How Smart, Connected Products are Transforming Competition

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Executive Event
Munich, Germany
January 21, 2015

The Third Wave of IT Driven Competition

1800s	1960s	1980s	2000s	Beyond
Mechanical Products & Physical Processes	**Value Chain Automation**	**Value Chain Dispersion and Integration**	**Smart, Connected Products**	
Products are mechanical and value chain activities are performed manually using analog information through paper processes and verbal communications	IT used to automate information collection and processing in **individual activities** across the value chain	The Internet enables **coordination and integration** across the value-chain, with customers and business partners, and across geography	**IT is embedded in products themselves**, transforming value creation by products while also triggering a new wave of transformation in the value chain, and creating the need for entirely new activities	

Smart, Connected Product Components

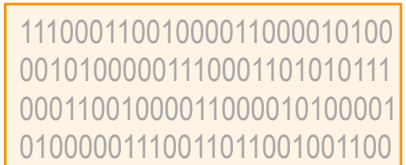
Smart, Connected Product

Product Cloud

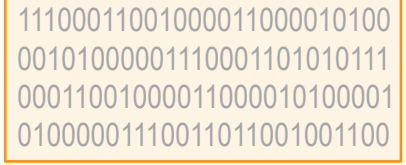
Database, Application Platform,
Rules / Analytics Engine, Smart Product Applications

Connectivity

One to One, One to Many, Many to Many



Smart Product



Enhanced UI

Software

Electronics and Controls

Sensors

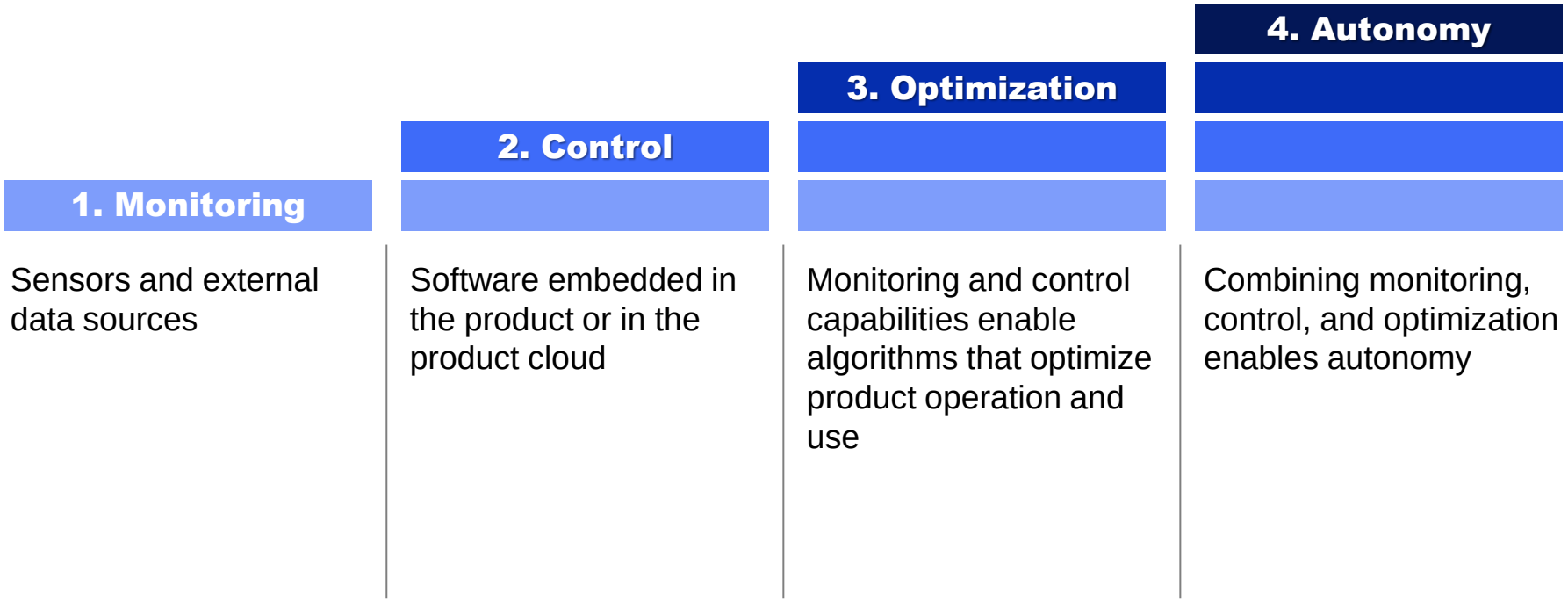
Physical Product

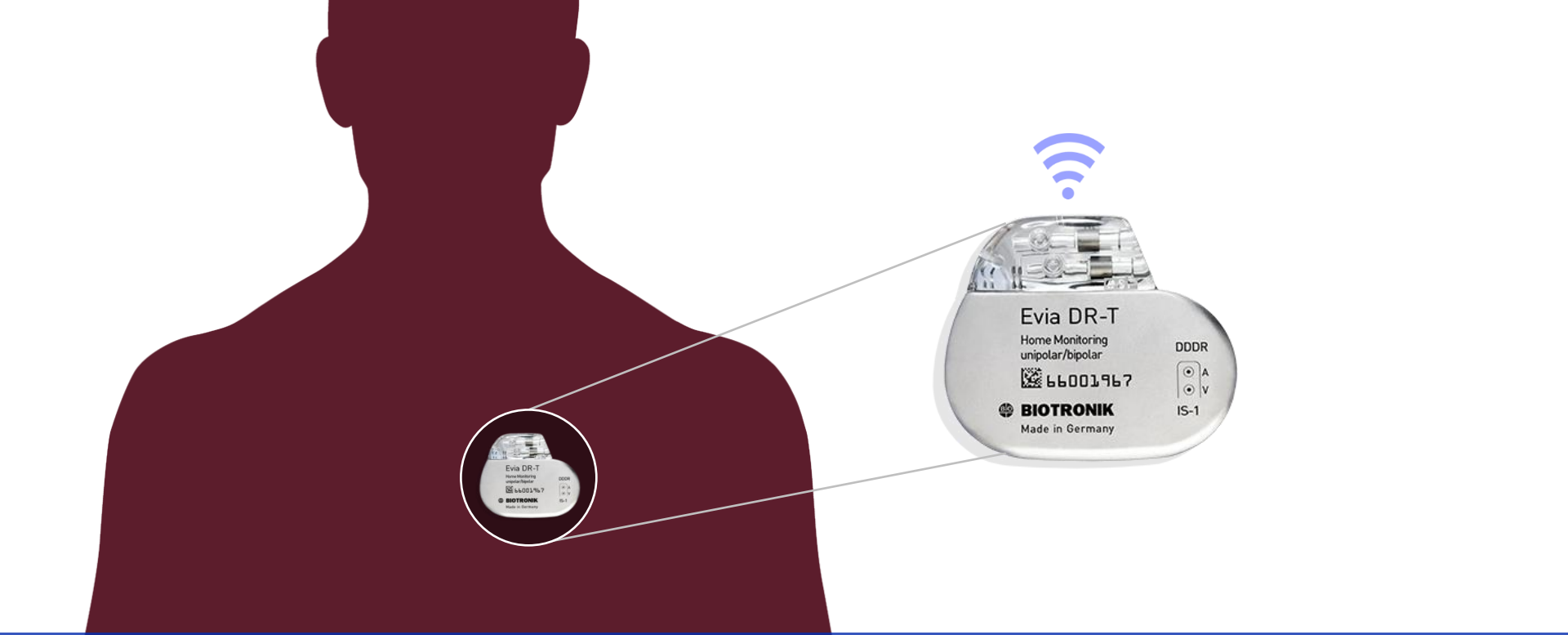
Electrical

Mechanical

Capabilities of Smart, Connected Product

Smart, connected products enable new categories of capabilities, with each building on the preceding layers

