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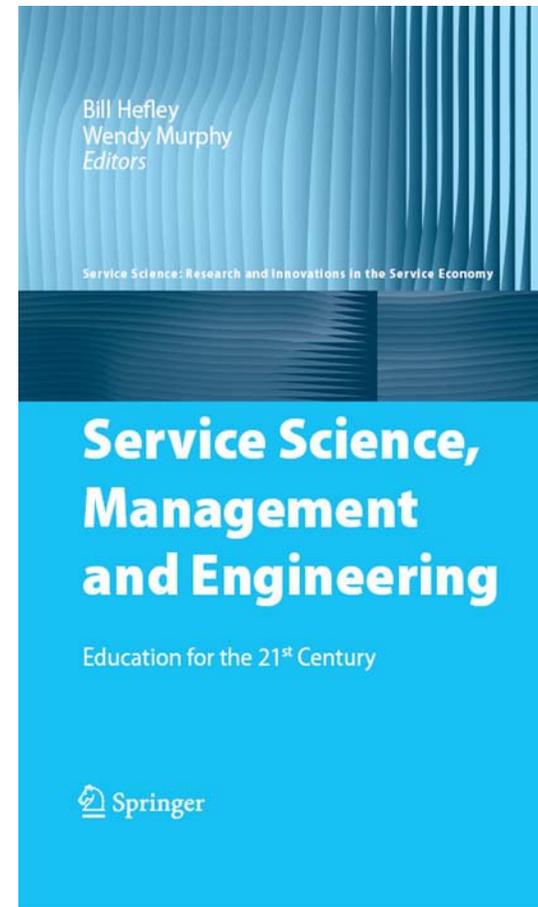
Service Science: A Key Driver of 21st Century Prosperity

Dr. Bill Hefley
Carnegie Mellon University

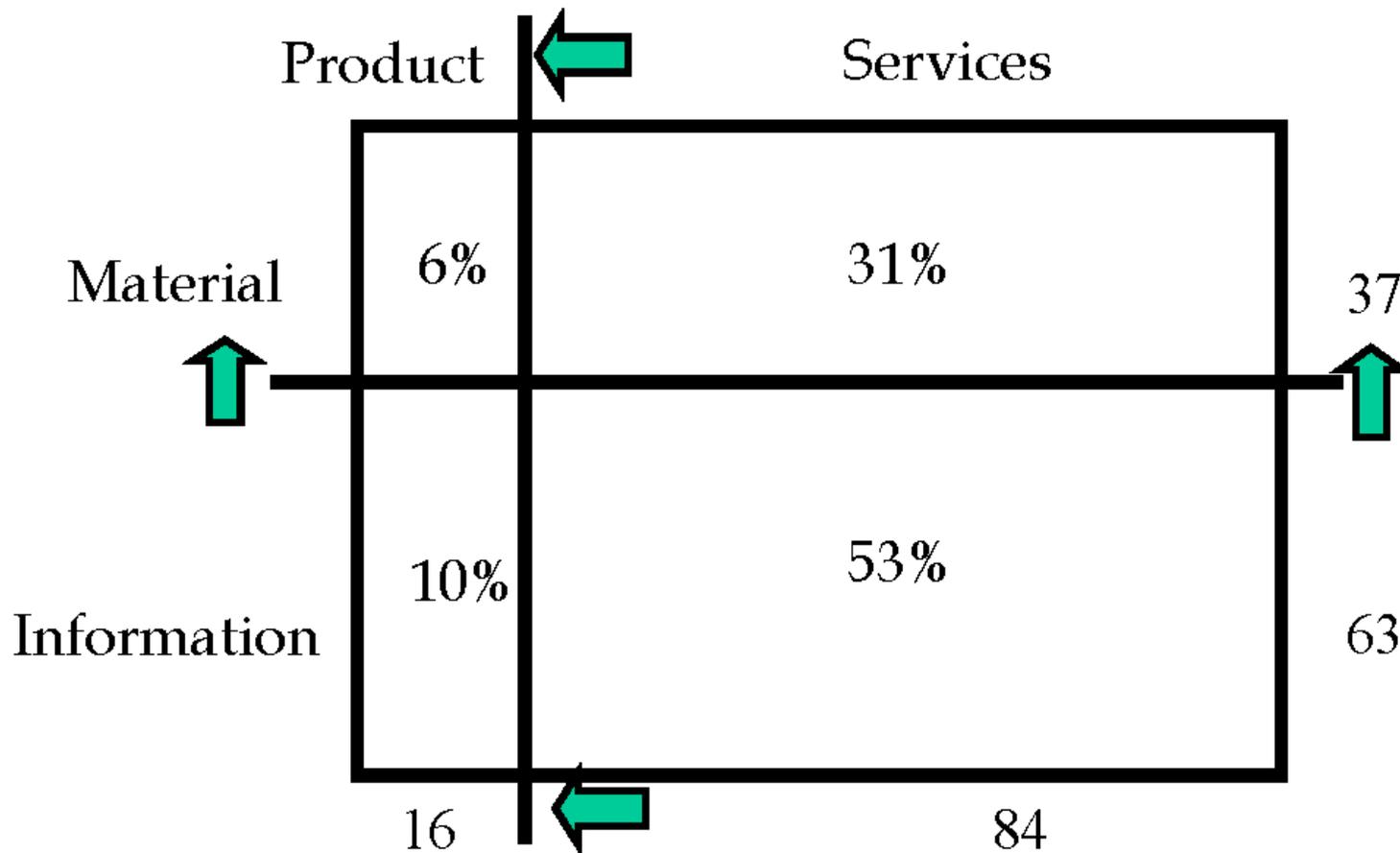
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Topics

