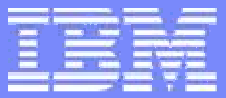


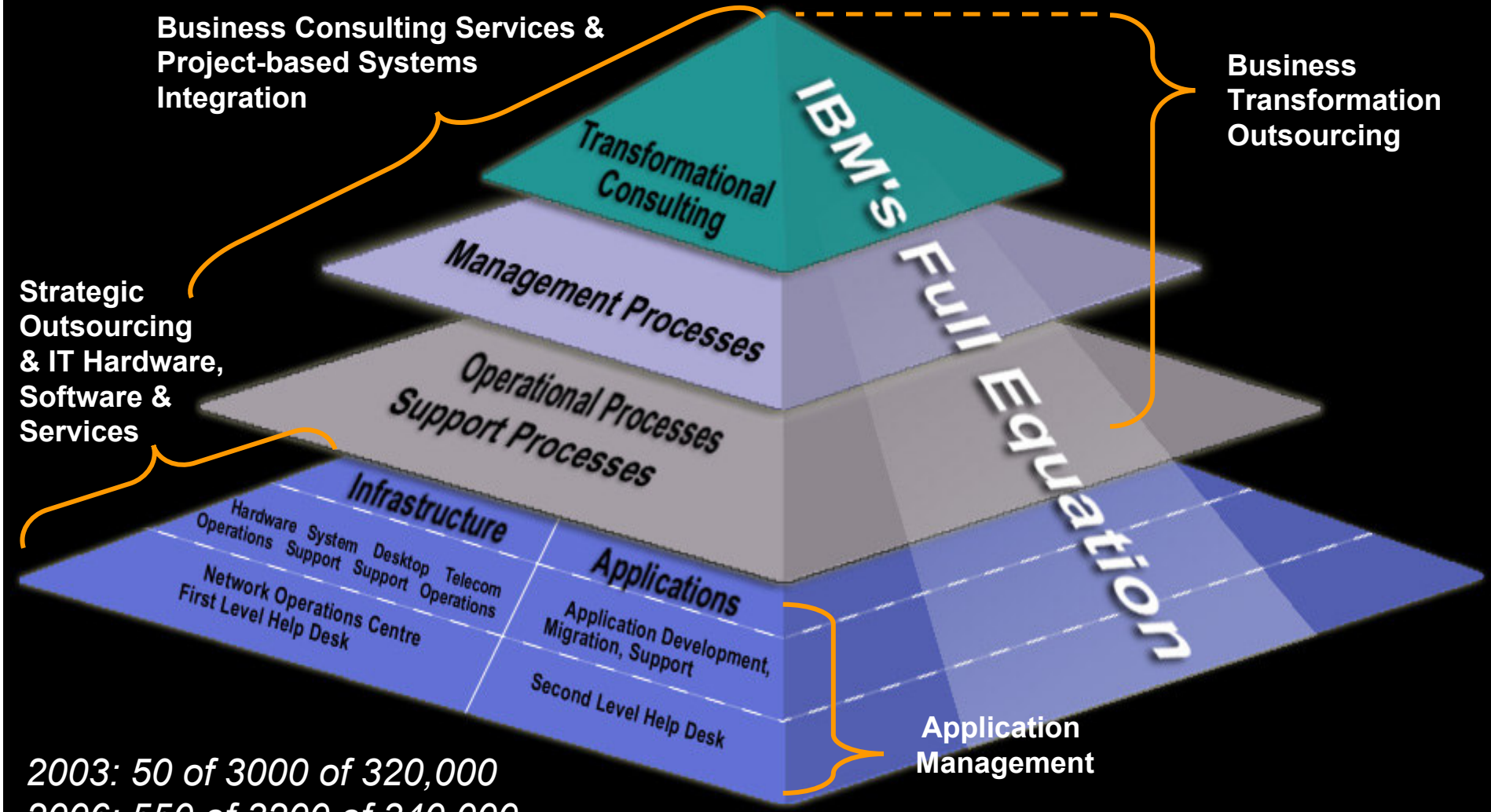
SSME: Education, Employment, Innovation, and Economic Growth

Education for Service Innovation

Jim Spohrer
Director, Almaden Services Research
spohrer@us.ibm.com

National Academy of Science: Education for Service Innovatoin | Washington, DC | April 18, 2006

IBM Perspective on Services: Business & IT



2003: 50 of 3000 of 320,000
2006: 550 of 3200 of 340,000

© 2006 IBM Corporation

Global Services: Opportunities & Challenges

- Opportunities
  - Globalization (Developed & Developing)
  - ICT (R)evolution (eServices & Semantics)
  - Business Performance Transformation Services (BPTS)
  - Service Entrepreneurship (SME)
- Challenges
  - Education (Talent & Tools: High Value Jobs)
  - Innovation (Investment & Protection: High Value Exports)
  - Science (Formalization of Service Systems & Systematic Methods: Sustainable Growth)

© 2006 IBM Corporation

What will the next new service industry be?

Ogre to Slay? Outsource It to Chinese (People Pay Other to Play Video Games for Them)

New York Times ^ | December 9, 2005 | DAVID BARBOZA

Posted on **12/10/2005 7:59:32 PM PST** by **nickcarraway**

One of China's newest factories operates here in the basement of an old warehouse. Posters of World of Warcraft and Magic Land hang above a corps of young people glued to their computer screens, pounding away at their keyboards in the latest hustle for money.

The people working at this clandestine locale are "gold farmers." Every day, in 12-hour shifts, they "play" computer games by killing onscreen monsters and winning battles, harvesting artificial gold coins and other virtual goods as rewards that, as it turns out, can be transformed into real cash.

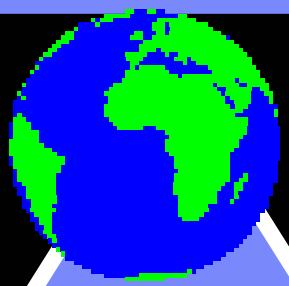
That is because, from Seoul to San Francisco, affluent online gamers who lack the time and patience to work their way up to the higher levels of gamedom are willing to pay the young Chinese here to play the early rounds for them.

"For 12 hours a day, 7 days a week, my colleagues and I are killing monsters," said a 23-year-old gamer who works here in this makeshift factory and goes by the online code name Wandering. "I make about $250 a month, which is pretty good compared with the other jobs I've had. And I can play games all day."

- Online game worlds for business applications?
- Google Search (less than a decade old)
- Semantic Search?
- Book: Blue Ocean Strategies

© 2006 IBM Corporation

"Innovative activity is fundamentally a service activity."
- William J. Baumol



Innovation

"We are continually creating a new and novel world."
- Douglass C. North

Service Economy

New Industries

And the rate of change is proportional to the size of the service sector
-Jim Spohrer

New Specialists

Knowledge Workers

Education & Employment

Based on slides by Jean Paul Jacob, IBM Researcher Emeritus

© 2006 IBM Corporation

Endless Stream of Industries & Knowledge Workers…

	Government & security	Health & education	Financial & insurance	Professional & business	Information & communication	Retail & wholesale	Leisure & hospitality	Transportation & utilities
High skill	executive, judge	doctor, professor, dean	broker, partner	executive, lawyer, scientist, engineer, architect, entrepreneur	executive, engineer	executive, proprietor	producer, director, proprietor, designer, star athlete performer	pilot, executive, engineer
Semi-autonomous	legislator, policy researcher, patent analyst	pharmacist, nurse, teacher, technician	analyst, actuary, underwriters	manager, accountant, HR, PR, marketing, business dev	technician, system administrator, journalist, writer, announcer	buyer, high end sales	actor, performer, artist, technician	attendant, maintenance technician, plumber, electrician
Unrationalized labor intensive	police, firefighter, security guard	nurses aid, day care worker, ambulance driver	adjustors, auditor, investigators	admin. assistant, hiring specialist, door to door sales	call center specialist, librarian	sales clerk, stocker, shipping & receiving	maid, janitor, waiter, gardener, cook, barber	truck driver, field force technician, machine operator
Tightly constrained	inspectors, data entry	data entry	bank teller, check proofers	inspectors, receptionist	telephone operator	sales counter clerks	fast food worker	inspectors
Client	citizen, plaintiff, defendant, inventor	patient, student, subscriber	shareholder, client, subscriber	client	subscriber	consumer, shopper	guest	subscriber, commuter

- based on Herzeberg et al, (1998). All occupations span a range, placement is representative only.

© 2006 IBM Corporation

Service jobs are increasingly the ***high skill*** knowledge worker jobs – especially in business and information services

95% of all business executives and research scientists are alive today.

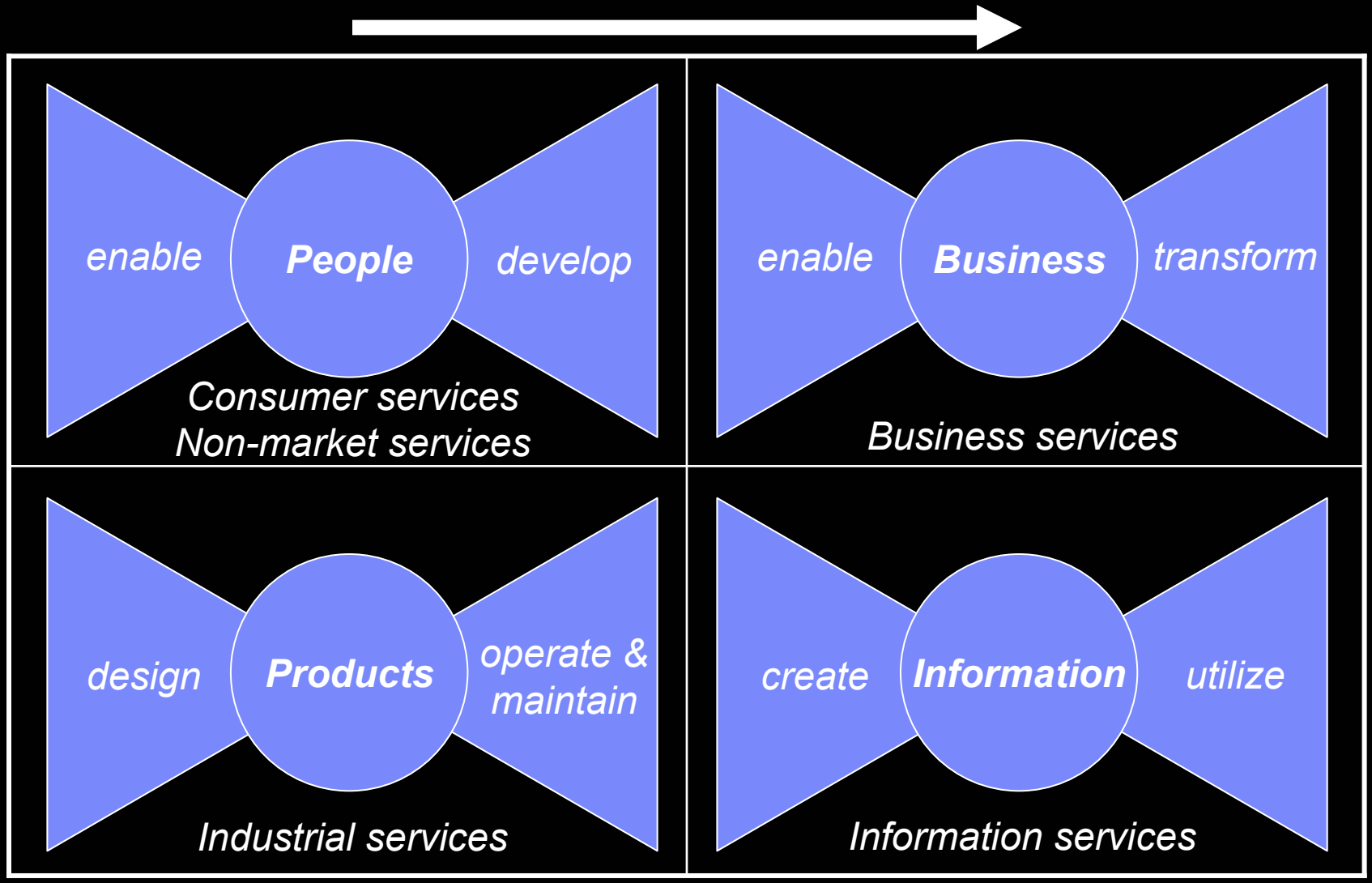
Type of work system	1979	1996			Example
		All	Service	Manufacture	Admin., Manager
High-skill Autonomous	34%	40%	40%	40%	Executive, Scientist
Semi-Autonomous	35%	30%	30%	35%	Admin., Manager
Unrationalized Labor Intensive	25%	25%	26%	15%	Maid, child care
Tightly Constrained	6%	5%	4%	10%	Call center, Fast food

From Herzenberg, Alic, Wial (1998)

-from Herzenberg, Alic, & Wial (1998). *New rules for a new economy. Employment and opportunity in postindustrial America.* Cornell University Press.

