

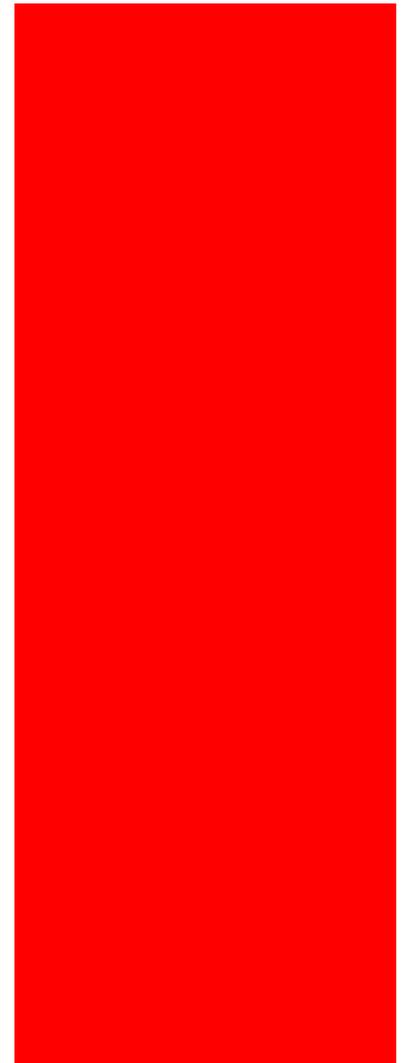
# The Impact of IT Investment on the US Economy

## **Vijay Gurbaxani**

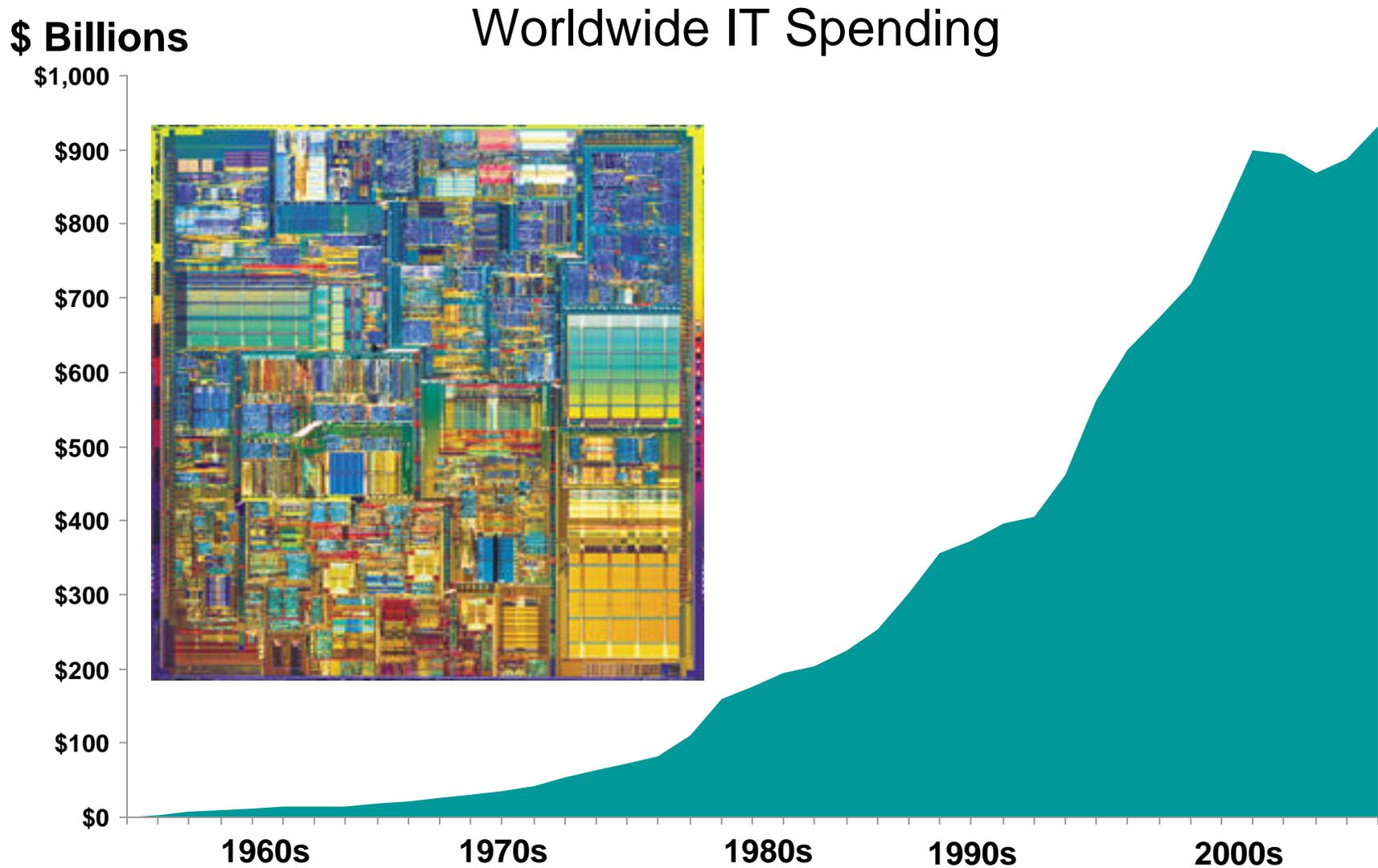
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Snowbird, Utah  
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# 40 Years of IT



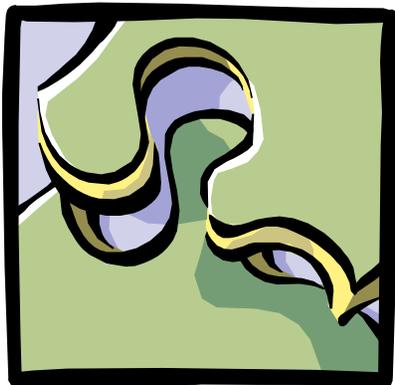
Source: IDC Directions 2004 Conference

## The Productivity Paradox (circa 1987)

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“Computers show up everywhere except in the productivity statistics.”