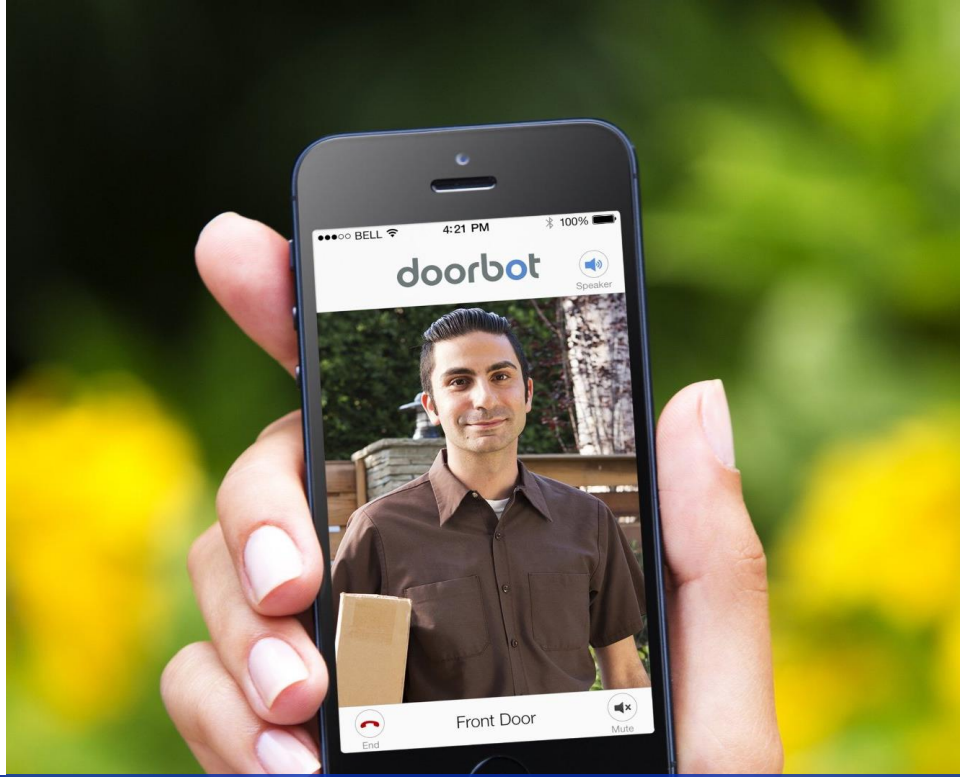




MONITORING

Alert and Notify of Changes

Monitor Product Condition	Monitor the Product's External Environment	Monitor Product Operation / Use



CONTROL

Control Product Operation / Use

Personalize User Experience

OPTIMIZATION

Enhance Product Performance

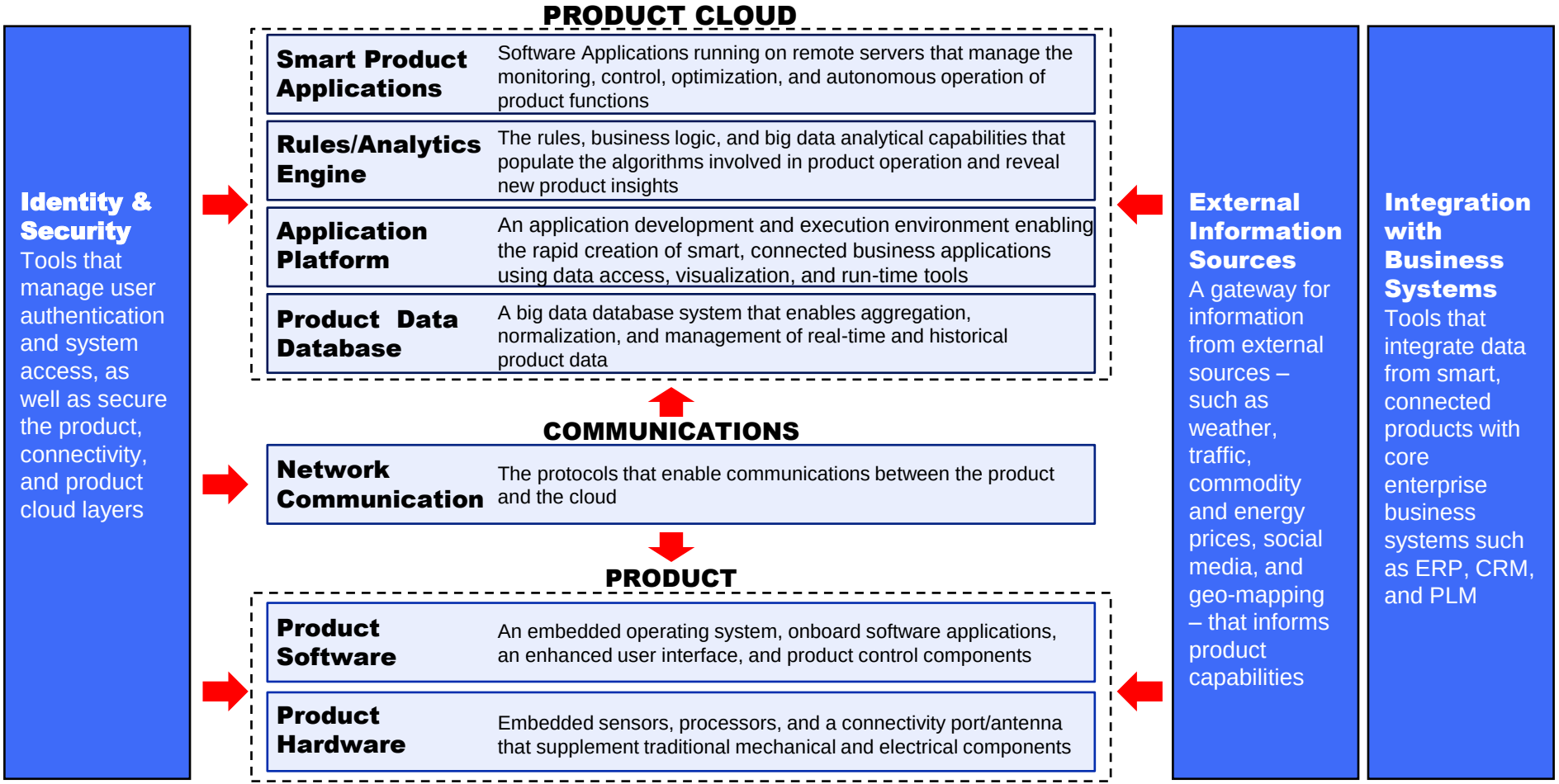
Perform Diagnostics / Service and Repair

