December 6, 2010

ICT and Innovation: Powering National Economic Growth

Boeing Event:
Leading and Nurturing a High Tech Enterprise

St. Louis

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 information technology will create new opportunities to boost economic growth and improve quality of life. ITIF focuses on:

- Innovation processes, policy, and metrics
- Science policy related to economic growth
- E-commerce, e-government, e-voting, e-health
- IT and economic productivity
- Innovation and trade policy

Today's Presentation

1. Why is Innovation Important?
2. Why is ICT Driving Innovation Today?
3. How Can Firms Lead Innovation?
4. How Can Nations Best Maximize Innovation?

Why is Innovation Important?

- **Because better tools drive progress and improve our lives.**
- **At least 2/3 U.S. per-capita income growth is from innovation.**

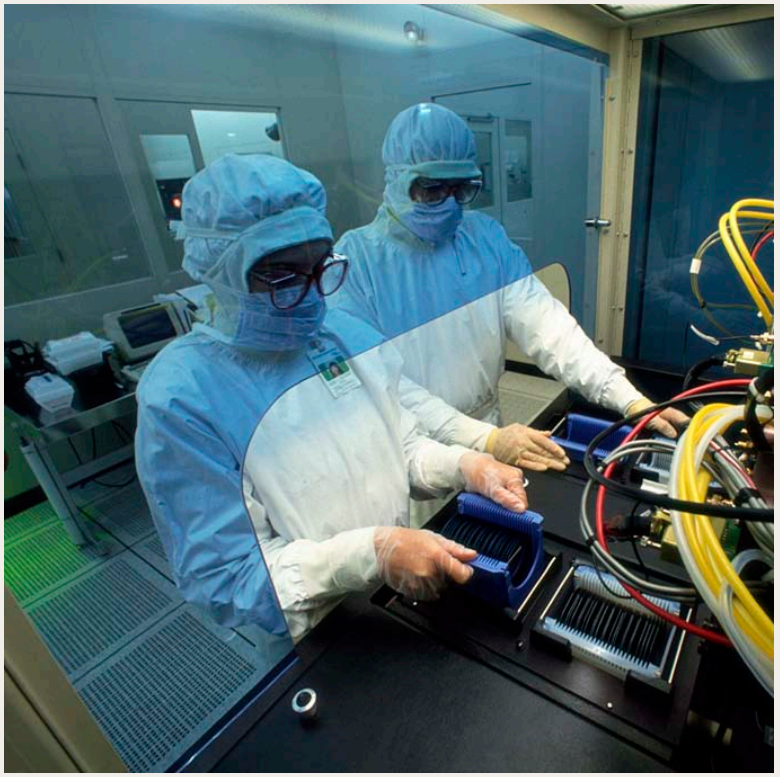
What is Innovation?

- **Innovation is more than the development of new technology-based products**

- **Innovation is the introduction to the marketplace of new:**
  - Products
  - Processes
  - Forms of work organization, and
  - Business models

The Faces of Innovation… look like this

Advanced cutting-edge development of new technologies.



They look like this…

Innovation through the use of existing ICT solutions.

- Former John Deere CEO said they didn't make tractors but rather "sophisticated mobile information factories."
  - GPS shows location
  - Sensors measure cotton flow
  - RFID let processors know origin of each bundle
  - Computing power of 8 PC's

80% of the benefits of ICT come from its usage…only 20% from its production

And They Look Like This

Use of ICT for new goods and services that had never existed before and can be transformational.

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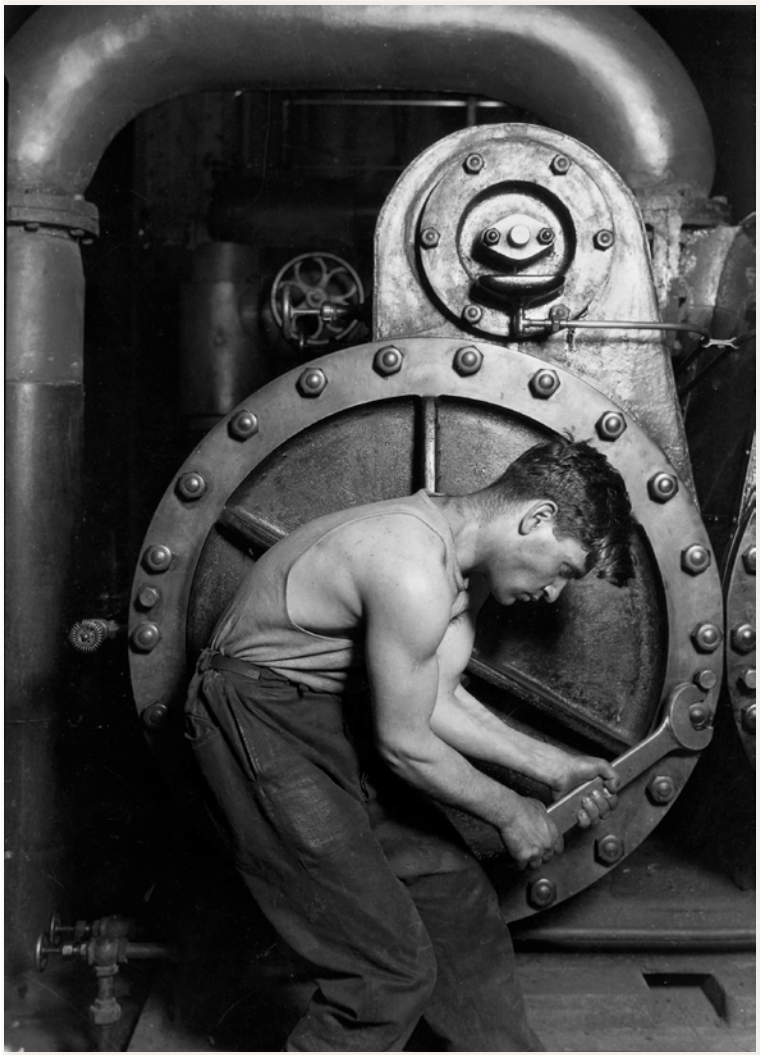
Game-Changer Innovations



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

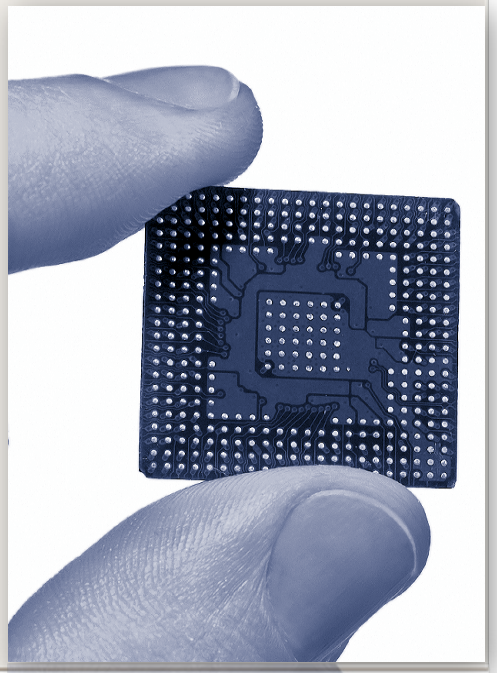
- The Railroad and Iron: 1840s
- Electricity and Steel: 1890s
- Electro-Mechanical Systems: 1950s

Game-Changer Innovations

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, *Information and Communications Technology (ICT) has been the engine of change*.