- Robert Solow, Nobel Prize winning economist

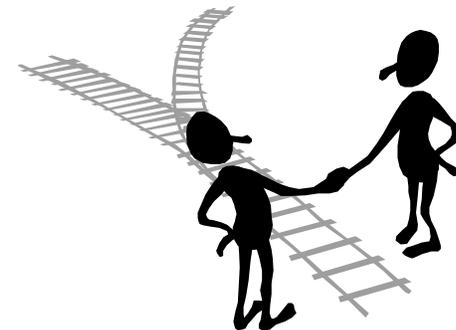


## Fast Forward to the New Economy (circa 2000)

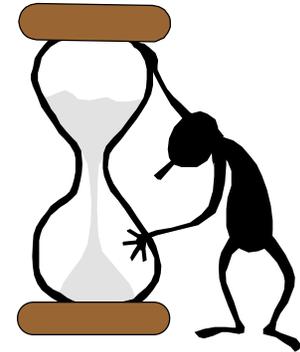
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“Despite differences in methodology and data sources, a consensus is building that the remarkable behavior of IT prices provides the key to the surge in economic growth”

- Dale Jorgenson, Harvard economist



# The New Economy: Fact or Fiction?



Is the move to an IT-intensive networked economy a fundamental change derived from structural changes in business processes and accompanied by a permanent improvement in the prospects for economic growth, or is it a temporary phenomenon, enabled by the business cycle?

# The Slowdown of the U.S. Economy

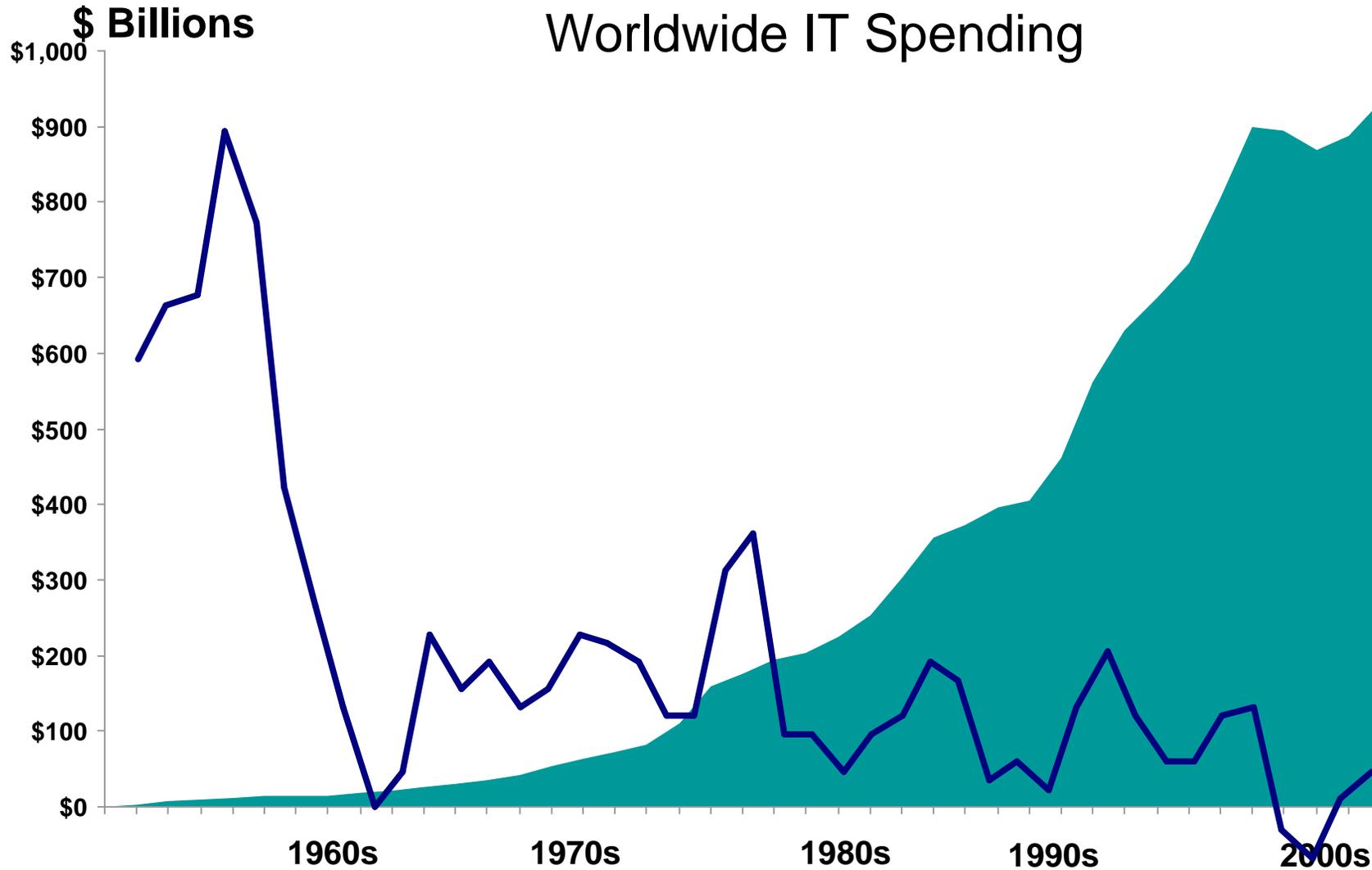
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“The collapse of business spending on computers, software, and equipment of all sorts led the U.S. into recession last year.”

- Wall Street Journal  
April 4, 2002



# 40 Years of IT



Source: IDC Directions Conference, 2004



## Why this Decrease in IT Spending?

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- Capital spending decreases in recessions
- Considerable uncertainty in payoffs from IT investment
- Dot-com bust reduced competitive pressure

The reduction in capital spending can have substantial negative impact on the national economy, and on the technology sector, in particular, which has been the engine of economic growth.

# Keep the Faith!

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“There is still -- in my judgment -- ample evidence that we are experiencing only a pause in the investment of a broad set of innovations that has elevated the underlying growth rate of productivity.”