AUTONOMY

Autonomous in Coordination with Other Products and Systems

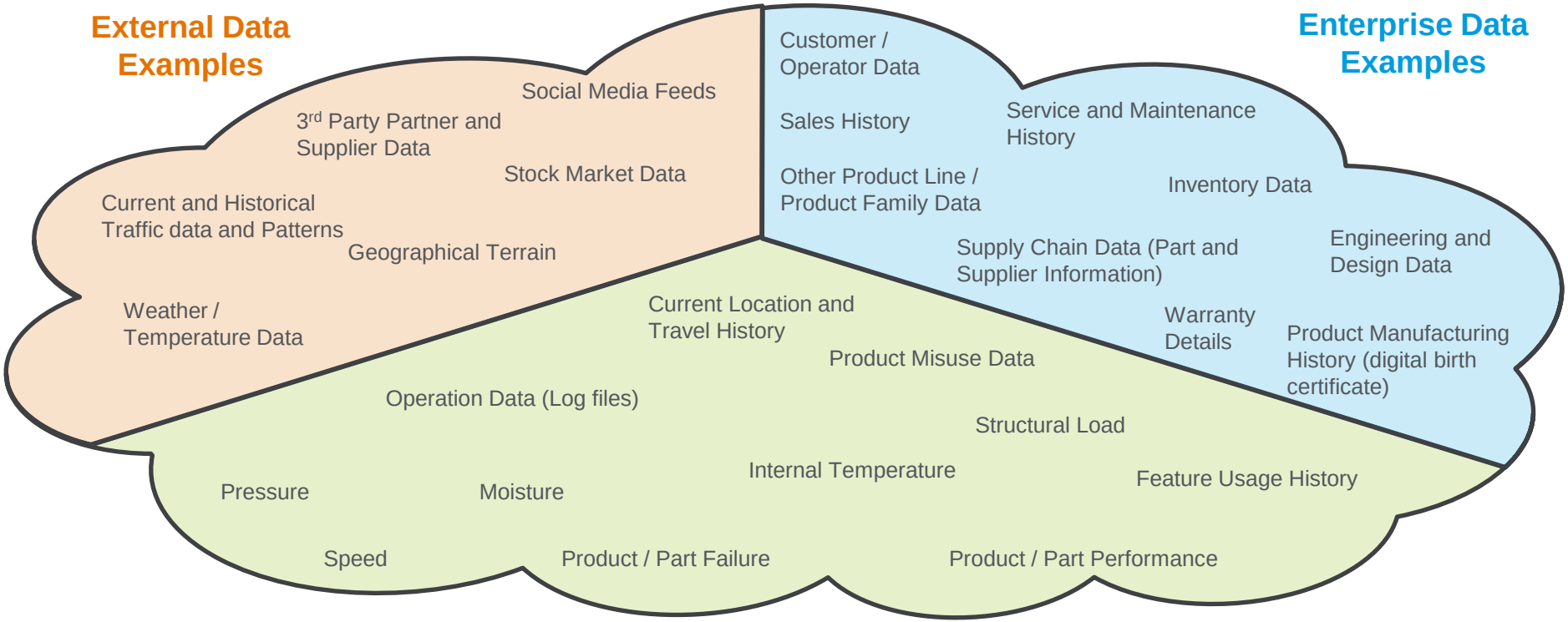
Autonomous Product Operation	Autonomous Product Diagnostic / Service	Autonomous Product Optimization

Smart, Connected Product Technology Stack

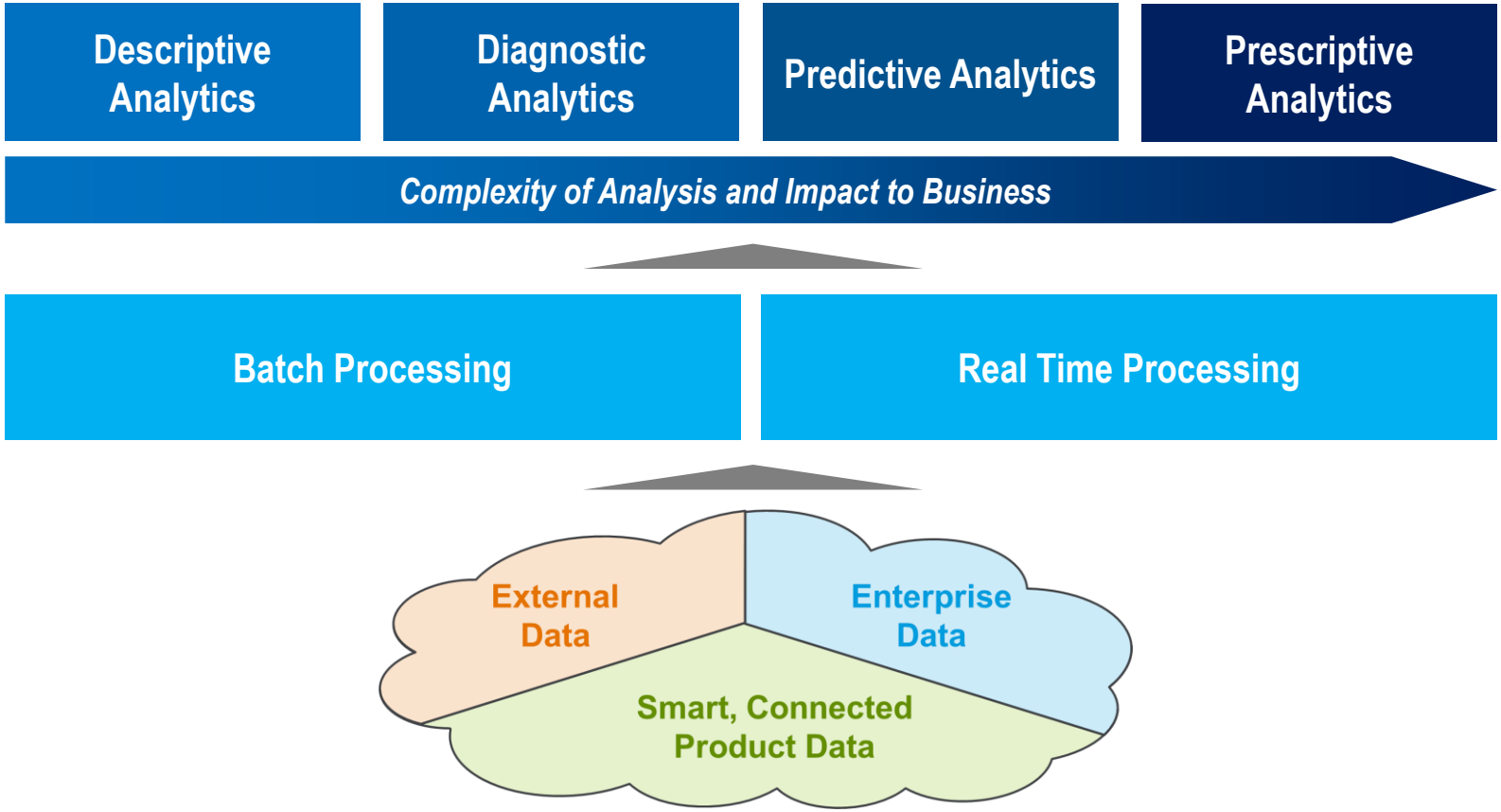


Big Data: A Whole New Level

The New "Data Lake"