These Revolutionary Systems Have 4 Main Characteristics

1. **They undergo rapid price declines and performance improvements.**

- How much would 5 GBs of storage have cost using 1995 technology?

1) $5.50
2) $55
3) $550
4) $5,500

- How much would 5 GBs of storage have cost using 1995 technology?

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These Revolutionary Systems Have 4 Main Characteristics

1. They undergo rapid price declines and performance improvements.

2. **They are pervasive and a part of most industries, products, and functions.**

ICT Used to be Scarce

Now ICT is Everywhere

These Revolutionary Systems Have 4 Main Characteristics

1. They undergo rapid price declines and performance improvements.
2. They are pervasive and a part of most industries, products, and functions.
3. **They enable innovation in products, processes, business models, and business organization**.

ICT Enables New Business Models and Processes

- **Business models:**
  - cost reductions based on tighter supply (e.g., Wal-Mart)
  - wider array of products (e.g., Amazon's "long tail")
  - better pricing models (e.g., Progressive Insurance pay by mile.)

- **Processes:**
  - self-service (kiosks)
  - mass customization (e.g., Dell build to order)
  - IT-enabled outsourcing (e.g., IBM services)
  - collaborative design and innovation (e.g., Innocentive).

- ICT enabled half of the product innovations and 75% of the process innovations of EU companies.

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1. They undergo rapid price declines and performance improvements.
2. They are pervasive and a part of most industries, products and functions.
3. They enable innovation in products, processes, business models and business organization.
4. **They drive productivity growth and profitability.**

ICT Has Outsized Impacts on Organizations

- In large U.S. firms, every dollar of ICT capital is associated with $25 of market value. $1 of non-ICT capital is associated with only $1 of market value.
- ICT workers contribute significantly more to productivity than non-ICT workers.
- ICT was responsible for 75% of productivity growth from 1995 to 2002, and 44% from 2000 to 2006.
- ICT has 3 to 7 times more impact on firm productivity than non-ICT capital.

Nations Have Benefited from ICT

- Korea: 20% of growth in GDP was from use of ICT from 1995 to 2004 (Kanamori and Motohashi, 2007).
- China: ICT usage accounted for 38% of the increase in Total Factor Productivity growth and 21% of GDP growth. (Heshmati and Yang, 2006)
- Malaysia: Use of ICT had the largest impact on manufacturing productivity, larger than human capital. (Ahmed, 2006)
- Hong Kong, Indonesia, South Korea, Malaysia, Philippines, Singapore, Taiwan, and Thailand: ICT use had significant, positive impacts on productivity, GDP growth and overall stock market values from 1991 to 2002. (Feinberg and Tokic).

ICT Has Driven Productivity Growth

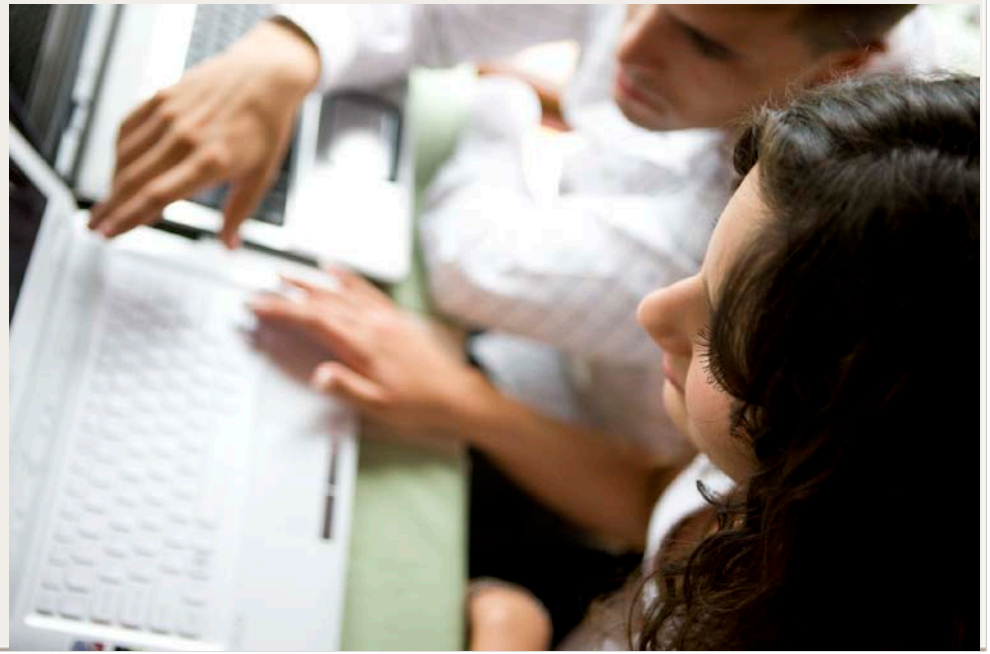
- The use of ICT in the U.S. economy since 1995 has meant that the economy is over $1.6 trillion larger than it would otherwise be. This is equivalent to 2 Indian economies (in $).

But Applying ICT is Not Enough…

Organizational Change is Also Required

- Firms that adopt *digital organization* practices and invest more in ICT 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."