Alan Greenspan  
Chairman, Federal Reserve  
May 2001



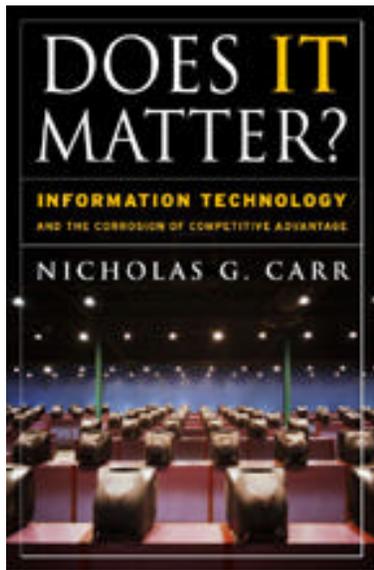
# The Choice for Companies

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- Should one pull back as many companies are doing?
- Or should one speed up spending on IT to improve corporate productivity because there are increased opportunities as competitors scale back spending?



## Does IT Provide Competitive Advantage?



**“As availability increases and cost decreases ... [technologies] become commodity inputs. From a strategic standpoint, they become invisible; they no longer matter ...**

**“Executives need to shift their attention from IT opportunities to IT risks — from offense to defense.”**

- Nicholas Carr

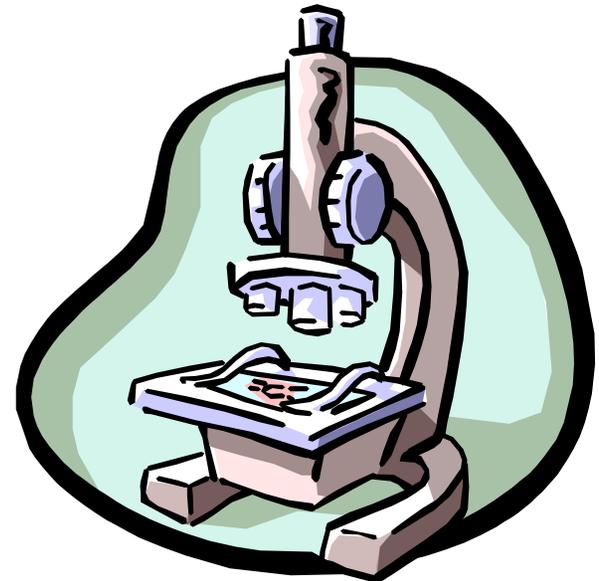
**“Carr’s premise threatens America’s technological innovation process.**

- Dr. Robert M. “Bob” Metcalfe

## The Scientific Evidence

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- Too much media hype and subjective points of view
- Rich academic literature that has emerged on the returns to IT investment
- Over 50 studies on this topic



# Dimensions of Productivity Payoff

- Labor Productivity
  - Output per unit of labor



- Multifactor Productivity
  - Output per of unit of combined inputs (capital, labor, energy, materials)



