November 11, 2011

Innovation and Productivity: What's the Relationship and How Does They Happen?

ATSE Forum

Presented by:

Rob Atkinson, President, ITIF

ITIF
The Information Technology
& Innovation Foundation

The Information Technology and Innovation Foundation (ITIF) is a Washington, D.C.-based think tank at the cutting edge of designing innovation policies and exploring how advances in technology will create new opportunities to boost economic growth and improve quality of life. ITIF focuses on:

- Innovation processes, policy, and metrics;
- E-transformation (e.g., commerce, government, health);
- IT and economic productivity;
- Science and technology policy related to economic growth;
- Manufacturing and innovation-based competitiveness; and
- Innovation and trade policy.

Today's Presentation

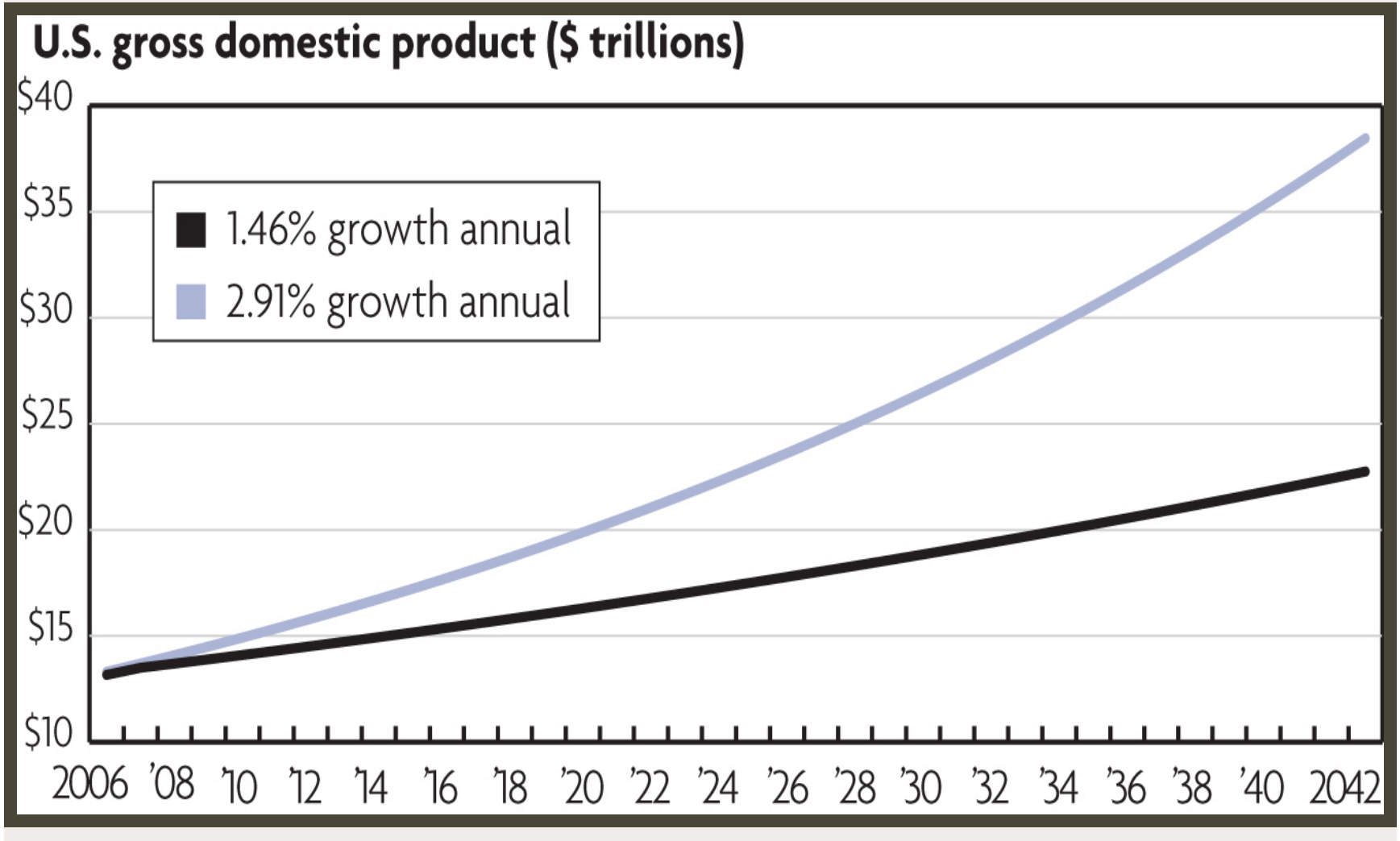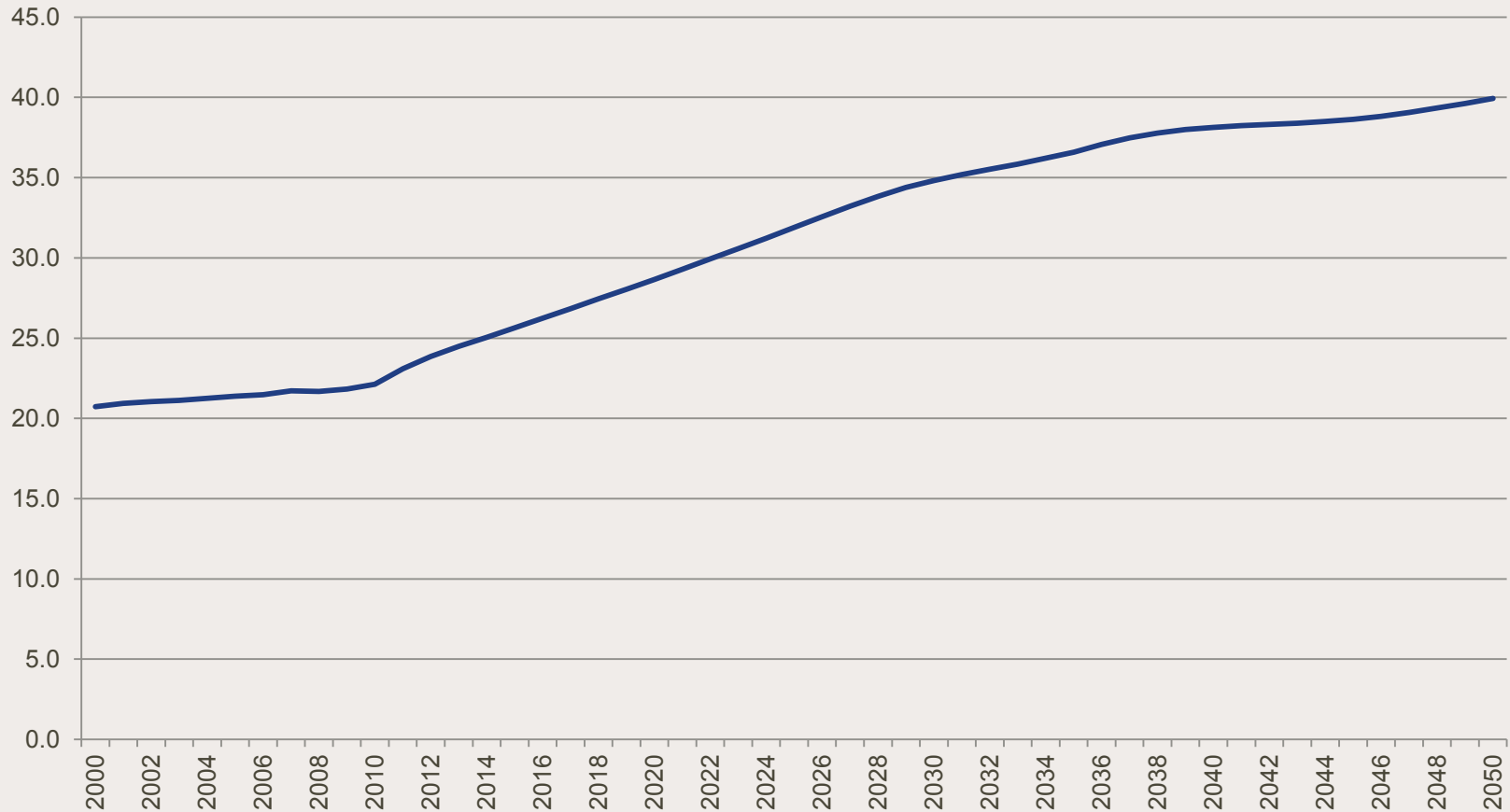| 1	**Why Productivity and Where Does It Come From?**
2	**The Role of IT in Driving Productivity**
3	**Three Paths to Productivity Through Innovation**
4	**Why Places Need an Innovation-Productivity Policy**
5	**Comprehensive IT-Based Productivity Policies**
6	**Barriers to an Innovation/Productivity Strategy**