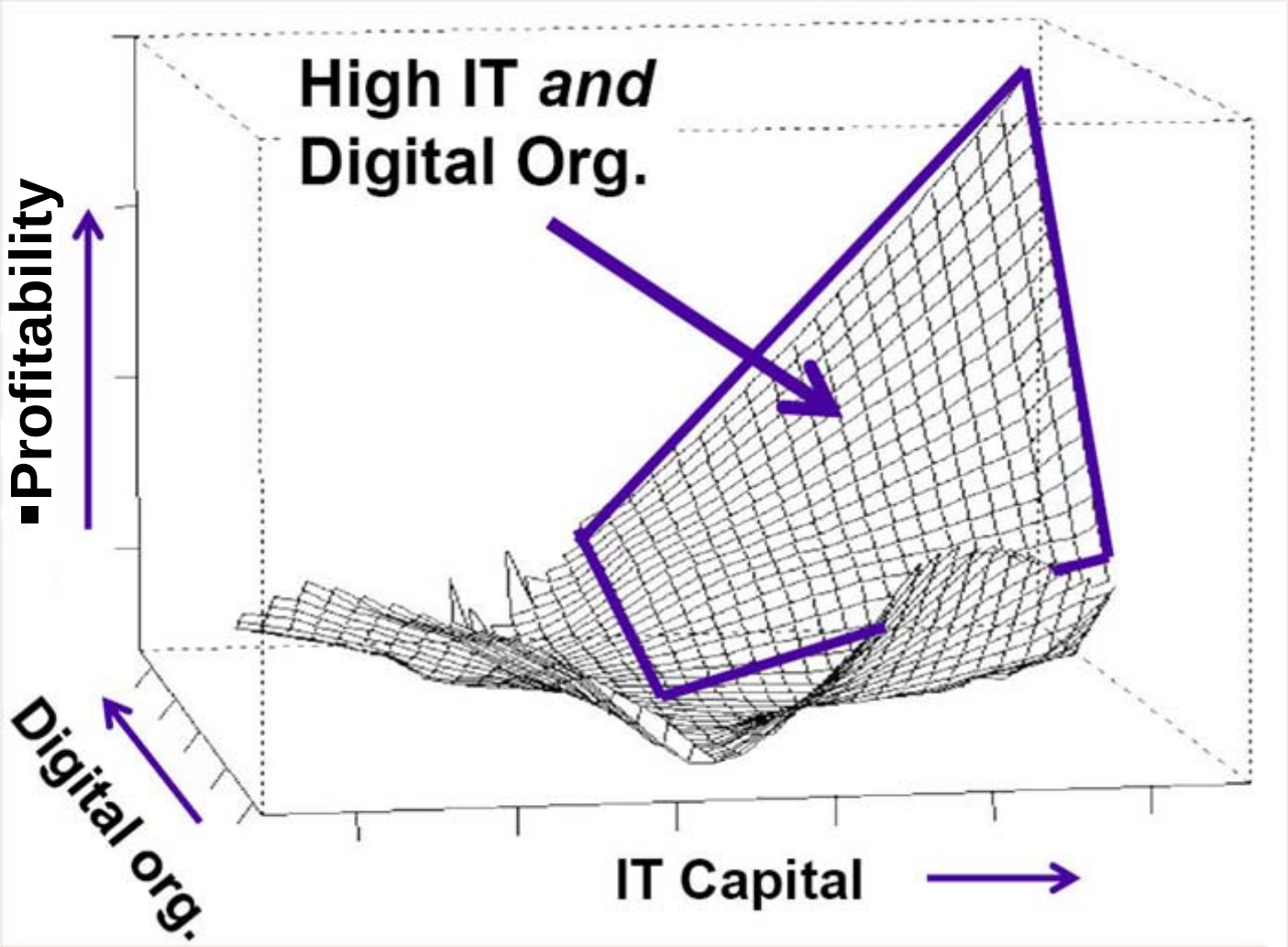
The Seven Practices of Digital Organizations

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

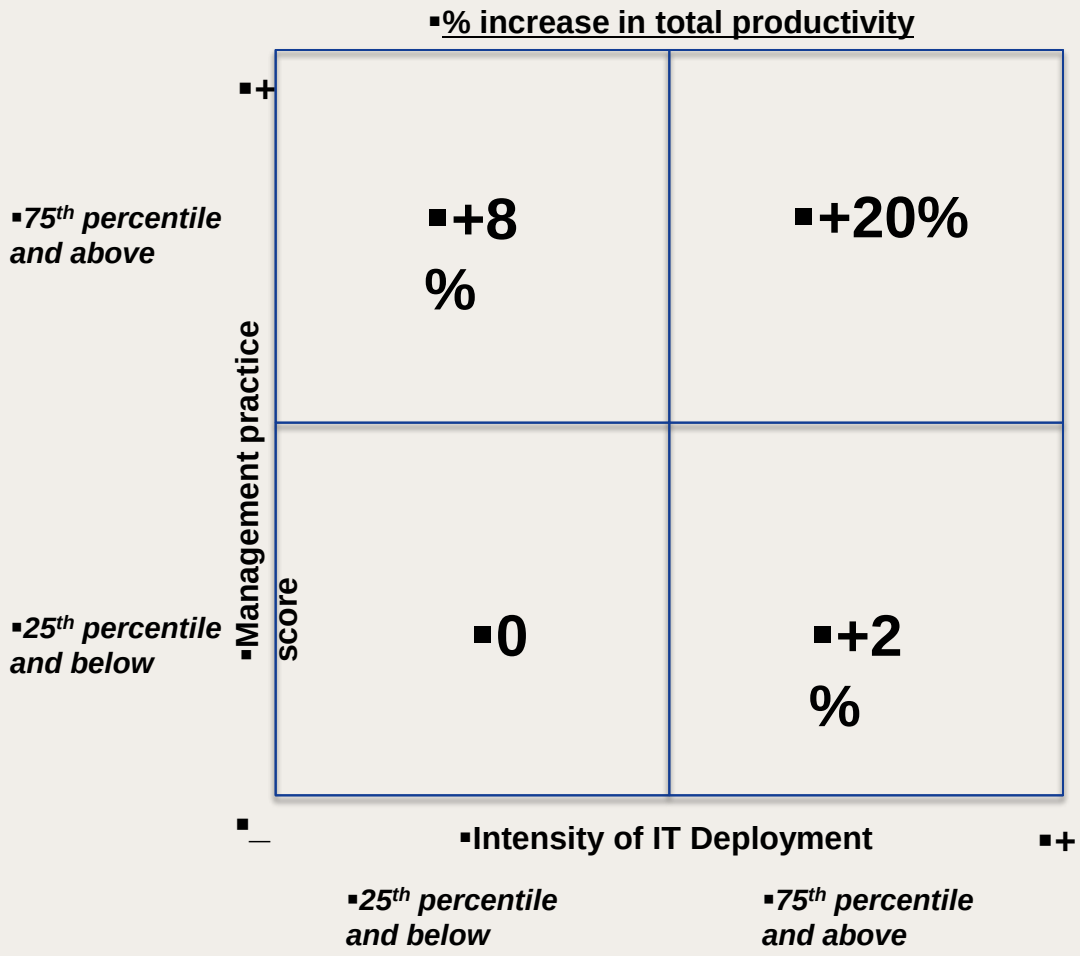
1. Move from paper-based to digital business processes
2. Empower front line service personnel
3. Foster open information access
4. Link incentives to performance
5. Maintain focus and communicate goals
6. Hire the best people
7. Invest in human capital

- Erik Brynjolffson

- Higher Profitability Accrues to Firms That Get Both Right



McKinsey Finds the Same Result



- There are productivity gains from automating processes.
- Biggest productivity gains are achieved when ICT is combined with changes in business practices.

Source: LSE – McKinsey survey and analysis of 100 US, UK, French, German companies, 1994-2002

ICT Engine Won't Run Out of Gas

- **Core technologies (memory, processors, storage, sensors, displays, and communication) continue to get better, faster, cheaper, and easier to use, enabling new applications to be introduced on a regular basis.**
- **Many sectors have barely tapped e-transformation.**
- **Application use is growing by business and consumers, and has not yet matured.**

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3. What is Innovation and How to Lead It?
4. How Can Nations Best Maximize Innovation?

- So, How to Drive Innovation?