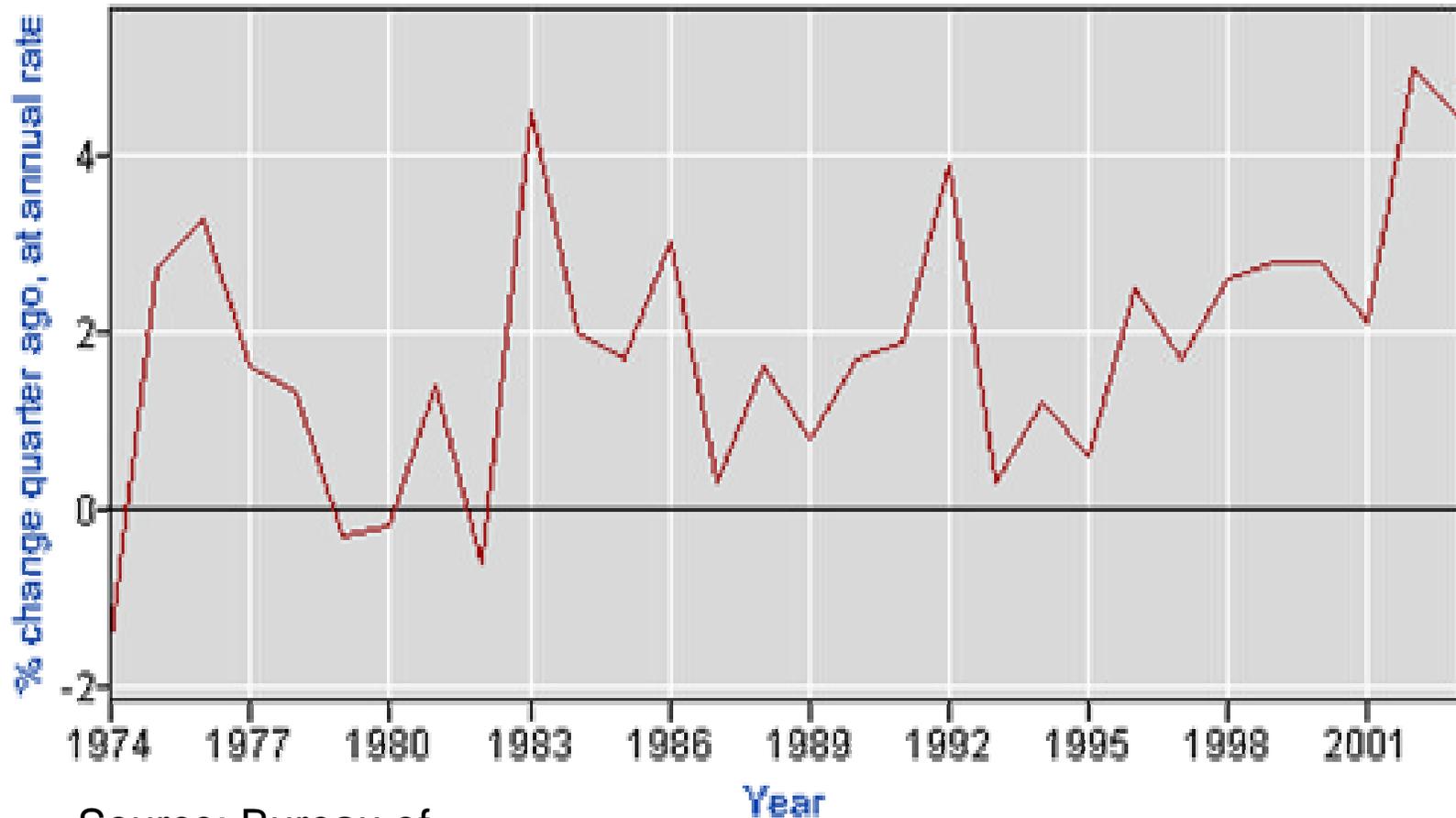


## Economic Growth can Derive from:

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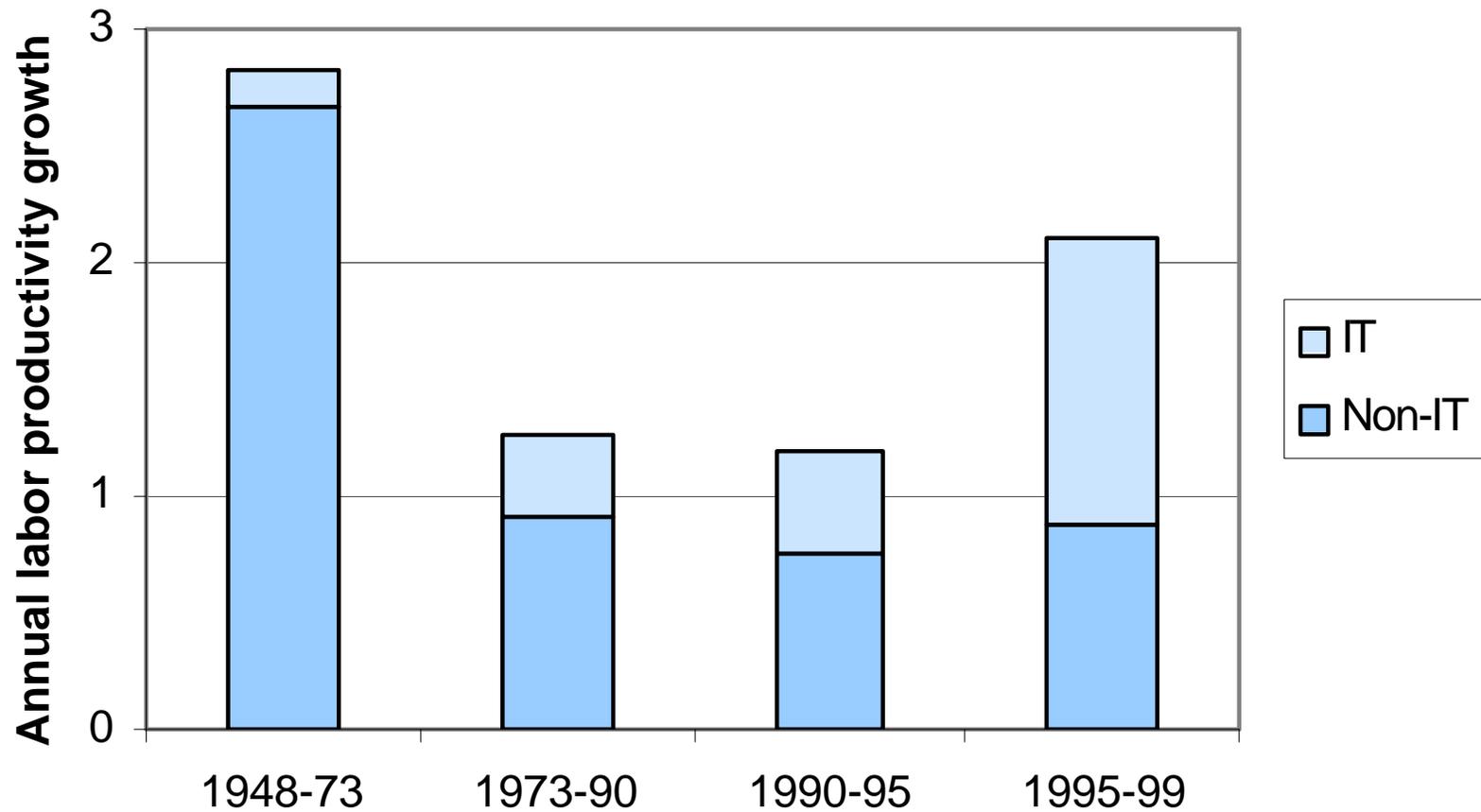
- Increased levels of inputs
  - Labor, IT, other capital
  - Capital deepening and labor productivity
- Improved quality of inputs
- Increased multifactor productivity
  - Improved production methods