- Why a focus on services
 - GDP
 - Employment
- The Challenges
- The Response
 - Selected milestones
 - SSME Palisades event
- The Opportunities



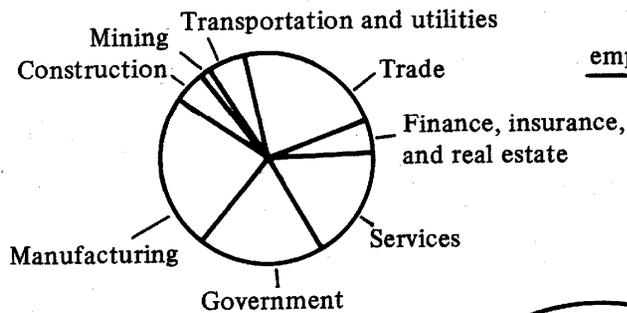
Continuing changes in the distribution of GDP in the US economy



Excludes government, agriculture and mining, based on data from Apte and Nath.
The information sector includes both primary and secondary information sectors.
Source: Karmarkar in Hefley & Murphy

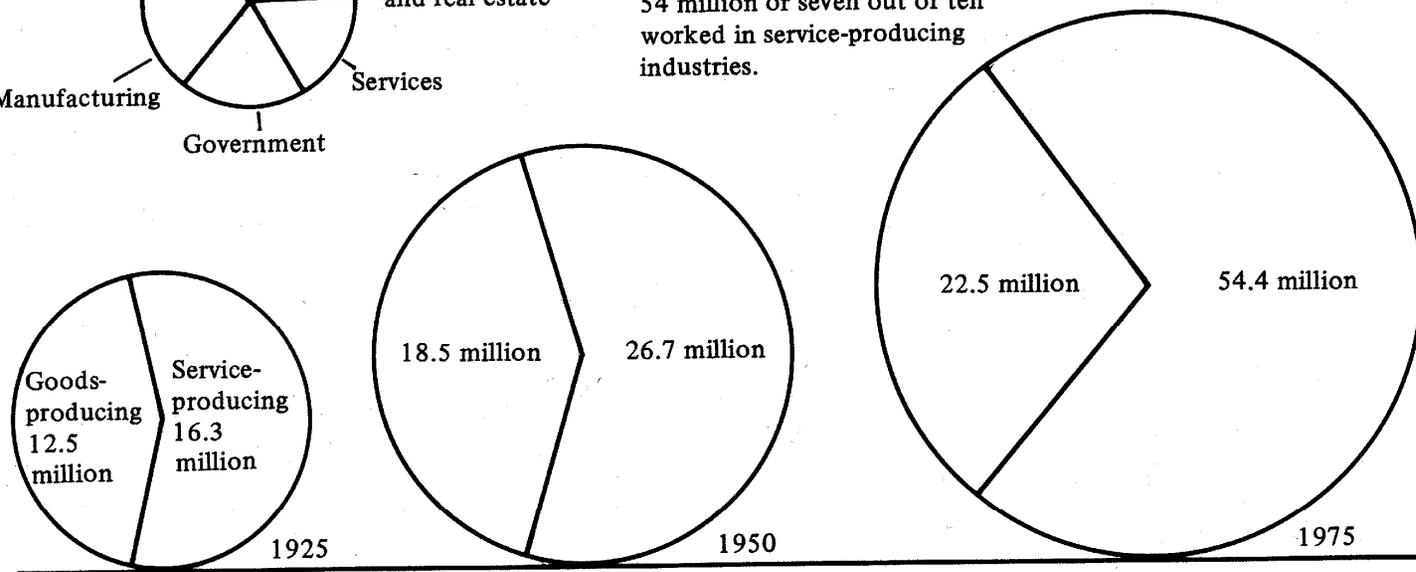
Where are the jobs?

U.S. Employment Growth in Services, 1925-75



Distribution of nonagricultural employment by industry division, 1975

In 1975 of the 77 million employees in nonfarm jobs, 54 million or seven out of ten worked in service-producing industries.



