dorothy Leonard-Barton, author of *Wellsprings of Knowledge*, believes that the most important streams of knowledge for companies are not internal but flow in from the outside.

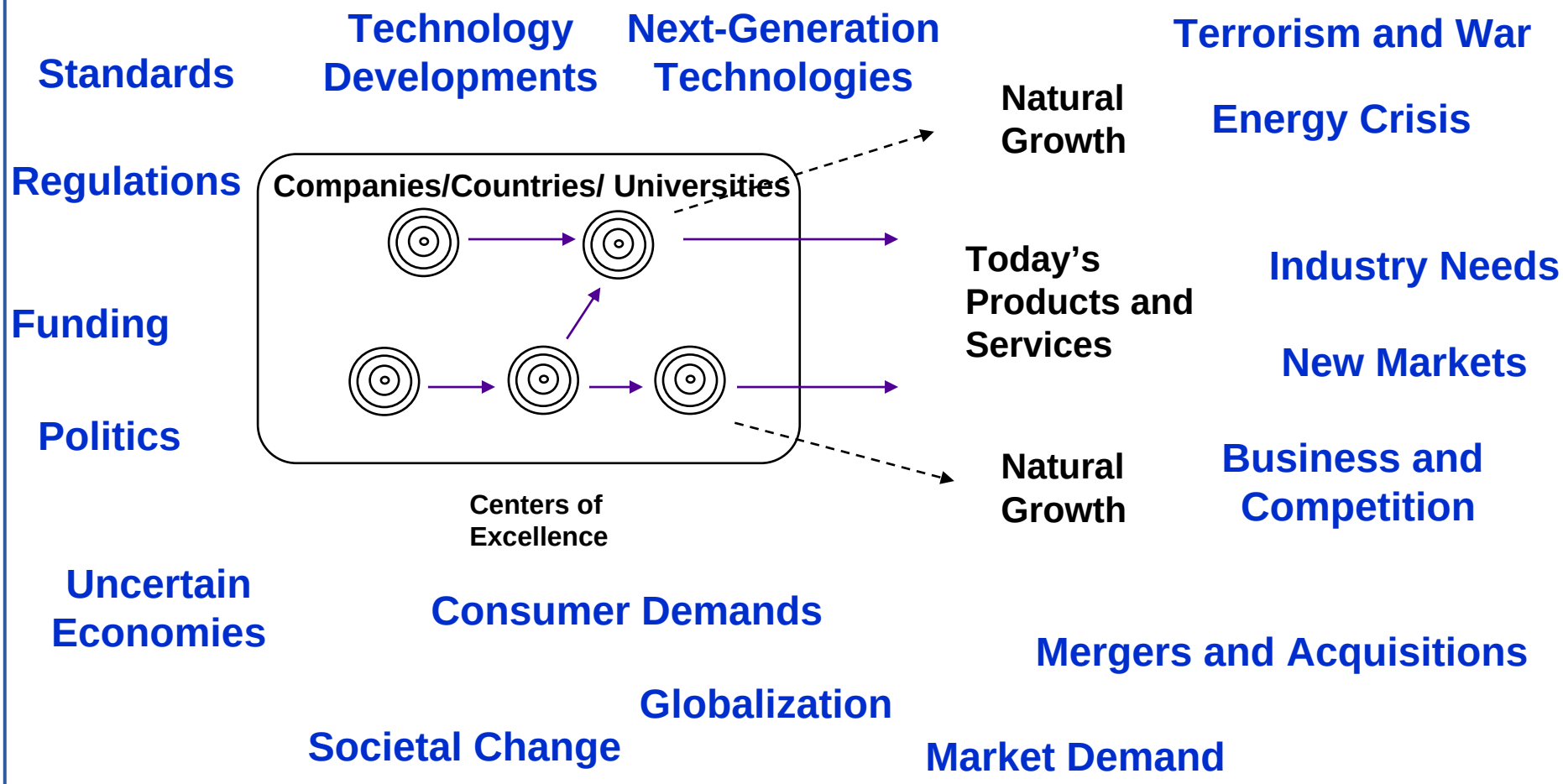
  - **Foster a futures orientation among corporate decision makers**

Eric Beinhocker and Sarah Kaplan, "Tired of Strategic Planning", McKinsey Quarterly, stress the importance of fostering executives with 'prepared minds" so that they have a strong grasp of the strategic context they operate in.

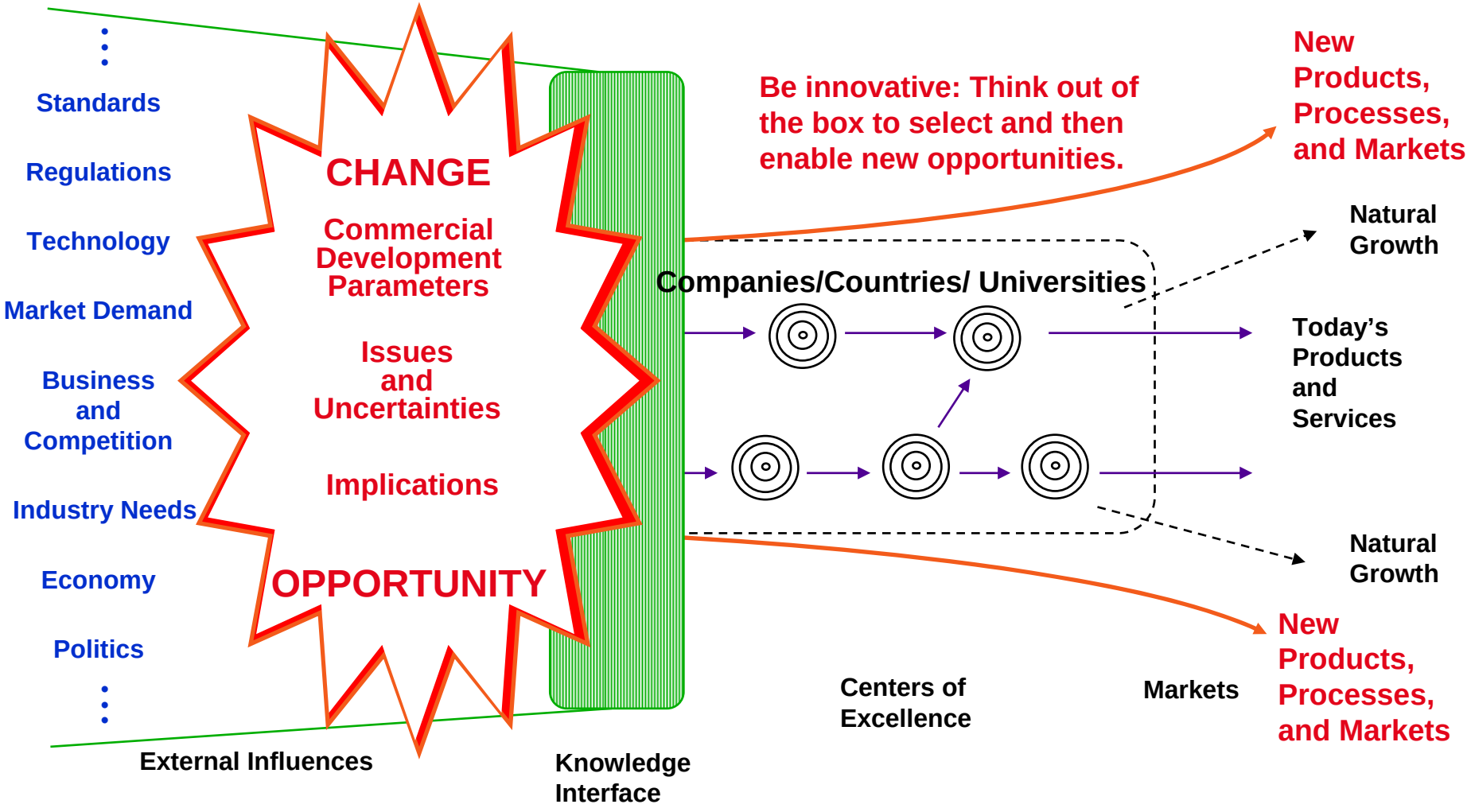
  - **Have effective business intelligence systems**