Big Data Analytics



Smart, Connected Products
Charting the Impact on Competition

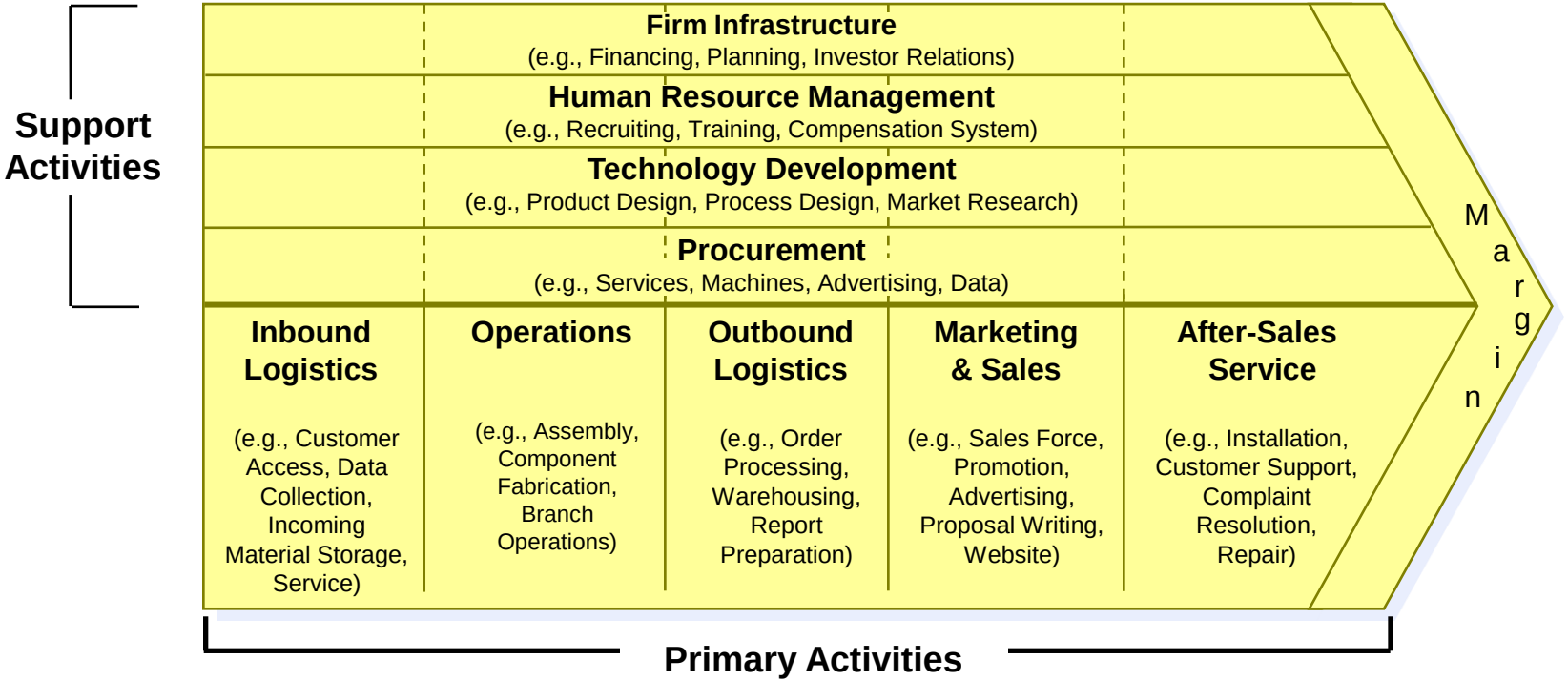
1. How do smart, connected products affect the configuration of the value chain and the set of activities required to compete?

2. How do smart, connected products affect the structure of the industry and industry boundaries?

3. What new types of strategic choices will smart, connected products require companies to make to achieve competitive advantage?

4. What are the organizational implications of embracing these new types of products and the challenges that affect implementation success?

Impact of Smart, Connected Products on the Value Chain



- The value chain is the **activities** involved in delivering value to customers
- Strategy is reflected in the **set of choices** about how activities are configured and linked together

Technology Development

New Principles of Product Design

- Design increases in complexity with combined physical and digital elements, connectivity and the cloud
- Extensive **product usage data** enables rapid redesign and quality improvements
- New design principles emerge, such as:
  - **Systems engineering**
  - Design for **service** (remote / predictive)
  - Design for **security**
  - Design for **continuous upgrades**
  - **Evergreen design** vs. episodic
  - Design for **customization** / personalization

Marketing & Sales

Redefining the Customer Relationship

- Product is a **sensor that measures consumer value**
- Focus shifts from a discrete product sale to **streams of upgrades, replacement products and services over the product's life**
- Improved **segmentation**, **new pricing models**, and **value added services** opportunities through access to customer usage data
- Potential new business models involving new, extended service offerings and selling **products as a service**

Manufacturing Operations

Convergence of Physical and Digital Processes

- Smart, connected production equipment creates **next generation** automated factories (Industry 4.0)
- The complexity of physical parts and assembly is often **simplified**, and the number of physical parts declines as more variability is delivered via software
- Smart, connected products enable **later stage design changes**
- Embedded software creates the ability to finalize the product **post manufacturing** and even **in the field**
- The **customer** can become part of the manufacturing process

After-Sales Service

New Service Delivery Approaches

- Shift from reactive service to **predictive, proactive, and remote service**
- Analyze **actual product usage data** to improve service efficiency, technician utilization, and warranty management
- Potential to disrupt channels and service providers through **“digital proximity”** and **direct connections** to products and customer

Human Resource Management

New Talent Requirements

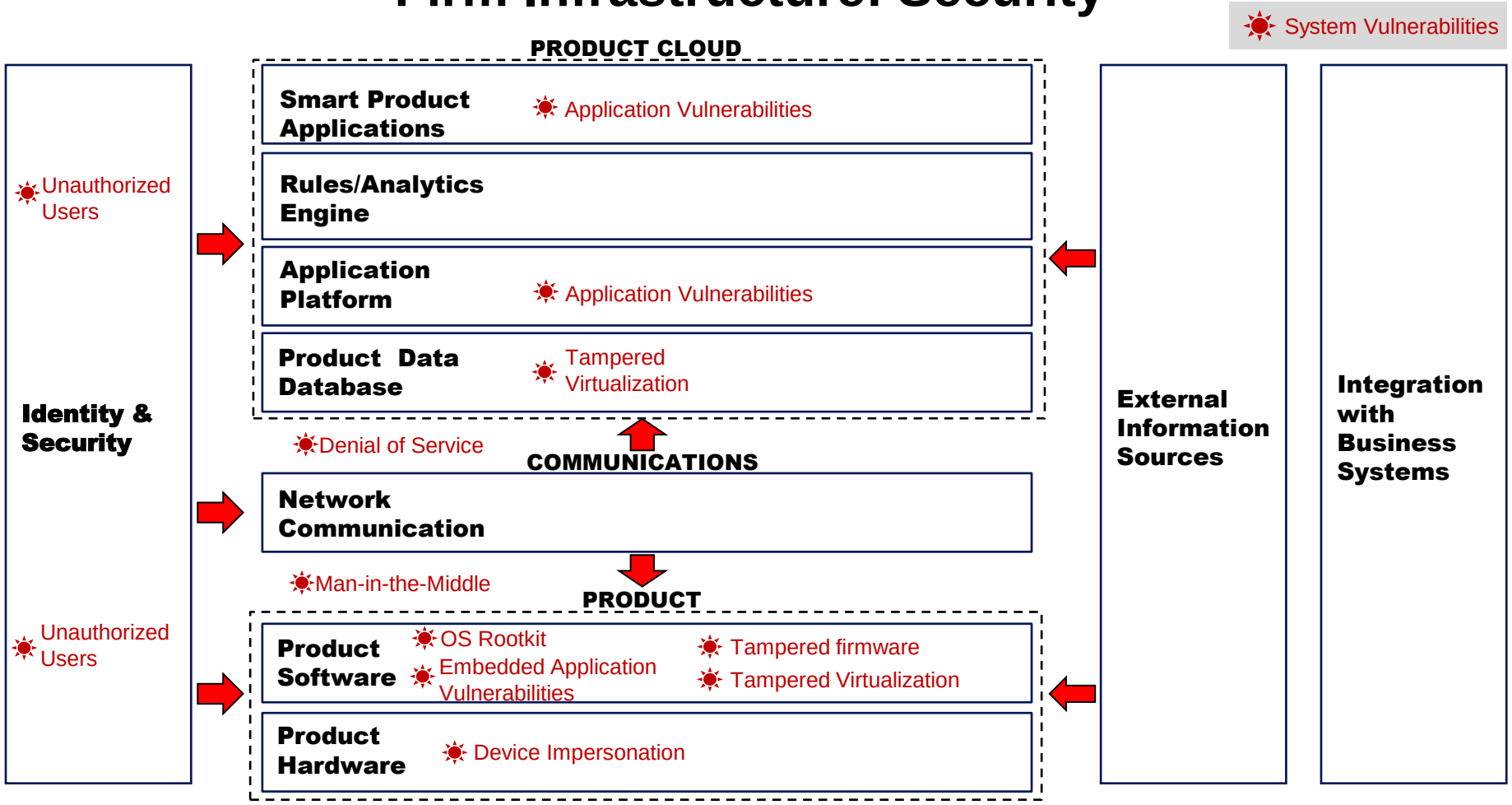
- Need for **new skills**, such as software developers, data scientists, UI developers, and systems integrators
- New processes and approaches needed to **recruit, integrate and retain new talent**, often in high demand and located in other geographies
- Need to enable the **collaboration** between the IT, product and service organizations