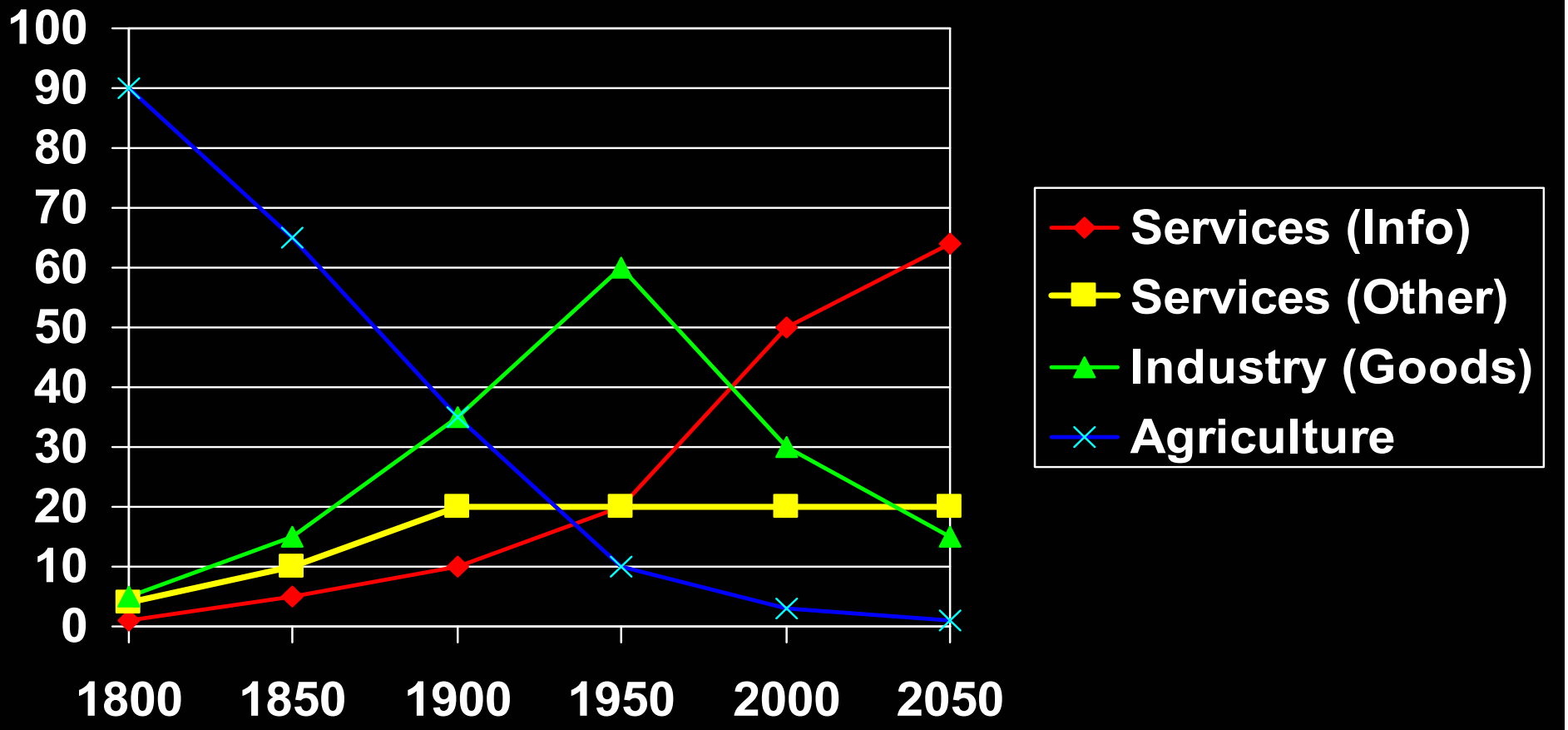
© 2006 IBM Corporation

Four worlds of services jobs, up stream and down stream for…



© 2006 IBM Corporation

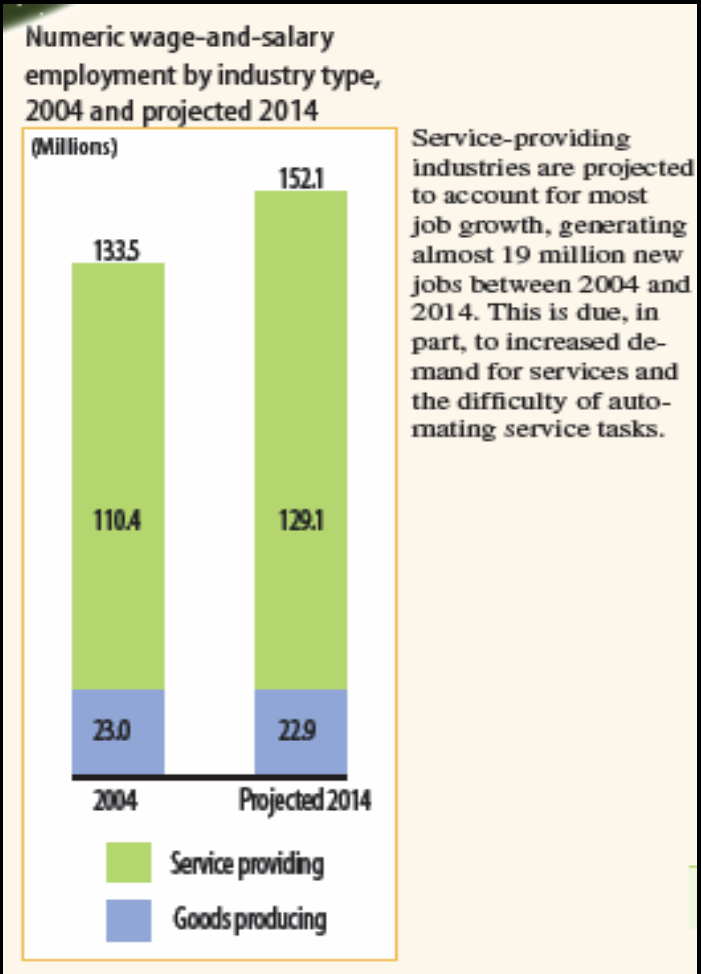
U.S. Employment Percentages by Sector

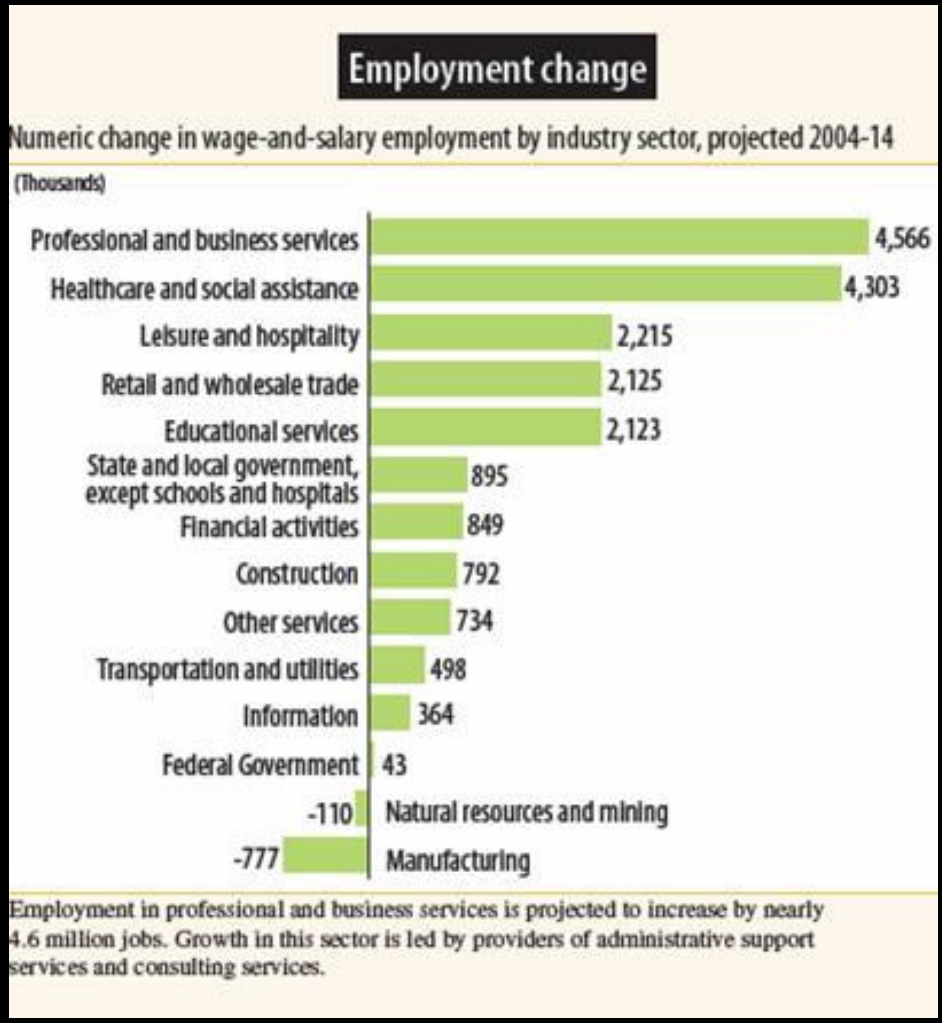


Estimations based on Porat, M. (1977) Info Economy: Definitions and Measurement, Augmented with recent data and projections from http://www.bls.gov/

© 2006 IBM Corporation

Projected US Service Employment Growth, 2004 - 2014





US Bureau of Labor Statistics.
http://www.bls.gov/opub/ooq/2005/winter/art03.pdf

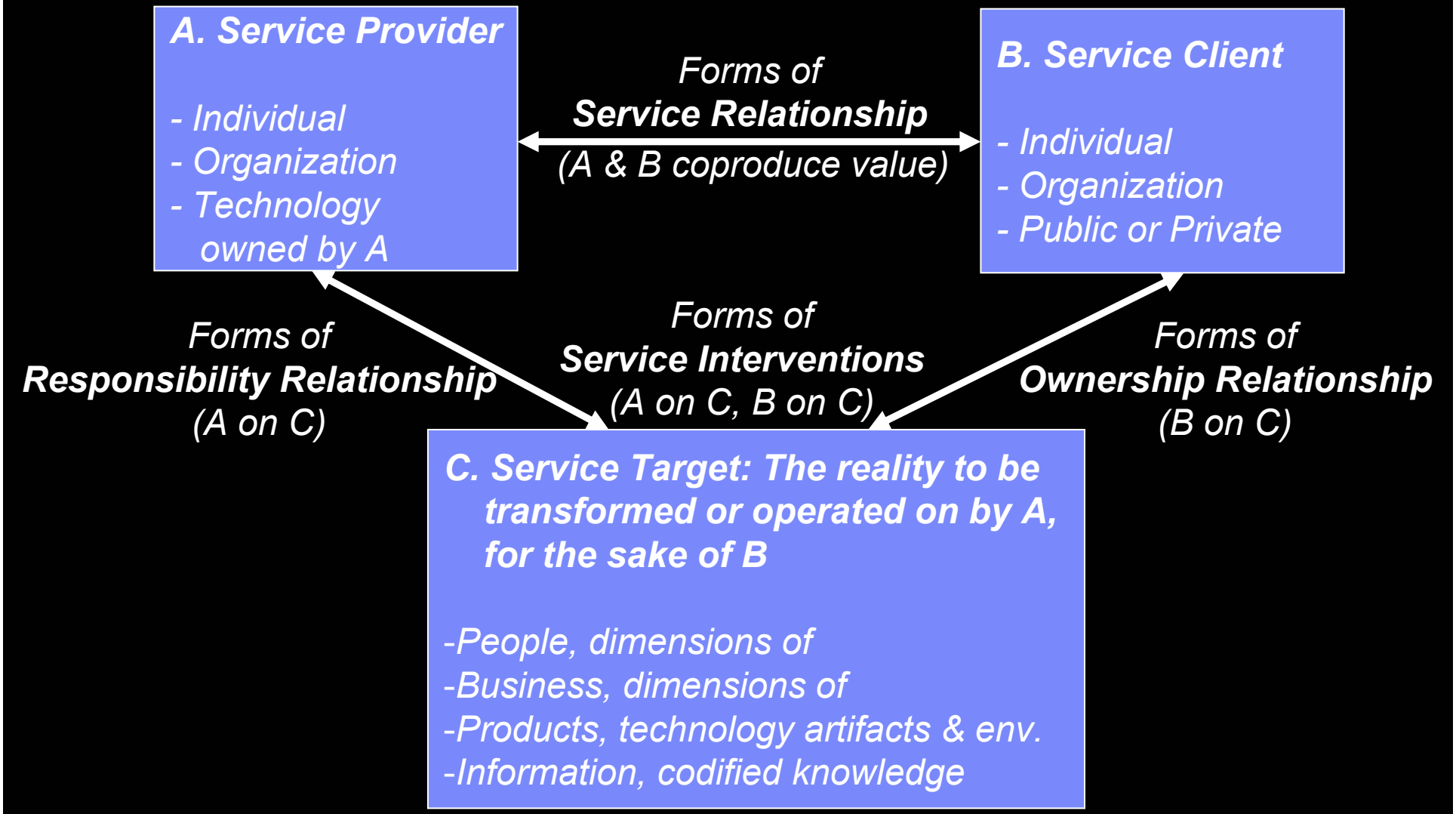
© 2006 IBM Corporation

Four targets of knowledge intensive service activities… people, business, products, and information

	Spatially localized & drive to increase local capabilities (Physical)	Potentially distributed & drive to increase network capabilities (Virtual)
Has Rights	**People**	**Business** (organizations)
Is Owned	**Products** (technology artifacts and environment)	**Information** (capital, reputation, process, laws, science)

© 2006 IBM Corporation

Definition of services (based on Gadrey, 2002)



© 2006 IBM Corporation

Services Systems: Value coproduction networks of people, technology, organizations, and shared information

- So two types of service innovation…
  - Integrate technology, business, social-organizational, demand innovations
- Type 1: Supply or Production-Side Innovation: New Plans: New Ways of Doing Things: Business Performance Transformation Services: Put existing service systems on improvement trajectories
  - Augmentation
  - Reconfiguration
  - Invention
- Type 2: Demand-Side Innovation: New Goals: New Needs, Wants, Aspirations: Entrepreneurship: Create new types of service systems
  - Augmentation
  - Reconfiguration
  - Invention

© 2006 IBM Corporation

So perhaps we need…

- A new generalist profession, a service scientist (entrepreneur?)
- A new tool, the CAD/CAM for service systems
- A new academic transdiscipline to integrate across discipline silos, SSME

- Herzenberg et al: Economies of depth (specialists) and coordination (generalists)
- Carley: Optimal ratio of generalists to specialists

© 2006 IBM Corporation

Today's talk

- What is SSME or "a Science of Services"?
- Why is SSME so important?
- Why does IBM care?
- Who else cares?
- What kinds of skills should a service scientist have?
  - Is there a "Services Rosetta Stone?"
- What kinds of tools should a service scientist have?
- What does a service scientist actually do?
- Are there "scale laws" of service innovation?
- Questions?

© 2006 IBM Corporation

What is SSME? (Services Sciences, Management, and Engineering)

- An urgent "call to action"
  - To become more systematic about innovation in services
  - Complements product and process innovation methods
  - To develop "a science of services"
- A proposed academic discipline
  - Draws on many existing disciplines
  - Aims to integrate them into a new specialty
- A proposed research area
  - Service systems are designed (computer systems)
  - Service systems evolve (linguistic and social systems)
  - Service systems have scale-emergent properties (economic systems)

© 2006 IBM Corporation

What is SSME? (Services Sciences, Management, and Engineering)

- **The application of scientific, management, and engineering disciplines to tasks that one organization beneficially performs for and with another ('services')**

  Understand the evolution and design of service systems

  Make productivity, quality, compliance, sustainability, and innovation rates more predictable

  Services are anything of economic value that cannot be dropped on your foot

  Services are value coproduction performances and promises between clients and providers

- **Science is a way to create knowledge**
- **Engineering is a way to apply knowledge and create new value**
- **Management improves the process of creating and capturing value**

© 2006 IBM Corporation

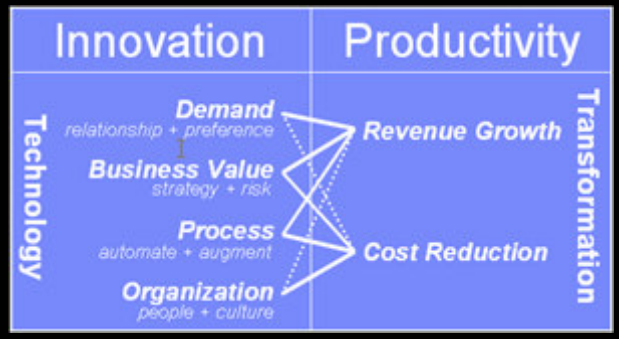
Why is SSME so important?

- Governments need to make service innovation a priority
  - GDP growth of nations increasingly depends on it
- Businesses need to make service innovation a priority
  - Revenue and profit growth increasingly depend on it
- Academics need to make service innovation a priority
  - Students' futures depend on it
  - Improved education productivity and quality depends on it
  - New frontier of research with business and societal impact

© 2006 IBM Corporation

Why is SSME so important?

Because the world is becoming a service system.

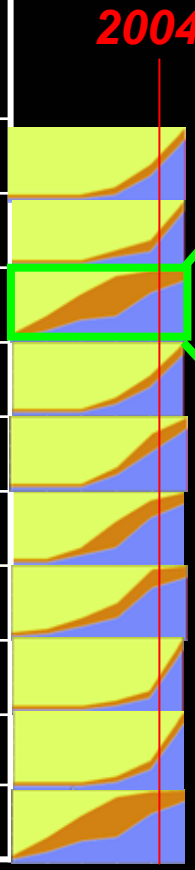


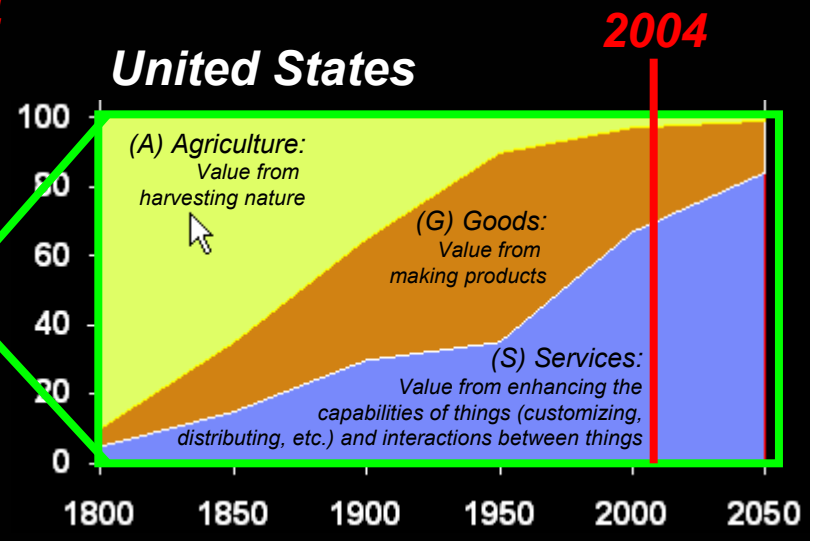
Top Ten Nations by Labor Force Size

(about 50% of world labor in just 10 nations)

A = Agriculture, G = Goods, S = Services

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**





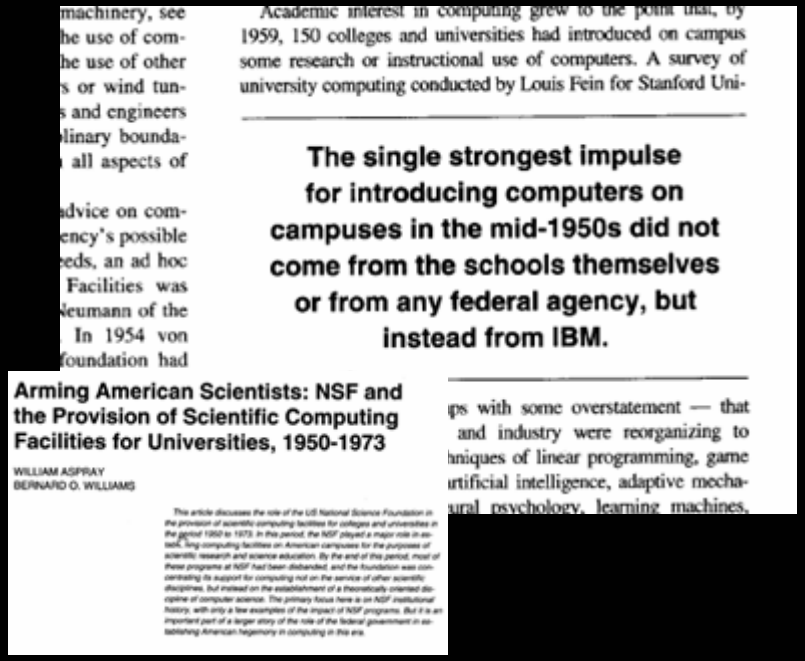
The largest labor force migration in human history is underway, driven by global communications, business and technology growth, urbanization and low cost labor.

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

© 2006 IBM Corporation

Why does IBM care? Our ability to hire needed talent and innovate

IBM played a role in establishing Computer Science



machinery, see
he use of com-
he use of other
s or wind tun-
s and engineers
linary bounda-
all aspects of

dvice on com-
ency's possible
eds, an ad hoc
Facilities was
Neumann of the
In 1954 von
foundation had

Academic interest in computing grew to the point that, by 1959, 150 colleges and universities had introduced on campus some research or instructional use of computers. A survey of university computing conducted by Louis Fein for Stanford Uni-

The single strongest impulse for introducing computers on campuses in the mid-1950s did not come from the schools themselves or from any federal agency, but instead from IBM.

ps with some overstatement — that
and industry were reorganizing to
hniques of linear programming, game
rtificial intelligence, adaptive mecha-
ural psychology, learning machines,

Arming American Scientists: NSF and the Provision of Scientific Computing Facilities for Universities, 1950-1973

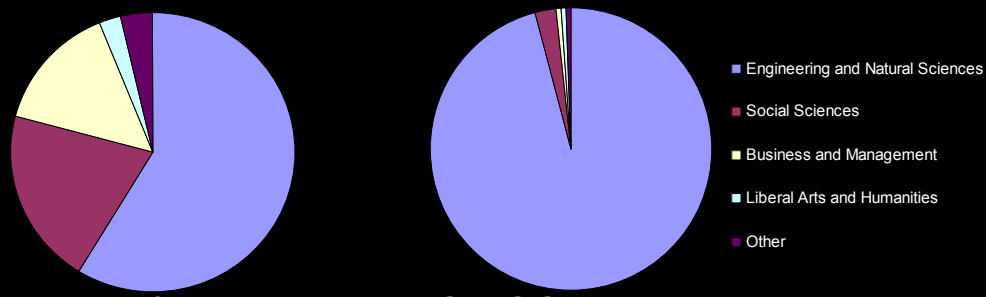
WILLIAM ASPRAY
BERNARD O. WILLIAMS

This article discusses the role of the US National Science Foundation in the provision of scientific computing facilities for colleges and universities in the period 1950 to 1973. In this period, the NSF played a major role in establishing computing facilities on American campuses for the purposes of scientific research and science education. By the end of this period, most of these programs at NSF had been disbanded, and the foundation was concentrating its support for computing not on the service of other scientific disciplines, but instead on the establishment of a theoretically oriented discipline of computer science. The primary focus here is on NSF institutional history, with only a few examples of the impact of NSF programs. But it is an important part of a larger story of the role of the federal government in establishing American hegemony in computing in this era.