Innovation Isn't Easy – Some Puzzles to Ponder

- Why didn't IBM keep the operating system?
- Why didn't Microsoft create the browser?
- Why didn't AT&T create AOL?
- Why didn't Citibank create PayPal?

- ***It takes effort to stand in the future and see new possibilities.***
- ***Just because you're not willing to disrupt your own business, doesn't mean someone else isn't willing to do it for you.***

A New Discipline of Innovation is Emerging Because…

- Operational excellence is no longer enough.
- Increased rate of change makes an ability to change more valuable.
- Tools are emerging to improve innovation success rates.
- Companies need new insights to achieve growth. Successful companies get these from identifying unmet customer needs.
- Innovation may be risky; but what is really risky is not innovating.

- ***Success is 99 percent failure!***

What Are the Consequences of Firms Not Innovating?

1. Failure to meet rising customer expectations.
2. Competition will get ahead.
3. Risk of losing the best talent.
4. Risk of losing new revenue opportunities.
5. Risk of getting “Baumol’s Disease” (low productivity, high costs).

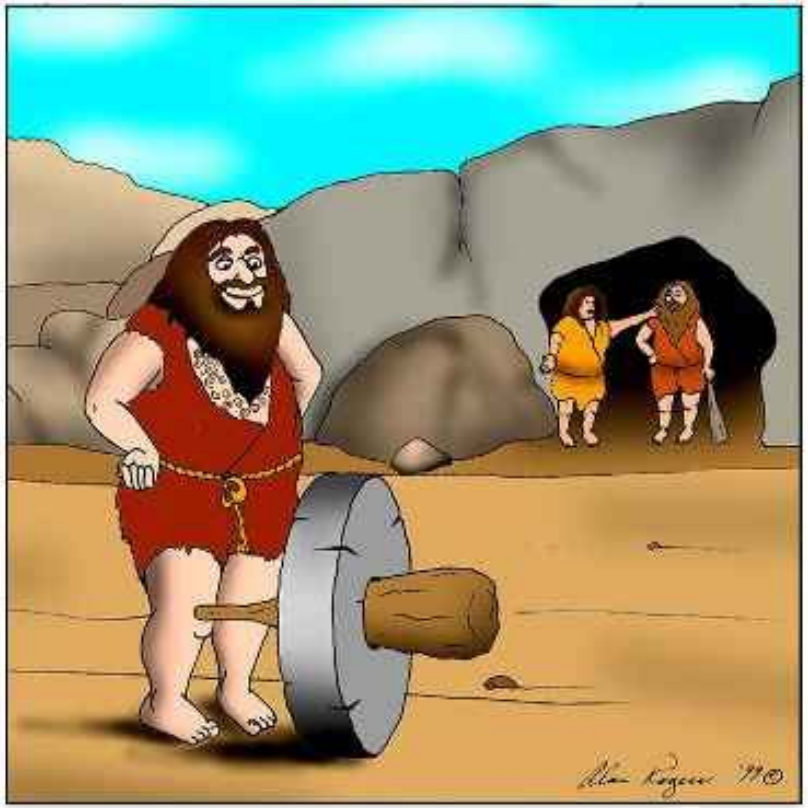
There are Ten Types of Innovation

- 1. Business model
  how the enterprise makes money
- 2. Networking
  enterprise's structure/ value chain
- 3. Enabling process
  assembled capabilities
- 4. Core process
  proprietary processes that add value
- 5. Product performance
  basic features, performance and functionality
- 6. Product system
  extended system that surrounds an offering
- 7. Service
  how you service your customers
- 8. Channel
  how you connect your offerings to your customers
- 9. Brand
  how you express your offering's benefit to customers
- 10. Customer experience
  how you create an overall experience for customers

Finance		Process		Offering			Delivery		
Business model	Networking	Enabling process	Core process	Service/prod. performance	Svc/prod system	Service	Channel	Brand	Customer experience

"Ten types of Innovation" by Larry Keeley/Doblin Inc.

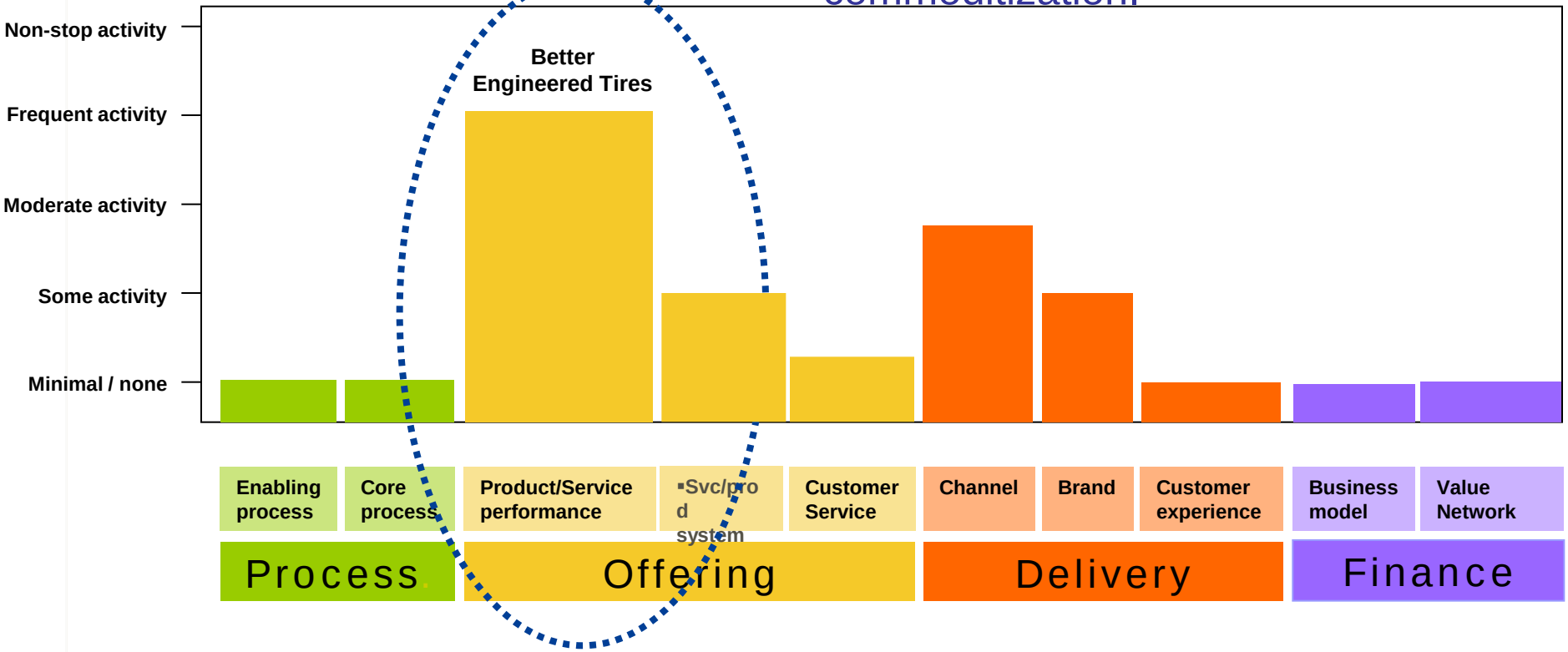
How Can We Innovate on This?