Explorer:
Opportunities through Commercialization of Emerging Technologies

Change in External Forces Provides New Opportunities



Establish a Methodology to Unearth Opportunities



Current Explorer Technology Areas

- Advanced Silicon Microelectronics
- Biocatalysis
- Biomaterials
- Biopolymers
- Biosensors
- Connected Cars
- Connected Homes
- Engineering Polymers
- Flat-Panel Displays
- Fuel Cells
- Genomics
- Knowledge-Based Systems
- Knowledge-Management Tools
- Membrane Separation
- MEMS/Micromachining
- Mobile Communications
- Nanobiotechnology
- Nanoelectronics
- Nanomaterials
- Novel Ceramic/Metallic Materials
- Optoelectronics/Photonics
- Organic Electronics
- Pervasive Computing
- Photovoltaics
- Polymer-Matrix Composites
- Portable Electronic Devices
- Portable Power
- Renewable Energy Technologies
- RFID Technologies
- Robotics
- Smart Materials
- Solid-State Microsensors
- User Interfaces
- Virtual Worlds

Explorer Technology Maps

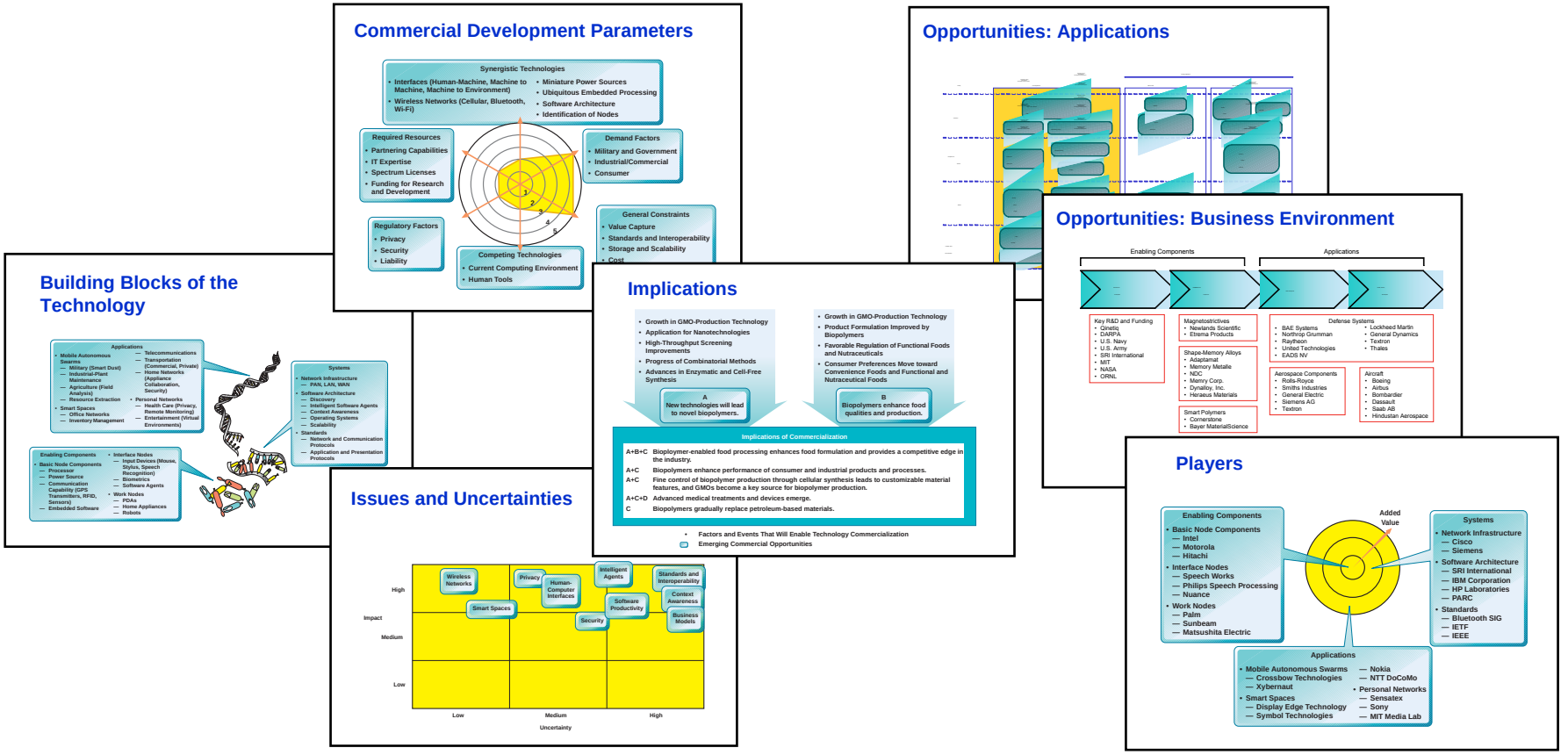
- **The Importance of the Technology—three-paragraph executive summary:**
  - **Technology Focus—technology description and potential benefits**
  - **Commercial Status and Trends—current and future applications, drivers, and barriers**
  - **Implications of Commercialization—benefits and competitive threats, opportunities, and timing**

Technology Maps: Structure

- **Technology Maps comprise six key sections reflecting elements of change that we monitor, question, and evaluate:**
  - **Technology evolution**
  - **Commercial development parameters—drivers of and barriers to the technology's commercialization**
  - **Issues and uncertainties**
  - **Implications of commercialization**
  - **Resultant opportunities—applications and markets**
  - **Industry structures.**

We integrate our current evaluations into a commercially focused Technology Map—which we review on an ongoing basis.

Explorer Technology Maps: Charts of Exploration



Understand the Technology

Applications

- Mobile Autonomous Swarms
  - Military (Smart Dust)
  - Industrial-Plant Maintenance
  - Agriculture (Field Analysis)
  - Resource Extraction
- Smart Spaces
  - Office Networks
  - Inventory Management
  - Telecommunications
  - Transportation (Commercial, Private)
  - Home Networks (Appliance Collaboration, Security)
- Personal Networks
  - Health Care (Privacy, Remote Monitoring)
  - Entertainment (Virtual Environments)