Productivity Growth is <u>the</u> Key To Economic Growth

U.S. gross domestic product ($ trillions)

- 1.46% growth annual
- 2.91% growth annual

$40 $35 $30 $25 $20 $15 $10

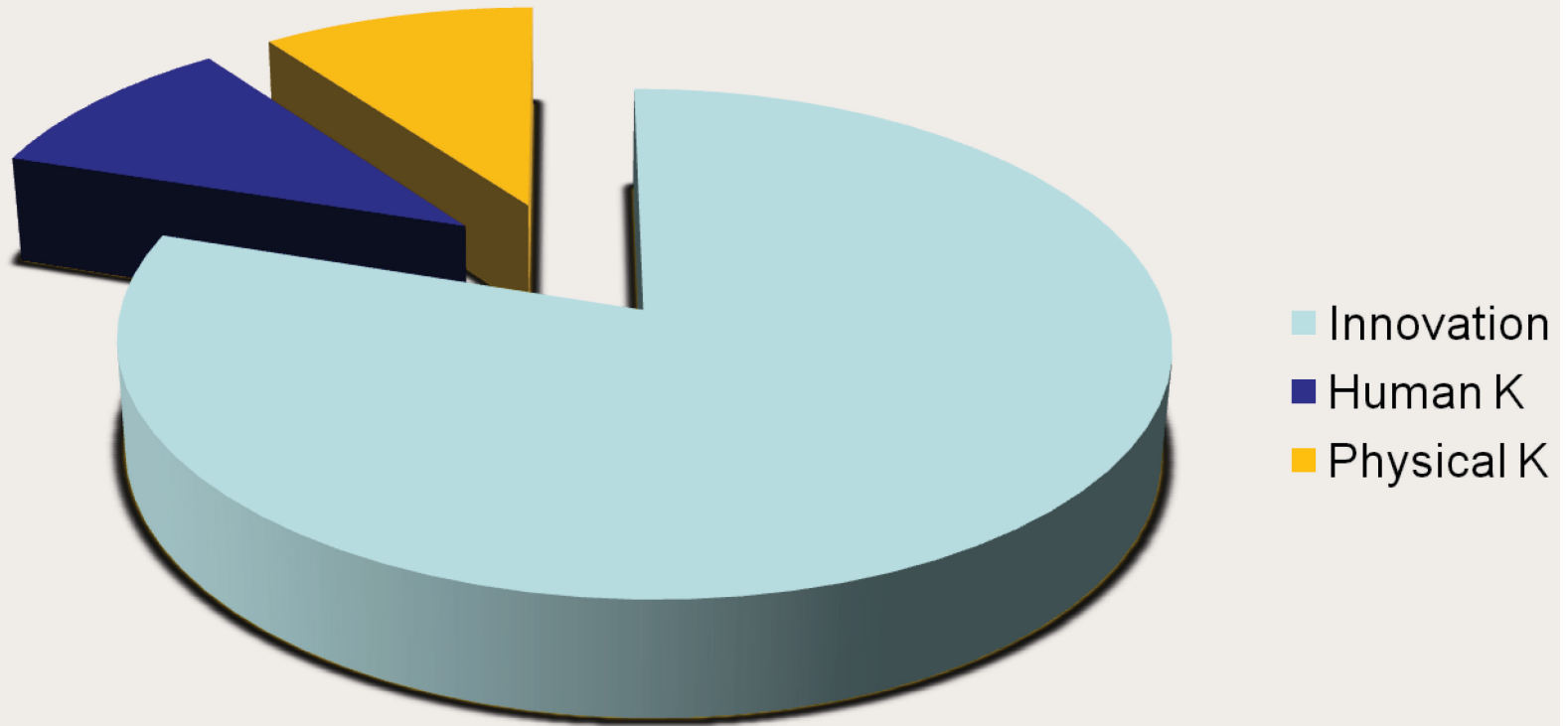2006 '08 '10 '12 '14 '16 '18 '20 '22 '24 '26 '28 '30 '32 '34 '36 '38 '40 2042