Firm Infrastructure: Security

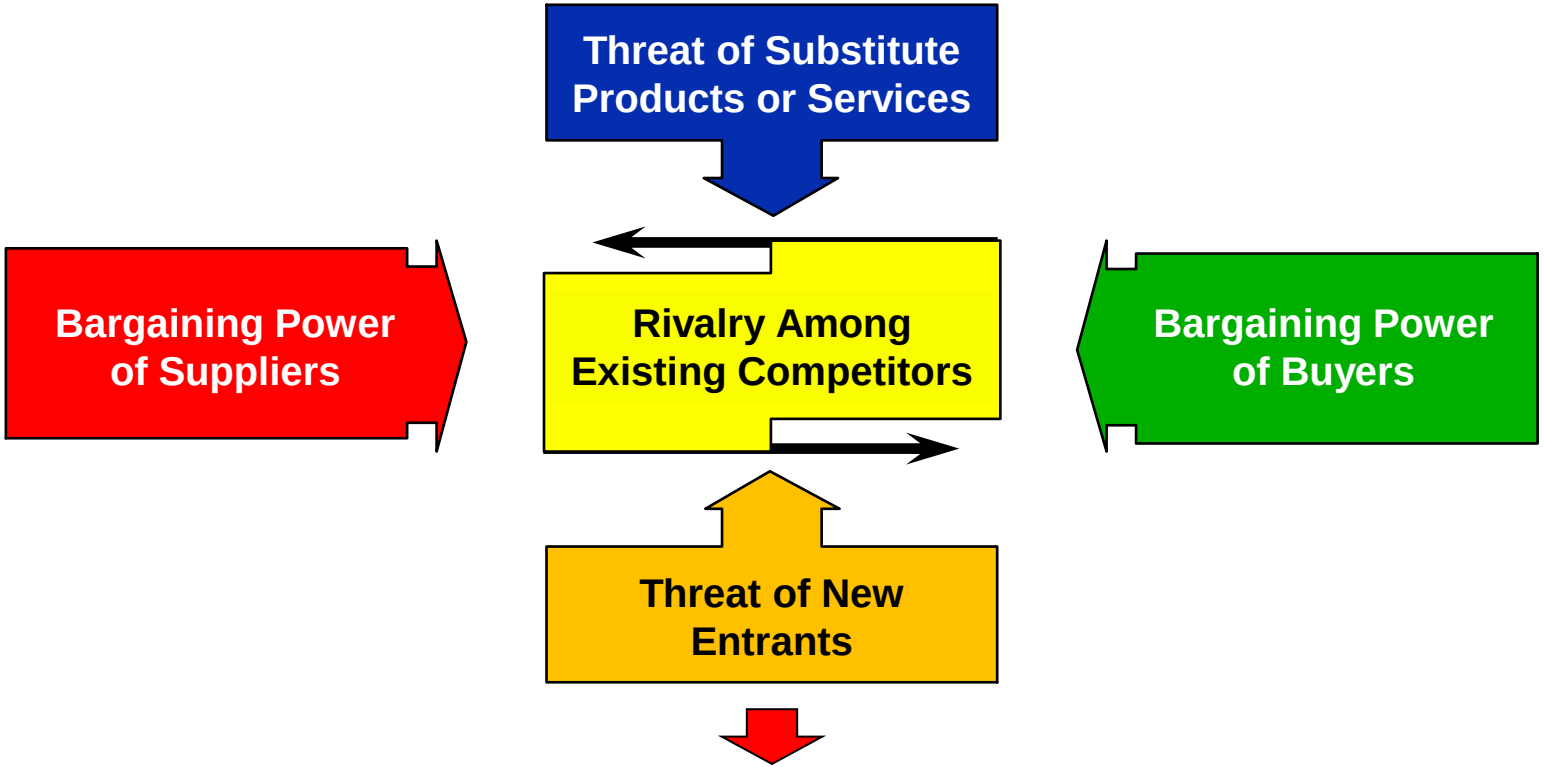


	Issue	Smart, Connected Product Security	vs.	Internet Security	Implications
More at Stake	Impact Magnitude	Lost Life		Lost Information	Security breaches can affect both physical and data assets
Easier To Attack	Number of End Points	Tens of Billions		Half a Billion	Higher number of devices to launch attacks
	Entry Points	Product Software, Network, and Cloud		Network, Data Center	More complex systems and more types of attack entry points
Harder To Defend	Physical Access	Distributed and Exposed		Centralized, Physically Protected	Many embedded devices can not count on physical security measures
	Processing Power	Weak or Limited Processing Power		Powerful Processors	Many embedded devices can not support run-time security solutions

Firm Infrastructure: Security



Impact of Smart, Connected Products on Industry Structure



- Part of strategy is to drive a **positive transformation** in industry structure

Impact on Rivalry

- (+) New capabilities, tailoring, and value-added services shift rivalry away from price
- (-) Cost structure shifts to higher fixed cost, lower variable cost, increasing discounting pressure
- (-) Potential for zero-sum competition on features/ functions