Computer Science	Physicists
	Electrical Engineers
	Mathematicians
	Philosophers (Boolean Logic)

Need to hire Computer Scientists

Now IBM is working with academics and government to establish Service Science



PhD's & Masters in U.S. IGS and IBM Research

Need to hire Service Scientists

© 2006 IBM Corporation

Who else cares?

- Governments
  - US, EU, European Commission, China, Japan, Germany, UK, Finland, Norway, Denmark, Sweden, Italy, Netherlands, Russia, India, Belgium, and others
  - US Department of Commerce, NSF, NIST, DARPA, VTT,etc.
- Industry
  - IBM, Accenture, HP, EDS, CSC, Cisco, P&G, American Express, John Deere, Avaya, Oracle, and many others
- Academics
  - ASU, PSU, NCSU, Berkeley, RPI, UCSC, Georgia Tech, Bentley, Stanford, CMU, UCLA, BYU, Yale, Harvard, MIT, Northwestern, UArizona, UMaryland, UGeorgia, UMichigan, UTexas, MichiganSU, Columbia, Oxford, Warwick, Tokyo University, Peking University, Carlsruhe, AIO, Norwegian School of Economics, Helsinki University of Technology, University of Rome La Sapienza, and many others
- Others
  - BestServ, OECD, Institute for the Future, Bay Area Economic Forum, etc.

© 2006 IBM Corporation

School	Discipline	Evolution & Revision	Selection & Aggregation	Transformation & Integration
School of Management	Marketing	Service Marketing	Service & Solutions Excellence Centers (Information Science & Technology Management)	Services Sciences, Management, and Engineering (SSME) and Solutions Engineering
	Operations	Service Operations		
	Accounting	Service Accounting (Activity-Based Costing)		
	Contracts & Negotiations	Service Sourcing (eSourcing)		
	Management Science	Service Management		
	Management of Technology	Management of Innovation		
School of Engineering and Science	Operations Research	Service Operations		
	Industrial & Systems Engineering	Service Engineering		
	Computer Science	Service Computing, Web Services, SOA		
School of Social Sciences	Economics	Institutional Economics Experimental Economics		
	Psychology	Labor Psychology (Human Capital Mgmt)		
	Anthropology	Business Anthropology		
	Organization Theory			
Other	Information Science & Systems, Service professional schools			

© 2006 IBM Corporation

What kinds of skills should a service scientist have?

- **Technology**
  Make, Verify, Deliver, Operate, plus eServices & eMarkets
- **Business**
  Propose (win-win), Finance, Market, Manage, plus eBusiness & eMarkets
- **Social-Organizational**
  Coordinate, Motivate, Govern, Learn, plus eSourcing and eMarkets

Education in reading, writing, and arithmetic (3 R's) enabled 19th century innovation. Add science, technology, engineering, and mathematics (STEM) for the 20th century. Add more info. technology, business, and social-organizational enable 21st century, or Social-Technology-Economic-Environmental-Political (STEEP).

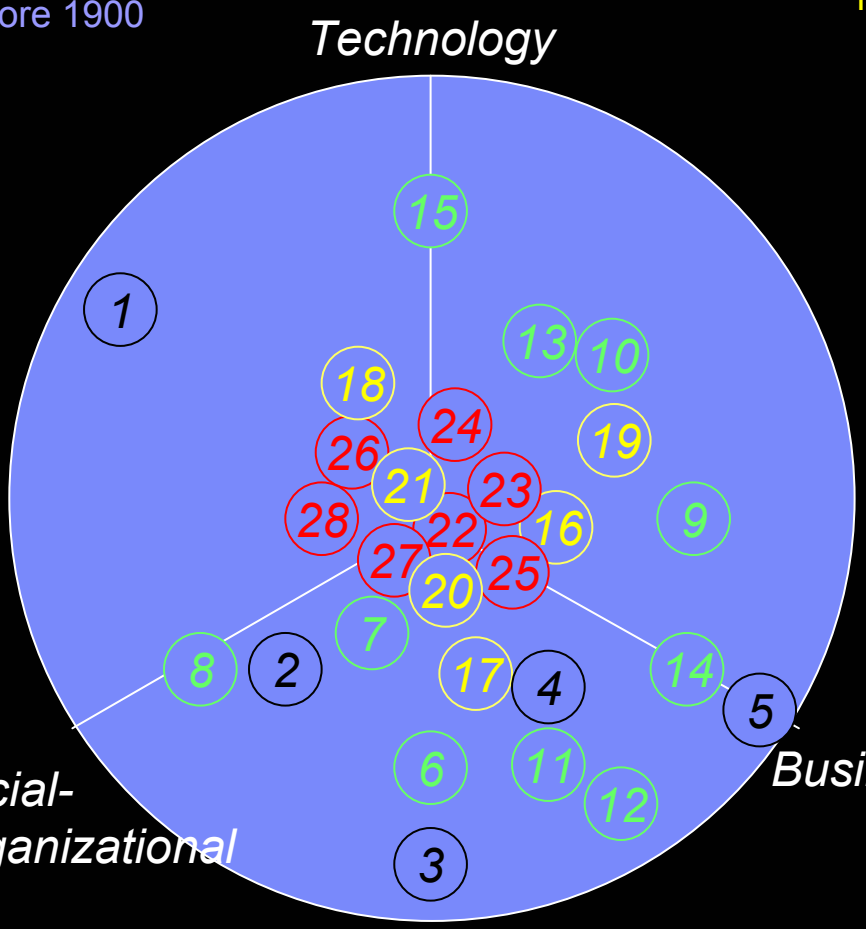
© 2006 IBM Corporation

What kinds of skills should a service scientist have?
Academic disciplines evolving to combine technology, business, and social-organization

1. Education
2. Sociology
3. Law
4. Economics
5. Business Administration (MBA)

Before 1900

6. Managerial Psychology
7. Human Capital Management (HCM)
8. Organization Theory
9. Operations Research
10. Systems Engineering
11. Management Science
12. Game Theory
13. Industrial Engineering
14. Marketing
15. Computer & Information Sciences



1960-1990

16. Management of Innovation & Tech (MoT)
17. Experimental Economics
18. AI & Games
19. Management of Information Systems
20. Computer Supported Collab. Work (CSCW)
21. Performance Support Systems In Business & Organization
22. Inform. Sci & Sys
23. Service Ops & Mgmt
24. Service Engineering
25. Service Marketing
26. Social Complexity
27. Agent-based compute. economics
28. Computational Organization Theory

© 2006 IBM Corporation

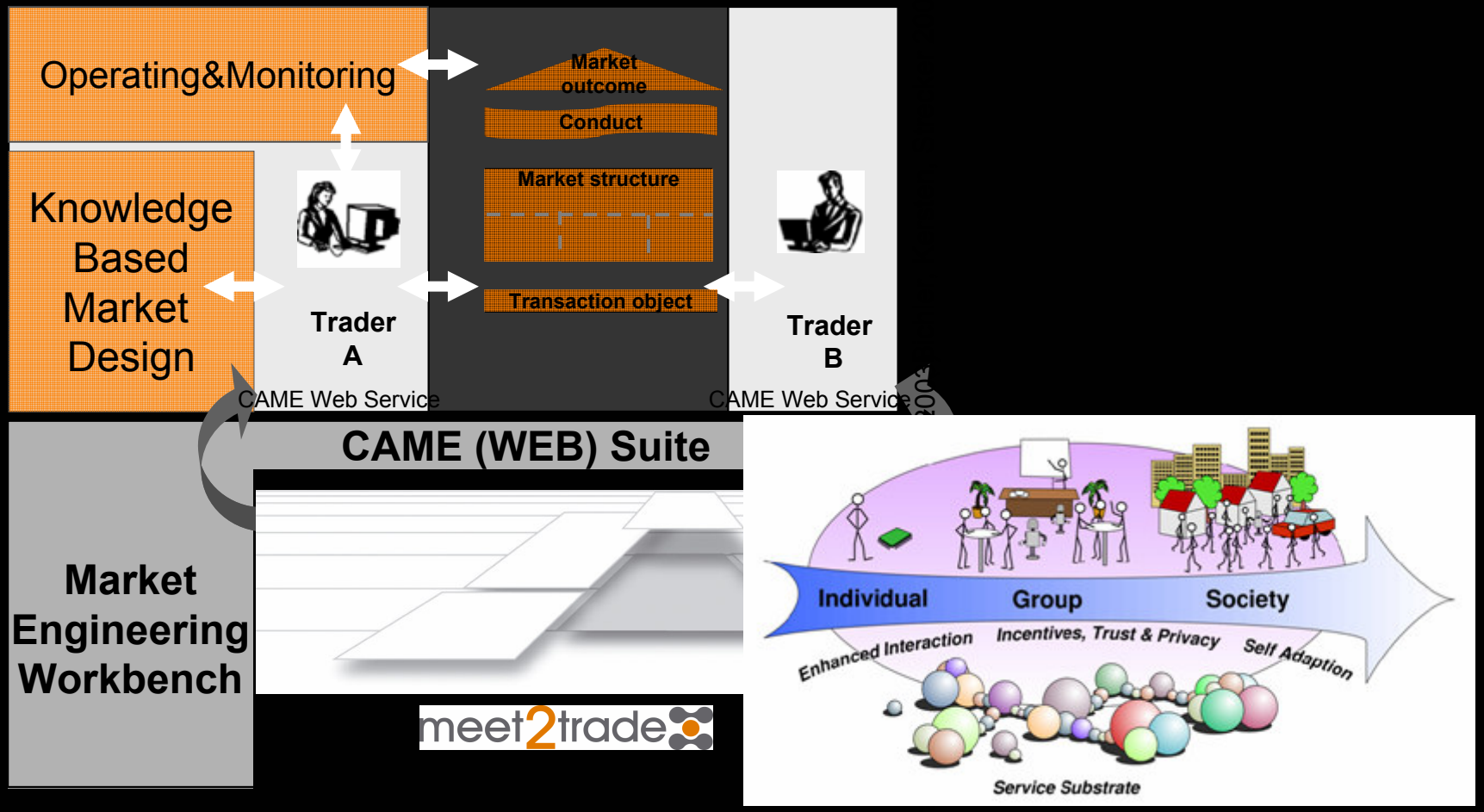
What kinds of tools should a service scientist have?

- Empirical tools – simulation tools and techniques
- Analytic tools – mathematical tools and techniques
- Engineering tools – workbench to assemble standard components, and infrastructure platform to deploy them into practice
- Multidisciplinary design tools – palette of customizations
- Theoretical tools – standard terminology, measures, and principles

© 2006 IBM Corporation

What kinds of tools should a service scientist have?

For Example: Computer-Aided Market Engineering System



D. Neumann, J. Maekioe, C. Weinhardt (2005): CAME - A Toolset for Configuring Electronic Markets; In: Proceedings of the ECIS 2005, Regensburg

© 2006 IBM Corporation

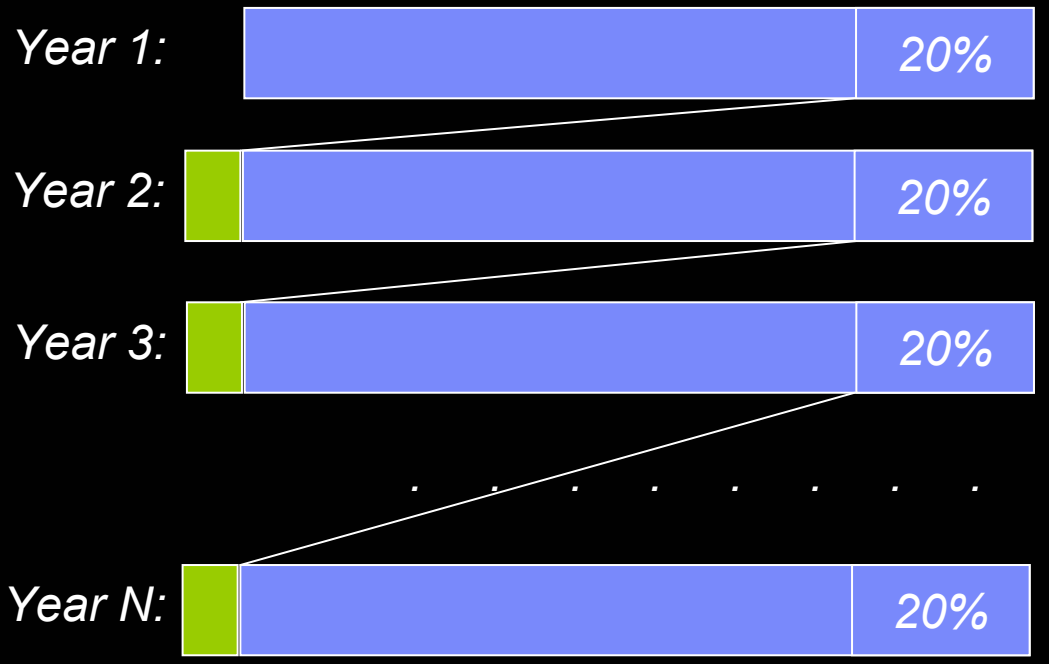
What would service scientists actually do?

- Service scientist own the body of knowledge around service system problem solving
- Service scientists identify a service system that needs improvement
- Service scientists identify the stakeholders their concerns and perceived opportunities
- Service scientists envision augmentations (additional new service systems) or reconfigurations (of old service systems components) that best address all problems and opportunities
  - Identify year-over-year improvement trajectories
  - Identify incentives to change (ROI, leadership, laws)

© 2006 IBM Corporation

Example: Are there "scale laws" of service innovation – year-over-year compounding effects?

- Problems
  - Input: Student quality
  - Process: Faculty motivation
  - Output: Industry fit
- Augmentations
  - A: -20% eLearning certification
  - B. +10% Faculty interest tuning
  - C. +10% On-the-job skills tuning



After a decade the course may look quite different
Service systems are learning systems: productivity, quality, etc.

© 2006 IBM Corporation

A Grand Challenge: Predictable Service Productivity Growth

Measurement of Sociotechnical Systems

Productivity	Other Considerations	Issues
Global	Values, Demands, Aspirations, Wants, Needs	Sustainability & Demand
National	Policies & Laws, Public Infrastructures	Growth & Innovation
Industry	Crime, Terrorism, Cheating, Other Mischief	Standards & Compliance
Enterprise	Foundations, Not-for-Profits, Research Organizations	Growth & Innovation
Work System	Graduates from Schools & Universities	Quality & Learning
Knowledge Worker Professions	Family Life, Local Community, Environment	Opportunity & Sustainability

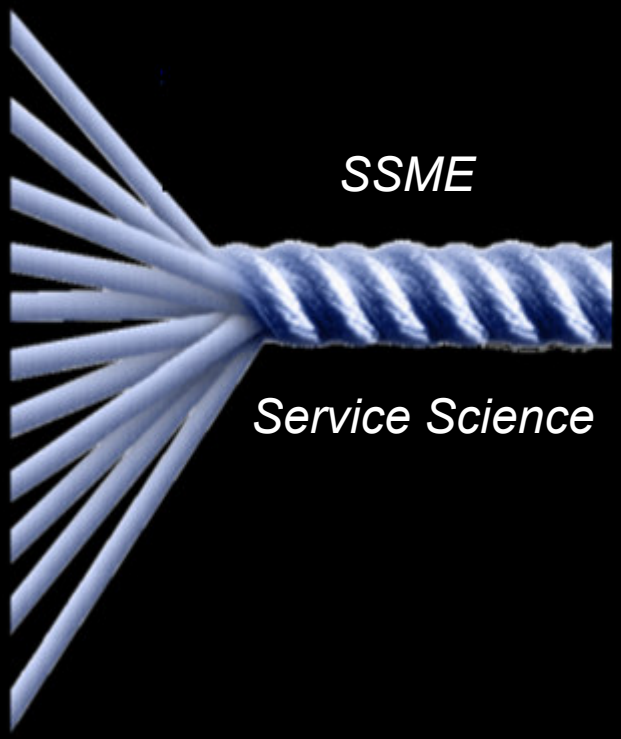
Measurement of Service Systems

© 2006 IBM Corporation

Questions?

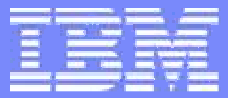
Focus on Education, Employment, Innovation, Economic Growth:
Complex Business Performance Transformation Services

Service Marketing, Operations, and Management
Operations Research and Management Science
Industrial & Systems Engineering, Control Theory
Information Sciences and Systems Engineering
Management of Technology and Innovation
Computer Science, Distributed AI, CSCW
Computational Organization Theory
Social and Cognitive Science
Economics & Jurisprudence
Game Theory and Mechanism Design Theory
Management of Information Systems
Organization Science, Complexity Management Theory
Business Informatics and Document Engineering
Business Anthropology and Learning Organizations
Decision Science and Knowledge Management
Human Capital Management & Incentive Engineering
Quality, Six Sigma, Statistics, Process Optimization
Computer Aided Market Engineering



Services: Value coproduction acts, promises, and relationships
via sharing work, risk, information, assets, decisions, responsibility, and authority

© 2006 IBM Corporation



SSME: Education, Employment, Innovation, and Economic Growth

REST IS BACKUP

Contact
Paul Maglio (maglio@us.ibm.com)
Wendy Murphy (wendym@us.ibm.com)

National Academy of Science: Education for Service Innovatoin | Washington, DC | April 18, 2006

So What?

- What is the key to being more innovative in services?
- What is the key to increasing high skill jobs that enable more service innovation?
- What is the key to developing innovative, high value services exports?
- In short, what policies, investments, research, and education is most needed?
- Challenge: Services breeding like rabbits – is the future simply an unending stream of new specialists hopping from innovation to commoditization, and back?

© 2006 IBM Corporation

Innovation sustains skilled employment and exports

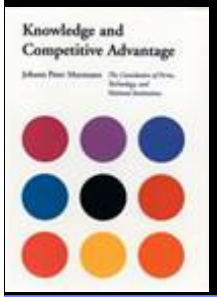
1800-	England	Industrial Revolution
1850-	Germany	Chemicals Revolution
1900-	USA	Electrical & Information Revolution
1950-	Japan	Quality Innovation: Product Revolution
1990-	Finland	Mobile Communication Revolution
2000-	India	Cost Innovation: Services Revolution
2000-	China	Cost Innovation: Product Revolution
	?	Future of Products & Services Exports

Sustainable growth depends on innovation via regional government, industry, academic collaboration.