Especially as the Australian Population Ages

Dependency Ratio: 65 and older/20 to 64 year olds

Productivity Comes From Innovation

■ Innovation-Based Productivity Comes From

1. **Helping workers produce more**
   - **better software tools**

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   - **elevators; self-serve gas stations; bank ATMs**

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   - **helping an elderly person stay in home longer**
   - **reducing electricity demand through smart grid**

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4. **Reducing waste or increasing quality**
   - **using "big data" to improve health care**

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IT is Today' Major Driver of Productivity-Innovation

- In large U.S. firms, every dollar of IT capital is associated with $25 of market value. $1 of non-IT capital is associated with only $1 of market value.

- IT workers contribute significantly more to productivity than non-IT workers.

- IT was responsible for 44% of productivity growth from 2000 to 2006, and the *use* of IT had a 30% bigger impact on total factor productivity growth than in the 1990s.

Game-Changer Innovations

**Approximately every half century a new technology *system* emerges that changes everything.**

- The Railroad and Iron: 1840s

- Electricity and Steel: 1890s

- Electro-Mechanical Systems: 1950s

IT is Today's Game-Changer Innovation

These new technology *systems* impact virtually everything:

- what we produce
- how we produce it
- how we organize and manage production
- the location of productive activity
- the infrastructure needed
- the laws and regulations required.

Since the mid-1990s, *InformationTechnology has been the engine of change*.
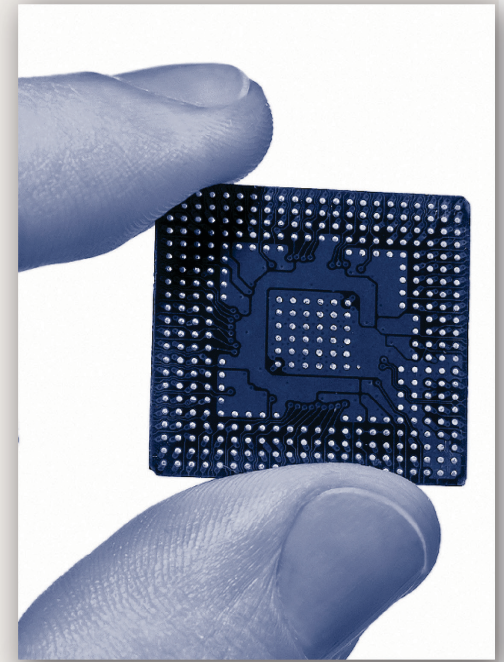
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Three Paths to Productivity Through Innovation

1. **Helping all firms expand productivity**

Three Paths to Productivity Through Innovation

1. Helping all firms expand productivity

2. **Expanding high productivity firms faster than low.**
   - One study of Canadian manufacturing found that plant turnover from entry and exit contributes from 15% to 25% of manufacturing-labor productivity growth.

Source: John R. Baldwin and Wulong Gu, "Plant Turnover and Productivity Growth in Canadian Manufacturing," *Statistics Canada*, No. 11F0019MIE, No. 193 (April 2003): 9.

Three Paths to Productivity Through Innovation

1. Helping all firms expand productivity

2. Expanding high productivity firms faster than low.

3. **Expanding high productivity industries faster than lower productivity ones.**

   - In the U.S., average compensation per employee in innovation-intensive sectors increased 50% between 1990 and 2007 - nearly 2.5 times the national average.
   - Jobs in the U.S. technology industry pay 70 percent more than average jobs.