Systems

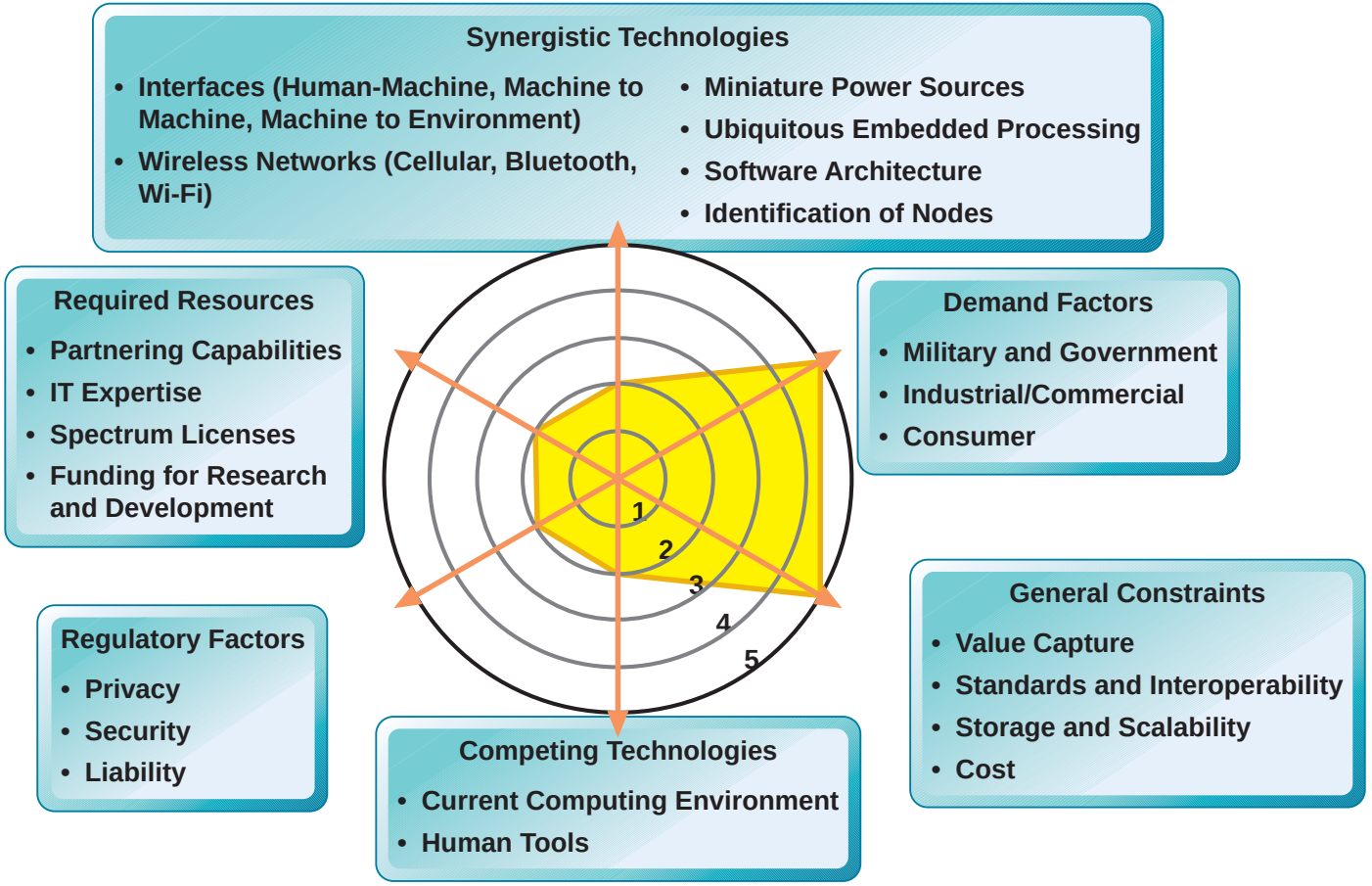
- Network Infrastructure
  - PAN, LAN, WAN
- Software Architecture
  - Discovery
  - Intelligent Software Agents
  - Context Awareness
  - Operating Systems
  - Scalability
- Standards
  - Network and Communication Protocols
  - Application and Presentation Protocols

Enabling Components

- Basic Node Components
  - Processor
  - Power Source
  - Communication Capability (GPS Transmitters, RFID, Sensors)
  - Embedded Software
- Interface Nodes
  - Input Devices (Mouse, Stylus, Speech Recognition)
  - Biometrics
  - Software Agents
- Work Nodes
  - PDAs
  - Home Appliances
  - Robots

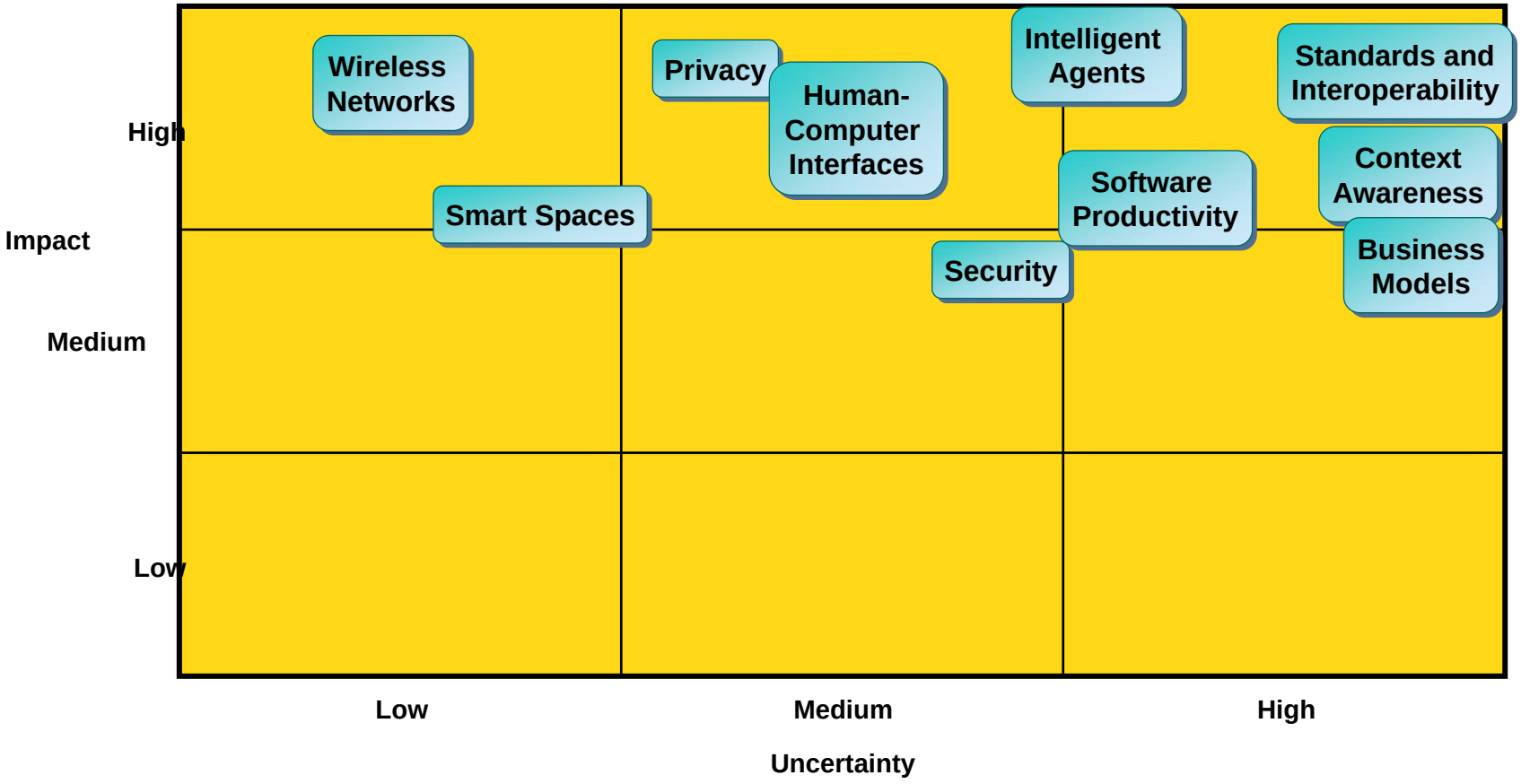
Commercial Development Parameters

Pervasive Computing



Issues and Uncertainties

Pervasive Computing



Implications of Commercialization

Biopolymers

- Growth in GMO-Production Technology
- Application for Nanotechnologies
- High-Throughput Screening Improvements
- Progress of Combinatorial Methods
- Advances in Enzymatic and Cell-Free Synthesis

A
New technologies will lead to novel biopolymers.