© 2006 IBM Corporation

Historical Example: Emergence of new academic discipline and systematic approach to innovation and wealth creation

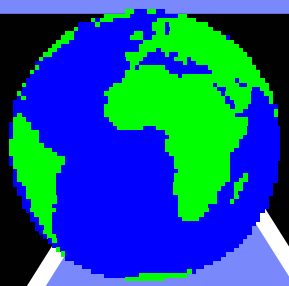
- Emergence of German dye industry, German mid-19th Century
- Emergence of chemistry as an academic discipline
- Emergence of patent protection in the new area of chemical processes and formula
- Emergence of new relationships connecting firms, academic institutions, government agencies, and clients
- Demonstrates needed coevolution of firms, technology, and national institutions
- Took England and US over 70 years to catch up!!!



Knowledge and Competitive Advantage :
The Coevolution of Firms, Technology, and National Institutions
by Johann Peter Murmann

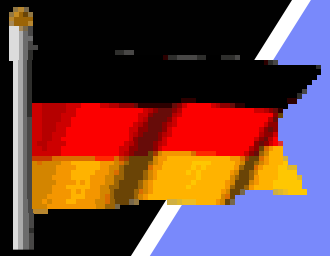
© 2006 IBM Corporation

"Innovative activity is fundamentally a service activity."
- William J. Baumol



Innovation

"We are continually creating a new and novel world."
- Douglass C. North



Service Economy

Knowledge Workers

Education & Employment

© 2006 IBM Corporation

Are there “scale laws” of service innovation?

- Moore’s Law underlies much of the information technology and business capability growth over the last half century
  - Are there analogous “predictable capability doubling laws” that apply in the realm of services? If so, how might they be exploited to improve service productivity and quality in a predictable manner?
  - It seems three improvement or learning curve laws that might be applicable in services:
    - The more an activity is performed (time period doubling, demand doubling) the more opportunities there are to improve the process
    - The better an activity can be measured (sensor deployment doubling, sensor precision doubling, relevant measurement variables doubling) and modeled the more opportunities there are to improve the process
    - The more activities that depend on a common sub-step or process (doubling potential demand points), the more likely investment can be raised to improve the sub-step.
- Example: Amazon’s Book Buying Recommendation Service Quality
  - The quality of the recommendations depends on accurate statistics – the more purchases made, the better the statistical estimates for recommendations
- Example: Call Centers Query-Response Productivity and Quality
  - The speed and quality of call center responses can be improved significantly given accurate statistics about the kinds and number of queries that are likely to be received.
- Example: New Service Offerings Viability (Blue Ocean Strategy)
  - The viability of new service offerings often depends on the scale (amount of demand) in adjacent market segments where service satisfaction is low enough to result in sufficient critical mass of defections to bootstrap the new offering.
- Example: Predictable Education Gains (Student Knowledge, Teacher Satisfaction)
  - If eLearning can be used to shift 20% of routine teacher activities into automation that can be covered in half the normal time, freeing up 10% of teacher time each year to innovate and add new content or exploratory activities to the curriculum, then each year students will be learning more and teachers will have time to try new things.

© 2006 IBM Corporation

What is SSME? (Services Sciences, Management, and Engineering)

- **The application of scientific, management, and engineering disciplines to tasks that one organization beneficially performs for and with another ('services')**
  - Make productivity, quality, compliance, sustainability, learning rates, and innovation rates more predictable in the service sector, especially complex organization to organization services – business to business, nation to nation, organization to population
  - Services are anything of economic value that cannot be dropped on your foot – the key to service value is in actions, performed now or promised for the future. Services transform/protect or promise to transform/protect a state of the target of the service. The client may not have the skill, time, desire, or authority to perform self-service, do it themselves. Services often create mutual interdependencies.
  - Services are value coproduction performances and promises between clients and providers, with alternative work sharing, risk sharing, information sharing, asset sharing, and decision sharing arrangements and relationships (promises to perform now or in the future, once or repeatedly, when needed or demanded, standard or customized, satisfaction guaranteed or best effort, service levels fixed or variable)
- **Science is a way to create knowledge**
- **Engineering is a way to apply knowledge and create new value**
- **Business Model is a way to apply knowledge and capture value**
- **Management improves the process of creating and capturing value**

© 2006 IBM Corporation

What can you do to get involved? [government]

- Does your agency fund innovation?
- Does your agency influence innovation policy?
- Does your agency establish standards?
- Does your agency deal with intellectual property?
- Does your agency deal with economic statistics?

© 2006 IBM Corporation

What can you do to get involved? [industry]

- Does your business develop, sell, and/or deliver service offerings?
- Does your business have a service innovation process?
- Does your business use services to complement and add value to manufactured products?
- Does your business invest in internal R&D?
- Does your business fund university or other external R&D?
- Does your business create case studies, success stories, white papers, or point-of-view documents about service offerings?
- Does your business recruit service professionals? Service researchers?
- Does your business provide feedback to schools (survey recent graduates hired) on what skills are desired to be most effective in your business?
- Does your business procure services? eSource of services? Outsource services?
- Does your company patent or otherwise protect intellectual property related to service innovation?

© 2006 IBM Corporation

What can you do to get involved? [academics]

- **Do you teach courses that include or could include complex business to business service case studies?**
- **Do you have responsibility for revising or creating new curriculum?**
- **Do you perform research that could be published in the *Journal of Service Research* or other relevant journals or conferences?**
- **Do you have students who could intern with business service or service research organizations? Compete for PhD fellowships in services?**
- **Are you interested in industry-academic rotations?**
- **Are you interested in developing tools that could enable SSME?**
- **Are you interested in creating business proposals or grant proposals related to SSME and service innovation? Competing for university research awards?**
- **Are you interested in participating/speaking in SSME events? Hosting one at your university?**
- **Does your school already have services related courses, degrees, centers, or institutes?**
- **Are you a service innovation pioneer? Are you interested in competing for a faculty award?**

© 2006 IBM Corporation

What is IBM doing to support others?

- Publicizing a “call to action” around SSME and the need for systematic approaches to service innovation (identify IBM relationship/ambassadors)
- Hosting and cosponsoring SSME and service innovation related events with government, industry, and academics around the world
- IBM Faculty Awards to select service innovation pioneers
- IBM PhD Fellowships to select services-related PhD students
- IBM University Research (SUR) awards to select academic institutions proposing leading edge service innovation and SSME related work
- Providing best paper awards for leading service research related journals and conferences
- Working with government funding agencies to increase focus and establish new programs related to service innovation
- Inviting people to contribute to an SSME blog, and share information about their SSME related efforts (http://www.research.ibm.com/ssme)
- Working with some academic institutions to provide access to service data
- Hiring recent graduates into IBM Global Services and IBM Research
- Supporting curriculum development and research efforts, and much more…

© 2006 IBM Corporation

IBM's SSME Course (Under Development)

1. **Services** – What are services?
2. **Systems** – Services depend on sociotechnical systems
3. **Methods** – Service delivery depends on methods
4. **Industrialization** – Services are being standardized
5. **Quality** – How do we ensure quality of service?
6. **Components** – Business processes are being modularized
7. **Science** – Is there a science of services?
8. **Management** – What is different in management of services?
9. **Engineering** – Can service engineering foster innovation?
10. **Productivity** – Why do services resist productivity gains?
11. **Challenges** – What are the big problems for the service economy?
12. **Innovation** – Can we be systematic about innovation on services?

© 2006 IBM Corporation

Who else cares?

- Governments
  - National innovation initiatives
  - Research funding agencies
- Industry
  - Numerous service providers, partners, clients
  - Even some competitors
- Academics
  - Deans and teaching faculty
  - Research faculty
  - Entrepreneurial students who want high value professional skills and who want to address complex societal challenges

© 2006 IBM Corporation

Services, Services, Services – A big part of our world

- Financial
  Banking, investment
- Transportation
  Trains, planes
- Infrastructure
  Telephone, electricity
- Entertainment
  Movies, television
- Hospitality
  Hotel, restaurants
- Government
  Police, fire
- Healthcare
  Doctors, nurses
- Education
  K-12, colleges, universities
- IT Services
  Outsourcing, search
- Business & Professional Services
  Consulting, outsourcing, lawyers

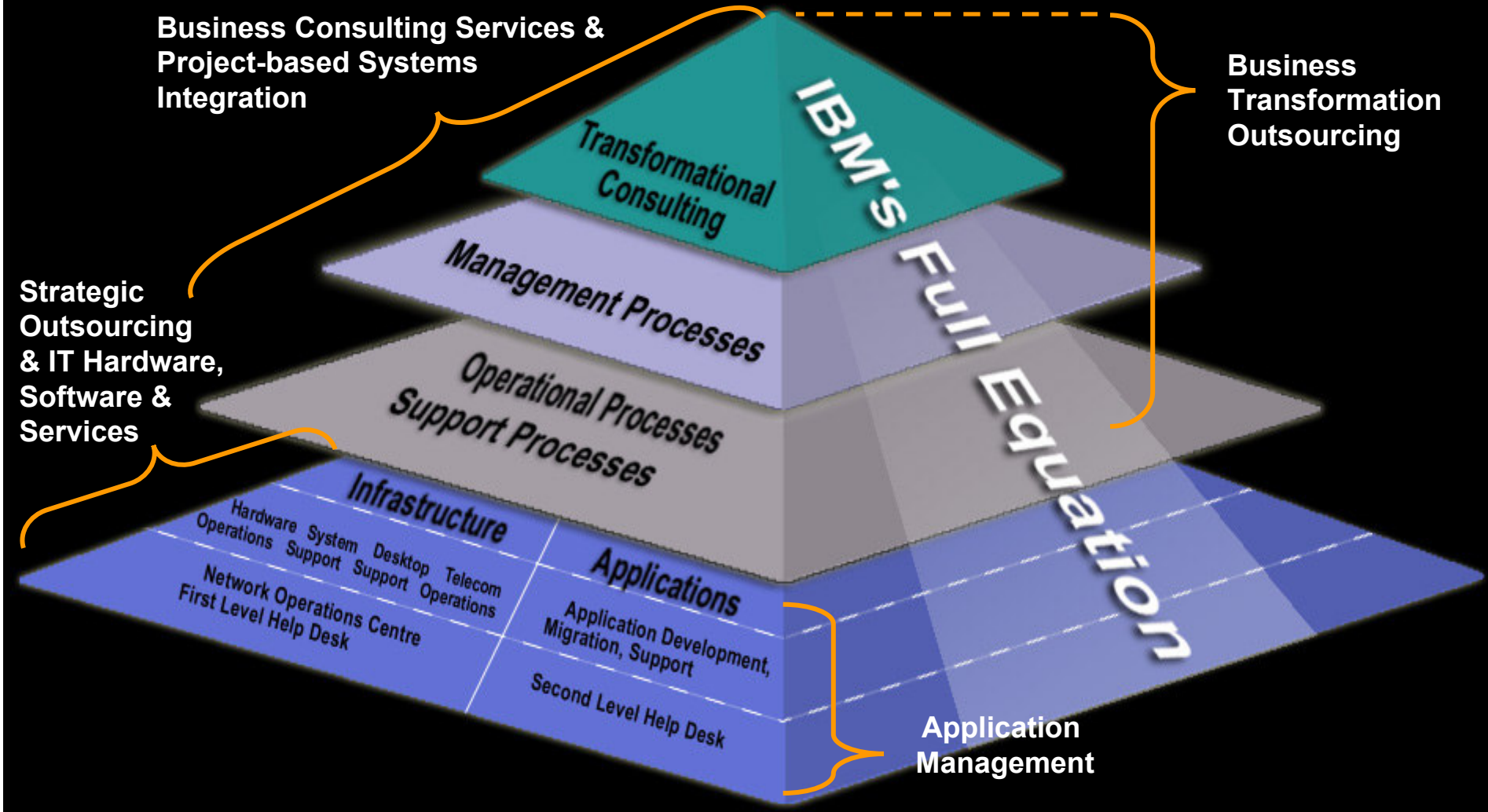
© 2006 IBM Corporation

Fastest growth in new business and information services

- Financial
  Banking, investment
- Transportation
  Trains, planes
- Infrastructure
  Telephone, electricity
- Entertainment
  Movies, television
- Hospitality
  Hotel, restaurants
- Government
  Police, fire
- Healthcare
  Doctors, nurses
- Education
  K-12, colleges, universities
- IT Services
  Outsourcing, search
- Business & Professional Services
  Consulting, outsourcing, lawyers

© 2006 IBM Corporation

What Services Does IBM Provide?



© 2006 IBM Corporation

Example: Service Science at ASU

W. P. CAREY SCHOOL of BUSINESS

ASU ARIZONA STATE UNIVERSITY

HOME INFORMATION ACADEMICS RESEARCH COMMUNITY CSL SITE SEARCH

- Add Me to Your Mailing List
- Visitor Information
- Research and Resources
- Center News
- Events and Membership
- Education
- Media
- Center Faculty & Staff

CONTACT INFORMATION:

Phone: 480-965-6201
Fax: 480-965-2180
Email: csl@asu.edu

CENTER FOR SERVICES LEADERSHIP

HIGHLIGHTS:

- The 20th Annual Services Leadership Institute March 27-29, 2005 Tempe, Arizona [more]
- The 17th Annual Compete Through Service Symposium November 1-3, 2006 Phoenix, Arizona [more]
- Knowledge@W. P. Carey Special Section on the 2005 Compete through Service Symposium [more]

Science - We are in the business of the science of services - we base our understanding of effective services on research and objective criteria, not just platitudes

community and the global academic community.

What makes us ~~different from other university centers and consulting~~ organizations?

Science - We are in the business of the science of services - we base our understanding of effective services on research and objective criteria, not just platitudes

Significance - We are in the business of developing and sharing what works in the real business world, not just pure theory

Symbiosis - We are in the business of building a cross-industry and cross-functional network of companies and academics who can help each other discover fresh ways to compete through service - not just business as usual

© 2006 IBM Corporation

Example: Berkeley's new ORMS undergraduate major

http://www.ieor.berkeley.edu/AcademicPrograms/Ugrad/ORMS.pdf

1. Decision Making in Economic Systems

Econ 101B	Economic Theory Macro (4)	Econ 161	Economic Systems (3)
Econ 104	Advanced Microeconomic Theory (4)	Math 104	Introduction to Analysis (4)
Econ 141	Economic Statistics and Econometrics (4)	E120	Princ. of Eng. Econ. (3)
IEOR 165	Engineering Statistics, Quality Control and Forecasting (3)		

2. Decision Making in Industrial and Service Systems

IEOR 150	Production Systems Analysis (3)	EOR 166	Decision Analysis (3)
IEOR 151	Service Operations Design and Analysis (3)	IEOR 170	Human Factors for Eng. Des. (3)
IEOR 153	Facilities Planning and Design (3)	Bus Ad. 123	Managerial Accounting (3)
IEOR 162	Linear Programming (3)	Bus Ad. 142	Prod. and Opns. Mgt. (3)
IEOR 165	Engineering Statistics, Quality Control and Forecasting (3)		

3. Decision Making in Societal Systems

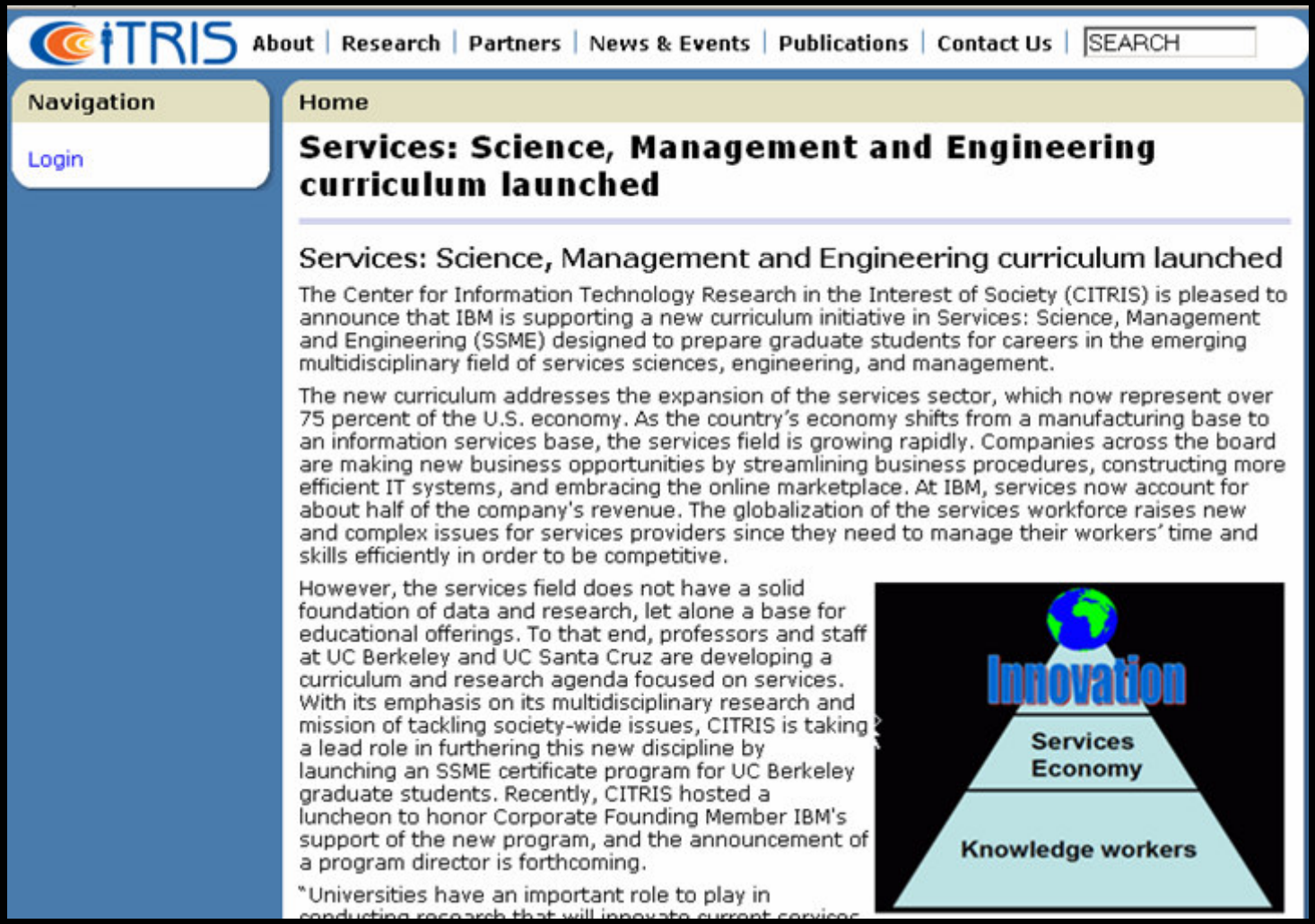
Soc 101A	Sociological Theory (5)	Soc 119	Society and Info. Theory (4)
Soc 105	Introduction to Sociological Methods (5)	Econ C110	Game Th. in the Soc. Sci. (4)
Soc 106	Intermediate Sociological Methods (4)	Econ 101A	Economic Theory Micro (4)
IEOR 165	Engineering Statistics, Quality Control and Forecasting (3)		

4. Algorithmic Decision Making

CS 61B	Data Structures (4)	IEOR 115	Indust. and Comm'l. Data Syst. (3)
CS 170	Efficient Alg. and Intractable Prob. (4)	IEOR 162	Linear Programming (3)
CS 172	Computability and Complexity (4)	IEOR 166	Decision Analysis (3)
CS 174	Combinatorics and Discrete Probability (4)	Math 110	Linear Algebra (4)

© 2006 IBM Corporation

Example: Berkeley SSME Certificate Program



iTRIS About | Research | Partners | News & Events | Publications | Contact Us | SEARCH

Navigation

Login

Home

Services: Science, Management and Engineering curriculum launched

Services: Science, Management and Engineering curriculum launched

The Center for Information Technology Research in the Interest of Society (CITRIS) is pleased to announce that IBM is supporting a new curriculum initiative in Services: Science, Management and Engineering (SSME) designed to prepare graduate students for careers in the emerging multidisciplinary field of services sciences, engineering, and management.