Innovation, Productivity and Competitiveness Are Distinct but Related
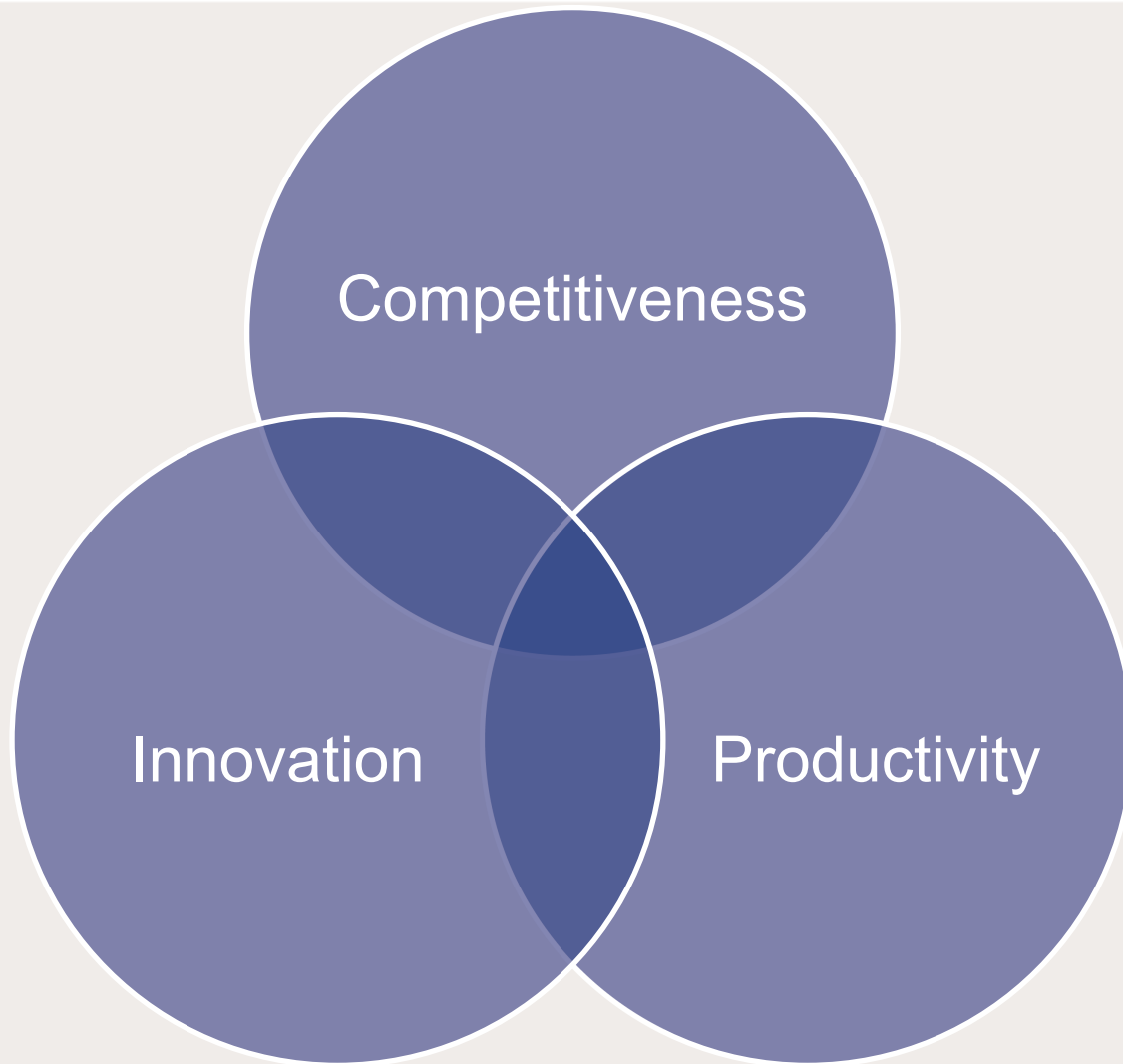
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Because Innovation is *not* Just a Market

It is a System, That Under Performs Without a an
■ Innovation-based Productivity Policy

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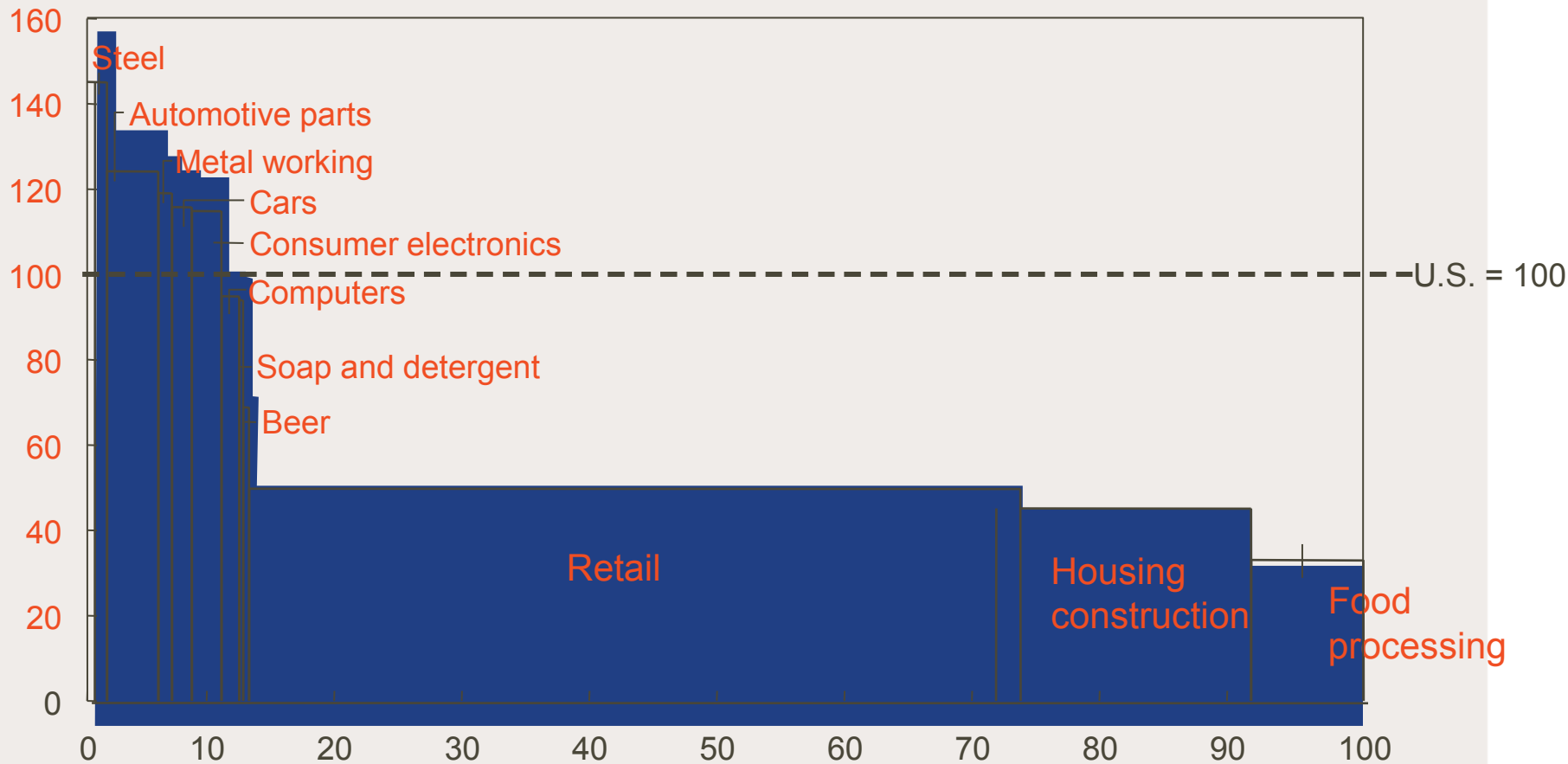# A Framework for Productivity-Innovation Policies