## Labor Productivity Growth (Non-farm business)

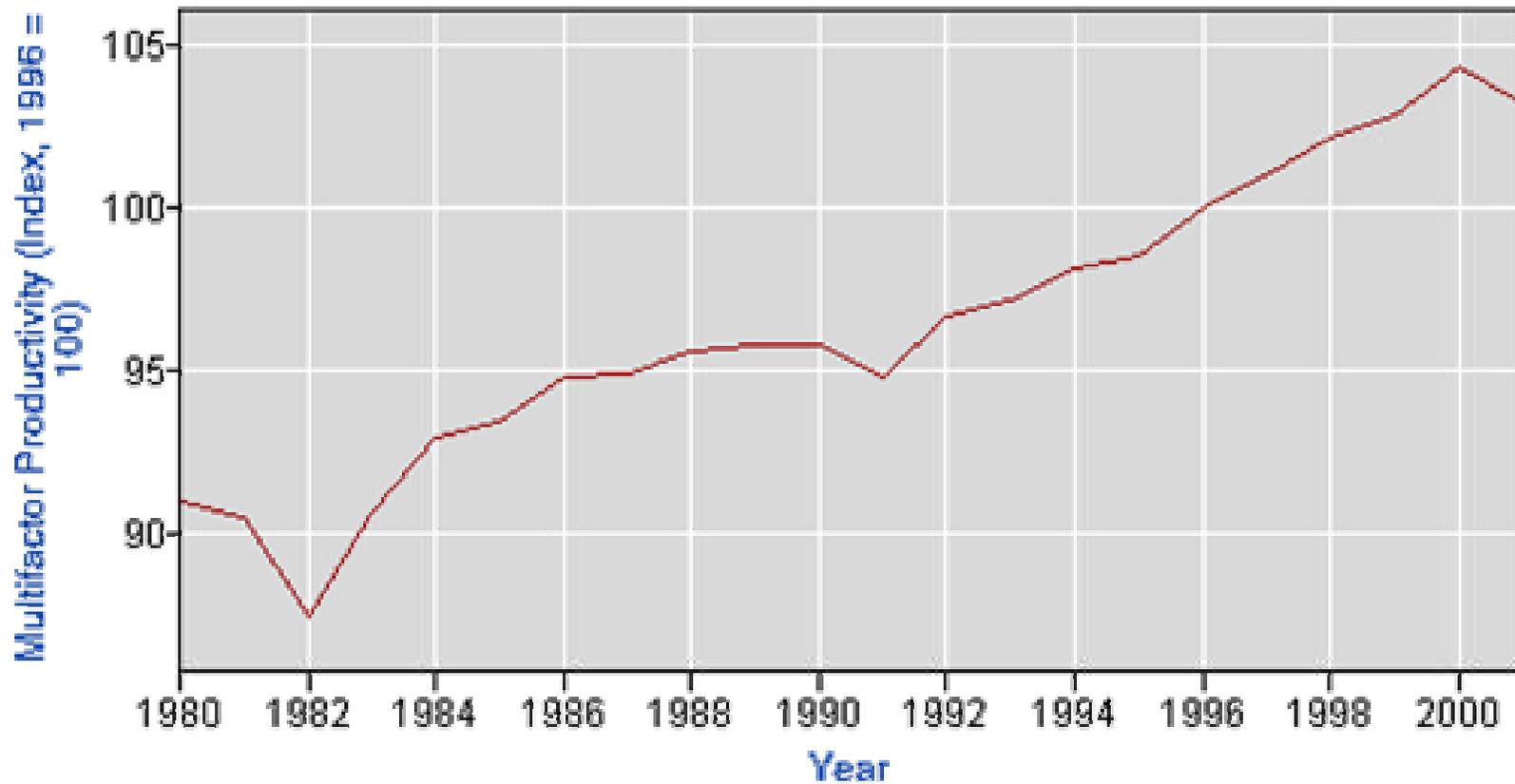


Source: Bureau of  
Economic Analysis

# IT Contribution to Labor Productivity Growth

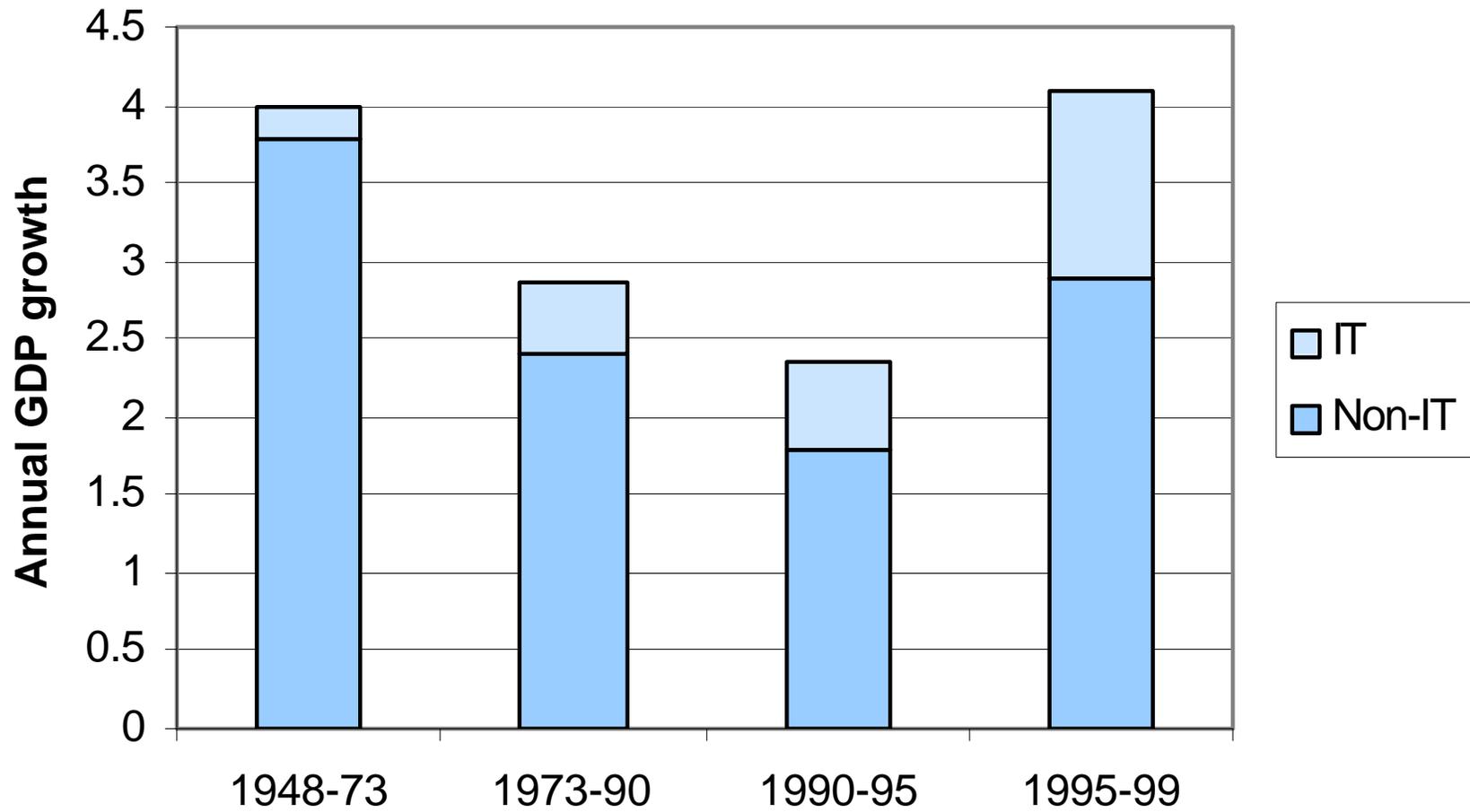


## Multifactor Productivity Growth (Non-farm business)



Source: Bureau of Economic Analysis

# IT Contribution to Economic Growth



## Companies Invest in IT to...

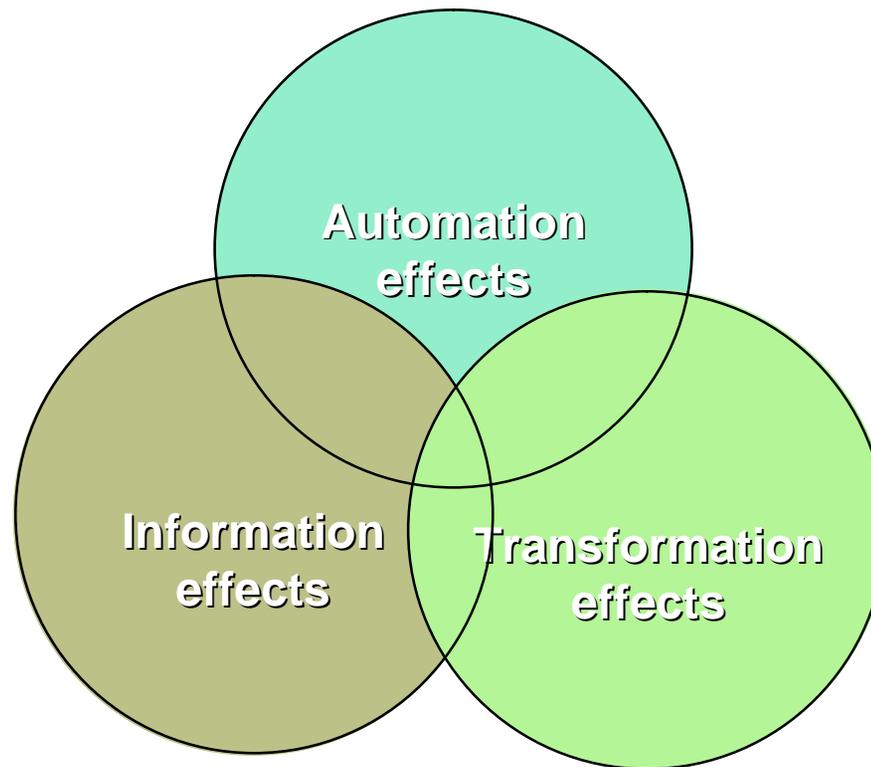
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- Lower costs
- Improve employee productivity
- Improve process performance
  - Supply chain management, new product development
- New marketing channels
- Competitive advantage...



# Impacts of Information Technology

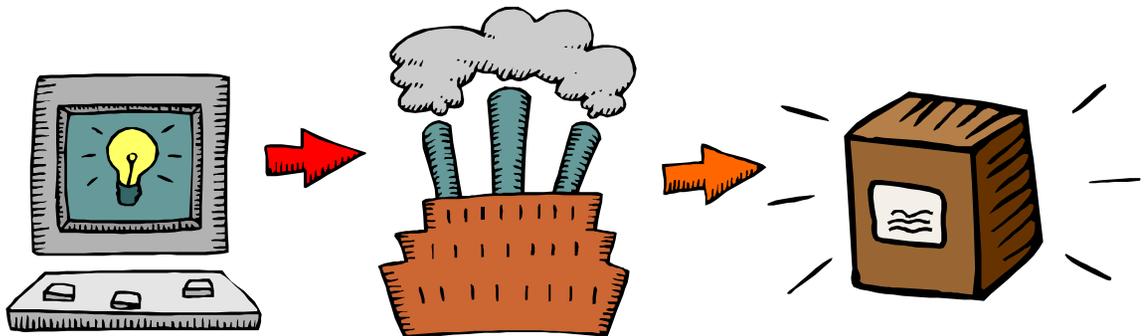
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# The Productivity Payoff from IT Investment



- IT investment is a major contributor to labor productivity via capital deepening
- IT-enabled innovation contributes to multifactor productivity through automation, information and structural improvements in processes, production and management techniques
  - This effect occurs in some, but not all, industries



# IT Pays Off for Companies (with some caveats)

- IT capital investments contribute to firm productivity and have higher marginal returns than other capital
- Returns vary widely among different firms
- Returns are higher when firms make co-investments in organizational capital
  - Decentralization, process redesign, organization structure and employee empowerment
- Payoffs can occur after a lag
- Difficult to correlate IT investment to financial performance measures





# Industry Matters!

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- Results vary by industry
- Industry structure is important
  - Degree of competition, regulation, unionization affect payoff
- IT intensive industries have seen a much higher return
- The Wal-Mart effect