The new curriculum addresses the expansion of the services sector, which now represent over 75 percent of the U.S. economy. As the country's economy shifts from a manufacturing base to an information services base, the services field is growing rapidly. Companies across the board are making new business opportunities by streamlining business procedures, constructing more efficient IT systems, and embracing the online marketplace. At IBM, services now account for about half of the company's revenue. The globalization of the services workforce raises new and complex issues for services providers since they need to manage their workers' time and skills efficiently in order to be competitive.

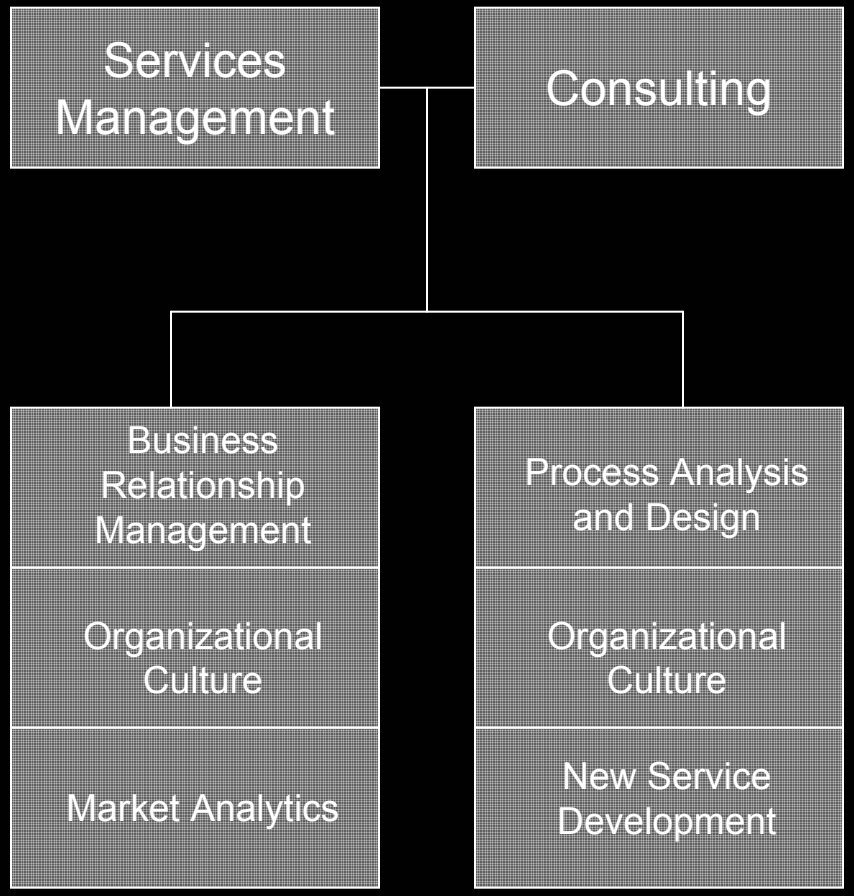
However, the services field does not have a solid foundation of data and research, let alone a base for educational offerings. To that end, professors and staff at UC Berkeley and UC Santa Cruz are developing a curriculum and research agenda focused on services. With its emphasis on its multidisciplinary research and mission of tackling society-wide issues, CITRIS is taking a lead role in furthering this new discipline by launching an SSME certificate program for UC Berkeley graduate students. Recently, CITRIS hosted a luncheon to honor Corporate Founding Member IBM's support of the new program, and the announcement of a program director is forthcoming.

"Universities have an important role to play in

http://www.citris-uc.org/news/2006/01/25/services_science_management_and_engineering_curriculum_launched

© 2006 IBM Corporation

Example: Business School SSME Curriculum for MBA



Relationship Management Focus

Market Research
Marketing Strategy
Project Management
Supplier Relations

Service Innovation Focus

Project Management
Marketing Strategy
Service Modeling
E-Commerce Practicum

© 2006 IBM Corporation

IBM's SSME Course Outline

1. **Services** – What are services?
2. **Systems** – Services depend on sociotechnical systems
3. **Methods** – Service delivery depends on methods
4. **Industrialization** – Services are being standardized
5. **Quality** – How do we ensure quality of service?
6. **Components** – Business processes are being modularized
7. **Science** – Is there a science of services?
8. **Management** – What is different in management of services?
9. **Engineering** – Can service engineering foster innovation?
10. **Productivity** – Why do services resist productivity gains?
11. **Challenges** – What are the big problems for the service economy?
12. **Innovation** – Can we be systematic about innovation on services?
13. **Business Transformation Services & Industry Solutions**

© 2006 IBM Corporation

Service Science – Reading List

- Motivation
  - Chesbrough (2005) Towards a new science of services. Harvard Business Review.
  - Chesbrough (2004) A failing grade for the innovation academy. Financial Times.
  - Rust (2004) A call for a wider range of services research. J. of Service Research.
  - Tien & Berg (2003) A case for service systems engineering. J. Sys. Science & Sys. Eng.
  - Rouse (2004) Embracing the enterprise. Industrial Engineer.
  - Karmarkar (2004) Will you survive the services revolution. Harvard Business Review.
- Philosophy
  - Vargo & Lusch (2004) Evolving a new dominant logic for marketing. J. of Marketing.
- Exemplar Model
  - Oliva & Sterman (2001) …Quality erosion in the services industry. J. of Management Science.
- Economics
  - Bryson et al (2005) Service worlds. Routledge. London, UK.
  - Herzenberg et al (1998) New rules for a new economy. Cornell University Press. Ithaca, NY.
- Technology
  - McAfee (2005) Will web services really transform collaboration? MIT Sloan Management Review.
- Textbooks
  - Fitzsimmons & Fitzsimmons (2001) Service management. McGraw-Hill. New York, NY.
  - Sampson (2001) Understanding service businesses. John Wiley: New York, NY.
- Evolution and Change: Managed, Designed, and Emergent
  - Khalil, Tarek (2000) Management of Technology. McGraw-Hill, New York, NY.
  - Nelson (2003) On the uneven evolution of human know-how. J. of Research Policy.
  - Agre (2004) An anthropological problem, a complex solution. J. of Human Organization.
  - Baba & Mejabi (1997) Socio-Technical Systems. J. of Human Factors & Industrial Egronomics.

© 2006 IBM Corporation

Select efforts to promote service science

- Dec. 2002: Almaden Service Research established, the first IBM Research group completely dedicated to understanding service innovations from a sociotechnical systems perspective, including enterprise transformation and industry evolution (http://www.almaden.ibm.com/asr/)
- March 2003: IBM-Berkeley Day: Technology… At Your Service! (http://www.eecs.berkeley.edu/IPRO/IBMday03/)
- September 2003: Coevolution of Business-Technology Innovation Symposium (http://www.almaden.ibm.com/coevolution/)
- April 2004: Almaden Institute: Work in the Era of the Global, Extensible Enterprise (http://www.almaden.ibm.com/institute/2004/)
- May 2004: "Architecture of On Demand" Summit: Service science: A new academic discipline? (http://domino.research.ibm.com/comm/www_fs.nsf/pages/index.html)
- June 2004: Paul Horn, VP IBM Research, briefs analysts on "Services as a Science"
- September 2004: Chesbrough's "A failing grade for the innovation academy" appears in the Financial Times (http://news.ft.com/cms/s/9b743b2a-0e0b-11d9-97d3-00000e2511c8,dwp_uuid=6f0b3526-07e3-11d9-9673-00000e2511c8.html)
- November 2004: IBM's GIO focuses on service sector innovations: government, healthcare, work-life balance (http://www.ibm.com/gio)
- November 2004: Service Innovations for the 21st Century Workshop (http://www.almaden.ibm.com/asr/events/serviceinnovation/)
- December 2004: Samuel J. Palmisano, IBM CEO, Harvard Business Review interview discusses the important role of "values" in organizational performance, "Leading Change When Business is Good" (http://harvardbusinessonline.hbsp.harvard.edu/b01/en/common/item_detail.jhtml?id=R0412C)
- December 2004: IBM expands academic initiatives related to service innovations, including sponsoring Tannenbaum Institute of Enterprise Transformation at Georgia Tech.
- February 2005: Chesbrough's "Service as a Science" in Harvard Business Review Breakthrough ideas of 2005
- 2005 - Oxford, Warwick, Bentley, Penn State, UMaryland, ASU, NCState, Japan, China, Norway, etc.

© 2006 IBM Corporation

Spotlight

- Find the pioneers of service innovation research & practice
- IBM has invested well over $1M in faculty and university awards to service innovation pioneers over the last two years
- IBM invests far more in hiring top talent from universities for our service business and IBM Research in service innovation

© 2006 IBM Corporation

Henry Chesbrough, Berkeley, a service science pioneer.

IBM Faculty Award

Harvard Business Review

www.hbr.org

THE HBR LIST

Our annual survey of emerging management ideas considers the downside of reliability and the upside of flip-flops; new directions for evolving technologies; and the persistent questions of who we are and what we fear.

Breakthrough Ideas for 2005

14. Toward a New Science of Services

Services is the name of the game in today's economy. Services represent about 80% of the U.S. gross domestic product and between 60% and 80% of the GDPs of the rest of the world's advanced economies. Getting better at services management must be a priority. Companies like General Electric, Xerox, and IBM that are seeing their own businesses shift from products to services are acutely aware of this. (At IBM, for example, more than half of total revenue now comes from services.)

So why can't we agree that services science is a legitimate field? Even as it is researched,

6 FT Mastering Innovation

HENRY CHESBROUGH

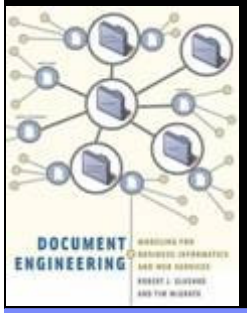
A failing grade for the innovation academy

Services dominate economic activity in developed economies, and yet understanding of innovation in this sector remains very limited

© 2006 IBM Corporation

Glushko (Berkeley): Document Engineering

- Document Engineering: A new synthetic discipline
  - With roots in Information and Systems Analysis (Data Analysis), Electronic Publishing (Document Analysis), Organization Science (Business Process Analysis), Business Informatics (Transaction Analysis), User-Center Design (Task Analysis)
  - Design of Documents and Business Processes
  - Design of Web Services and Service Oriented Architectures
- Related to Business Informatics– "combine the modern theory, methods, and techniques of business (i.e., organization science) and informatics (information and computing science) into one integrative programme." (definition from Utrecht University)



Document Engineering :
Analyzing and Designing Documents for Business Informatics and Web Services
by Robert J. Glushko, Tim McGrath

© 2006 IBM Corporation

Berkeley's new ORMS undergraduate major

Rhonda Righter, IBM Faculty Award

http://www.ieor.berkeley.edu/AcademicPrograms/Ugrad/ORMS.pdf

1. Decision Making in Economic Systems

Econ 101B	Economic Theory Macro (4)	Econ 161	Economic Systems (3)
Econ 104	Advanced Microeconomic Theory (4)	Math 104	Introduction to Analysis (4)
Econ 141	Economic Statistics and Econometrics (4)	E120	Princ. of Eng. Econ. (3)
IEOR 165	Engineering Statistics, Quality Control and Forecasting (3)		

2. Decision Making in Industrial and Service Systems

IEOR 150	Production Systems Analysis (3)	EOR 166	Decision Analysis (3)
IEOR 151	Service Operations Design and Analysis (3)	IEOR 170	Human Factors for Eng. Des. (3)
IEOR 153	Facilities Planning and Design (3)	Bus Ad. 123	Managerial Accounting (3)
IEOR 162	Linear Programming (3)	Bus Ad. 142	Prod. and Opns. Mgt. (3)
IEOR 165	Engineering Statistics, Quality Control and Forecasting (3)		

3. Decision Making in Societal Systems

Soc 101A	Sociological Theory (5)	Soc 119	Society and Info. Theory (4)
Soc 105	Introduction to Sociological Methods (5)	Econ C110	Game Th. in the Soc. Sci. (4)
Soc 106	Intermediate Sociological Methods (4)	Econ 101A	Economic Theory Micro (4)
IEOR 165	Engineering Statistics, Quality Control and Forecasting (3)		

4. Algorithmic Decision Making

CS 61B	Data Structures (4)	IEOR 115	Indust. and Comm'l. Data Syst. (3)
CS 170	Efficient Alg. and Intractable Prob. (4)	IEOR 162	Linear Programming (3)
CS 172	Computability and Complexity (4)	IEOR 166	Decision Analysis (3)
CS 174	Combinatorics and Discrete Probability (4)	Math 110	Linear Algebra (4)

© 2006 IBM Corporation

Mary Jo Bitner, ASU, Center for Services Leadership
IBM faculty award, Service research pioneer

© Academy of Management Executive, 2002, Vol. 16, No. 4

Implementing successful self-service technologies

Mary Jo Bitner, Amy L. Ostrom, and Matthew L. Meuter

Executive Overview

As companies race to introduce technology that enables customers to get service on their own, managers often find that implementing and managing effective self-service technologies (SSTs) is more difficult than it looks. In this article, we present findings from qualitative interviews and survey research investigating SSTs from the customer's point of view. This research identifies factors that impact customer satisfaction and dissatisfaction with SSTs. It also explores the issue of customer adoption of SSTs and highlights factors that are necessary for a customer to try an SST for the first time. Based on this research and our work with companies, we present important lessons to guide managers in developing successful SSTs.

© 2006 IBM Corporation

Jim Tien and Daniel Berg, RPI

IBM Faculty Award, Service research pioneers

Established RPI "Service Research and Education" Center in early-90's

A CASE FOR SERVICE SYSTEMS ENGINEERING

James M. TIEN **Daniel BERG**

Department of Decision Sciences and Engineering Systems
Rensselaer Polytechnic Institute
Troy, New York 12110-3590, U.S.A.

Abstract

A case is made for further developing a branch of systems engineering that focuses on problems and issues which arise in the service sector. We promulgate this special focus not only because of the size and importance of the service sector but also because of the unique opportunities that systems engineering can exploit in the design and joint production and delivery of services. We begin by considering the economic, technological and demographic contexts within which the service sector has flourished; we then address both services, especially emerging services, and systems engineering, followed by a discussion of how to advance the field of service systems engineering, and concluding with several remarks. In particular, a number of service systems engineering methods are identified to enhance the design and production/delivery of services, especially taking advantage of the unique features that characterize services – namely, services, especially emerging services, are information-driven, customer-centric, e-oriented, and productivity-focused.

Keywords: Service sector, systems engineering, information technology, decision technologies, customer-centric, productivity

© 2006 IBM Corporation

Marietta Baba, Dean, Social Sciences, Michigan State University

IBM Visiting Scholar, Spring 2005, Sociotechnical Systems Theory Pioneer

Advances in Sociotechnical Systems Integration: Object-Oriented Simulation Modeling for Joint Optimization of Social and Technical Subsystems[1]

Marietta L. Baba and Olugbenga Mejabi
Wayne State University

1. INTRODUCTION

The realization that human factors are integral to the effective deployment and operation of advanced manufacturing systems has come slowly, and painfully, to American industry. While the technological imperative is still alive and well in many American organizations, much of the intellectual and practitioner elite seems ready to admit that "getting the technology right" does not, by itself, guarantee success (Grayson, 1990; Manufacturing Studies Board, 1986; MIT Commission on Industrial Productivity, 1989; National Research Council, 1987). To ensure that new manufacturing technologies perform and deliver as promised, human factors[2]—which we construe broadly to include the characteristics of all of the individuals and social groups that directly or indirectly interact with a technical system[3]—have to be recognized and understood, and also managed and often changed. Change is needed because human factors and technological systems are interdependent; one is not strictly causal (in a linear sense) with respect to the other (Majchrzak, 1992). This means that a new technological system will not automatically drive changes in human factors that may be necessary if new technology is to operate effectively. Rather, existing human factors may place constraints on new technology that limits its effectiveness (Adler, 1989; Hayes and Jaikumar, 1988). Therefore, to the extent that new technology has capabilities and requirements that place new demands on existing human factors, those factors also may need to change simultaneously.