- Growth in GMO-Production Technology
- Product Formulation Improved by Biopolymers
- Favorable Regulation of Functional Foods and Nutraceuticals
- Consumer Preferences Move toward Convenience Foods and Functional and Nutraceutical Foods

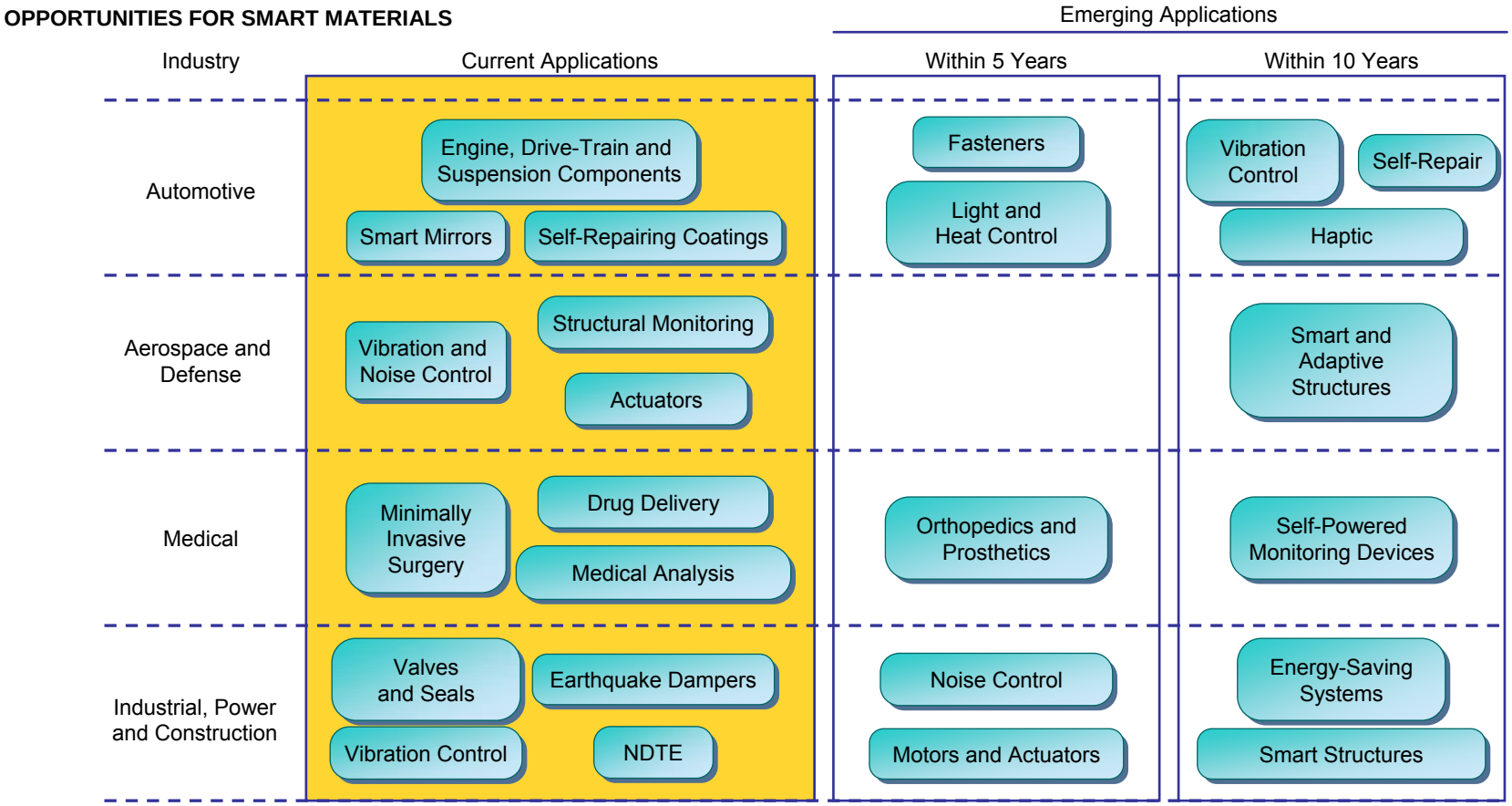
B
Biopolymers enhance food qualities and production.

Implications of Commercialization

A+B+C	Bioploymer-enabled food processing enhances food formulation and provides a competitive edge in the industry.
A+C	Biopolymers enhance performance of consumer and industrial products and processes.
A+C	Fine control of biopolymer production through cellular synthesis leads to customizable material features, and GMOs become a key source for biopolymer production.
A+C+D	Advanced medical treatments and devices emerge.
C	Biopolymers gradually replace petroleum-based materials.

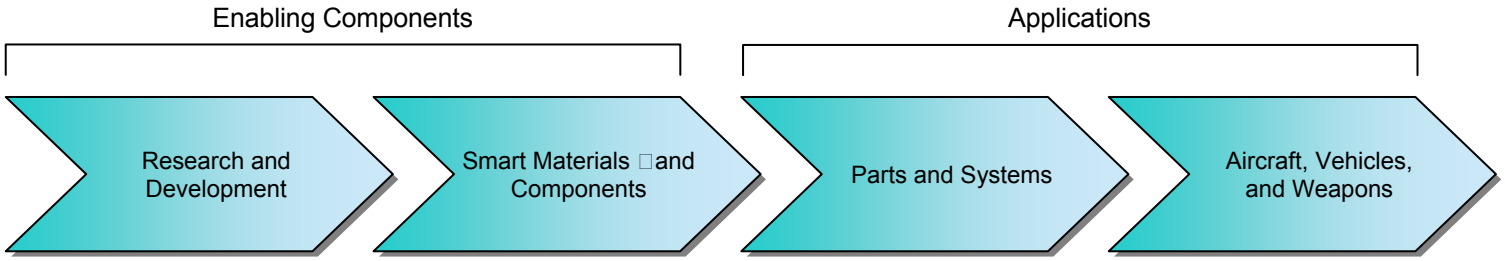
- Factors and Events That Will Enable Technology Commercialization
- Emerging Commercial Opportunities

Opportunities: Applications



Opportunities: Value Chain

VALUE CHAIN FOR SMART MATERIALS IN AEROSPACE AND DEFENSE APPLICATIONS



Key R&D and Funding
- QinetiQ
- DARPA
- U.S. Navy
- U.S. Army
- SRI International
- MIT
- NASA
- ORNL

Magnetostrictives
- Newlands Scientific
- Etrema Products

Shape-Memory Alloys
- Adaptamat
- Memory Metalle
- NDC
- Memry Corp.
- Dynalloy, Inc.
- Heraeus Materials