  - As Wal-Mart uses IT and supply chain management to increase its productivity, its competitors work harder to realize similar gains

# Payoffs, Small at First, have Increased over Time!

- IT investments have had a positive impact on labor productivity for more than three decades
- The contribution of IT investments has grown over time
- Higher IT capital investments in the second half the '90s contributed to accelerating productivity growth
  - Some question of the share attributable to business cycle versus IT
- Productivity growth rates are higher in IT-intensive industries



## What Does All This Mean?

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- Continuing IT innovation will continue to provide opportunities for firms to raise productivity
- Back to the basics – understand and leverage the role of IT in key business processes
- Investments in IT capital must be complemented with corresponding investments in organizational capital



# Competing With I/T: Strategy AND Structure

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- Competing via strategy
  - Product leadership (Charles Schwab)
  - Operational excellence (Federal Express)
  - Customer intimacy (Land's End)
  
- Competing via structure
  - Horizontal alliances (Star Alliance)
  - Value added partnerships (Amazon.com)
  - Networked organization (Cisco)

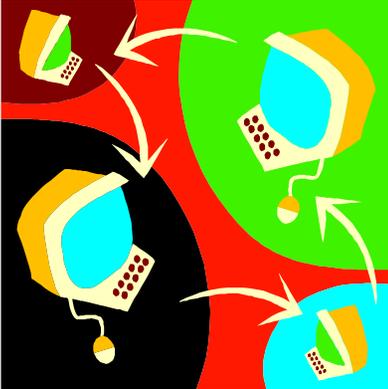
# Competing via Structure: the Role of Electronic Integration

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- Wal-Mart provides suppliers with access to its internal databases
- Dell Computer virtually-integrates its entire value chain
- Airline reservation systems facilitate the coordination of schedules and code-sharing arrangements
- GM, Ford and Daimler Chrysler created an electronic market in the automobile industry (Covisint)
- Control no longer requires ownership

The Internet dramatically reduces transaction costs, facilitating the creation and utilization of electronic markets and value networks.