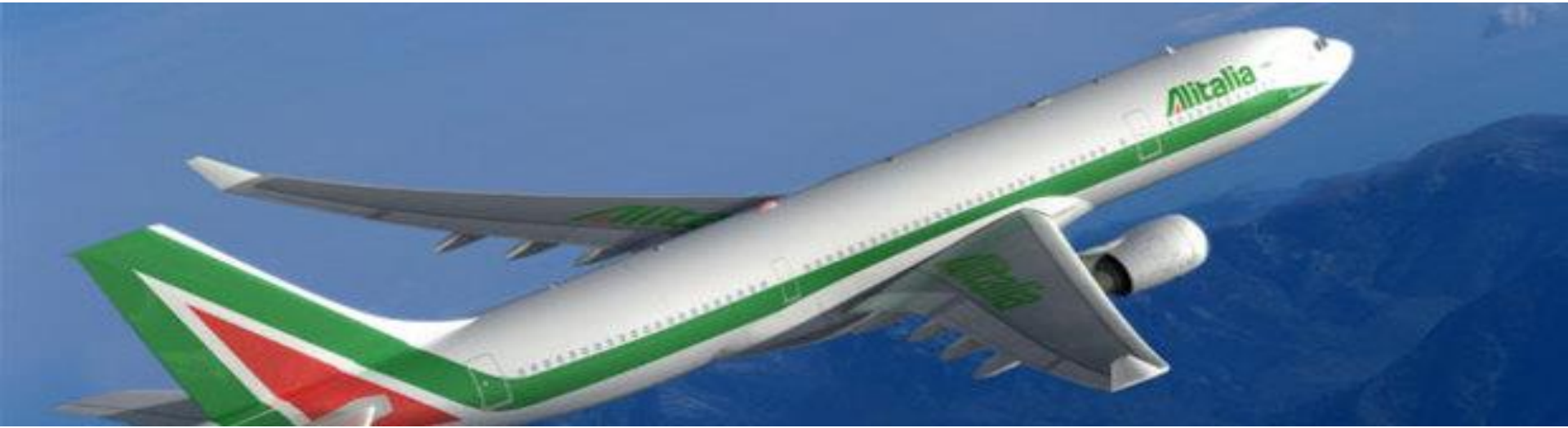
Impact on Bargaining Power with Suppliers

- (+) Decreased power of mechanical suppliers
- (-) IT suppliers an increasing part of cost and functionality
- (-) New suppliers can gain additional leverage through product data and direct relationships with end users

Impact on Barriers to Entry

- (+) Higher fixed costs of product development, technology infrastructure
- (+) Potential first mover advantages based on product data and stickiness of customer relationships
- (-) New entrants leap frog incumbents who lack SCP skills

Impact on Bargaining Power with Buyers



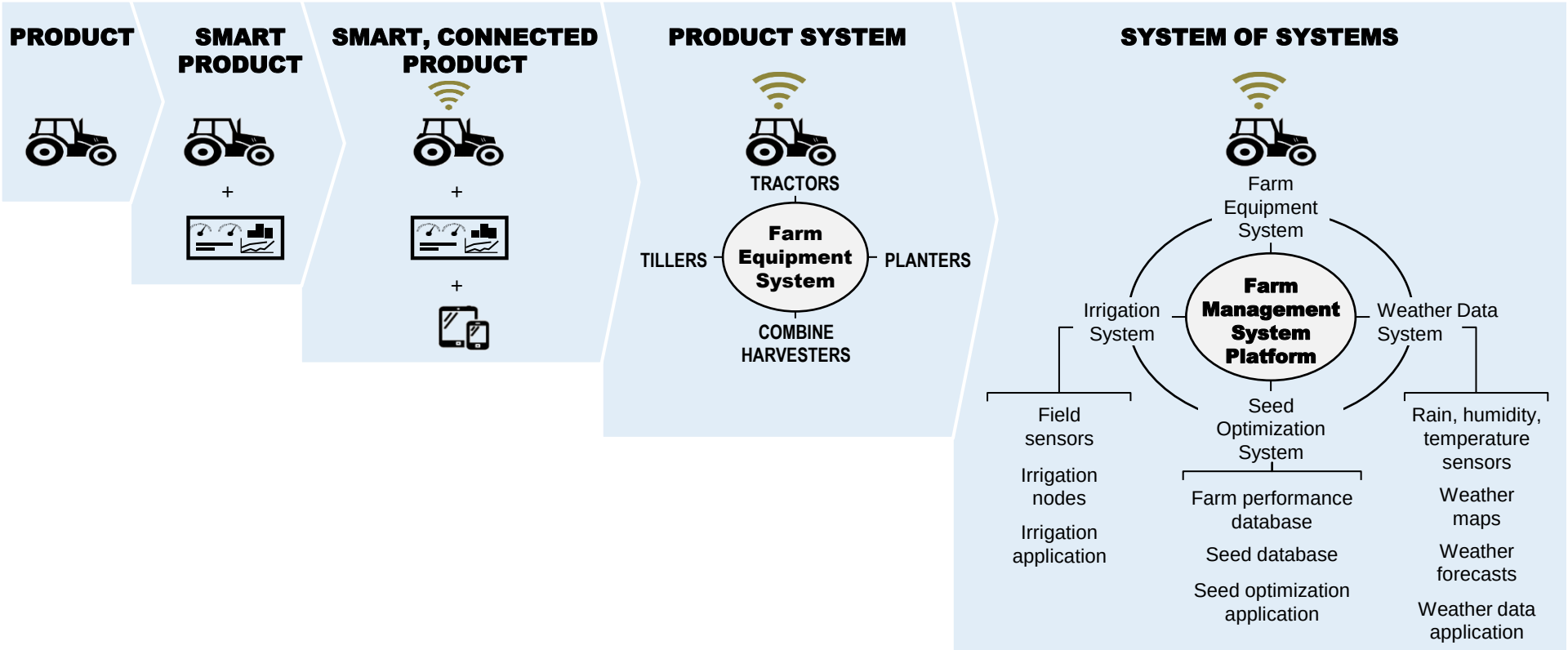
- (+) Expanded opportunities for differentiation/ segmentation
- (+) New insights extend customer relationships creating stickiness
- (+) Reduced dependency on channels/ service partners
- (+/ -) “Product as a service” business model