"Oh look, Thog got "The Club" and now nobody can steal his wheel."

Competition in Automobile Tires

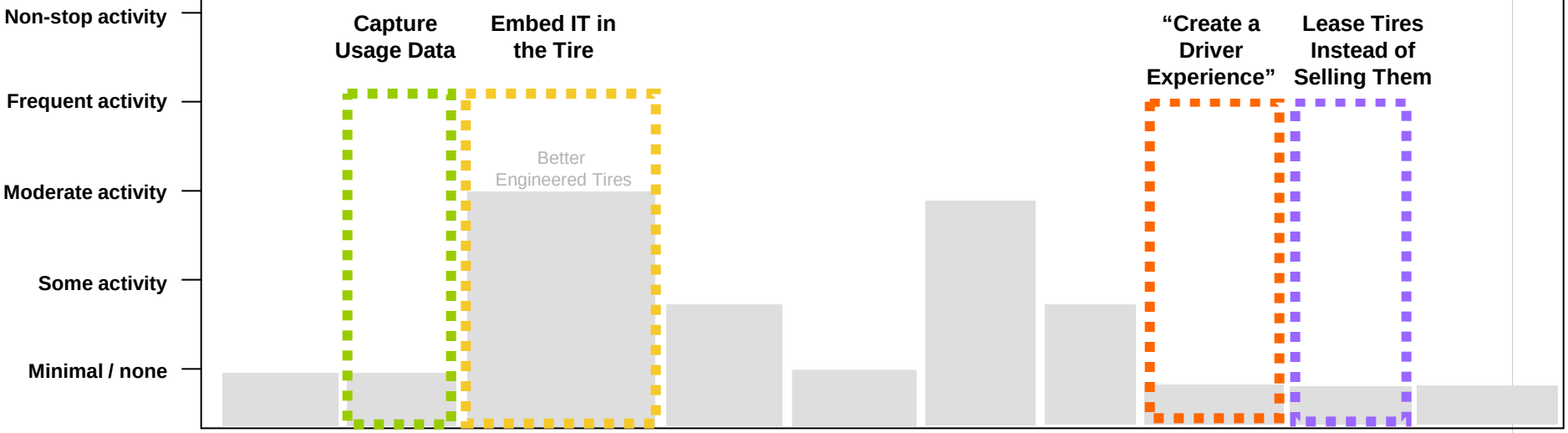
- Most competitive activity in the tire industry has been here. Price pressures have led to commoditization.



Bridgestone Automobile Used the Ten Types to Innovate

BRIDGESTONE
PASSION for EXCELLENCE

- Wireless-enabled sensors embedded in tires send tread data to a central server.
- Bridgestone informs customers when they need new tires.
- Bridgestone now leases tires.
- Moving from being a product manufacturer to a service provider.



Enabling process	Core process	Product/Service performance	▪Svc/prod system	Customer Service	Channel	Brand	Customer experience	Business model	Value Network
Process		▪Offering			▪Delivery			▪Finance	

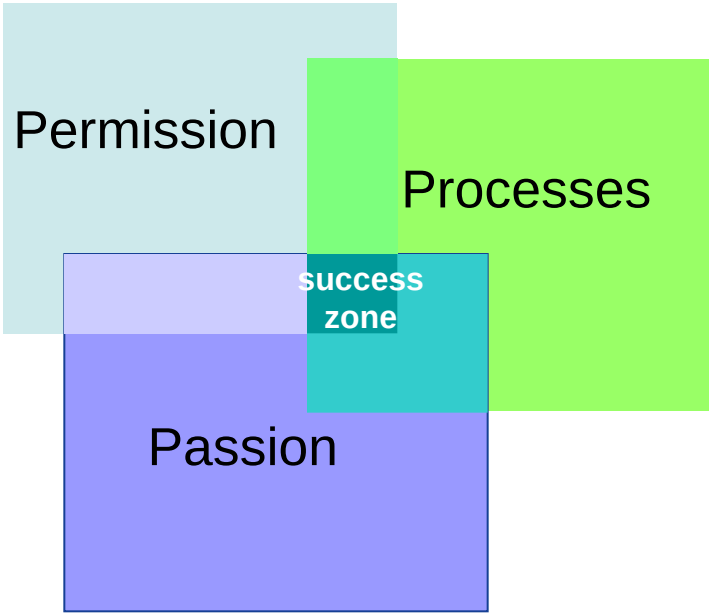
- *"We have to strike the right balance between being in touch and being in control. The irony is that the more in control we are, the more out of touch we become."*

- A.G. Lafley, CEO Proctor and Gamble

Striking the Right Balance: Successful innovation requires marrying Passion, Permission, and Protocols

- **Senior management:**
  - Declares an innovation intent
  - Sets conditions for innovation

- **Your people:**
  - Have the passion, they just need the proper channels to unleash it.



- **The organization:**
  - Establishes processes to support innovation.

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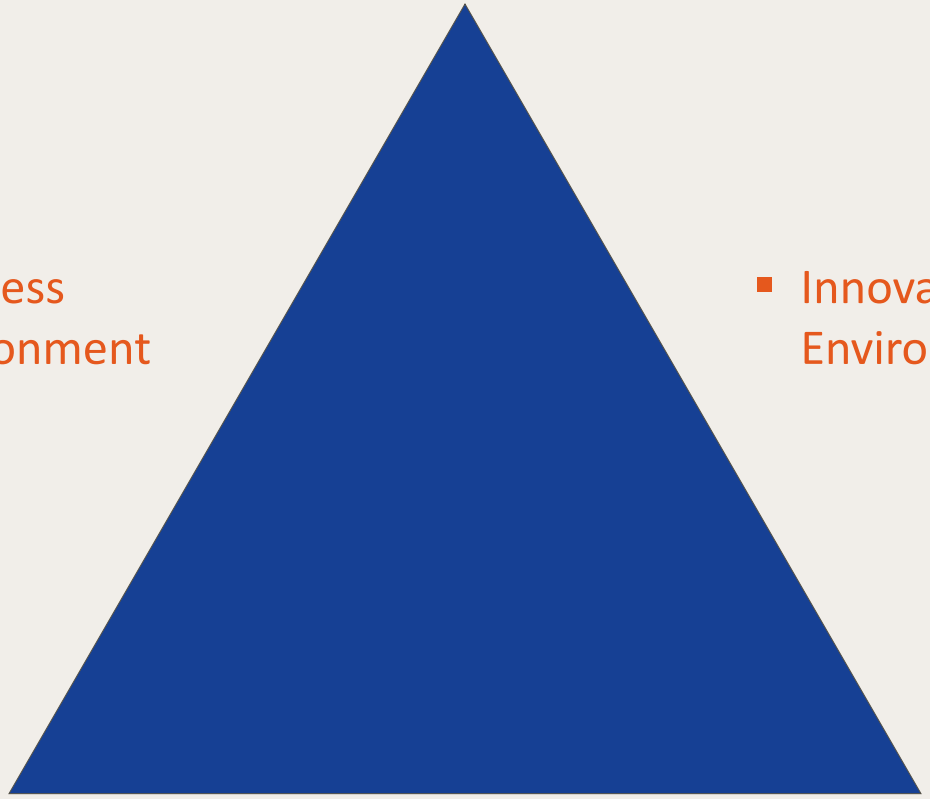
How to Best Maximize Innovation