Smart Polymers
- Cornerstone
- Bayer MaterialScience

Piezoelectrics
- Many Suppliers

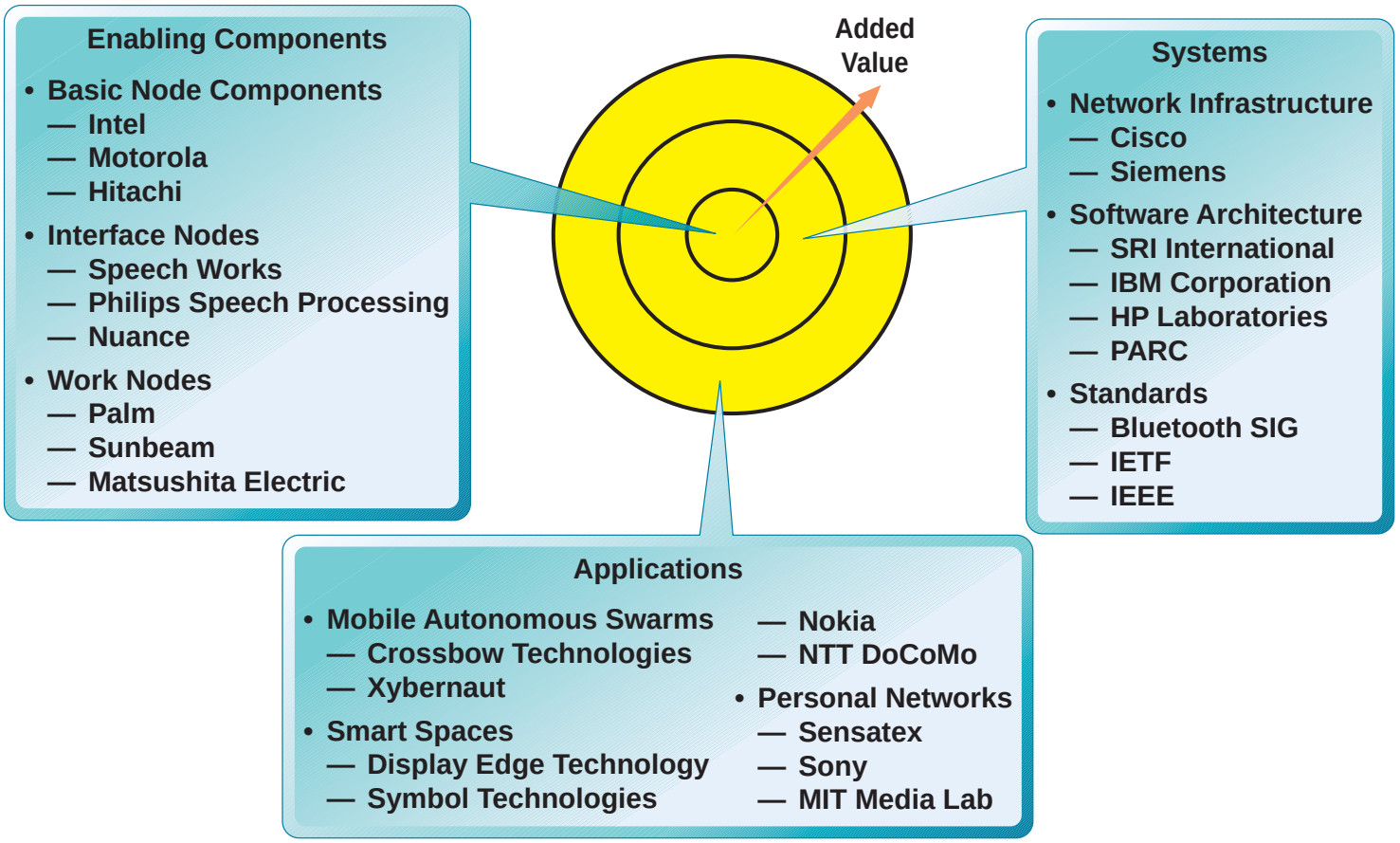
Defense Systems
- BAE Systems
- Northrop Grumman
- Raytheon
- United Technologies
- EADS NV
- Lockheed Martin
- General Dynamics
- Textron
- Thales

Aerospace Components
- Rolls-Royce
- Smiths Industries
- General Electric
- Siemens AG
- Textron

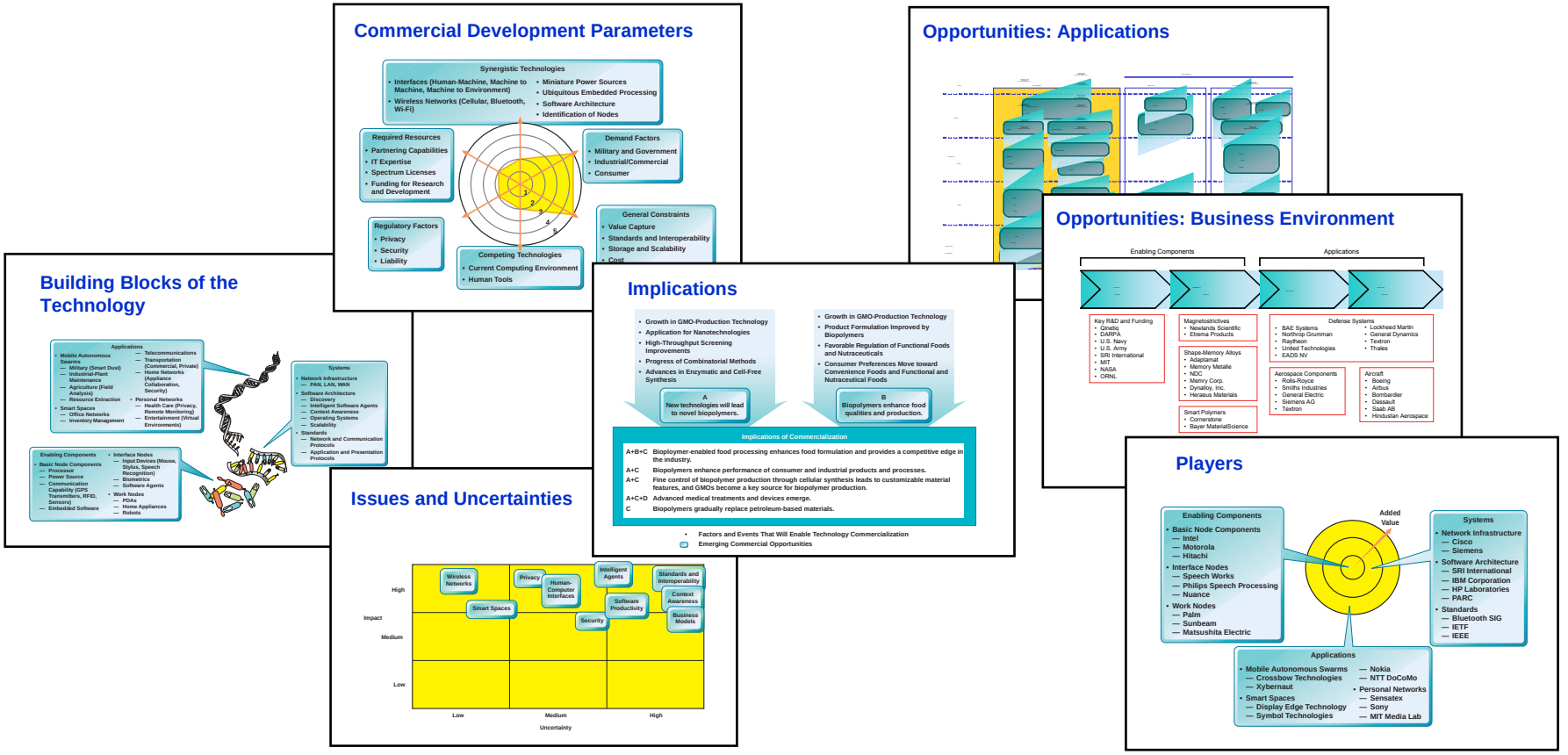
Aircraft
- Boeing
- Airbus
- Bombardier
- Dassault
- Saab AB
- Hindustan Aerospace

Players and Structure of the Industry

Pervasive Computing



Explorer Technology Maps: Charts of Exploration



How Entrepreneurs Use Explorer

- **Explorer is a service to support decision making where you need to:**
  - **Identify potential technology-enabled opportunities to monitor**
  - **Evaluate the reasons for and the likely timing, path, and implications of technology development and commercialization—in application areas you have already identified as opportunities.**
- **Explorer will:**
  - **Bring you up the learning curve fast in technology areas and applications new to you**
  - **Challenge or support your current thinking**
  - **Reduce the risk of surprise**
  - **Extend your peripheral vision.**