1. **Macro**

■ A Framework for Productivity-Innovation Policies

1. Macro
2. **Factor Inputs/Framework Conditions (e.g., education levels, science support, etc.)**

Productivity Performance Can Differ Dramatically Between Industries

Relative Japanese productivity levels: Index U.S. = 100

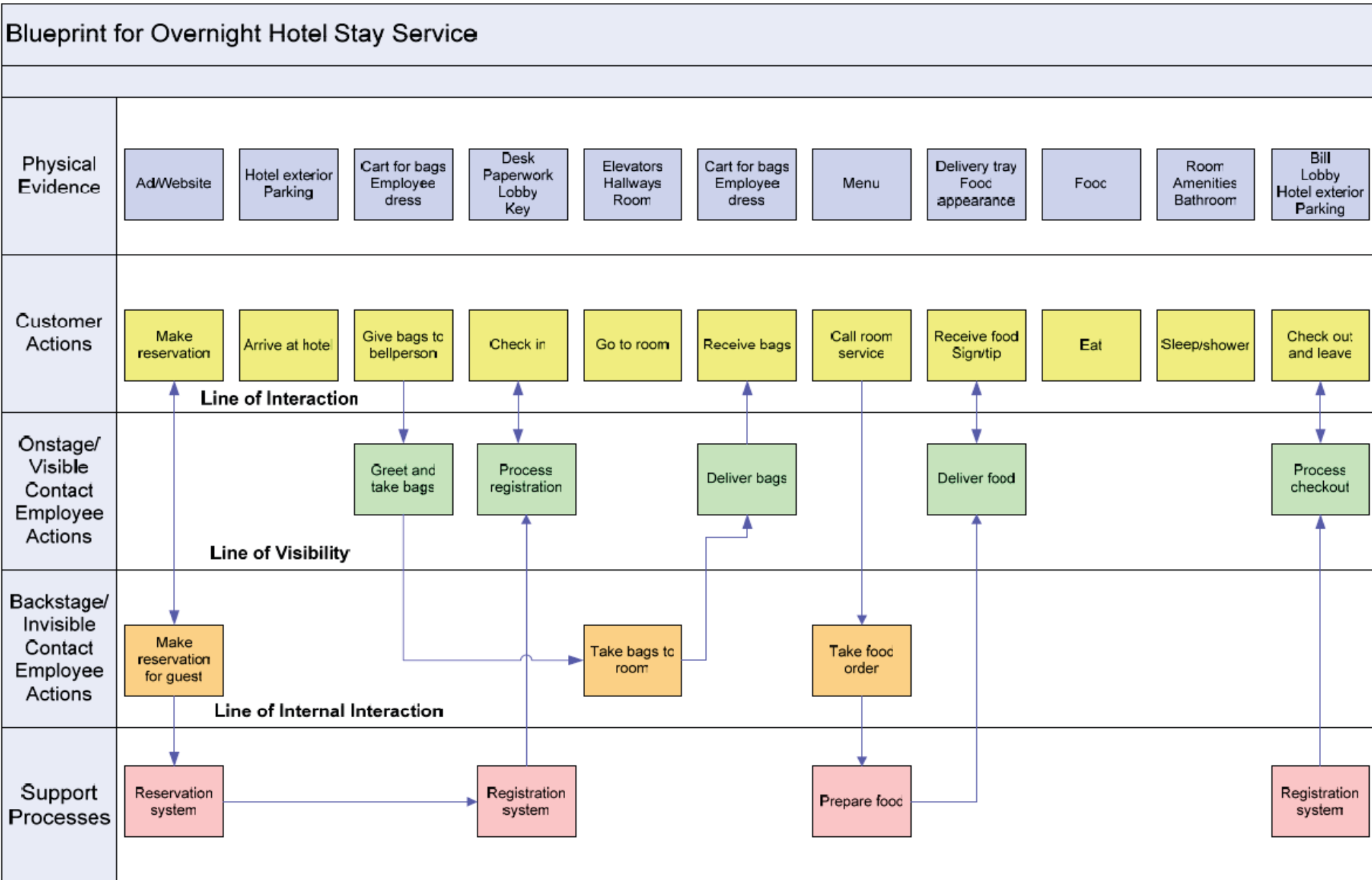**Employment:** 100% = 12.473 million employees   (Source: Bill Lewis, "The Power of Productivity")