1. Get the “Innovation Triangle” right
2. Target all types and phases of innovation
3. Get the balance between markets and government right
4. Get the balance between traded and non-traded sectors right
5. Spur strong technology adoption

Maximizing Innovation: Get the Innovation Triangle Right



Business Environment

1. Vibrant capital markets
2. Churn and change are accepted, even embraced
3. High level of entrepreneurship
4. Cooperation and collaboration is part of the culture
5. High levels of university licensing and patenting
6. Strong ICT adoption, especially among business
7. Strong management skills
8. Striking the right balance between short and long-term

Regulatory Environment

1. Pro-innovation tax system
2. Competitive and open trade regime
3. Ease of starting a business
4. Transparency and rule of law
5. Support for competitive product and labor markets
6. Protection of intellectual property
7. Limited regulations on the digital economy

Innovation Policy Environment

1. Funding for research, especially that which is commercially oriented
2. Incentives for private sector research
3. Incentives for adoption of new capital equipment, particularly ICT
4. Support for education, especially science, technology, engineering and math (STEM)
5. Active policies to spur digital transformation (e.g., broadband, digital adoption, e-government, health IT, smart grid, etc.)
6. Support for tech transfer from universities and national labs
7. Procurements based on performance standards

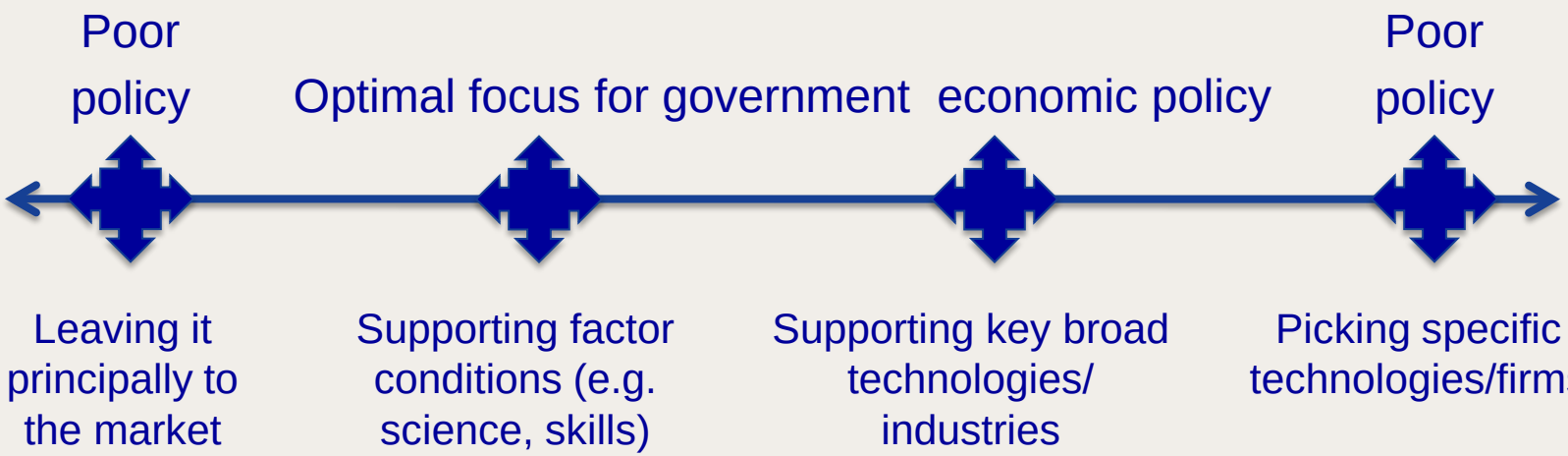
Maximizing Innovation:
Target All Types and Phases of Innovation

		Phase of Development				
Type of Innovation		Conception	Research & Development	Transfer	Production/ Deployment	Usage
	Products					
	Services					
	Production process					
	Organizational models					
	Business models					

Too Many Nations Focus Too Narrowly

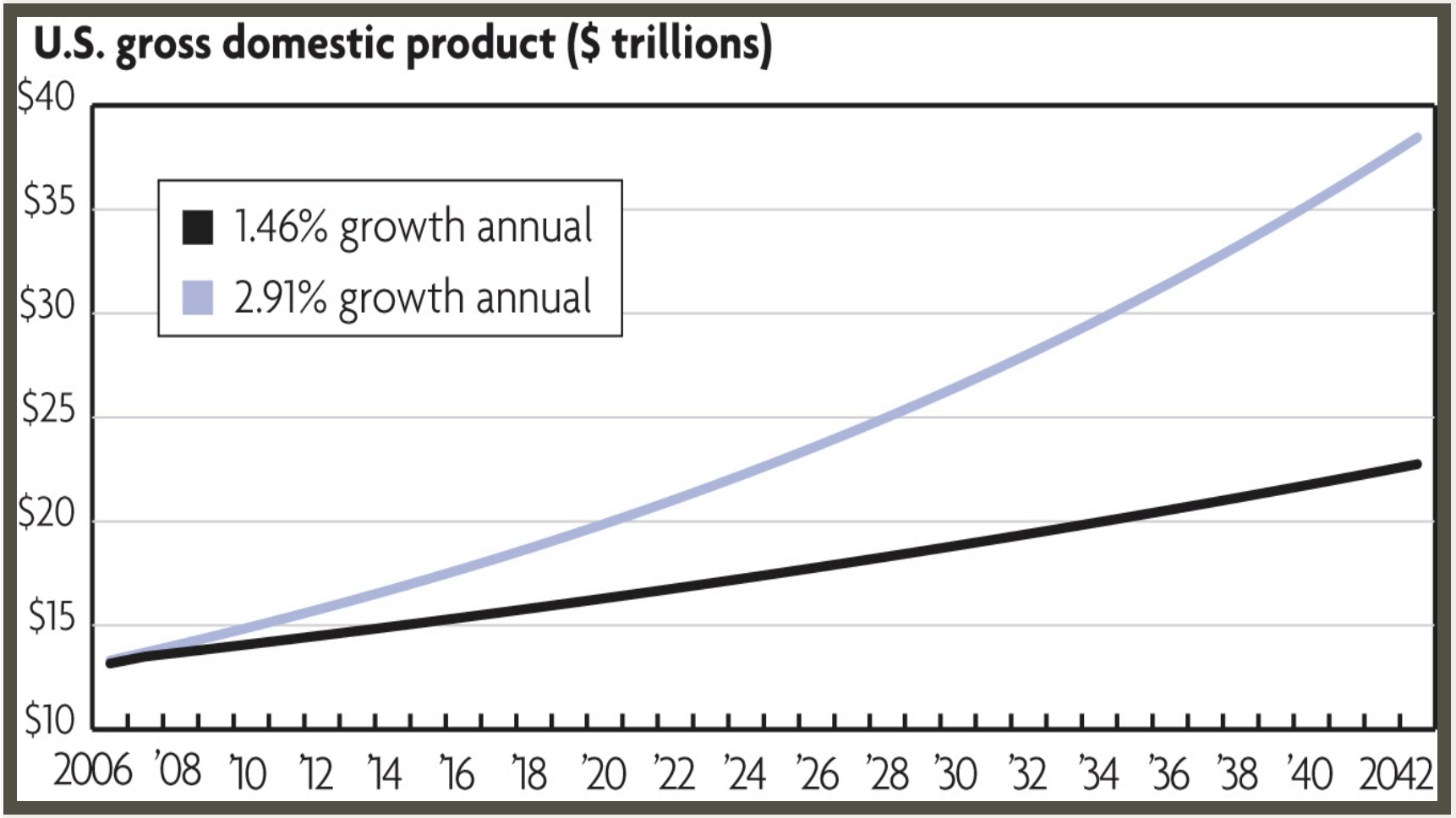
		Phase of Development				
Type of Innovation		Conception	Research & Development	Transfer	Production/ Deployment	Usage
	Products			*	*	
	Services					
	Production process					
	Organizational models					
	Business models					