© 2006 IBM Corporation

Augier and March: “Models of a Man”

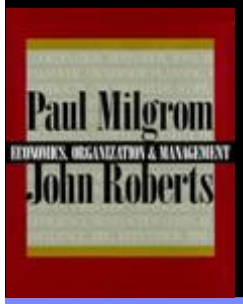
- “Herbert Simon (1916-2001), in the course of a long and distinguished career in the social and behavioral sciences, made lasting contributions to many disciplines, including economics, psychology, computer science, and artificial intelligence. In 1978 he was awarded the Nobel Prize in economics for his research into the decision-making process within economic organizations. His well-known book *The Sciences of the Artificial* addresses the implications of the decision-making and problem-solving processes for the social sciences. “

Models of a Man :
Essays in Memory of Herbert A. Simon
by Mie Augier (Editor), James G. March (Editor)

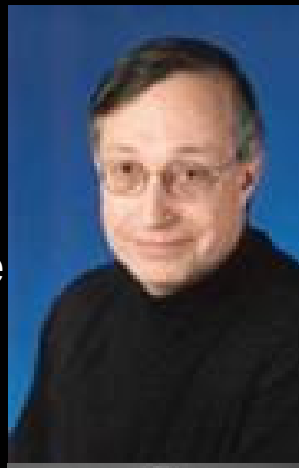
© 2006 IBM Corporation

Milgrom & Roberts: "Economics, Organization & Management"

- "First, and most fundamentally, organizations and business strategy can be as important as technology, cost, and demand in determining a firm's success."
- "The study of organization is not about how berries are arranged on a tree of authority, but about how people are coordinated and motivated to get things done."
- "We study coordination: what needs to be coordinated, how coordination is achieved in markets and inside firms, what the alternatives are to close coordination between units, and how the pieces of the system fit together. We also study incentives and motivation: what needs to be motivated, why incentives are needed, and how they are provided by markets and firms, what alternative kinds of incentive systems are possible, and what needs to be done to make incentive systems effective."



Economics, Organization and Management
by Paul Milgrom, John Roberts



© 2006 IBM Corporation

Bryson, Daniels, Warf: "Service Worlds: People, Organisations, and Technologies"

- People, organizations, technologies
- Space/Geography in the economics of services
- Consumer power in services: Client demand
- Dynamics of knowledge value
- Unifying themes across all service sectors

Service Worlds: People, Organisations, Technologies
by John R. Bryson, Peter W. Daniels, Barney Warf

Also, see "Age of Services"
By James Teboul

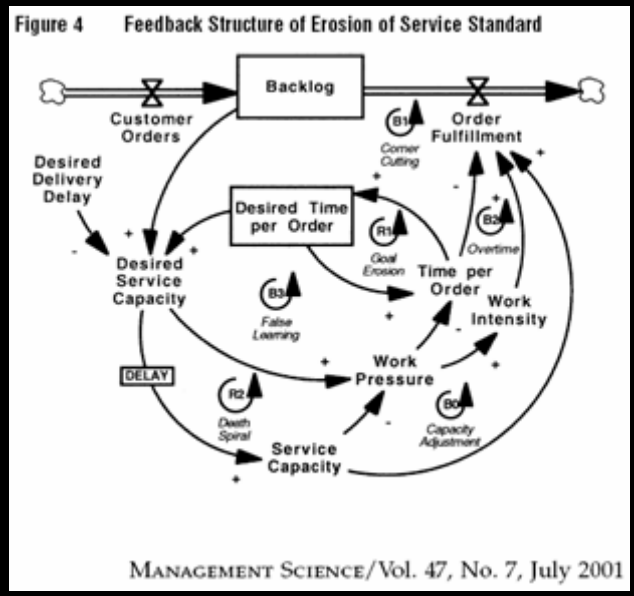
© 2006 IBM Corporation

Example Model:
Oliva & Sterman (2001) Quality Erosion in Service Industry

Table 2 Parameters and Sources for Service Model

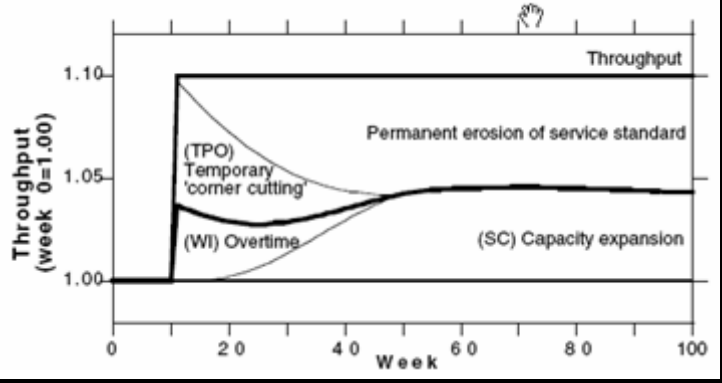
Parameter		Value		Source
Service delivery				
τ_r	Minimum time required to process an order	0.1	week	Set based on observations
λ	Desired delivery delay	0.1	week	Set based on stated goals
Service capacity				
τ_l	Time to adjust labor	11.5	week	Estimated to fit past data on labor hiring
τ_h	Hiring delay	29.9	week	Estimated to fit past data on labor hiring
τ_a	Time for attrition	401.0	week	Estimated to fit past data on attrition
τ_v	Time to cancel vacancies	1.0	week	Set based on stated procedures
τ_{pe}	Time to perceive labor effectiveness	6.7	week	Estimated to fit past data on desired labor
τ_l^*	Time to adjust desired labor	18.8	week	Estimated to fit past data on desired labor
τ_e	Time for experience	12.0	week	Judgmentally set based on interviews
ε	Relative effectiveness of rookies	0.35	dimensionless	Judgmentally set based on interviews
η	Fraction of experienced personnel for training	0.05	dimensionless	Judgmentally set based on interviews
Employees' responses				
f_{wt}	Effect of workload on time per order	$e^{-0.64w}$	dimensionless	Estimated to fit past data on time per order
τ_{ti}	Time for upward adjustment of time per order	813, 564	week	Estimated to fit past data on time per order
τ_{td}	Time for downward adjustment of time per order	18.8	week	Estimated to fit past data on time per order
f_{wi}	Effect of workload on work intensity	$e^{0.37w}$	dimensionless	Estimated to fit past data on work intensity
τ_{fe}	Time for effect of fatigue on effectiveness	3.0	week	Set based on previous studies
τ_{fa}	Time for effect of fatigue on attrition	52.0	week	Set based on previous studies
f_{fe}	Effect of fatigue on effectiveness $F_e \in [1.14, 2]$	$1\text{-}0.5F_e$	dimensionless	Set based on previous studies
f_{fa}	Effect of fatigue on attrition $F_a \in [1, 2]$	$1\text{-}0.2F_a$	dimensionless	Set based on previous studies
Service quality				
ω_c	Weight for customers' service expectation	1.0	dimensionless	Set a fortiori and based on interviews
ω_e	Weight for employees' quality expectation	1.0	dimensionless	Set based on interviews
μ	Customers' service expectation reference	1.16	hours/order	Estimated to fit past data on time per order
f_{pt}	Effect of quality pressure on time per order	$e^{0.00p}$	dimensionless	Estimated to fit past data on time per order
f_{qa}	Effect of quality on attrition	1.00	dimensionless	Set based on historical data
τ_{qe}	Time for employees' perception of quality	4.0	week	Judgmentally set based on interviews

Figure 4 Feedback Structure of Erosion of Service Standard



MANAGEMENT SCIENCE/Vol. 47, No. 7, July 2001

Figure 6 Response to a 10% Increase in Demand



© 2006 IBM Corporation

Model of service business

Profitability measures for each of the 14 items below…
(profits/time; time is life-span, year, quarter, month, week, day, hour, minute, second)

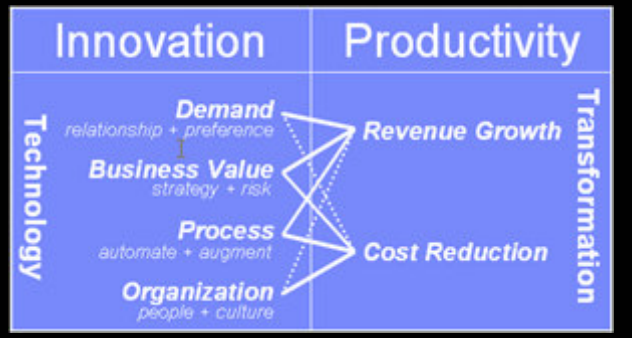
First level measures	Second level measures	Third level measures
Relationship & Sales Excellence	Operations & Delivery Excellence	Value Chain & Partnership Excellence
Client-provider negotiations 1. value creation 2. differentiation 3. cost cutting 4. compliance 5. market insights	**Internal to service provider** 1. providers resources 2. investments & incentives 3. quality & productivity 4. innovation & growth 5. life cycle management	**External to service provider** 1. clients resources 2. suppliers resources 3. complementors resources 4. substitutors resources 5. academic, government, etc.

clients 1	proposals & negotiation 2	engagements & renegotiation 3	offerings (solutions) 4	methods 5	assets 6	products 7	people 8	service organizations 9	methods 10	assets 11	products 12	people 13	service organizations 14
Governance & Management Excellence													
Geographies, Industry Sectors, Solutions													

© 2006 IBM Corporation

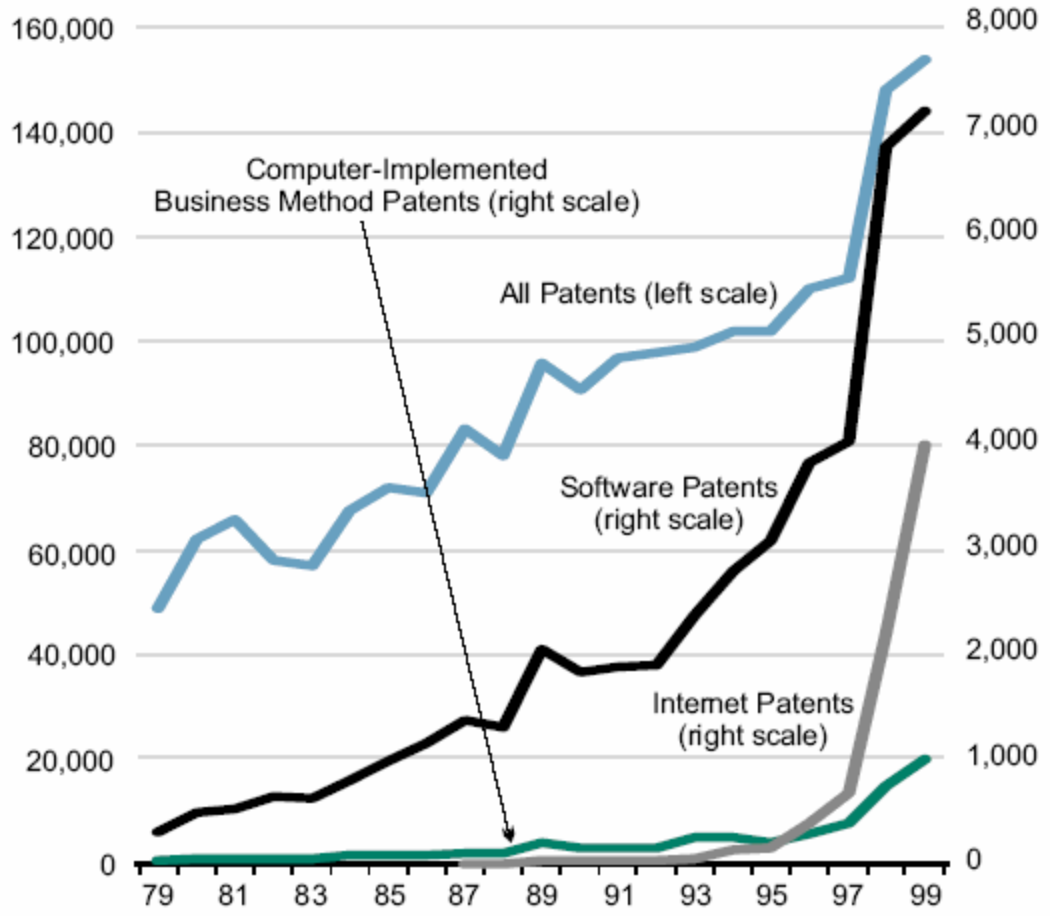
One Policy Challenge:

Beyond Technology Patents… Patenting Business, Social-Organizational, Demand Innovations



Source:
Robert M. Hunt
"You can patent that? Are patents on software and business models good for the new economy?"

FIGURE
Patents Granted in the U.S.



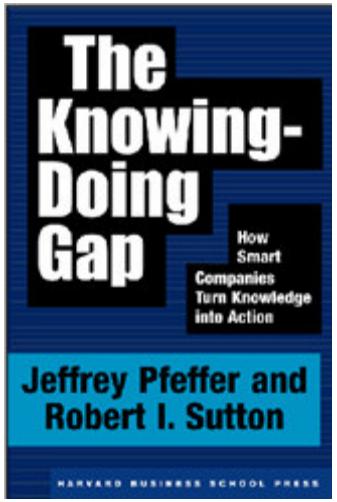
Source: U.S. Patent and Trademark Office and author's calculations.

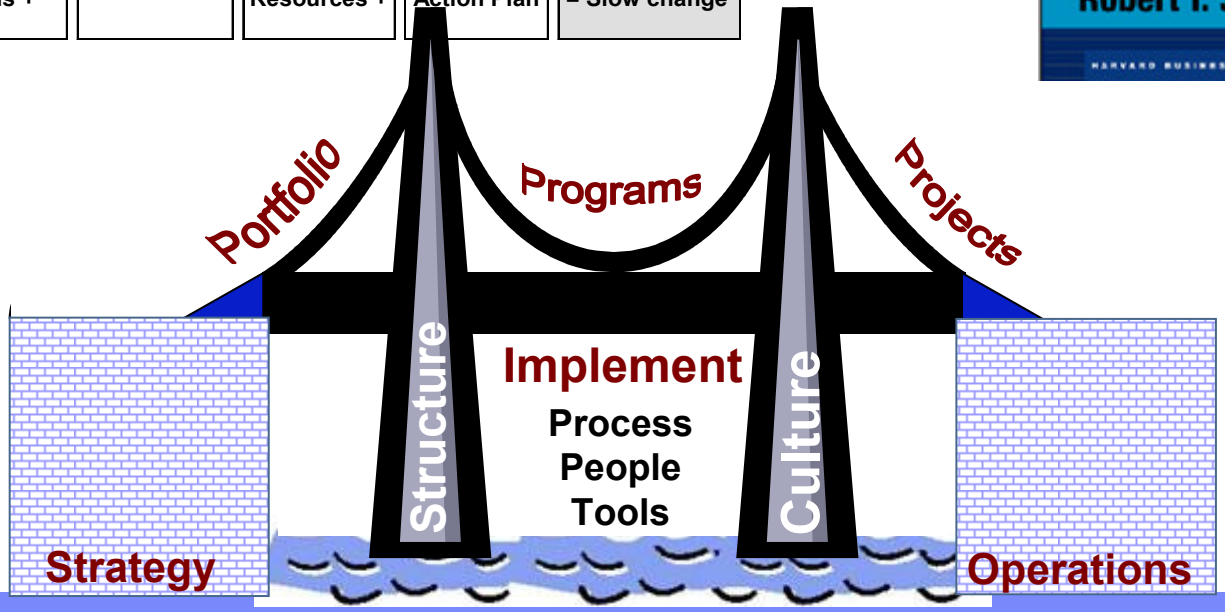
© 2006 IBM Corporation

Having a vision is not enough …

Bob Sutton, IBM Faculty Award, pro-Service Innovations

Vision +	Skills +	Incentives +	Resources +	Action Plan	= Change
	Skills +	Incentives +	Resources +	Action Plan	= Confusion
Vision +		Incentives +	Resources +	Action Plan	= Anxiety
Vision +	Skills +	Incentives +	Resources +		= False starts
Vision +	Skills +	Incentives +		Action Plan	= Frustration
Vision +	Skills +		Resources +	Action Plan	= Slow change