Explorer

- **Business opportunities in technology commercialization**

  - **A balanced understanding of the implications of change**
  - **Improvement in timing and effect of technology portfolio decisions**

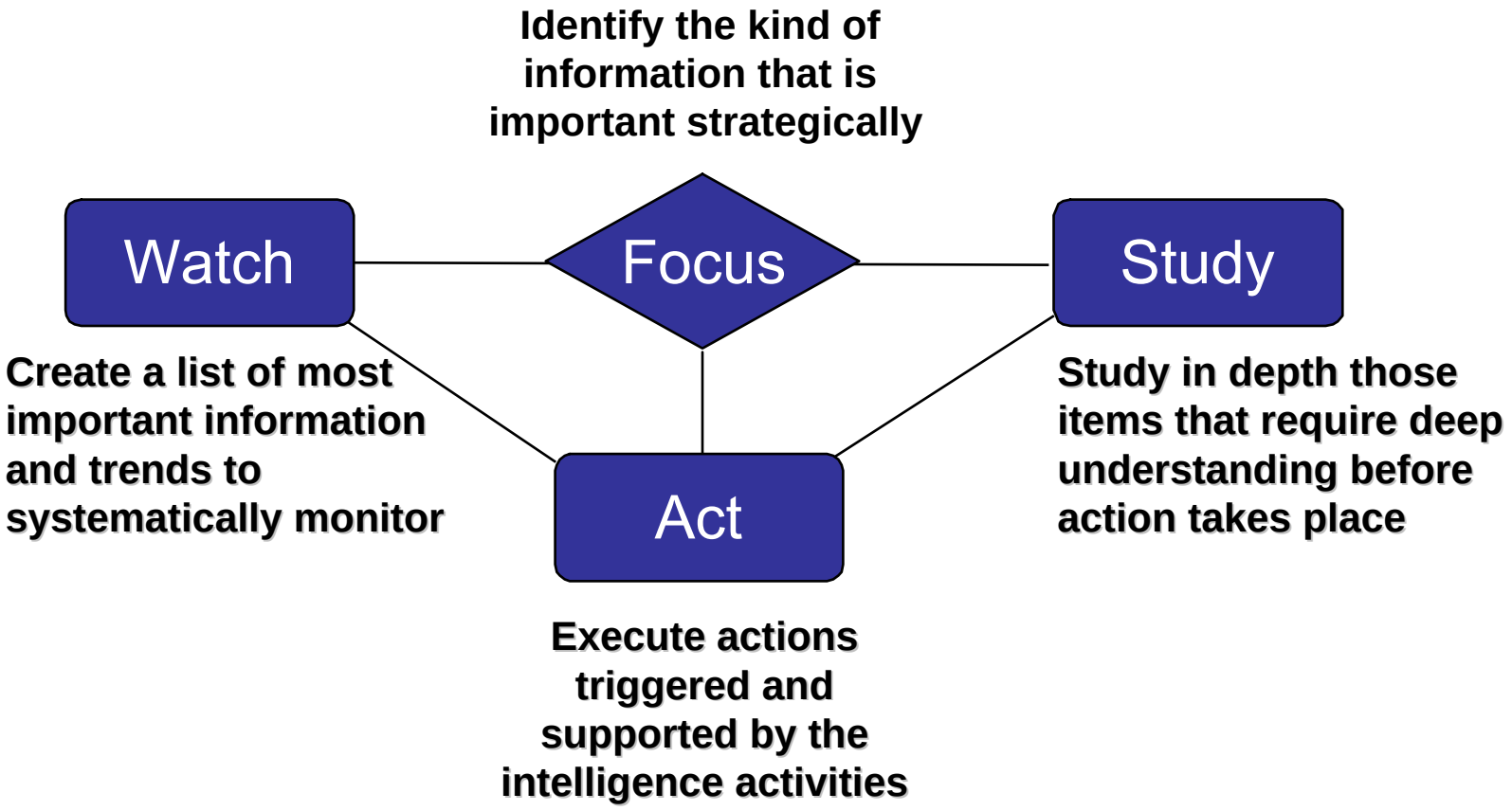
- **Separation of facts from hype**

Scan: Open Intelligence

scan
ANTICIPATING FUTURES

- **Insight about the defining forces of the business environment**
  - **Peripheral vision for innovation**
  - **Frameworks—identification of threats and opportunities—for successful strategies**
  - **Scanning for early signals of change**

Most Business Intelligence Systems Target Key External Information

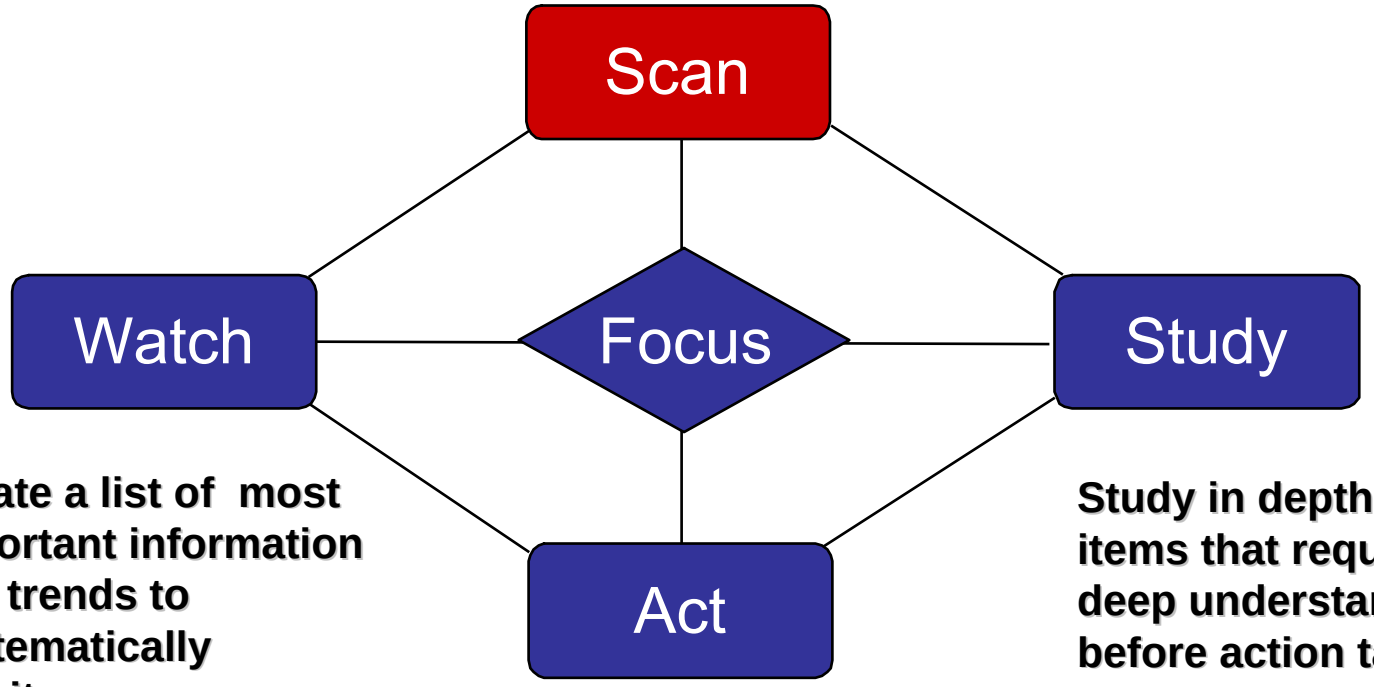


Most Businesses Excel In The Targeted Intelligence Processes

- **Targeted Intelligence processes:**
  - Monitor topics identified through an internal company process or by key decision makers
  - Track development of issues that have strategic importance
  - Stimulate and trigger decision making
- **Once important intelligence topics are identified, decision makers know how to analyze them—**
  - Where to go for more information
  - How to monitor changes
  - When to report back on new developments

Scanning: Open Intelligence

Scanning enables companies to look continuously across diverse sources for new signals of change that may have an impact but are not yet on a company watch list. Scanning brings many new ideas to light.