Impact on Threat of Substitution

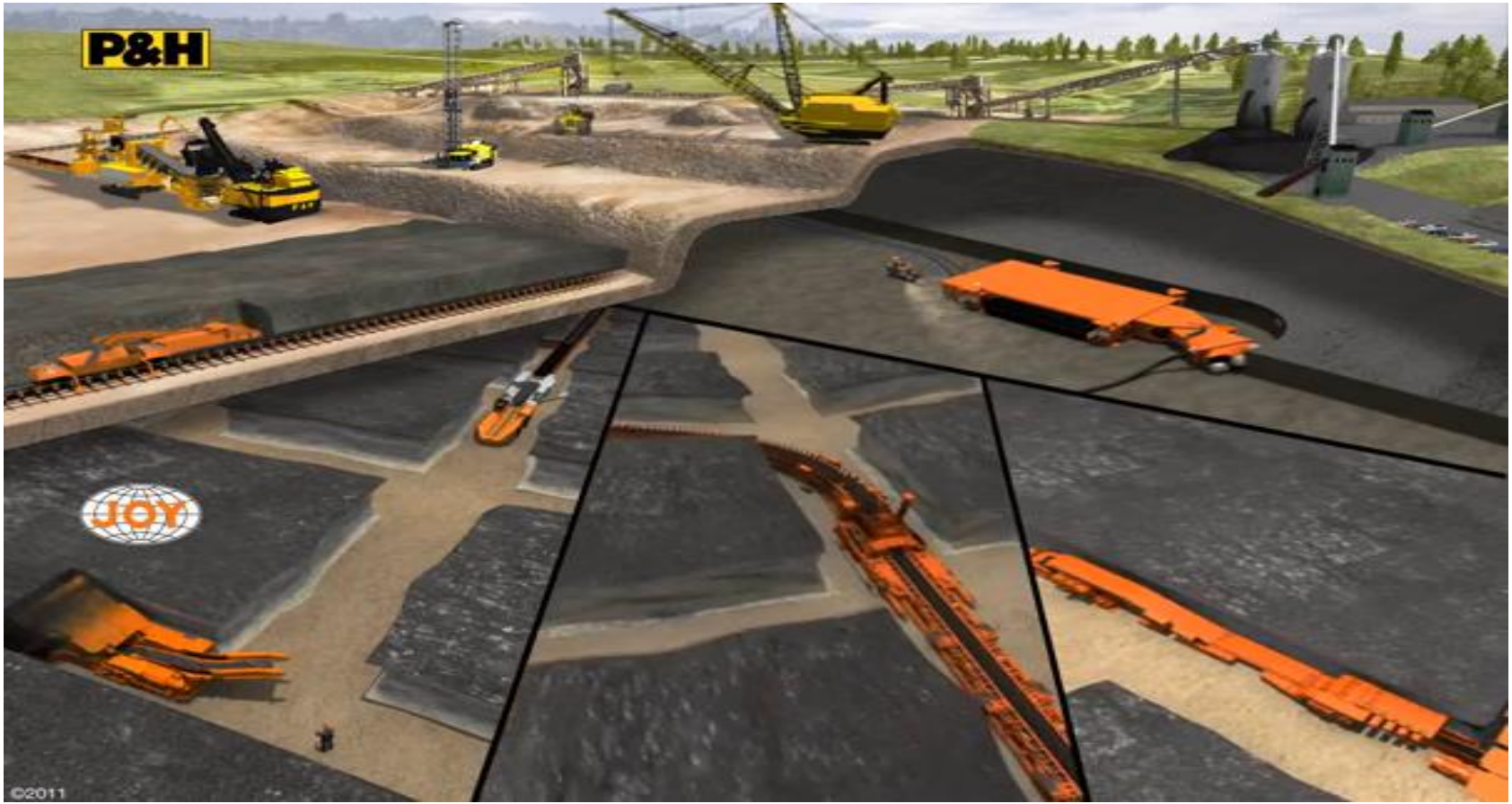
- (+) Functionality creates better performance versus substitutes
- (-) Product sharing models

Expanding Industry Boundaries

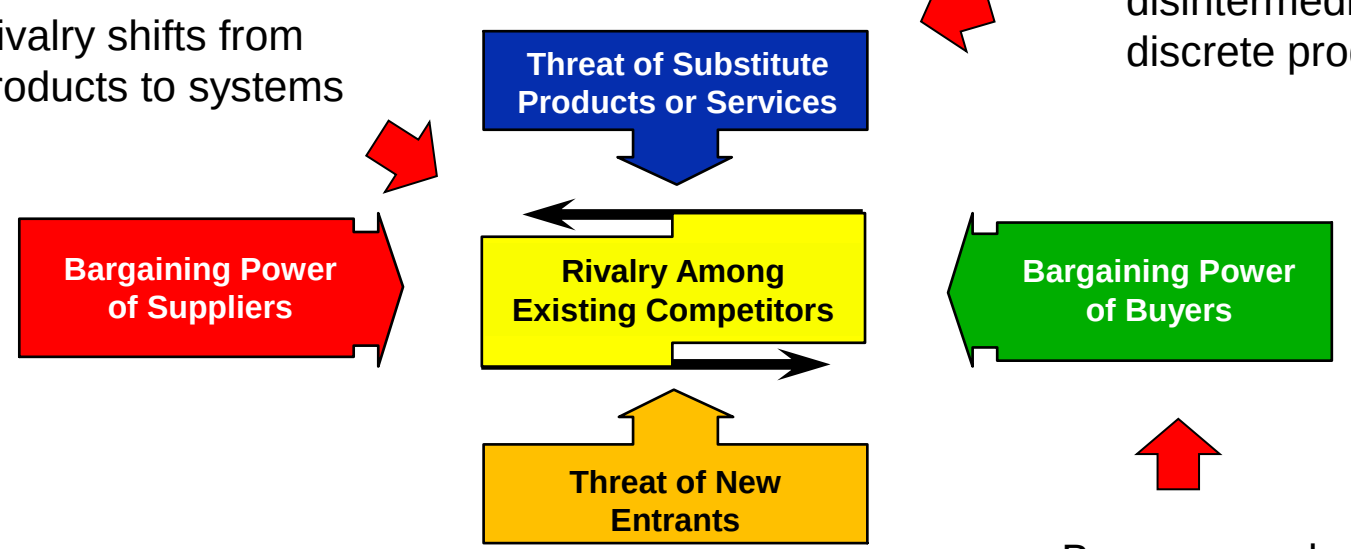
Farm Equipment



Joy Global: Building the Smart, Connected Mine



How Industry Definition Affects Competition



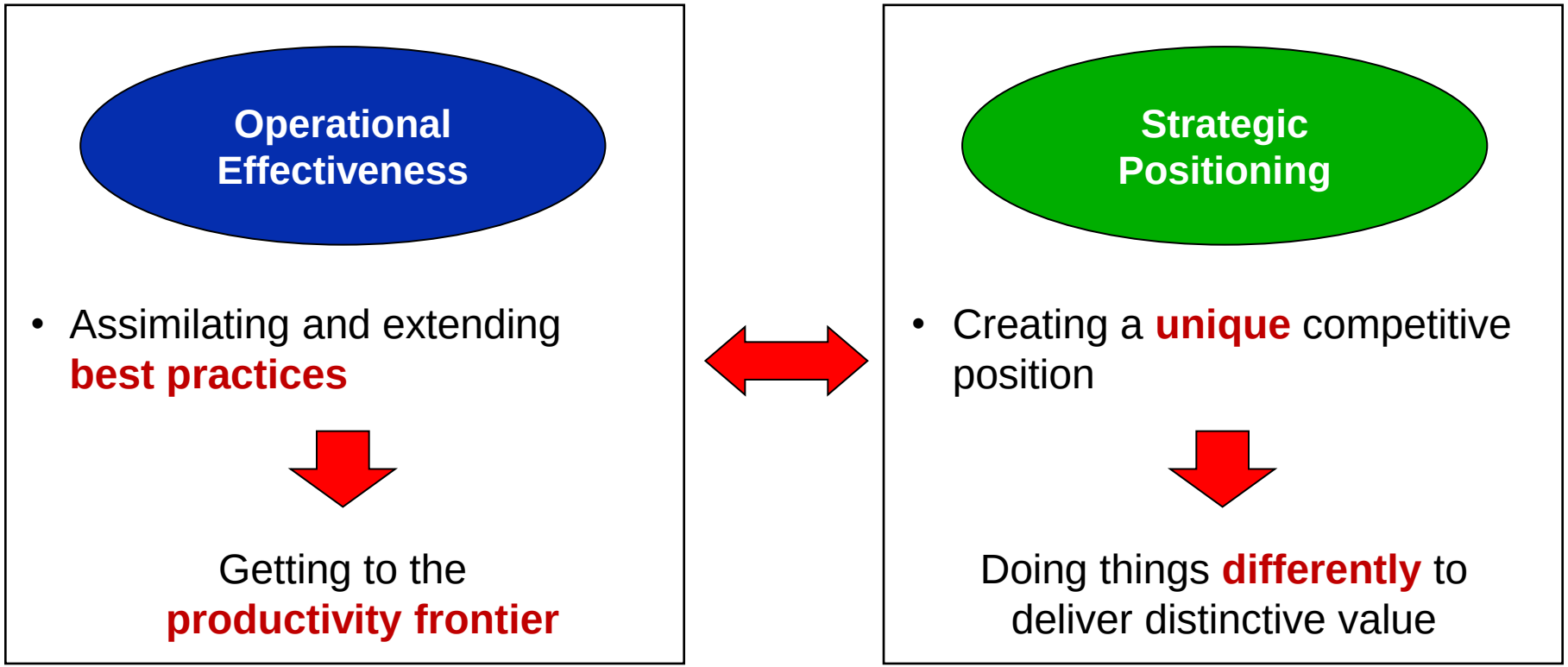
- Rivalry shifts from products to systems
- Product systems disintermediate discrete products
- Potential entrants from other parts of the product system
- Platform competitors enter while producing no products
- Buyers can choose among multiple system competitors