Source: U.S., Department of Labor, Bureau of Labor Statistics, *U.S. Workers and Their Jobs: The Changing Picture* (Bulletin 1919) (Washington, D.C.: Government Printing Office, 1976).

The world is becoming increasingly service-intensive.

A = Agriculture
G = Goods
S = Services

Top Ten Nations by Labor Force Size

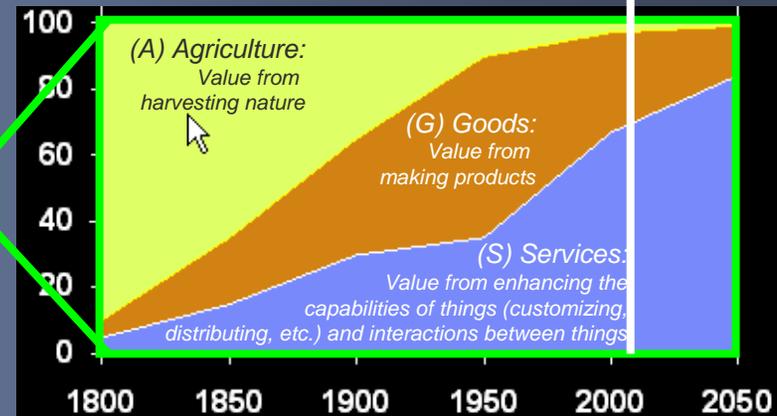
About 50% of world labor in just 10 nations

Nation	% ww Labor	% A	% G	% S	25 yr % delta S
China	21.0	50	15	35	191
India	17.0	60	17	23	28
U.S.	4.8	3	27	70	21
Indonesia	3.9	45	16	39	35
Brazil	3.0	23	24	53	20
Russia	2.5	12	23	65	38
Japan	2.4	5	25	70	40
Nigeria	2.2	70	10	20	30
Banglad.	2.2	63	11	26	30
Germany	1.4	3	33	64	44

2004

United States (U.S.)