A Framework for Productivity-Innovation Policies

1. Macro
2. Factor Inputs/Framework Conditions (e.g., education levels, science support, etc.)
3. **Sector Studies/Policies**
   - Hotels
   - Construction
   - Music
   - Health care
   - Government
   - Education

Service Blueprinting

Blueprint for Overnight Hotel Stay Service

Physical Evidence	Ad/Website	Hotel exterior Parking	Cart for bags Employee dress	Desk Paperwork Lobby Key	Elevators Hallways Room	Cart for bags Employee dress	Menu	Delivery tray Food appearance	Food	Room Amenities Bathroom	Bill Lobby Hotel exterior Parking
Customer Actions	Make reservation	Arrive at hotel	Give bags to bellperson	Check in	Go to room	Receive bags	Call room service	Receive food Sign/tip	Eat	Sleep/shower	Check out and leave

Line of Interaction

Onstage/ Visible Contact Employee Actions			Greet and take bags	Process registration		Deliver bags		Deliver food			Process checkout

Line of Visibility

Backstage/ Invisible Contact Employee Actions	Make reservation for guest					Take bags to room		Take food order			

Line of Internal Interaction

Support Processes	Reservation system		Registration system					Prepare food			Registration system

Finland's Omena Hotelli: A Vision of the Future?

- **"A modern hotel for the Internet age."**

- Customers book online and the key code is transmitted to the door lock and customer's email.

- Eliminates the need for receptionists, sales personnel, and concierges.

- Offers the core product of hotel operations—high-quality accommodations—without expensive auxiliary services.

▪ Applying IT Prior to the Customer's Visit, Pre Check-In

1. E-commerce reservations

2. Trip Advisor and Facebook

Applying IT at Check-In: Kiosks

Applying IT at Check-In: Room-Key Alternatives

- Alternatives to the plastic room key card.
    - RFID-enabled guest loyalty card as the room key.
    - Mobile phone
        - Using near-field communications (NFC) technology.
        - Openwave allows mobile phone to play audio file to open door.

Applying IT to Concierge Services/Social Spaces

- Surface computing can bring interaction, connectivity, and a social experience to the lobby.

  - 360-degree satellite maps/tools allow guests to search for local restaurants and bars, recreation, etc.

  - Download and view photos, order food/drinks from menus, play games, watch videos, etc.

Applying IT to Operations

1. Equip bell hops, room service, and repair personnel with handheld devices informing them and allowing them to confirm fulfillment of specific room service requests.

•

Applying IT to Restaurant/Conference Facilities

1. Electronic self-serve ordering

2. Restaurant staff use a handheld to take order

A Framework for Productivity-Innovation Policies

1. Macro
2. Factor Inputs/Framework Conditions (e.g., education levels, science support, etc.)
3. Sector Studies/Policies
4. **Functions (e.g., processing information; processing money; moving people; growing foods-fiber; etc.)**

A Framework for Productivity-Innovation Policies

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3. Sector Studies/Policies
4. Functions
5. **Tool Development (e.g., faster computers, voice recognition, expert systems [e.g, IBM's Watson], flexible displays, analytics, machine vision; etc.)**

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5. Tool Development
6. **Platform Enablement (e.g., smart grid; health IT; broadband; 4G wireless; mobile payments; electronic IDs; GPS; ITS)**

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3. Sector Studies/Policies
4. Functions
5. Tool Development
6. Platform Development
7. **Firms'/Organizations' Adoption (e.g., tax incentives for R&D and capital equipment)**