## Emerging Organizational Alternatives



- Successful enterprises will increasingly structure as value-added partnerships among specialists
- These enterprises must retain the agility of small companies, while also accruing the benefits of scale
- These enterprises must be flexible to facilitate the entry of new partners that bring new value, and the exit of current partners who no longer create value

Do companies have the skills and capabilities to manage the extended enterprise?



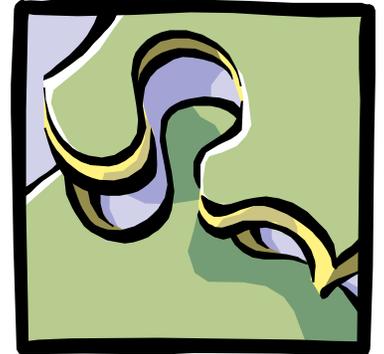
# What are the Major Information Technology Challenges for Businesses?

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- Constant technological change
- Technology assessment and transfer
- Co-evolving business and technology
- Realizing business value
- Managing costs
- Increasing technical complexity
- Dependence on experts
- Developing and delivering systems
- Systems integration
- Costs of failure

# The Technology Management Puzzle

- While individual technologies may be moving toward commoditization, technology infrastructure and systems are getting ever more complex
- Technology infrastructures are creating new options for leveraging information for competitive advantage
- Successfully implementing an information-based strategy is difficult, and requires close coordination between users and technology professionals
- Utility outsourcing and e-business on demand seem to suggest that we can leave it all to the service providers
- Global economies of scale and specialization are creating compelling value propositions for IT outsourcing, business process outsourcing and business services provisioning



# As a result, market sourcing for IT services has grown dramatically in the last few years

Italy's State Railroad \$260 million/8 yrs	American Express \$4 billion/7 yrs	National Bank of Canada \$800 million/10 yrs
State of South Australia \$600 million/9 yrs	Fluor Corporation \$351 million/7 yrs	Boeing Corporation \$2 billion/5 yrs
<b>Kooperativa Forbundet</b> <b>\$1.0 billion/10 yrs</b>	Air Canada \$569 million/7 yrs	<b>British Aerospace</b> <b>\$1.3 billion/10 yrs</b>
Internal Revenue Service \$8.0 billion/15 years	Gothaer Versicherung \$640 million/10 yrs	Baxter Diagnostics \$250 million/8 yrs
Chase Manhattan Bank \$480 million/12 yrs	Coamerica Corp. \$50 million/5 yrs	<b>Inland Revenue</b> <b>\$2.0 billion/10 yrs</b>
Grupo Santander \$100 million/10 yrs	<b>Xerox</b> <b>\$3.2 billion/11 yrs</b>	Halliburton Energy \$500 million/10 yrs
<b>Delta Airlines</b> <b>\$2.8 billion/10 yrs</b>	Ameritech Mobile Communications \$50 million/4 yrs	State of Connecticut \$1.0 billion/7 yrs
Hertz Corporation \$80 million/5 yrs	Hill Samuel \$15 million/5 yrs	<b>J.P. Morgan</b> <b>\$5.0 billion/7 yrs</b>
Equifax \$650 million/10 yrs	Fox Meyer Health Corp. \$750 million/3 yrs	<b>Hughes Aircraft</b> <b>\$ 1.5 billion/8 yrs</b>
	Allianz Life Insurance \$45 million/6 yrs	

- Complexity of technology and business environments
- Goals for IT services
- Diversity of choices
- Dimensions of deals
- Kinds of relationships
- Notions of how external sourcing adds value



## The IT Outsourcing Market is Evolving

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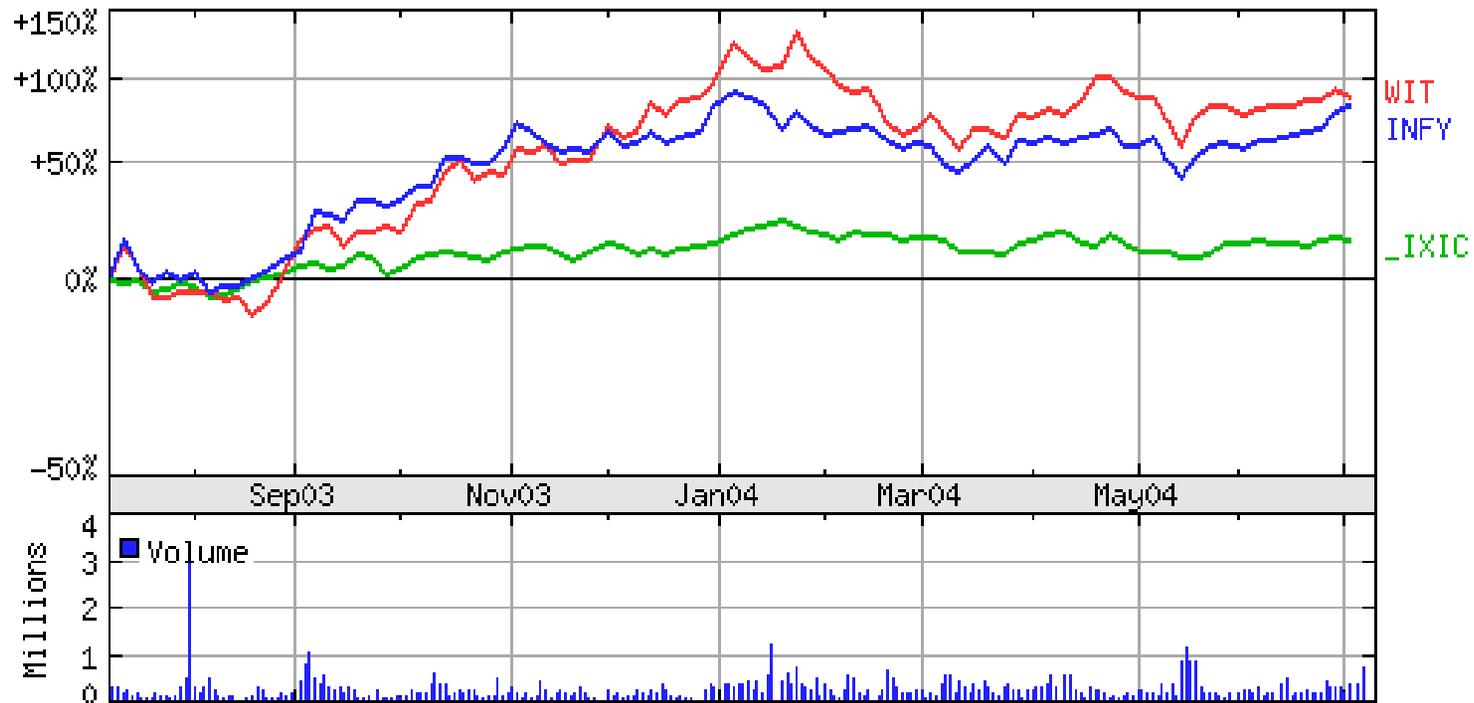
- On-demand services
- Utility computing
- Business process outsourcing
- Off-shore solution providers
- Focus on domain expertise (process, industry)