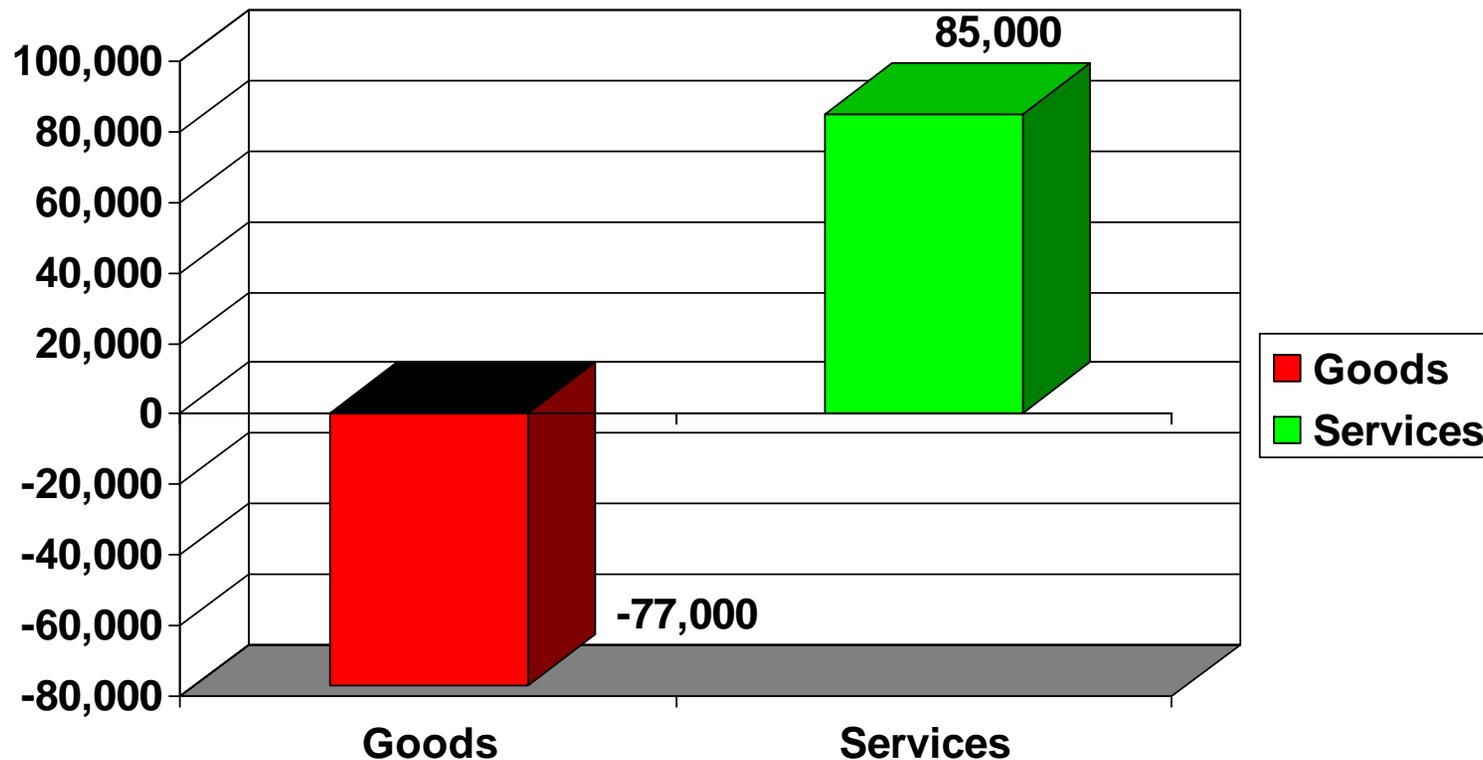
2004



The largest labor force migration in human history is underway, driven by urbanization, global communications, low cost labor, business growth and technology innovation.