Applying IT Tools is Not Enough…
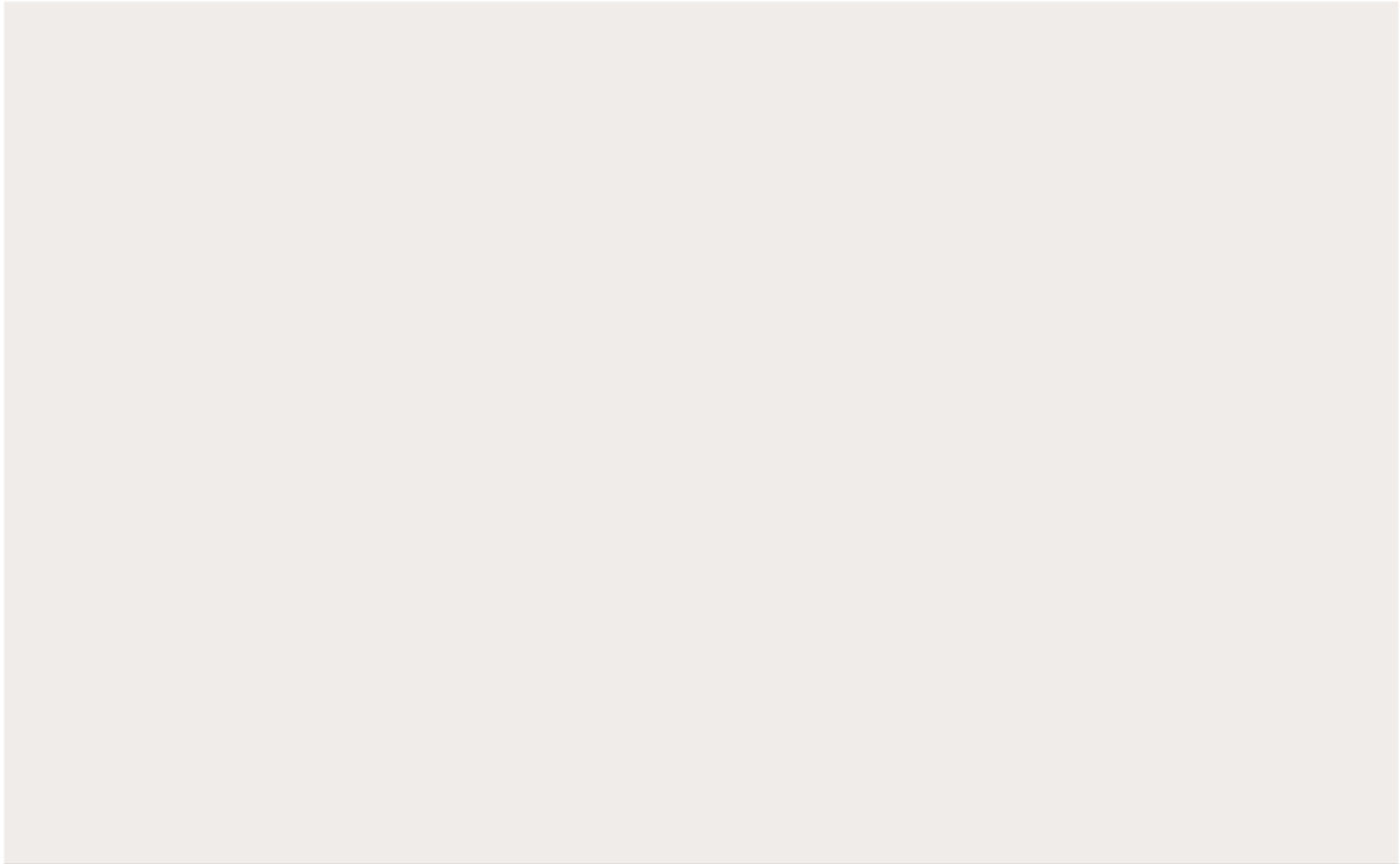
Organizational Change is Also Required

- Firms that adopt *digital organization* tenets and simultaneously invest more in IT have disproportionately higher performance than firms that do not.

- MIT's Erik Brynjolfsson: "Something unique happens when human capital and other workplace practices are combined with technology."

■ The Seven Practices of Digital Organizations

A distinct corporate culture and organizational practices are found in most corporations that make extensive use of IT and the Internet. They are:

1. Move from paper-based to digital business
2. Empower front line service personnel
3. Foster open information access
4. Link incentives to performance
5. Maintain focus and communicate goals
6. Hire the best people
7. Invest in human capital

Erik Brynjolffson

■ Higher Profitability Accrues to Firms That Get Both Right
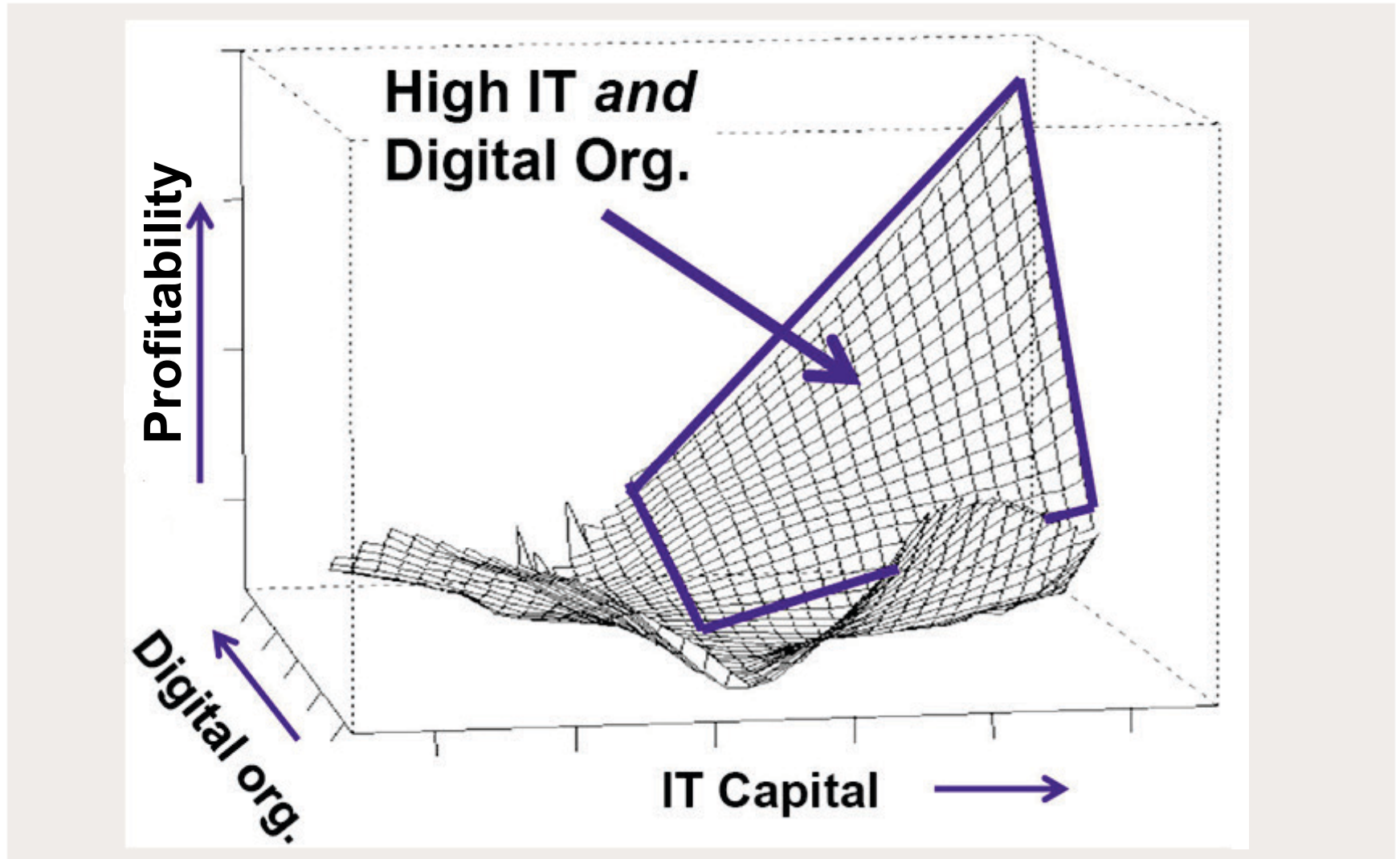
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5. Tool Development
6. Platform Development
7. Firms'/Organizations' Adoption
8. **Individuals**