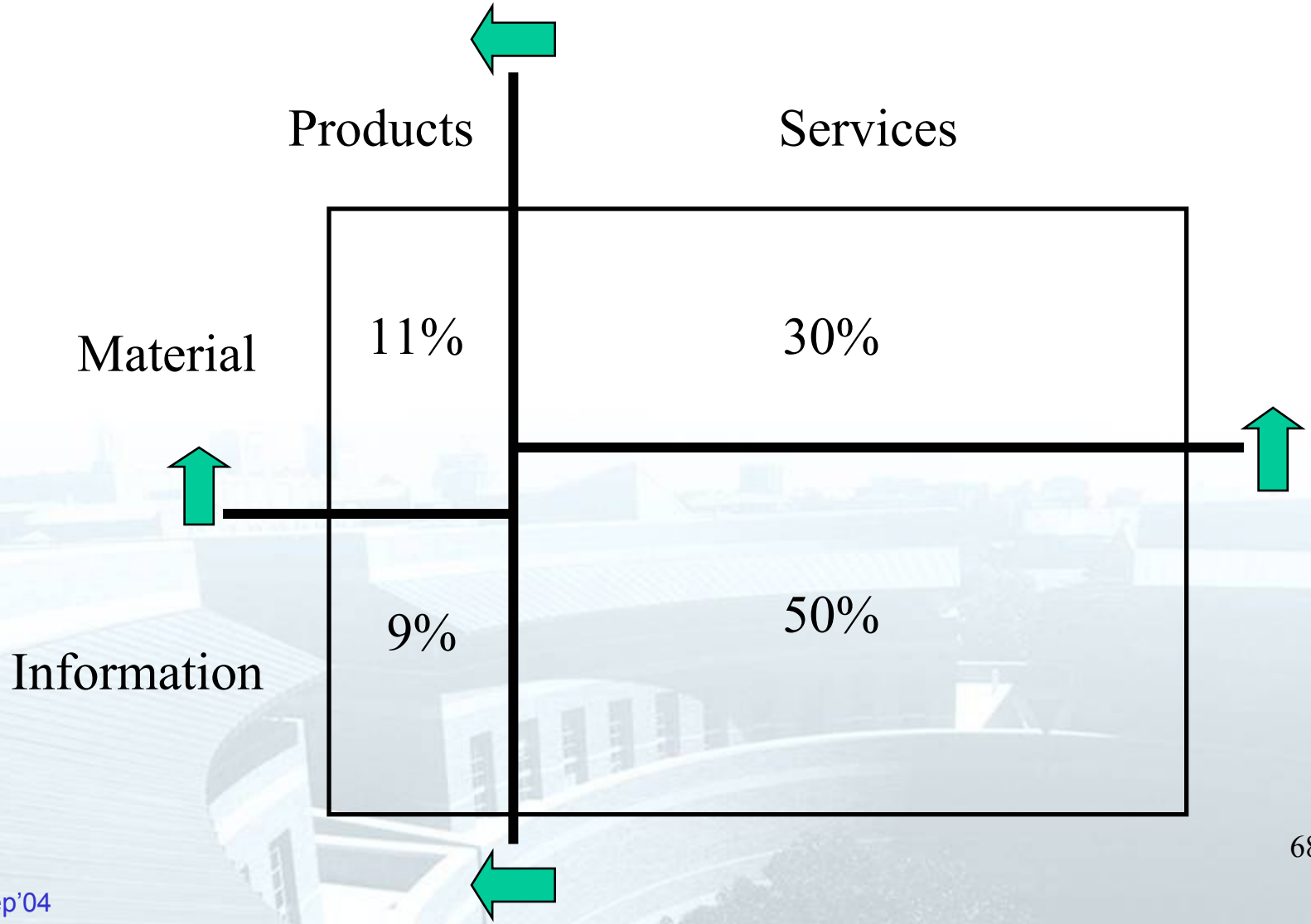




IBM Confidential
© Copyright IBM Corporation 2004

Information services is fastest growth

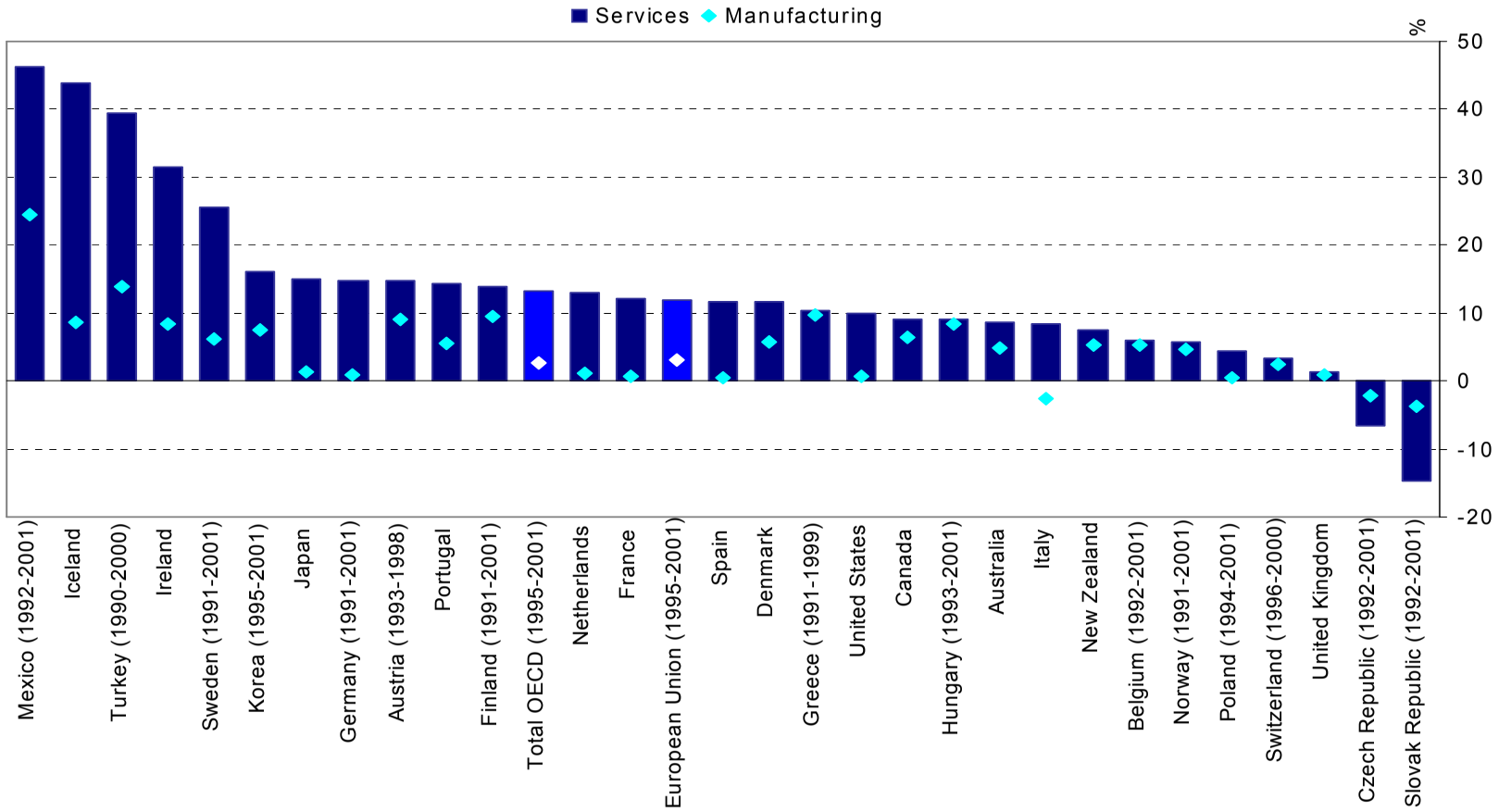
Uday Karmarkar & Uday Apte: "Service industrialization in the global economy"
Author of HBR article: "Will you survive the services revolution?"



© USK/Sep'04

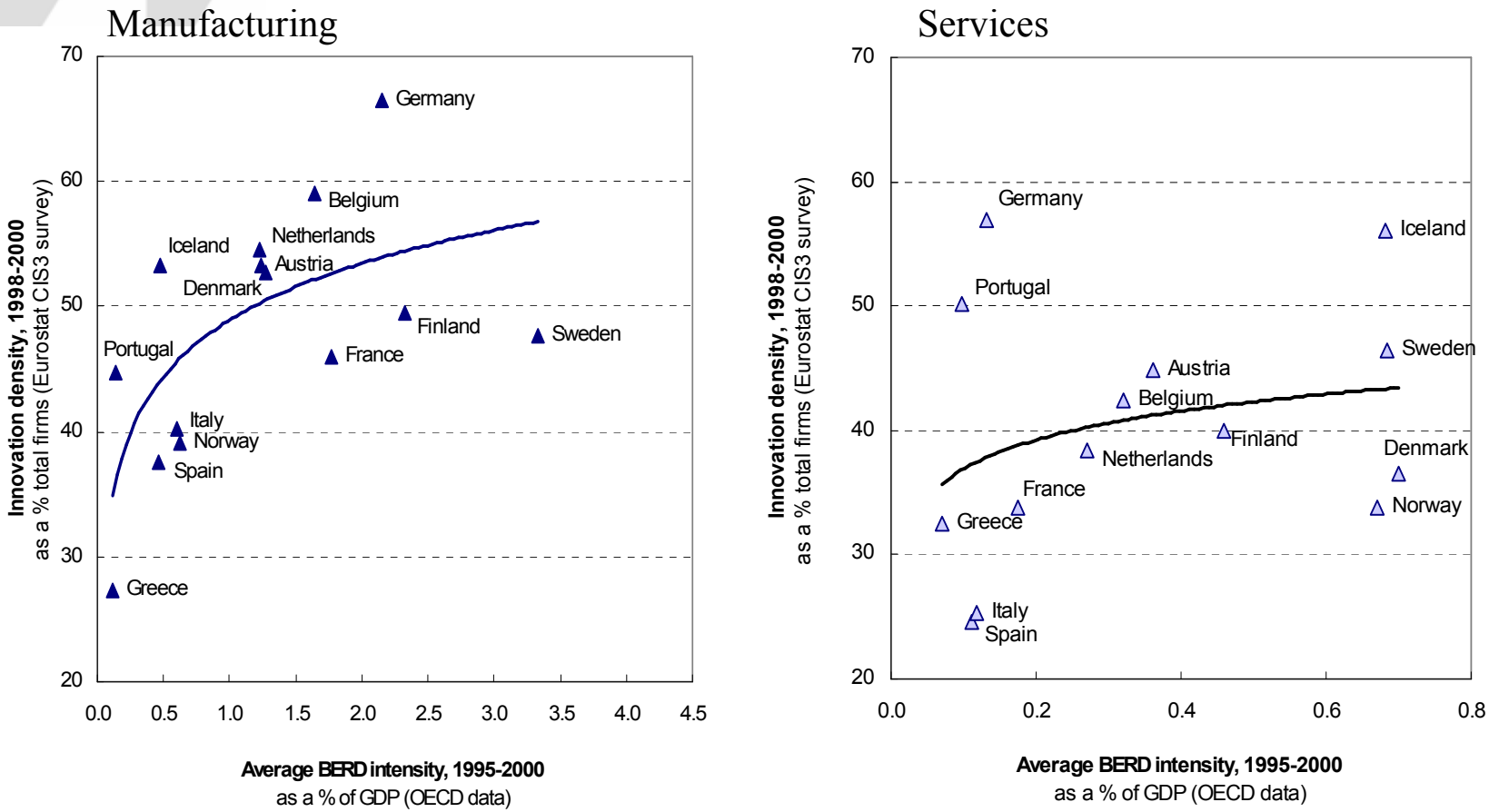
Growing role of services

Average annual growth rate of business R&D expenditure, 1990-2001



Source: OECD *Science, Technology and Industry Outlook 2004*
Jerry Sheehan

Even though R&D is less closely linked to service-sector innovation



Source: OECD *Science, Technology and Industry Outlook 2004*
Jerry Sheehan

OECD Science, Technology and Industry Outlook
Jerry Sheehan, OECD, 8 February 2005

- Science, technology and innovation are receiving greater policy attention as their links to economic growth are more widely appreciated.

- Innovation policy has been slow to adapt to the needs of the service sector, which accounts for growing share of output and employment in OECD economies.

- Science, technology and industry are increasingly globalized, requiring further adaptation of policy to ensure benefits accrue to national economies.

School	Discipline	Evolution & Revision	Selection & Aggregation	Transformation & Integration
School of Management	Marketing	Service Marketing	Service & Solutions Excellence Centers (Information Science & Technology Management)	Services Sciences, Management, and Engineering (SSME) and Solutions Engineering
	Operations	Service Operations		
	Accounting	Service Accounting (Activity-Based Costing)		
	Contracts & Negotiations	Service Sourcing (eSourcing)		
	Management Science	Service Management		
	Management of Technology	Management of Innovation		
School of Engineering and Science	Operations Research	Service Operations		
	Industrial & Systems Engineering	Service Engineering		
	Computer Science	Service Computing, Web Services, SOA		
School of Social Sciences	Economics	Institutional Economics Experimental Economics		
	Psychology	Labor Psychology (Human Capital Mgmt)		
	Anthropology	Business Anthropology		
	Organization Theory			
Other	Information Science & Systems, Service professional schools			

© 2006 IBM Corporation

Terms & Definitions

- **Service Science, short for Services Sciences, Management, and Engineering (SSME)**
- **Definition 1: The application of scientific, management, and engineering disciplines to tasks that one organization beneficially performs for and with another ('services')**
  - **Make productivity, quality, performance, compliance, growth, and learning improvements more predictable in work sharing and risk sharing (coproduction) relationships.**
- **Definition 2: The study of service systems.**
  - **Evolution & Design: Services systems evolve in difficult to predict ways because of naturally emergent and rationally designed path dependent interactions between economic entities, acting in the roles of clients and providers coproducing value.**
  - **Interactions & Value Coproduction: Service systems are made up of large numbers of interacting clients and providers coproducing value. Each economic entity is both a client and a provider. Service system dynamics are driven by the constantly shifting value of knowledge distributed among people, organizations, technological artifacts (culture), and embedded in networks or ecosystems of relationships amongst them.**
  - **Specialization & Coordination: One mechanism for creating value is specialization of clients and providers, which results in the need for coordination via markets, organizational hierarchies, and other mechanisms. Specialization creates efficiency. Efficiency creates profits and leisure. Profits and Leisure create investment (profits to innovation) and new demand (leisure to new aspirations).**

© 2006 IBM Corporation

Definitions of Services

- Deed, act, or performance (Berry, 1980)
- An activity or series of activities… provided as solution to customer problems (Gronroos, 1990)
- All economic activity whose output is not physical product or construction (Brian et al, 1987)
- Intangible and perishable… created and used simultaneously (Sasser et al, 1978)
- A time-perishable, intangible experience performed for a customer acting in the role of co-producer (Fitzsimmons, 2001)
- A change in condition or state of an economic entity (or thing) caused by another (Hill, 1977)
- Characterized by its nature (type of action and recipient), relationship with customer (type of delivery and relationship), decisions (customization and judgment), economics (demand and capacity), mode of delivery (customer location and nature of physical or virtual space) (Lovelock, 1983)
- Deeds, processes, performances (Zeithaml & Bitner, 1996)

© 2006 IBM Corporation

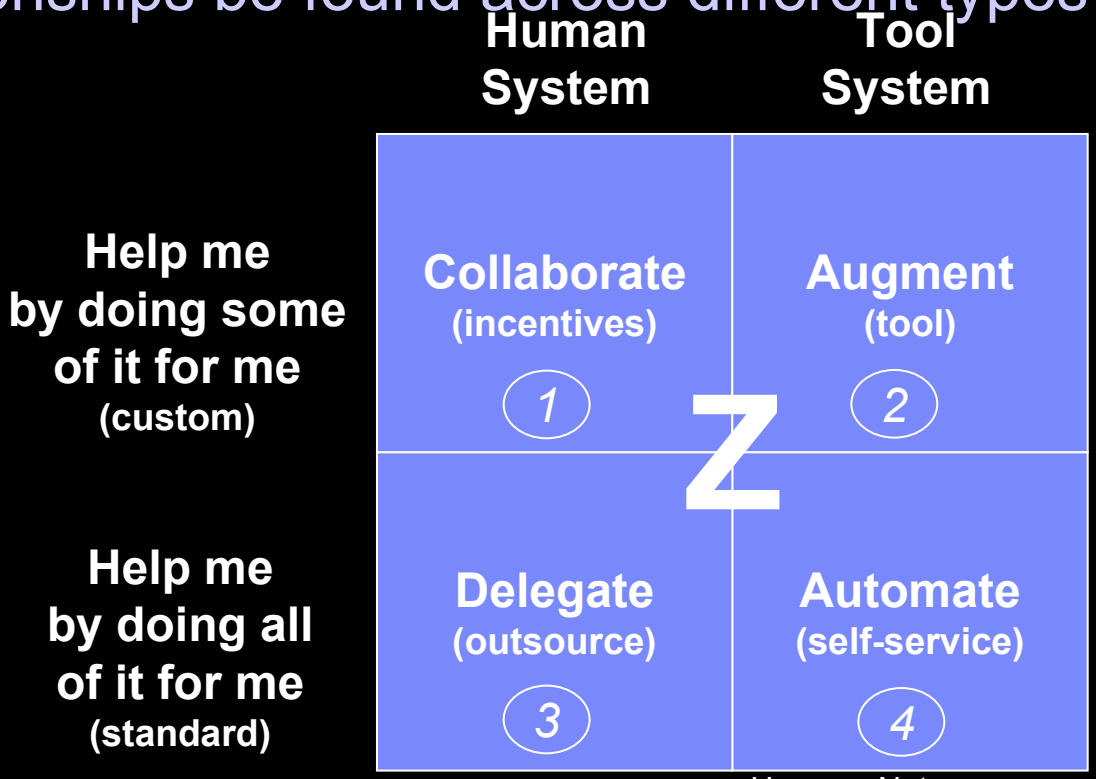
So, services are…

Pay for performance in which client and provider coproduce value

- High talent performance
  - Knowledge-intensive business services (business performance transformation services) (e.g., chef's, concert musicians)
- High support performance
  - Environment designed to allow average performer to provide a superior performance (average cook with great cook book and kitchen; average musician with a synthesizer)
- High tech performance
  - Computational services (e-commerce, self service – client does work)
  - Even here… talent builds, maintains, upgrades, etc. the technology
- Routine performance (sometime High Finance)
  - This is being automated, outsourced, labor arbitrage, financial arbitrage, migrated to high talent/value sectors, or otherwise being rationalized

© 2006 IBM Corporation

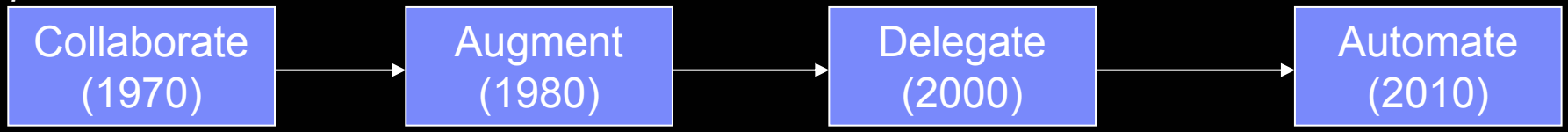
Service Science Core Questions: How do work systems reconfigure? What role does innovation play? Can integration relationships be found across different types of work system?



The choice to change work practices requires answering four key questions:

- **Should we? (Value)**
- **Can we? (Technology)**
- **May we? (Governance)**
- **Will we? (Priorities)**

Example: Call Centers



Experts: High skill people on phones

Tools: Less skill with FAQ tools

Market: Lower cost geography (India)

Technology: Voice response system

© 2006 IBM Corporation

High talent performance is on the rise in the US economy

95% of all scientists are alive today.

Type of work system	1979	1996			Example
		All	Services	Goods	
Tightly Constrained	6%	5%	4%	10%	Call center, Fast food
Unrationalized Labor Intensive	25%	25%	26%	15%	Maid, child care
Semi-Autonomous	35%	30%	30%	35%	Admin., Manager
High-skill Autonomous	34%	40%	40%	40%	Executive, Engineer

From Herzenberg, Alic, Wial (1998)

© 2006 IBM Corporation

The emerging challenges

- Many general challenges
  - Defining, measuring, and scoping services
  - Creating more case studies, especially IT & B2B cases (urgent need!)
    - Service “mind set” needed in curriculum reform
    - Especially, knowledge-intensive business services cases – sociotechnical systems evolution
  - Integrating across discipline boundaries
    - Jurisdiction and fundamental question – “coopetition” with other disciplines
    - Overcoming multidisciplinary stigma to find true leaders – future Herb Simon’s
  - Government and industry challenges
    - compiling accurate and meaningful industry data sets; sharing confidential data
    - patenting service innovations
  - Coordinating collaborator activities (government, industry, academic, non-profit)
    - especially motivating funding from government agencies, industry, non-profit

- Five key science and research challenges
  - Challenge 1: Empirical frameworks needed
  - Challenge 2: Analytic framework needed
  - Challenge 3: Engineering framework needed
  - Challenge 4: Theoretical framework needed
  - Challenge 5: Multidisciplinary Design framework needed

© 2006 IBM Corporation

Getting systematic about service innovations

- Improve back stage provider or client productivity: Applying six sigma, process re-engineering, and other transformation activities to the back stage. Function of costs of activities, including costs of unwanted variance.
- Improve front stage scope: Expanding the scope of front stage services – addressing more or better the custom requests of clients, as well as exploiting more of the unique capabilities of providers. Function of value of needs, including enabling new capabilities.
- Improve coordination: Standardize processes and interactions. This can boost quality (compliance) and productivity. Function of scale, complexity, and uncertainty in the system.
- Improve dynamic evolution: Continuously migrate provider-client pairs to higher value creation and capture points on an on-going basis. Function of time. Systematically move lectures into eLearning systems improve productivity of learning, and quality screening for problem-based learning.
- Improve capabilities of people, organizations, institutions or technologies to enter into higher value creation and capture configurations. Function of systems productive capacity – innovating new capabilities (incremental, radical, and super-radical innovations).

