The Future of Service Science

Paul P. Maglio
IBM Almaden Research Center and UC Merced
October 8, 2008
Agenda

- What the heck is **service science** and why would we want it?
- What’s been going on with service science?
- What does the future look like for service science?
What the heck is Service Science or SSME(D)?

Service Science, Management, and Engineering (SSME) is a term introduced by IBM to describe Service Science, an interdisciplinary approach to the study, design, and implementation of services systems – complex systems in which specific arrangements of people and technologies take actions that provide value for others. More precisely, SSME has been defined as the application of science, management, and engineering disciplines to tasks that one organization beneficially performs for and with another.
What the heck is Service Science or SSME(D)?

Today, SSME is a call for academia, industry, and governments to focus on becoming more systematic about innovation in the service sector, which is the largest sector of the economy in most industrialized nations, and is fast becoming the largest sector in developing nations as well. SSME is also a proposed academic discipline and research area that would complement – rather than replace – the many disciplines that contribute to knowledge about service.
Service Science is about building common language

An analogy can be made with Computer Science. The success of CS is not in the definition of a basic science (as in physics or chemistry for example) but more in its ability to bring together diverse disciplines, such as mathematics, electronics and psychology to solve problems that require they all be there and talk a language that demonstrates common purpose.

Service Science may be the same thing, only bigger: an interdisciplinary umbrella that enables economists, social scientists, mathematicians, computer scientists and legislators (to name a small subset of the necessary disciplines) to cooperate to achieve a larger goal - analysis, construction, management and evolution of the most complex systems we have ever attempted to construct.
US House and Senate voted to approve on August 2\textsuperscript{nd}, 2007; President has signed.

**SEC. 1106. STUDY OF SERVICE SCIENCE.**

- (a) Sense of Congress- It is the sense of Congress that, in order to strengthen the competitiveness of United States enterprises and institutions and to prepare the people of the United States for high-wage, high-skill employment, the Federal Government should better understand and respond strategically to the emerging management and learning discipline known as service science.

- (b) Study- Not later than 270 days after the date of enactment of this Act, the Director of the Office of Science and Technology Policy, through the National Academy of Sciences, shall conduct a study and report to Congress regarding how the Federal Government should support, through research, education, and training, the emerging management and learning discipline known as service science.

- (c) Outside Resources- In conducting the study under subsection (b), the National Academy of Sciences shall consult with leaders from 2- and 4-year institutions of higher education, as defined in section 101(a) of the Higher Education Act of 1965 (20 U.S.C. 1001(a)), leaders from corporations, and other relevant parties.

- (d) Service Science Defined- In this section, the term `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.
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Service Science is emerging as a distinct field. Its vision is to discover the underlying logic of complex service systems and to establish a common language and shared frameworks for service innovation. To this end, an interdisciplinary approach should be adopted for research and education on service systems.

- **For education:** Enable graduates from various disciplines to become T-shaped professionals or adaptive innovators; promote SSME education programmes and qualifications; develop a modular template-based SSME curriculum in higher education and extend to other levels of education; explore new teaching methods for SSME education.

- **For research:** Develop an interdisciplinary and intercultural approach to service research; build bridges between disciplines through grand research challenges; establish service system and value proposition as foundational concepts; work with practitioners to create data sets to understand the nature and behaviour of service systems create modelling and simulation tools for service systems.

- **For business:** Establish employment policies and career paths for T-shaped professionals; review existing approaches to service innovation and provide grand challenges for service systems research; provide funding for service systems research; develop appropriate organisational arrangements to enhance industry-academic collaboration; work with stakeholders to include sustainability measures.

- **For government:** Promote service innovation and provide funding for SSME education and research; demonstrate the value of Service Science to government agencies; develop relevant measurements and reliable data on knowledge-intensive service activities; make public service systems more comprehensive and citizen-responsive; encourage public hearings, workshops and briefings with other stakeholders to develop service innovation roadmaps.
In 2006 the service sector’s share of global employment overtook agriculture for the first time, increasing from 39.5% to 40%. Agriculture decreased from 39.7% to 38.7%. The industry sector accounted for 21.3% of total employment.

- International Labour Organization


Fitzsimmons & Fitzsimmons (2008)
What the heck is service?

Utilities
Wholesale Trade
Retail Trade
Transportation and Warehousing
Information Services
Finance and Insurance
Real Estate and Rental
Professional and Technical Services
Management Services
Administrative and Support Services
Educational Services
Health Care and Social Assistance
Arts, Entertainment, and Recreation
Accommodation and Food Services
Public Administration Services
Other Service Industries

http://www.naics.com/
Goods-dominant logic

- Purpose of economic activity is to make and distribute units of output (or goods)

- Goods are embedded with utility (value) during manufacturing

- Goal is to maximize profit by efficient production and distribution of goods
  - goods should be standardized
  - produced away from the market
  - inventoried till demanded

Services are

- Value-enhancing add-ons for goods
- A particular (inferior) type good, characterized by
  - Intangibility
  - Heterogeneity (non-standardization)
  - Inseparability (of production and consumption)
  - Perishability

Service-dominant logic

- Service is the application of competences for the benefit of another entity
- Service is exchanged for service
- Value is always co-created
- Goods are appliances for service delivery
- All economies are service economies
- All businesses are service businesses

Service is the application of competence for the benefit of another entity.