>50% (S) services, >33% (S) services

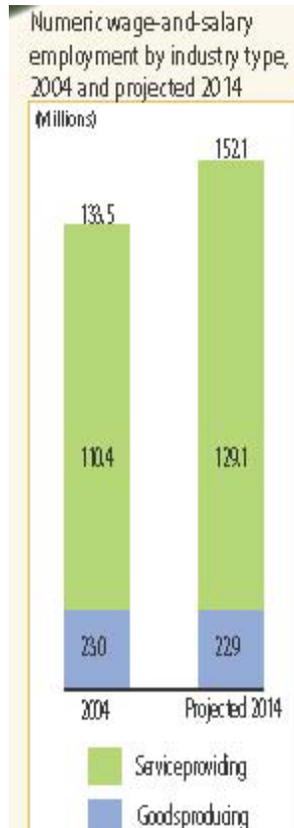
When we speak of the current economic situation, where are the jobs in the US today?



The goods-producing sector lost 77,000 jobs last month, but the services sector *added* 85,000.

ADP Monthly Employment Report, 2 April 2008

Where will we experience job growth?

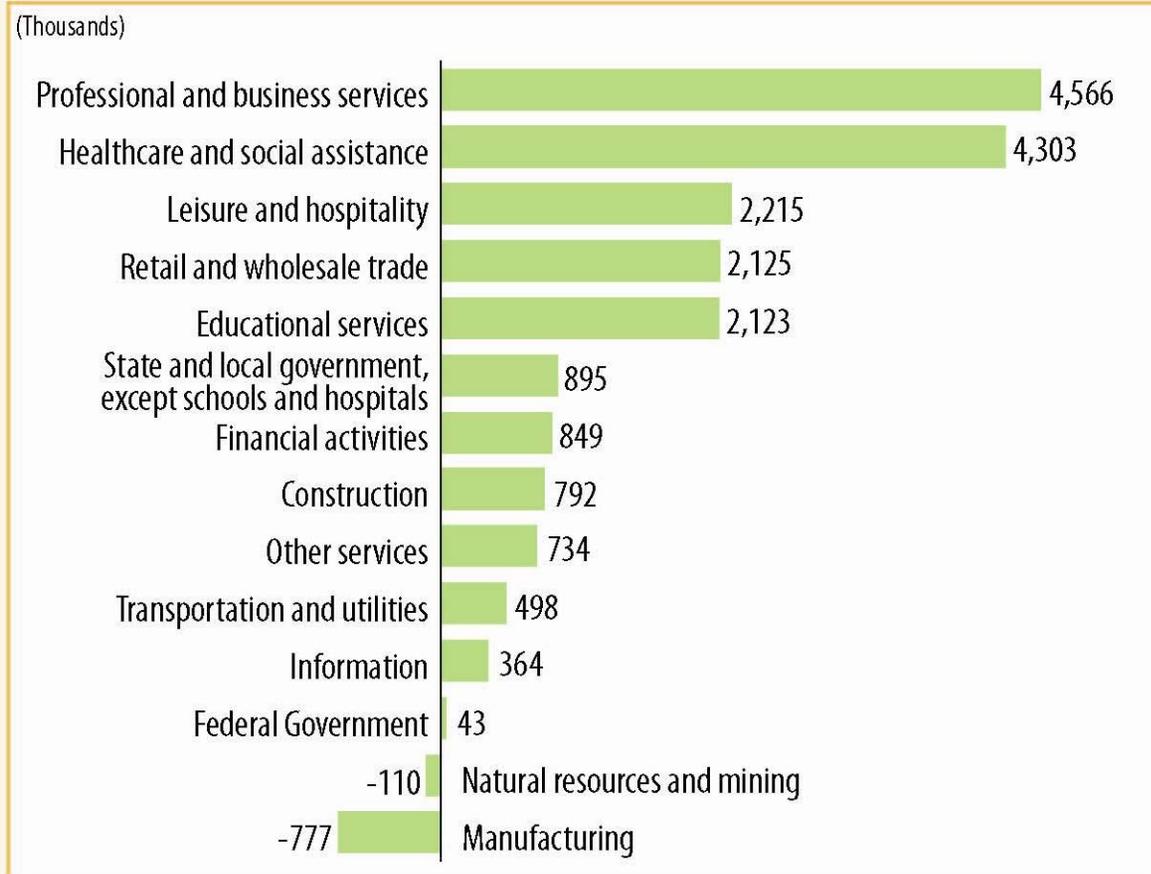


Service-providing industries are projected to account for most US job growth, generating almost 19 million new jobs between 2004 and 2014.