Systems Replace Discrete Products

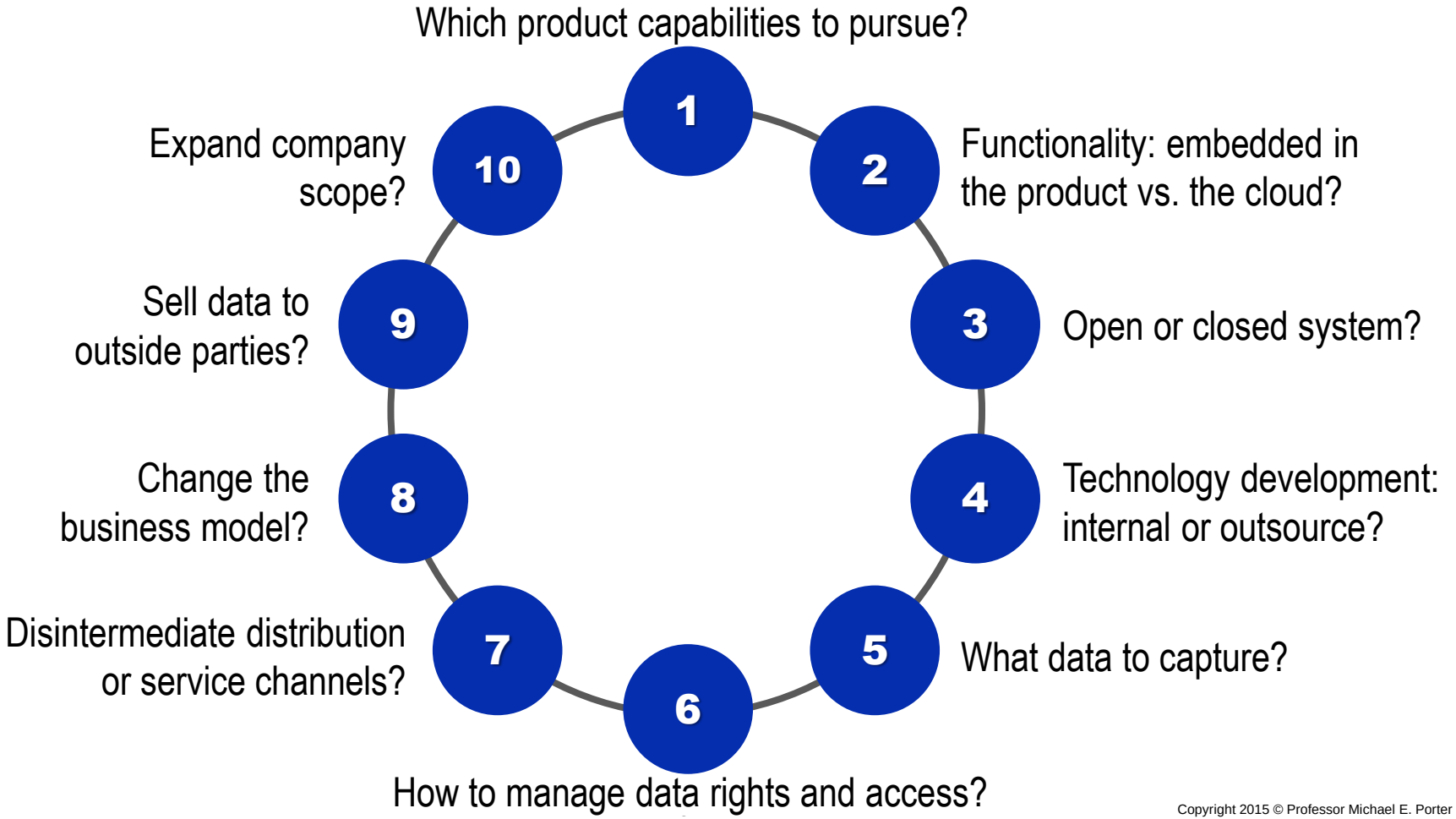
Pedometer

Fitbit

Smart, Connected Products Strategy



Ten Strategic Choices



1. Which smart, connected product capabilities and features should the company pursue?

Focused Capabilities

Wider Capabilities

2. How much functionality should be embedded in the product versus the cloud?

Cloud-Driven Innovation

Sound Quality Focus

3. Should the company pursue an open or closed system?

Closed System

Open System

4. Should the company develop the full set of smart, connected products capabilities and infrastructure internally or outsource to vendors and partners?

JOHN DEERE

Internal Development

Audi

Physical and Smart component suppliers (select)

Continental · MICHELIN · GKN · BOSE

Infotainment suppliers (select)

SiriusXM · NUANCE · QNX SOFTWARE SYSTEMS · Google · NVIDIA

Connectivity / Data analytic suppliers (select)

IBM · T-Mobile · RACO wireless

Partner Outsourcing

5. What data does the company need to capture, secure and analyze to maximize the value of its offering?

ELEKTA

Radiation Therapy Equipment

Consumer Thermostat

6. How does the company manage ownership and access rights to the data it seeks and collects?

All-in-One Health Monitor

Pacemaker

7. Should the company fully or partially disintermediate distribution channels or service networks?

Traditional Dealership

Direct to Customer

8. Should the company change its business model?

Transactional Sales Model

Product-as-a-Service

9. Should the company enter new businesses by monetizing its product data by selling it to outside parties?

Selling User Data to Advertisers

GE Software

Data Proprietary to GE

10. Should the company expand its scope?

Product System Optimized to Work Together

System of Systems

The Larger Opportunity

- The recent decade has been consumed with slow growth, cost reduction, reduced investment, limited innovation, and rising M&A, with focus on short-term profitability
  - **Slow economic growth** and a **diminished sense of opportunity**

- Smart, connected products can **change this trajectory**
  - Pace of innovation and investment
  - Sustainability and resource utilization across the economy and society
  - Productivity growth in the economy
  - Economic growth, jobs and wages

- The U.S. has the potential to lead, but **every country** should benefit

Next Steps

To help you understand your company's potential in the IoT space and how you can actively get started forming your winning strategy, we have developed the PTC Innovation Workshop. This personalized workshop will be delivered onsite at your company with the goal of helping you find new sources of value for your customers using PTC solutions.

To request a PTC Innovation Workshop or for more information, please email Innovationworkshop@ptc.com or visit us at www.ptc.com/smart-connected-products

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