Create a list of most important information and trends to systematically monitor

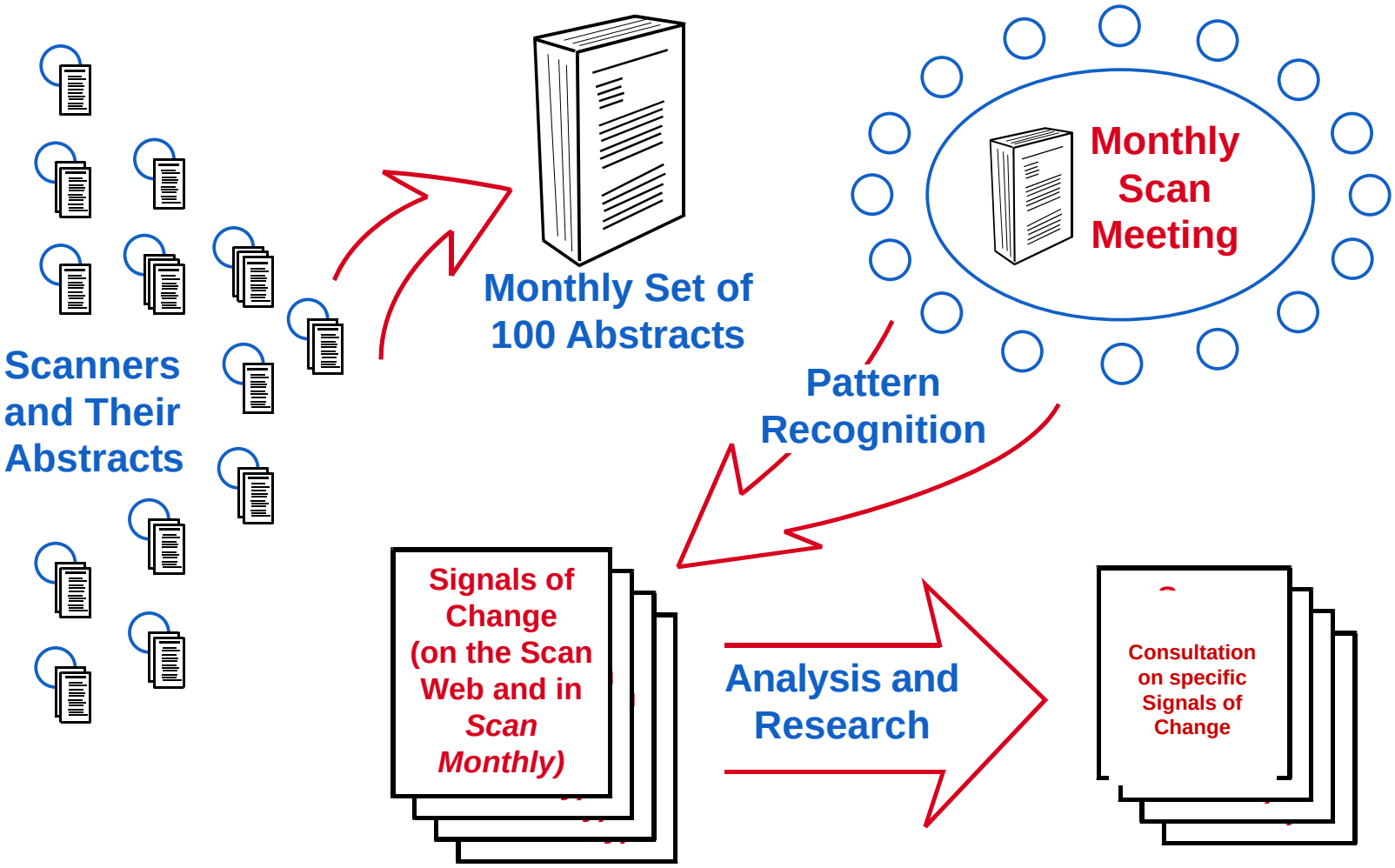
Execute actions

Study in depth those items that require deep understanding before action takes place

Scan is an Open Intelligence Process

- **Open Intelligence processes:**
  - **Provide early warning about topics not yet identified as strategic**
  - **Continuously scan unstructured information about the external environment**
  - **Cluster data points into topic areas of possible strategic importance**
  - **Identify new topics of strategic importance (through sorting and ranking) that may require monitoring in the targeted process**
- **Decision makers need a process to identify and apply intelligence from the volumes of unstructured external information in a way that is:**
  - **Continuous**
  - **Systematic**
  - **Refreshing to the targeted intelligence processes**