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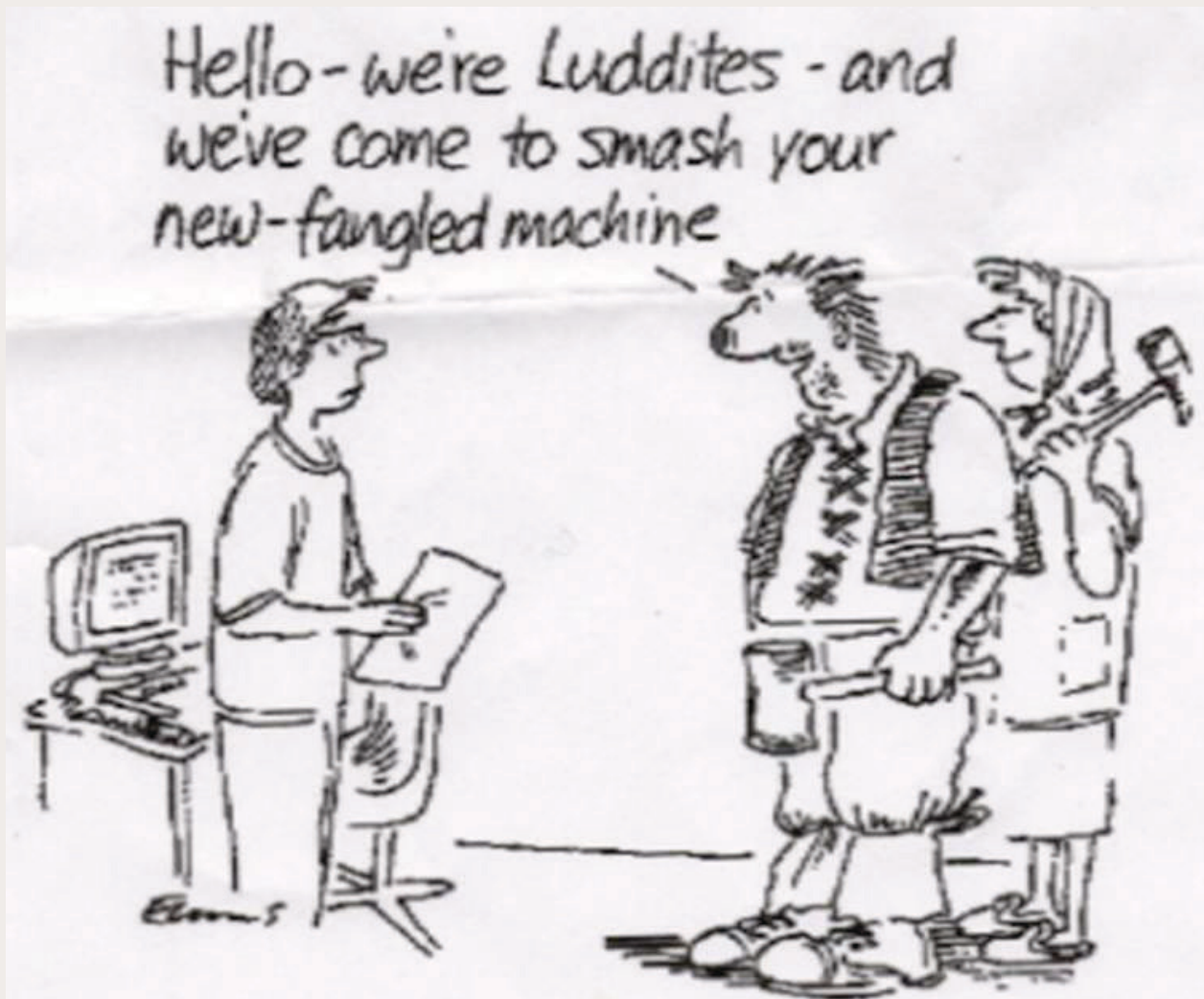**5**   **Comprehensive IT-Based Productivity Policies**

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Neo-Classical Economists

▪ Luddites and Incumbents

Thank You

Robert Atkinson   ratkinson@itif.org

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