This is due, in part, to increased demand for services and the difficulty of automating service tasks.

What industries will experience this growth?

Numeric change in wage-and-salary employment by industry sector, projected 2004-14



Employment in professional and business services is projected to increase by nearly 4.6 million jobs. Growth in this sector is led by providers of administrative support services and consulting services.

What do we know from recent studies?

Key topics that matter:

- Services
- Service innovation
- Tertiary education
- Information and communications technologies (ICT)
- Domestic R&D intensity
- Human capital

What do we know from recent studies?

Recent analyses showed that

- Skilled human capital have more impact than that of total human capital
- Skilled human capital has a stronger growth-enhancing effect in economies which are closer to the technological frontier¹
- It is closer to this frontier where innovation matters more¹
- Tertiary schooling matters closer to this frontier
- More flexible labor markets, such as services, have had greater use of ICT, leading to greater multi-factor productivity (MFP) growth
- Technological diffusion crucially depends on domestic R&D intensity and human capital²
- The effects of human capital are economically significant: an increase in the share of high-skill workers in total labor compensation by one standard deviation (13 percent) would lead to an acceleration of industry multi-factor productivity (MFP) growth of 0.5 percent annually.²

Status in 2003

The studies suggest that services industries represent a significant source of opportunity for university-industry interaction.

Services:

- account for more than 80 percent of the U.S. gross domestic product,
- employ a large and growing share of the science and engineering workforce, and
- are the primary users of information technology.

In most manufacturing industries, service functions (such as logistics, distribution, and customer service) are now leading areas of competitive advantage.

Innovation and increased productivity in the services infrastructure (e.g., finance, transportation, communication, health care) have an enormous impact on productivity and performance in all other segments of the economy.

How are we meeting these needs?

“... Nevertheless, the academic research enterprise has not focused on or been organized to meet the needs of service businesses.”

Major Challenges: NAE 2003

Major challenges to services industries that could be taken up by universities include:

- 1) the adaptation and application of systems and industrial engineering concepts, methodologies, and quality-control processes to service functions and businesses;
- 2) the integration of technological research and social science, management, and policy research; and the
- 3) the education and training of engineering and science graduates prepared to deal with management, policy, and social issues.

What are some key milestones in addressing these challenges?

2002 – IBM forms Services Research group

2004 – Carnegie Mellon holds Global Strategic Service Management Symposium

2005 – Carnegie Mellon begins teaching graduate Service Management concentration

2005 – IBM begins sponsoring SSME workshops in US and abroad

2006 – *Communications of the ACM* special issue on Service Science

2006 - IBM Palisades Event

2007 – Service Research and Innovation Initiative (SRII) formed (thesrii.org)