- Service involves at least two entities, one applying competence and another integrating the applied competences with other resources and determining benefit (value co-creation).

- We call these interacting entities **service systems**.

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A. **Service Provider**
- Individual
- Organization
- Public or Private

B. **Service Client**
- Individual
- Organization
- Public or Private

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**Forms of Service Relationship**
(A & B co-create value)

**Forms of Service Interventions**
(A on C, B on C)

**Forms of Responsibility Relationship**
(A on C)

**Forms of Ownership Relationship**
(B on C)

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C. **Service Target:** The reality to be transformed or operated on by A, for the sake of B
- People, dimensions of
- Business, dimensions of
- Products, goods and material systems
- Information, codified knowledge

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Value depends on the capabilities a system has to survive and accomplish other goals in its environment. Taking advantage of the service another system offers means incorporating improved capabilities. Value can be defined as system improvement in an environment.

Experience and knowledge, and the experience and knowledge of others, provide hints as to what is reasonable to exchange for some new capability. But measuring exchange value this way — through human judgment and operationalized in the market — is not necessary for one system to provide value to another.

All ways that systems work together to improve or enhance one another’s capabilities can be seen as being value creating. Some organisms may have symbiotic relationships with others, completely dependent on one another for food, each dependent on capabilities the other provides. Neither may measure or judge explicitly what is exchanged, but each provides service for, and creates value with, the other nonetheless.


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New view of value-creation processes

With service processes, the customer provides significant inputs into the production process.
- Sampson & Froehle (2006)

The customer is always a co-producer.
Service-dominant logic requires a new view of processes.

Production process:
- The appointment process
- The anamnesis process
- The diagnostic process
- The treatment process

Preparations

Output:
- What was done to a patient

Outcome:
- What happened to a patient

Service event:
- Customer input and involvement

Patient episode

Health events


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Service system encounters: Agreements

- **Data**
  - Interviewed more than 25 Delivery Project Executives, Project Executives, Account Managers, Technology Solution Managers and Technology Solution Architects in service delivery.
  - Field visits to customer sites, met delivery team management and clients.
  - Collected and analyzed service delivery, contractual, and other documents.

- **Service-Level Agreement (SLA)**
  - A contract between provider and client specifying what will be done.
  - Penalties often apply for missed Service Level targets.
  - Performance measurements must be reported at specified intervals.

- **SLA performance measures are but one indication of account health.**
  - “The SLAs are green month after month, but my employees are complaining about IT service.” Quoted by Delivery Project Executive.
  - “It’s frustrating to me that when the SLAs are green month after month, no one pays any attention to them. You can’t see how hard we work to keep the SLAs green month after month. I wish there was a way to make this more visible.” Delivery Project Executive.
  - “I don’t care whose fault it is, when the cash registers aren’t working my business suffers.” Customer.

- **SLA performance recedes into the background when these measures remain relatively constant over time – but this doesn’t mean the delivery teams are not dealing with account problems.**

- **Full self-service isn’t what many clients want. They want their service provider to be proactive in providing client-specific info and analysis.**
  - “The SLA measures are great, but I don’t feel like I’m getting what I signed up for with my service provider. I want you guys to bring your IT expertise to be proactive and help me with my business problems.”
    - Quoted by Delivery Project Executive.

Agreements

- **Negotiation** and re-interpretation of information is at the core of meaning-making.

- No single window on service delivery performance.

- The meaning of information is negotiated in working and organizational relationships.

- Negotiating the meaning of IT performance is the ongoing work of client–provider collaboration.

- Tools and processes should support the often unacknowledged work of providing "transparent" views – producing good data, deciding what to expose, negotiating meaning.

Why
- Deliver non-obvious, game changing improvements to the work, technology and organizational structure / business process

What
- Engagement component (primary)
- Manage component (secondary)

How
- Examine individual work practices of SO engagement team members
- Analyze practices using socio-technical and service system perspectives
- Identify key issues and challenges in how work is performed today
- Deliver descriptions, explanations, and potential interventions and solutions

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How current process elements map to the nature of the work

1. Initialize engagement
2. Requirements review
3. Design solution
4. Develop & document solution
5. Develop cost case
6. Final reviews
7. Due diligence
8. Develop client deliverables
Interactions are key

- As more 21st century companies come to specialize in core activities and outsource the rest, they have greater need for workers who can interact with other companies, their customers, and their suppliers.

- The traditional organization, where a few top managers coordinate the pyramid below them, is being upended.

- Raising the productivity of employees whose jobs can’t be automated is the next great performance challenge – and the stakes are high.