© 2006 IBM Corporation

Services: Client pays provider for a performance or promise of a performance. The client and provider share responsibility for coproduction of value within the boundaries of the relationship (aspire to "win-win").

- Performance: Activities that transform the state of something.
- Coproduction relationship: A relationship in which goals/work responsibilities and risks/rewards are shared, with an explicit or tacit contract defining initial/intermediate/ongoing/final states/results/effort/quality levels. External factors that might impact the relationship may or may not be enumerated. Third party partners may be involved in establishing, evaluating, and working front stage or back stage in the coproduction relationship.
- Front stage activities: Sometimes called the "moments of truth" in which client and provider directly interact. Pure services are mostly front stage. Variance in the front stage is largely due to the client's requests and actions, and provides opportunities to provide higher value services. Eliminating front stage variance can lead to standards and higher quality, but may also destroy a lot of high end value creation opportunities.
- Back stage activities: Both provider-side activities that do not directly involve the client, and client-side activities that do not directly involve the provider. Pure products are mostly back stage for providers (manufacturer). Six sigma is an effective method for eliminating unnecessary variance in the backstage, which leads from custom processes to standard processes.
- Services vary based on how much front-stage or back-stage activities are required, how custom or standard the activities are, and how client intensive or non-client intensive the activities are.
- Provider firms orchestrate or coordinate employees, partners, and clients in the coproduction of value. Some have referred to this as creating economies of coordination – simple to complex.

© 2006 IBM Corporation

Services

- Services include government, security, healthcare, education, financial, insurance, retail, wholesale, leisure, entertainment, information, communication, transportation, utilities, professional, and business services

- Characteristics of service systems
  - Service systems are made up of clients and providers interacting & investing effort to coproduce value
  - Clients and providers, especially businesses, care how much value is created & captures (coproduced), quality, productivity, experience
  - Clients can play greater (self service) or lesser roles during performance
  - Clients and providers as economic entities with preferences, capabilities, assets, relationships, roles, and unique histories are transformed by the nature of the service experience
  - The primary output of the service performance is always transformed clients and providers – assets, preferences, capabilities, relationships, roles, history

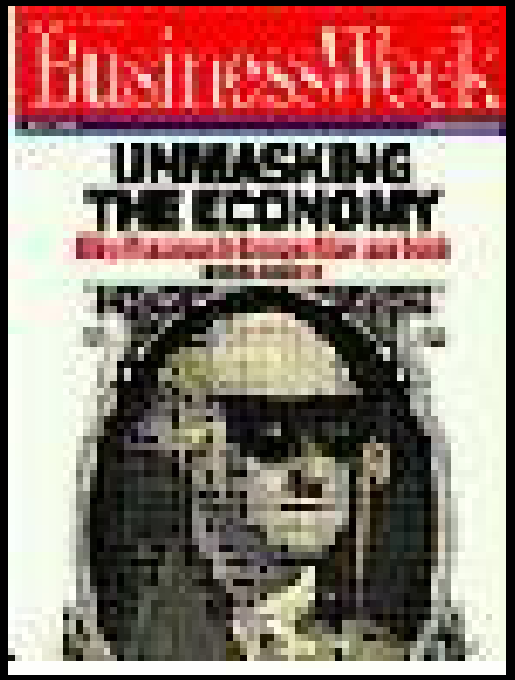
© 2006 IBM Corporation

Intangibility of services…

Big Companies Go Intangible

Companies are putting more emphasis on R&D and less on capital investment. Since 2000, the "intangibility index"—the ratio of R&D to capital spending, multiplied by 100—has risen for 9 of the 10 biggest U.S. companies that report R&D

COMPANY	INTANGIBILITY INDEX* 2000	LATEST**
EXXONMOBIL	5.1	4.4
GE***	73.6	100.7
MICROSOFT	429.1	761.6
PROCTER & GAMBLE	62.9	89.0
PFIZER	211.0	295.4
JOHNSON & JOHNSON	183.8	239.2
ALTRIA	32.0	42.3
CHEVRONTEXACO	2.2	2.9
INTEL	58.4	88.4
IBM	95.6	129.9
ALL 10	56.8	79.1



© 2006 IBM Corporation

Services Businesses are "People Businesses"

RANK	COMPANY	INDUSTRY	($ billion 2003) REVENUE
1	IBM Global Services*	IT services	42.6
2	UPS	Postal and courier	33.5
3	Deutsche Post World Net*	Postal and courier	30.5
4	FedEx	Postal and courier	24.7
5	Hospital Corporation of America	Hospital management, health care	21.8
6	EDS	IT services	21.5
7	Compass Group	Contract catering	18.4
8	Deloitte Touche Tohmatsu	Accounting, consulting	16.4
9	PricewaterhouseCoopers	Accounting, consulting	16.3
10	Bechtel	Oil, engineering, industrial	16.3
11	Halliburton	Oil, engineering, industrial	16.3

- Barber & Strack (2005, June). The surprising economics of a "people business." *Harvard Business Review.*

© 2006 IBM Corporation

Service jobs are increasingly the High Skill knowledge worker jobs – especially in business and information services

	1979	1996			Example
		All	Services	Goods	
Tightly Constrained	6%	5%	4%	10%	Call center, Fast food
Unrationalized Labor Intensive	25%	25%	26%	15%	Maid, child care
Semi-Autonomous	35%	30%	30%	35%	Admin., Manager
High-skill Autonomous	34%	40%	40%	40%	Executive, Engineer

-from Herzenberg, Alic, & Wial (1998). *New rules for a new economy. Employment and opportunity in postindustrial America.* Cornell University Press.

© 2006 IBM Corporation

More Examples… by Industry…

	Government & security	Health & education	Financial & insurance	Professional & business	Information & communication	Retail & wholesale	Leisure & hospitality	Transportation & utilities
High skill	executive, judge	doctor, professor, dean	broker, partner	executive, lawyer, scientist, engineer, architect, entrepreneur	executive, engineer	executive, proprietor	producer, director, proprietor, designer, star athlete performer	pilot, executive, engineer
Semi-autonomous	legislator, policy researcher, patent analyst	pharmacist, nurse, teacher, technician	analyst, actuary, underwriters	manager, accountant, HR, PR, marketing, business dev	technician, system administrator, journalist, writer, announcer	buyer, high end sales	actor, performer, artist, technician	attendant, maintenance technician, plumber, electrician
Unrationalized labor intensive	police, firefighter, security guard	nurses aid, day care worker, ambulance driver	adjustors, auditor, investigators	admin. assistant, hiring specialist, door to door sales	call center specialist, librarian	sales clerk, stocker, shipping & receiving	maid, janitor, waiter, gardener, cook, barber	truck driver, field force technician, machine operator
Tightly constrained	inspectors, data entry	data entry	bank teller, check proofers	inspectors, receptionist	telephone operator	sales counter clerks	fast food worker	inspectors
Client	citizen, plaintiff, defendant, inventor	patient, student, subscriber	shareholder, client, subscriber	client	subscriber	consumer, shopper	guest	subscriber, commuter

- based on Herzeberg et al, (1998). All occupations span a range, placement is representative only.

© 2006 IBM Corporation

Trend 1: Rise of the Service Economy

Service sector has rapidly grown in US (70% of labor force)

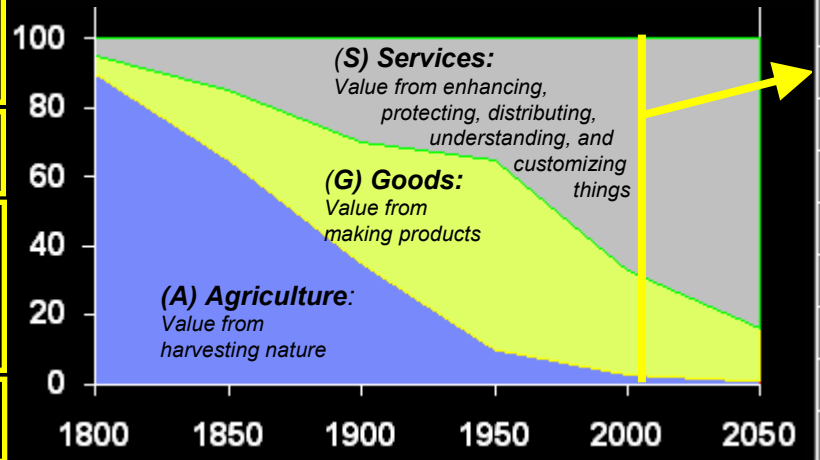
Other nations are following the same pattern (urbanization, infrastructure, and business growth drive the shift)

Service sector buys 80% of the $2.1T IT annual spend (worldwide)

Four service industries are large and growing their IT spend rapidly to transform processes: financial and information, professional and business, retail and wholesale, and government

IT spend contributes to rapid growth of productivity (GDP/Jobs) as well

% US Labor Force by Sector



Top Ten Labor Forces by Size

(WW 50% Agriculture., 10% Goods, 40% Services)

Nation	% Pop	% 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	NA
Banglad.	2.2	63	11	26	NA
Germany	**1.4**	**3**	**33**	**64**	**44**

	U.S. Economy by Industries 2002 (Jobs, Value Add GDP, CAGRs)	Jobs (M)	CAGR	GDP ($B)	CAGR	GDP/ Jobs ($)	CAGR
A	Agriculture (incl. forestry, fishing)	2.245	-1.6	99	-0.9	43920	0.7
G	Goods (Manufacturing)	22.551	0.3	1922	1.7	85233	1.4
S	**Government (Federal & Local)**	**21.489**	**1.1**	**1327**	**4.9**	**61739**	**3.8**
S	**Retail & Wholesale**	**20.688**	**1.2**	**1399**	**5.0**	**67126**	**3.8**
S	Education & Health	16.184	2.8	793	5.0	49005	2.1
S	**Professional & Business**	**16.010**	**2.7**	**1220**	**5.7**	**76215**	**2.9**
S	Leisure & Hospitality	11.969	1.7	371	5.0	31039	3.2
S	**Financial & Information**	**11.263**	**1.5**	**2610**	**6.0**	**231706**	**4.4**
S	Transportation & Warehousing	4.205	2.0	295	1.9	70130	-0.1
S	Utilities & Other	6.705	1.3	1455	3.8	67405	2.5
	Services (subtotal)	108.513	1.8	8460	5.4	77964	3.5

	Worldwide IT Spend Business Process Transformation Services ($2.1T 2004)	BPTS ($1.4T)	Non-BPTS ($0.7T)	CAGR
A	Agriculture (incl. forestry, fishing)	NA		NA
G	Goods (Manufacturing)	20%		4
S	**Government (Federal & Local)**	**13%**		**5**
S	**Retail & Wholesale**	**9%**		**4**
S	Education & Health	6%		5
S	**Professional & Business**	**8%**		**6**
S	Leisure & Hospitality	NA		NA
S	**Financial & Information**	**36%**		**4**
S	Transportation & Warehousing	4%		4
S	Utilities & Other	4%		5
	Services (subtotal percentage)	80%		5

© 2006 IBM Corporation

Trend 2: Rise and Shift in Service Research

Academic centers have slowly increased over the past 20 years to advance the practical and theoretical knowledge of services businesses

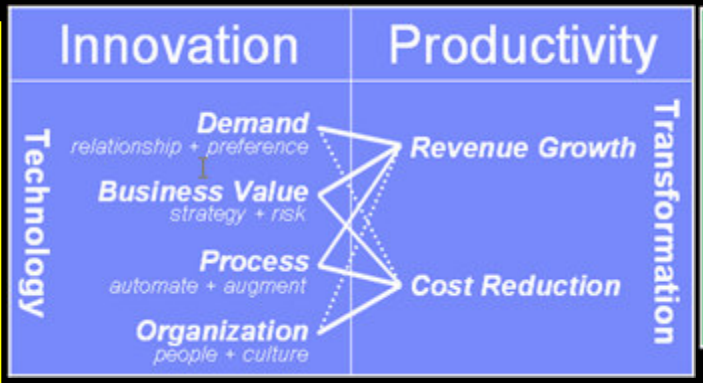
Initially, the emphasis in service research and teaching was on B2C capacity and demand models – because underutilized capacity hurts productivity. Also demand that is simply waiting in queues may be lost or damage client satisfaction. Service places like banks, airports, hotels, etc.

Increasingly over the past ten years, the new frontier of service research and teaching has shifted more and more towards B2B business process transformation models. Process re-engineering, IT productivity paradox, and other case studies highlight the need to constantly redesign work to improve productivity through multiple types of innovation (demand, business value, process, and organization)

Service research and practice agree that effective communication in service engagements depends on an appreciation of multiple factors: technology and process, business value and strategy, and organizational culture and people. With proper coordination between these per-spectives BPTS engagements succeed. A top adaptive work force requires people with a level of capability and familiarity in many relevant areas.

"The biggest costs were in changing the organization. One way to think about these changes is to treat the Organizational costs as an investment in a new asset. Firms make investments over time in developing a new process, rebuilding their staff or designing a new organizational structure, and the benefits from these Investments are realized over a long period of time." Eric Brynjolfsson, "Beyond the Productivity Paradox"

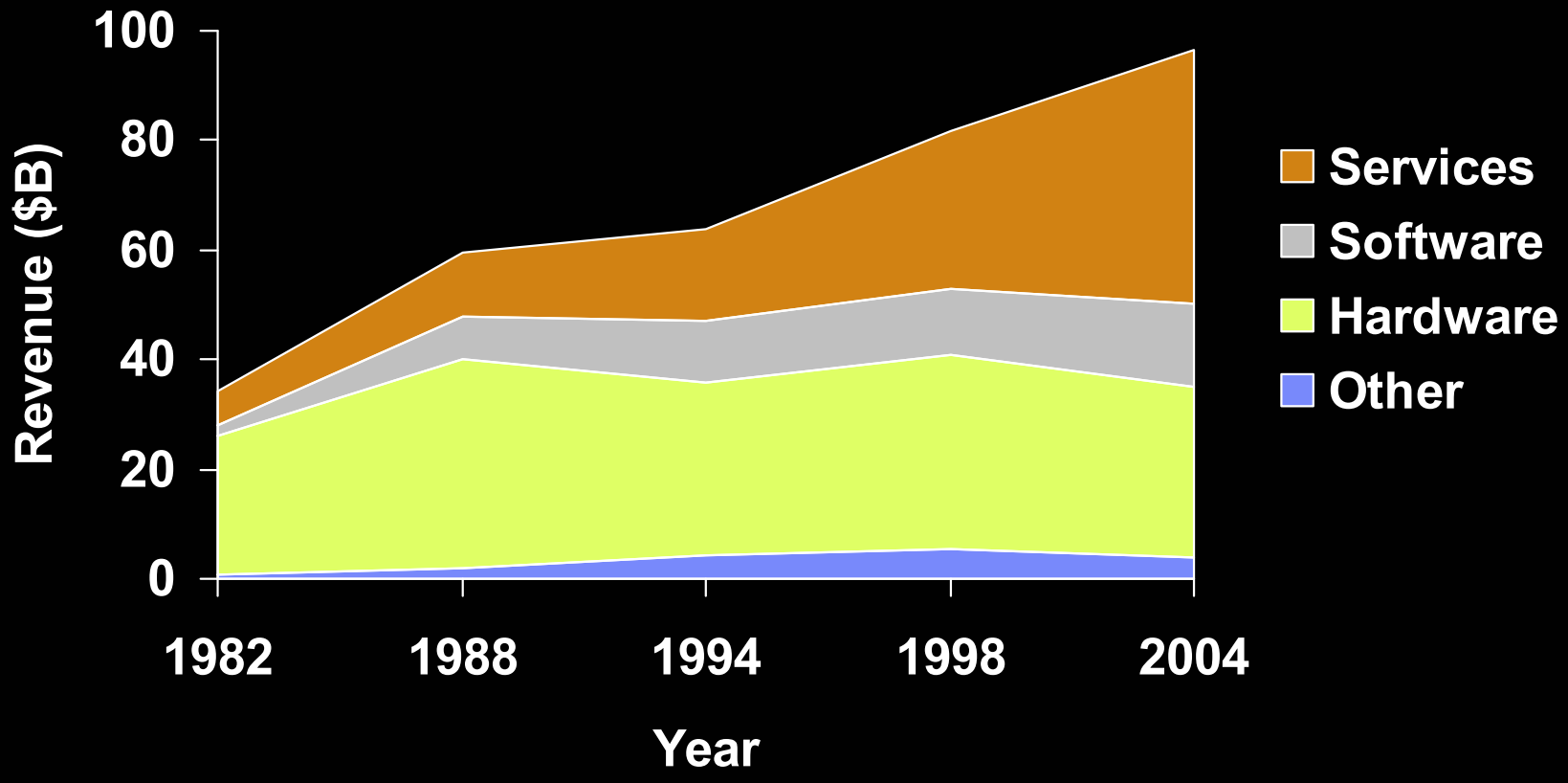
Part 3: Managing Service Operations
Chapter 10. Forecasting Demand for Services
Chapter 11. Managing Waiting Lines
Chapter 12. Queuing Models and Capacity Planning
Chapter 13. Managing Capacity and Demand
(Excerpt from Fitzsimmons & Fitzsimmons)



BPTS = Business Process Transformation Services

© 2006 IBM Corporation

Why does IBM care? Our growth depends on it



Complex business to business services enabled by IT advances drive economic growth
(BPTS = Business Performance Transformation Services)

© 2006 IBM Corporation