The IT outsourcing value proposition is becoming more compelling and diverse; companies are seeking a service delivery model that maximizes the value they derive

# Offshore Outsourcing



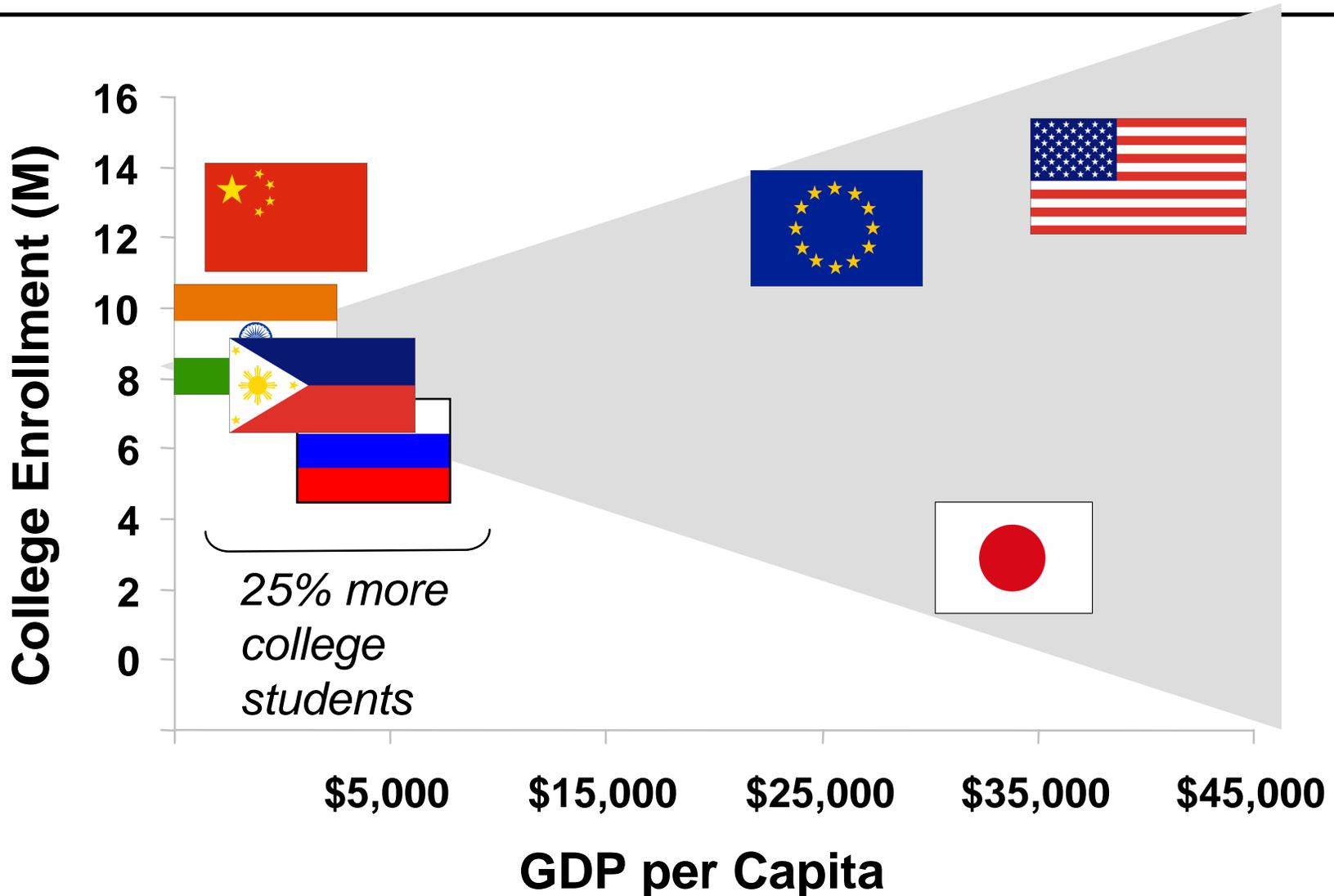
NAS/NMS COMPOSITE (NASDAQ Stock  
as of 7-Jul-2004



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# The Offshoring Flow



Source: IDC Directions Conference, 2004

## The Next Few Years

- The Internet and other information and communication technologies will provide substantial opportunities for firms to achieve gains in labor productivity and multifactor productivity
- Future gains will increasingly come to companies engaging in networked partnerships
- Continued IT investment should lead to continuing productivity growth
- The global IT delivery model is here to stay!





# Value (and jobs) will increasingly accrue from innovating at the intersections!

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- Technology and domain/vertical
  - Bioinformatics, Medical Informatics
  - Semiconductors (Rosetta Net)
  - Gaming
  - History
  - Literature
- Technology and organization
  - Net-Centric Organizations
  - Net-Centric Warfare
- Technology and process/function
  - Business services provisioning
  - Process modeling
- Technology and technology (integration)
  - Web services
  - Information bus (Tibco)
  - Embedded systems (RFID, MOTES)