Maximizing Innovation:
Get the Balance Between Market and Government Right



Maximizing Innovation:
Boost productivity across-the-board in all sectors

Productivity Growth is Critical



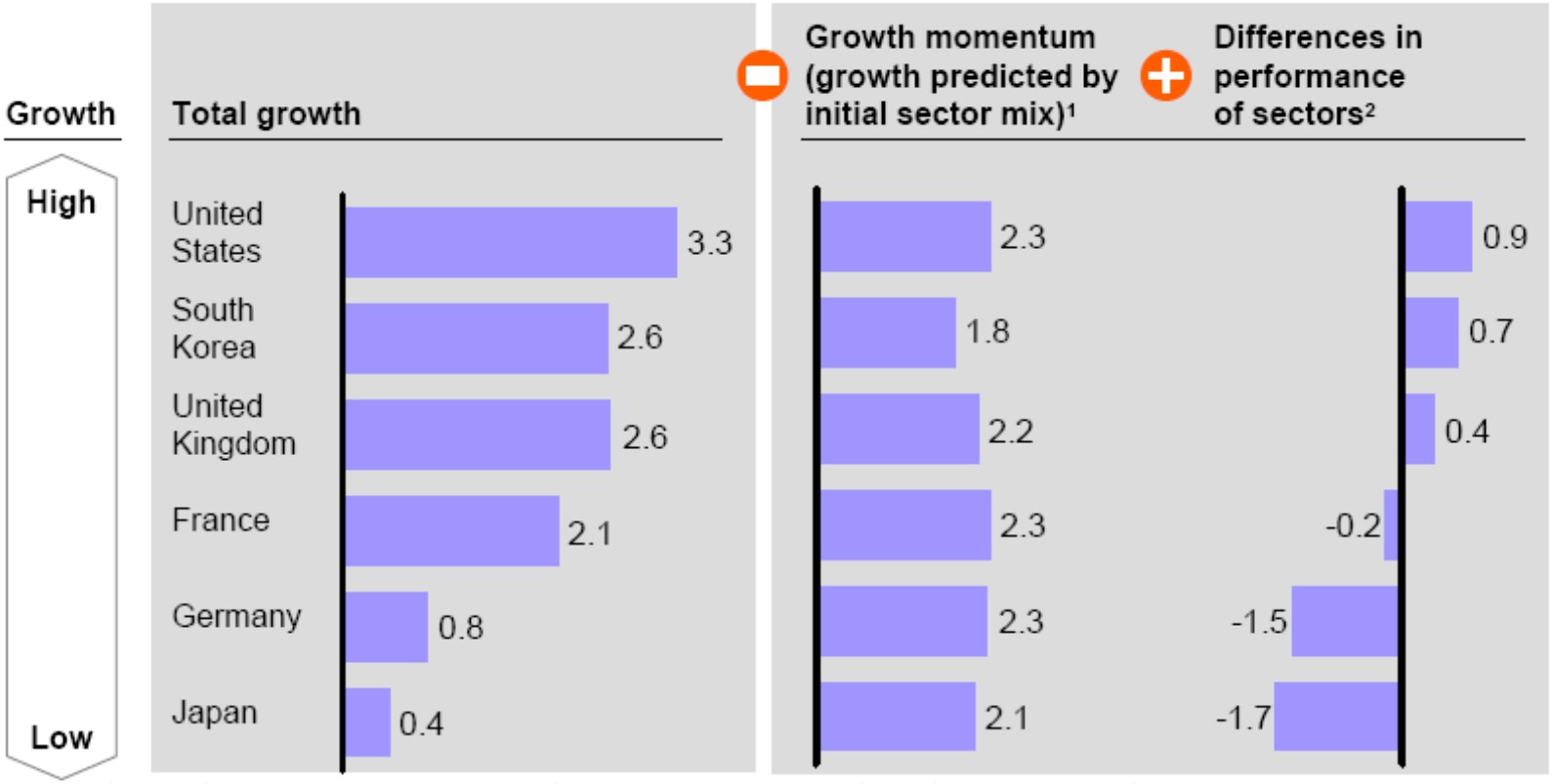
Economies Can Increase Productivity Two Ways

1. Through the "growth effect":
   - Firms in all sectors become more productive.

2. Through the "shift effect":
   - Lower-productivity industries shrink, while higher-productivity ones expand.

Sector performance has mattered more than the mix of sectors for overall GDP growth in developed countries