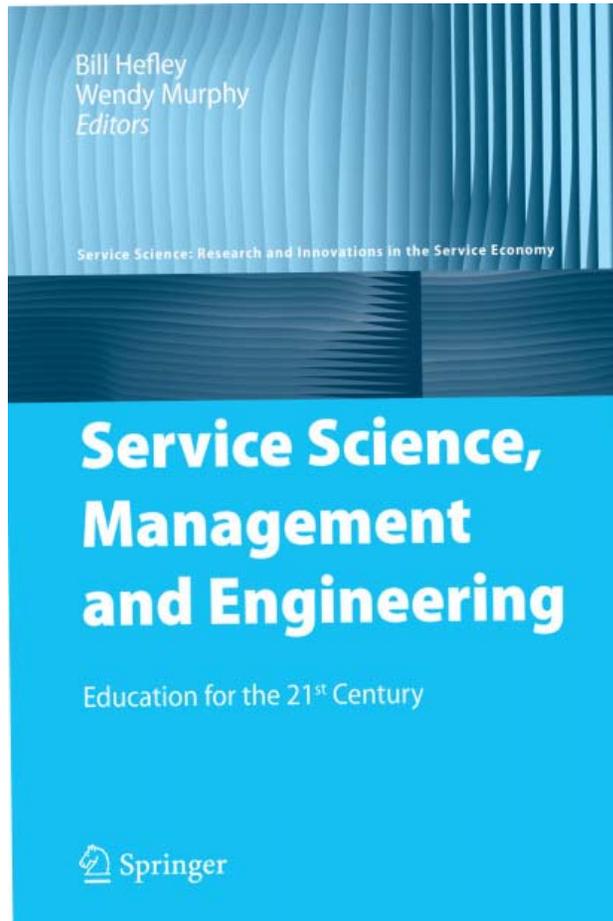
2007 – America COMPETES Act passed

SSME Workshops...



“The IBM SSME Palisades event was the biggest and most diverse gathering ever in support of service education.” - Roland Rust

The 2006 Palisades Conference



- SSME summit at Palisades with more than 250 participants from 22 countries
- Papers in this volume were developed from the 2006 conference hosted by IBM, ***Service Science, Management, and Engineering: Education for the 21st Century***, designed to discuss the current status and foster the development and advancement of SSME.
- Contributions explore:
 - the ways SSME has been introduced into curricula,
 - services research that is underway or is planned, and
 - recommended actions for academia and governments to establish SSME as its own discipline.
- The book includes 55 papers from 56 institutions in 14 countries

Key take-aways from Palisades – The Service Economy

- The global economy is at a tipping point.
 - Technological advances that fuel the tipping point include network ubiquity and a new state of openness and connectedness, from sharing of personal information to sharing of technological and transactional specifications.
 - Business design advances through horizontally-integrated operations that allow for dynamic transformation with limited disruption to the organization.
 - A new view of revenue expansion and customer equity as key corporate metrics.
- Evolution of new institutional forms.
- Innovation is a culture, not a department
 - Service innovation is a test of leadership for the academy, government, and industry.
 - Need for service innovation because services are not seen as being innovative; foreseen imperatives include:
 - Integration of technological and social research domains
 - Education and training of college graduates
 - Understanding how service innovation is captured, as intellectual property or through other avenues?
- Need for government and institutional advocacy and support as catalyst.

Key take-aways from Palisades – Human Capital

- Need for trained and hireable people
 - There is an urgent need for graduate education in service.
 - Service has not been viewed as a business function, but instead as a personal matter or skill. Service has not been documented, so innovation is difficult.
- Continued need for domain experts and new demand for people who have focused knowledge in one or two domains and spectral knowledge about related domains (T people or pi people).
- Demand for people skilled at fusing their technical competency with industry-specific knowledge and business-process expertise.

Key take-aways from Palisades – Service Science Research

- Continue to improve the state of services curriculum and research, demonstrated through a surge of services programs at the masters level and samples of program development and evolution.
- Need for an integrated research program that generates a more coherent and standard definition and language around services and builds on research that is underway
- Focus on value, overcoming the tendency for productivity- and efficiency-focused work.