The Process Of Scanning

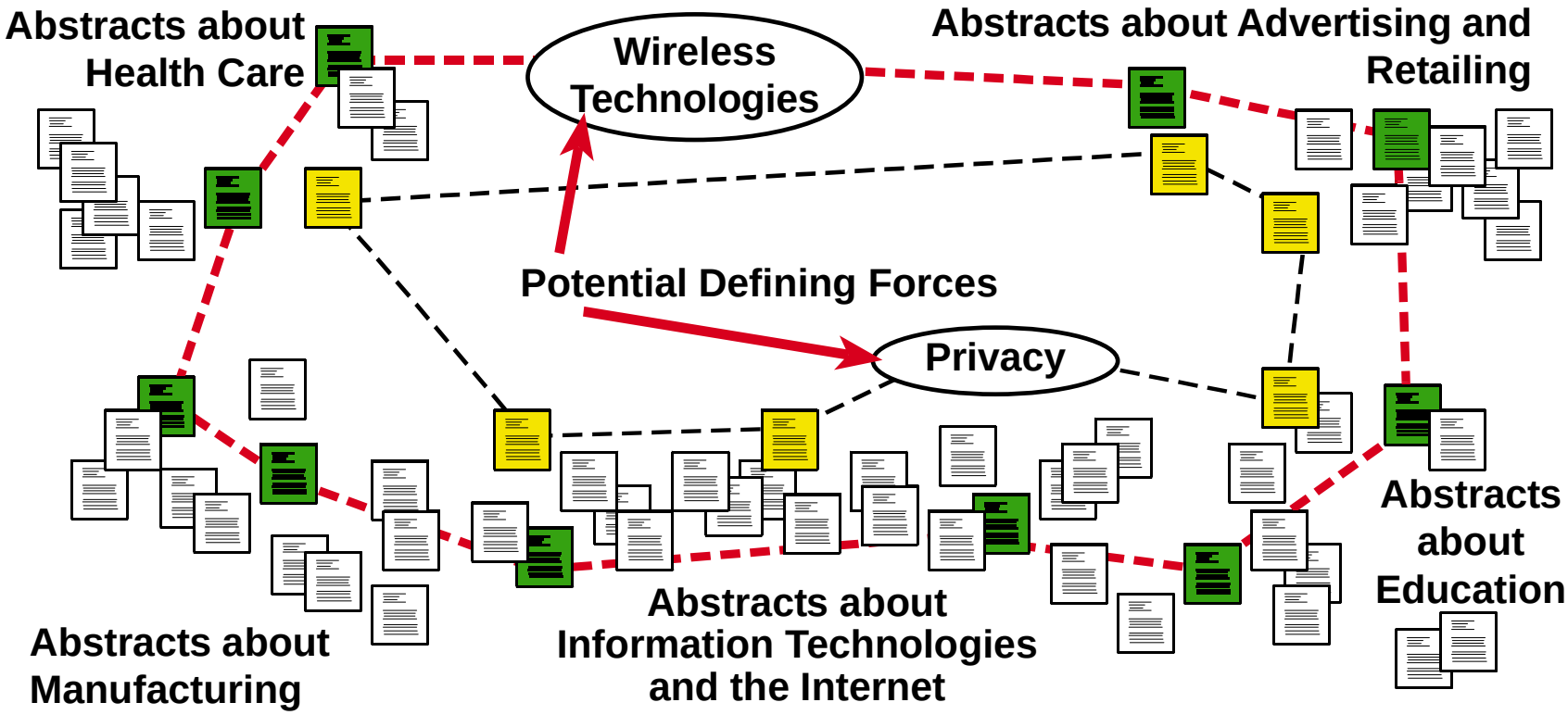


Scan™ Abstract Origins

- **We look for**
  - Faint signals of change
  - Discontinuities
  - Inflection points
  - Disruptive technologies
  - Outliers
  - Unconventional wisdom
- **In all arenas**
  - Consumer behavior
  - Regulations/politics
  - Business processes
  - Culture
  - Public opinion
  - Science and Technology

Finding Clusters Of Related Abstracts

Scan abstracts typically cluster around industry categories.



Clustering Close-up

- **Scan provides a way to recognize interesting ideas and drivers of change across industry categories.**

Da Ren Chen at Washington University in St. Louis has developed a wristwatch-size gauge that sounds an alarm when air quality drops below a certain level.

Medtronic has announced FDA approval of an implantable heart-monitoring device that can send data to the Internet.

Automakers now install equipment that records mechanical performance during the seconds before an accident.

How do these abstracts relate to each other?

They all involve continuous monitoring.

Prioritizing Clusters

Clusters Result In Signals Of Change…

Signals of Change are collections of early signs of emerging trends, new ideas, or technology breakthroughs.

- Beauty medicine and the worried well
- Emotion technologies
- Brand as network
- Neuromarketing
- Continuous monitoring
- Surfing the data deluge
- Downloading risk to consumers
- eScience
- Selling Serenity

Benefits Of Scan Process

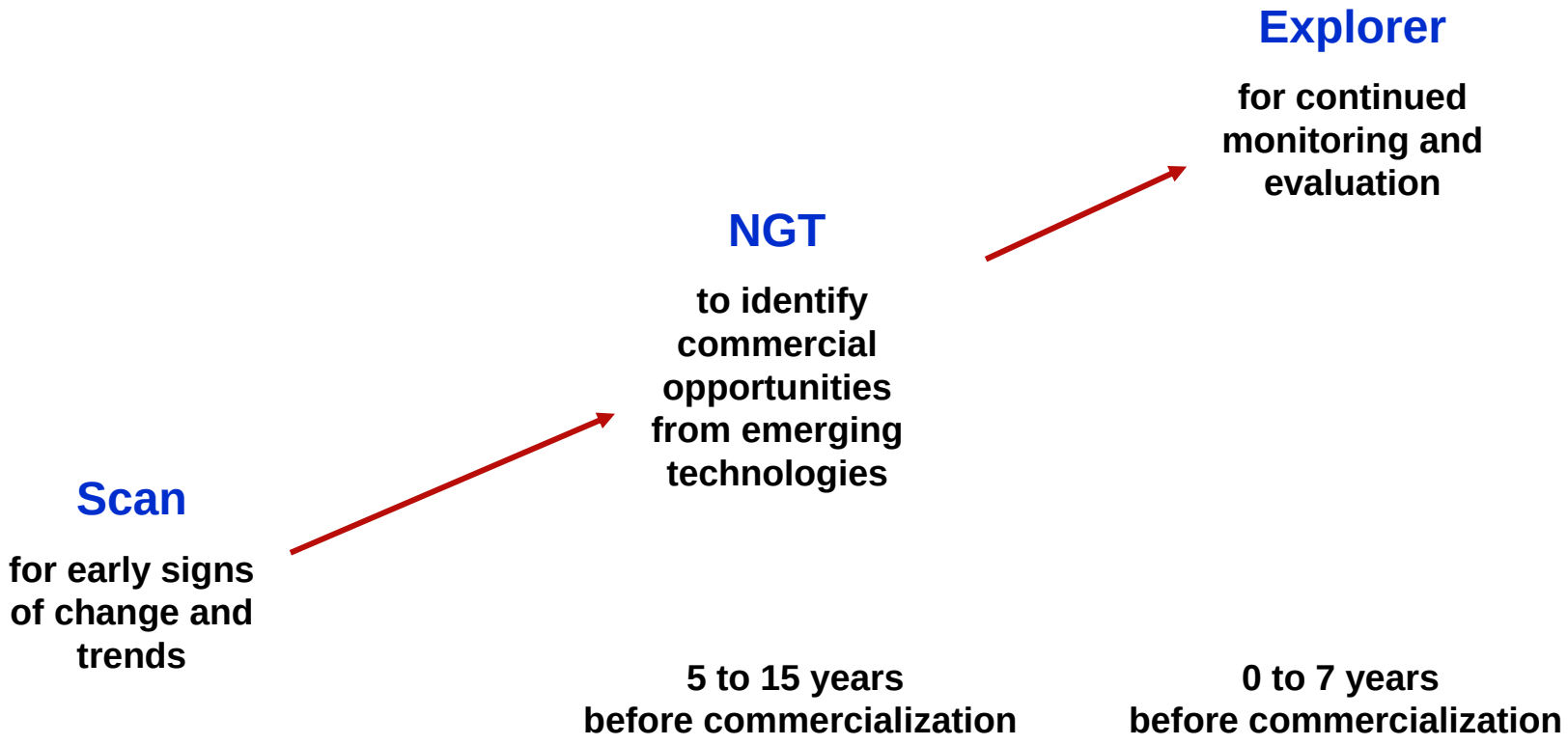
- **Specific benefits:**
  - **Provides advance warning of possible emerging technological, commercial, and cultural trends**
  - **Fosters broad vision outside normal industry domains**
  - **Sets up an analytical framework for deflating media hype**
  - **Nurtures futures thinking more broadly in the organization.**
- **Broad structural benefit:**
  - **Scanning is a reliable way to navigate through the turbulence of change. It allows decision makers to identify:**
    - **What to watch**
    - **What to study**
    - **What to act upon now**

Scan

scan
ANTICIPATING FUTURES

- **Insight about the defining forces of the business environment**
  - **Peripheral vision for innovation**
  - **Frameworks—identification of threats and opportunities—for successful strategies**
  - **Scanning for early signals of change**

Emerging Technologies: From Scan™ to Explorer



Establishing Your Own Open Intelligence Process

Key Success Factors For Establishing Your Own Open Intelligence System (1 of 2)

- Require a senior level champion
- Select Scan meeting participants carefully. They need:
  - breadth of expertise
  - non-judgmental attitudes
  - a creative spirit
  - self-motivation
  - humor
- Select a good facilitator
- Capture the meeting discussion
- Hold meetings on a regular basis

Key Success Factors For Establishing Your Own Open Intelligence System (2 of 2)

- Provide incentives for submitting abstracts and attending meetings (for example, a newsletter where cool ideas are reported)
- Design a simple process for abstract submission (such as on-line submission)
- Integrate the open intelligence process into the decision making process
- Protect from “accountantitis”—the demand for documentation of a return on investment for the cost of the meetings.
- Develop a regularly scheduled process for determining if/when watch list topics need to removed, studied and/or acted on

Questions?