Contribution to total value added, 1995–2005
Compound annual growth rate, %

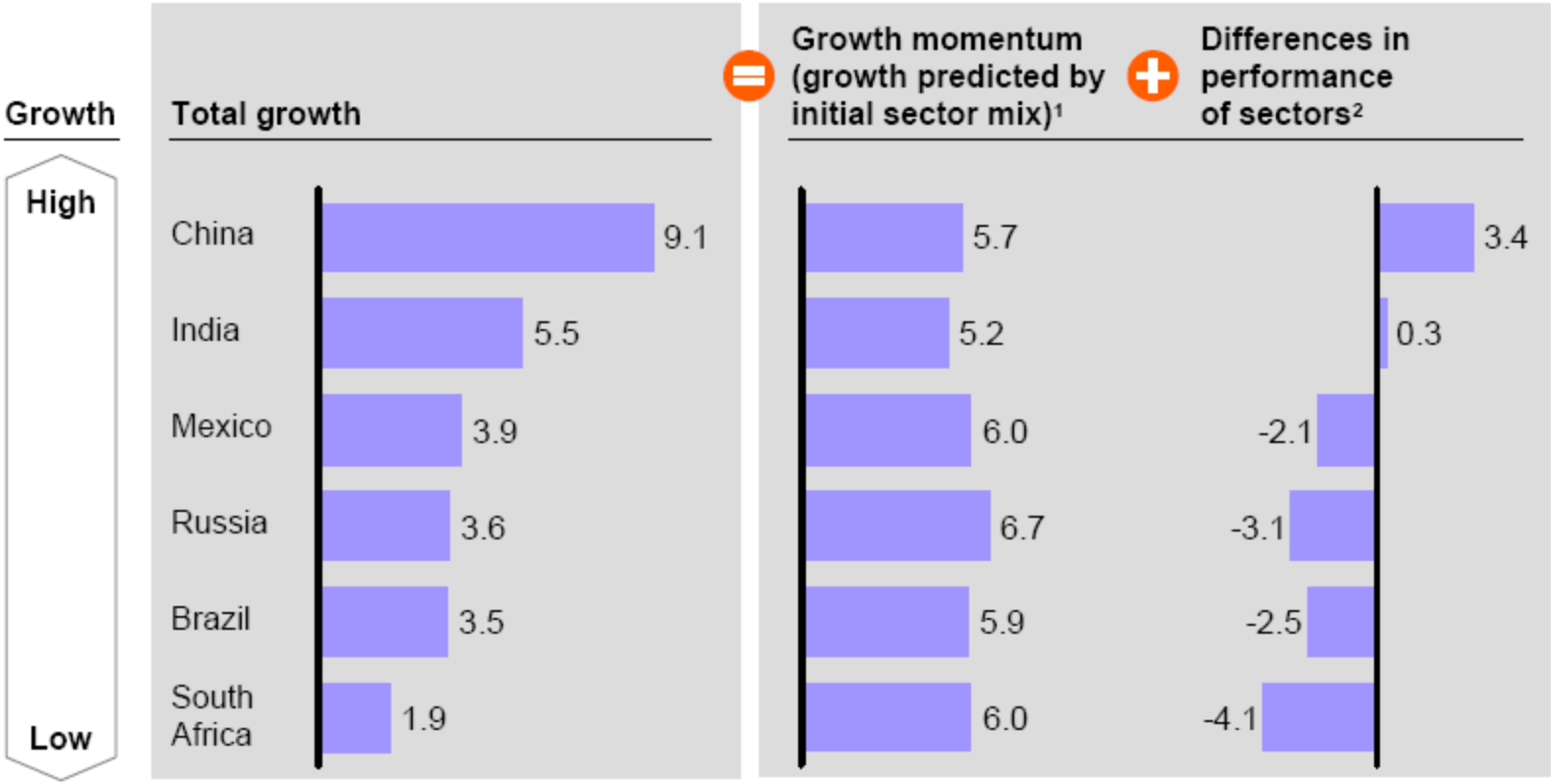


1 Country growth rate calculated as if all sectors would have grown with sector-specific growth rate average across all developed countries.
2 Actual country growth minus growth momentum of initial sector mix.

SOURCE: Global Insight; McKinsey Global Institute analysis

Sector performance matters more than sector mix in developing countries as well.

Contribution to total value added, 1995–2005
Compound annual growth rate, %



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SOURCE: Global Insight; McKinsey Global Institute analysis

Trade Surpluses Are Not Needed to Drive Growth

- In the moderate and long-term trade surpluses don't lead to more jobs or necessarily higher incomes,

$$\Delta \text{ GDP} = \Delta \text{ C} + \Delta \text{ Inv} + \Delta \text{ G} + \Delta(\text{eX} - \text{i})$$

  - Δ C = Change in private consumption
  - Δ Inv = Change in private investment
  - Δ G = Change in government spending and investment
  - Δ (eX – i) = Change in exports minus change in imports

- There is only a very small (.08) correlation between per-capita GDP growth and growth in trade surplus between 1999 and 2008 for 180 nations.

A Focus on Traded Sectors Alone Courts Risk of a Dual Economy

Dual economies have very competitive traded sectors but very uncompetitive domestic, non-traded sectors:

- Japan: Despite world-leading mfg. firms, retail sector is 50% as productive as U.S.; construction and food processing 40% and 33%.
- South Korea: wholesale-retail sector productivity is 30% of U.S. Economy-wide productivity 50% U.S. levels. Korean manufacturers are 20% less cost competitive than if their service sector had U.S. levels of productivity.
- Israel: ICT sector exported 70% of its output. But "A fast growing ICT sector is not enough to guarantee sustained economy-wide growth."
- India: Only 5% of the output of Indian ICT service firms is consumed by Indian firms. Boosting retail productivity to 1/3 of US levels would create more wealth than entire Indian ICT sector.

All Sectors Can Drive Growth and Innovation

"Even taking into account the spillover benefits generated by innovative sectors, the fact remains that these sectors alone cannot fuel economy-wide growth.

Governments therefore need to pursue policy efforts across the broad swath of existing industrial and service sectors."

- McKinsey Global Institute, *How to Compete and Grow*

Liberalizing Retail Sector Increases Productivity

Argentina/Japan place burdensome regulations on retail grocery sector:

- Large firms disadvantaged against smaller grocers; pay more in taxes, harder to get permits, size restrictions, different pay/work place rules.
- Argentina: “Hardship pay” for work in large grocery stores; no firings.
- Japan: 50% mom-and-pop stores, vs. 25% in France, 12% U.S.

Sweden/Mexico/Russia liberalized and saw productivity improvements:

- Sweden: Liberalized opening hours/zoning regulations; retail sector productivity increased 4.6% per year for 10 years after 1995.
- Russia: Productivity doubled in past ten years as more modern retailers were able to gain market share.
- Mexico: Increasing competition lowered prices and increased number of convenience stores six-fold in 5 years.

Distorting GPT Markets, Especially in ICTs, Often Backfires

- Trade-distorting measures placed on ICT sectors mean consumers/ firms have to pay more, yet often receive inferior products/services.
  - This makes downstream ICT-using firms/sectors less competitive.
  - Diminishes productivity of financial, transportation, etc. sectors.
- India: For every $1 of tariffs India applied to imported computers, the country lost $1.30 due to lost spillover effects.
- Argentina: Imposed tariffs on assembled computers (though not computer parts) with goal of creating a domestic computer assembly industry. Result: Inefficient computer industry, where up to one-third of computers sold in Argentina are hand-assembled in small shops.

Summary

- Innovation (defined broadly to apply to all sectors) is becoming more important for prosperity
- ICT is the key “general purpose technology” driver of growth today.
- Countries that succeed will have a large share of the organizations as “digital organizations.”
- Innovation is needed in all sectors (traded and non-traded, “high-tech” and “low-tech”)

Thank you!

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