Global Activities

- Germany - \$87M Innovation with Service
- European Union - Networked European Software and Services Initiative (NESSI)
 - Tied to EU Framework Programme (FP7)
 - Goal: Web 3.0 for the 2010's...replacing the "Net economy" by the "Service economy"
- China – Five Year Plan in Modern Services
- Japan - \$30M Service Productivity

US Activities

- US is the largest net exporter of services, but...
- NSF SEE program (within Manufacturing?)
- America COMPETES Act

America COMPETES Act

Public Law 110–69—Aug. 9, 2007

- “America COMPETES Act” or the “America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act”
- STUDY—Within 1 year, the Director of the Office of Science and Technology Policy shall, through the National Academy of Sciences, conduct a study and report to Congress on how the Federal Government should support, through research, education, and training, the emerging management and learning discipline known as service science.
- “service science” means curricula, training, and research programs that are designed to teach individuals to *apply scientific, engineering, and management disciplines that integrate elements of computer science, operations research, industrial engineering, business strategy, management sciences, and social and legal sciences, in order to encourage innovation in how organizations create value for customers and shareholders that could not be achieved through such disciplines working in isolation.* NB: Italics added for emphasis

The Opportunities

- All national economies are shifting to services – service systems are an important type of complex system
 - Major industrialized nations are >75% services, developing nations are close behind – growth is increasingly depends on service innovation at multiple scales - person, family, city, firm, nation
- New workforce skills are needed - to better understand, participate in, manage, and engineer service systems
- Educational system is slowly shifting toward services
- National systems are slowly shifting policy to recognize services and the importance of service innovation as engines for economic growth

The Opportunities for the US - 1

- Stronger support for pre-tertiary education
 - Recent data from the Organization for Economic Cooperation and Development indicate that the US is now ranked 12th among major industrialized countries in higher education attainment.
 - There is a need to overcome insufficient preparation of high school graduates, especially among low-income, rural, and minority students

The Opportunities for the US - 2

- Support tertiary education in key growth areas: professional and business services & healthcare and social assistance
 - Ninety percent of the fastest-growing jobs in the new information and service economy will require some postsecondary education.*
 - Job categories that require only on-the-job training are expected to see the greatest decline.*
 - In high-demand fields, the value of postsecondary credentials and skills is likely to rise.*

* U.S. Department of Education, *A Test of Leadership: Charting the Future of U.S. Higher Education*. Washington, D.C., 2006.

The Opportunities for the US - 3

- Coordinated support for innovative services curriculum development and clearinghouse
 - At a time when innovation occurs increasingly at the intersection of multiple disciplines (including business and social sciences), curricula and research funding remain largely contained in individual departments.¹
 - Carnegie Mellon led in the development and dissemination of software engineering curriculum modules, which supported the establishment of numerous software engineering programs
 - We have proposed to take a similar leadership role in a collaborative effort with other universities and thought leaders to create and make available a robust curriculum in services science, as we did with software engineering.²

1 U.S. Department of Education, *A Test of Leadership: Charting the Future of U.S. Higher Education*. Washington, D.C., 2006.

2 Hefley, B. (2006). Educating an Innovative Services Science Workforce. Position paper for *Education for Service Innovation Workshop*, National Academy of Sciences, Washington, DC, April 18.

The Opportunities for the US - 4

- Support for Professional Masters programs in service-related topics
 - Several schools have launched service science programs
 - Graduate programs: Carnegie Mellon, UC Berkeley, NC State
 - Undergraduate: Michigan Tech

The Opportunities for the US - 5

- Establish national priorities on services
 - Begin bootstrapping investments in research and education through targeted programs
 - Address issues on intellectual property protection for service innovation
 - Establish new innovation policies and metrics around services
 - The government has a key role in creating historical data sets to understand reality and drive policy decisions

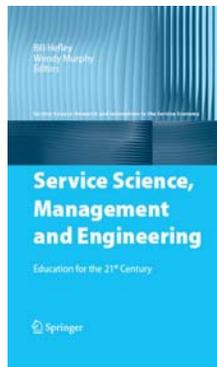
Contact Details



Bill Hefley, Ph.D.

Associate Teaching Professor
Institute for Software Research
School of Computer Science
Carnegie Mellon University
5000 Forbes Ave.
Pittsburgh, PA 15213

Tel: 1-412-268-4576
Email: hefley@cmu.edu



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