- Companies that get that right will build complex talent-based competitive advantages that competitors won’t be able to duplicate easily – if at all.

Distributed Cognition and Joint Activity in Computer-System Administration

Paul P. Maglio, Eser Kandogan, Ehren Haber
IBM Almaden Research Center

Troubleshooting large computer systems is often highly collaborative. Because these systems consist of complex infrastructures with many independent components, expertise is spread across people and organizations. Those who administer such systems are faced with cognitive and social challenges, including the establishment of common ground and coordination of attention, as they troubleshoot in collaboration with peers, technical support, and software application developers. We take a distributed cognition approach to interpreting a specific instance of problem-solving in administering a web-based system, examining the movement of representational state across media in a single system administrator's environment. We also apply the idea of language use as joint activity to understand how discourse attributes affect what is accomplished collaboratively. Our analysis focuses on information flow among participants and other sources, and how these affect what information is attended to, transmitted, and used.

1 Introduction

Millions of users of online services such as banking and shopping rely on instant transactions, round-the-clock access, and foolproof record keeping. The computer system infrastructures needed to support such applications consist of diverse components, such as database management systems, web servers, and application servers, all of which must work together in a complex way to deliver fault-tolerant, scalable, secure applications. Yet with such systems increasing in both size and complexity, manageability is quickly becoming a significant obstacle to system administration: Administration who install, configure, maintain, and support such systems must handle larger and more complex tasks (Anderson 2002; Woods 1988).

Field Studies of Computer System Administrators: Analysis of System Management Tools and Practices


ABSTRACT

Computer system administrators use a number of tools for the administration of their work, but there is little research on how these tools are used, and how they affect the practices of administration. We conducted a series of field studies of large computer information system administrators in an ongoing investigation of their practices. In this paper, we draw from two data sources: administration tool use data in a partial log file, and informal interviews conducted with the same administrators. We find that the way in which system administrators use tools is heavily influenced by the characteristics of the tools themselves, and by the context in which these tools are used.

Keywords

System Administration, Collaboration, Computer-Supported Collaborative Work

1. INTRODUCTION

System administrators are now responsible for the management of complex, distributed, и internet-connected computer systems. The performance of their jobs is highly dependent on the tools that they use. In this paper, we explore the use of tools by system administrators, focusing on the tools that they use to manage the activities of their computer systems.

M. S. Ackerman, C. Halverson, T. Erickson, & W. A. Kellogg (Eds.), Resources, co-evolution, and artifacts: Theory in CSCW. New York: Springer.
What do system administrators do?

- They communicate, with one another, with clients
- Environments are complex and idiosyncratic
- Social, organizational, and business factors matter
- System tool changes don’t address their real activities

Jobs and tasks are changing

Based on U.S. Department of Labor’s Dictionary of Occupational Titles (DOT)

Distribution of Educational Degrees in IBM (2004)

- Services
  - Science Engineering
  - Business
  - Social Science
    - Humanities
    - Arts

- Software & Systems
  - Science Engineering
  - Business
  - Social Science
    - Humanities
    - Arts

- Research
  - Science Engineering
  - Research
Service Science skills, abilities, and knowledge

T-shaped professionals are in high demand because they have both depth and breadth.

They combine expert thinking (depth in one or more areas) and complex communications (breadth across many areas).

Cross-disciplinary communication
- Service system design, management, and modeling
- Value co-creation analysis
- Service lifecycle analysis (for quality assurance)
- Service supply and demand management
- New service development
- Business project management
- Business case development and analysis
- Organizational change management
- Marketing and sales
- Creative and critical thinking
- Communication skills
- Leadership and collaboration skills

Wendy Murphy & Bill Hefley, "What's new in service science, management, and engineering?" Presented at Frontiers in Service Conference, October 2008

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Real Business Problem

- Where to locate the people providing the services?

- Key differences from “product” location problem include
  - Cost structure
  - Perishable capacity
  - Simultaneous needs for a set of people of different types

Given the demand of customers in a geographic region
Profit is determined by travel cost.

Center of competency approach has economy of scale advantages, e.g.,
- Equipment
- Knowledge management
- Administration

These can be modeled using the labor rate per person.

$w = \text{difference in travel costs between the cases 10-0-0-10 & 5-5-5-5}$

$w/5 = \text{min. average labor rate decrease per person for center of competency approach to be cost effective}$
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Service Science educational programs are emerging

Undergraduate
1. Mich Tech
2. Singapore Mgmt

Graduate concentration
3. Karlstads U
4. NCSU MBA
5. NCSU MSCN

Graduate
6. Carnegie Mellon
7. Helsinki Polytec
8. Peking U
9. Portland State
10. Rochester Inst T
11. RMIT
12. Scuola santAnna
13. Stevens
14. U del Salvador
15. U Bridgeport
16. U Buffalo
17. U Exeter
18. U Manchester
19. U Trento
20. U Pavia

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Information and Service Design (ISD) program was established at UC Berkeley's School of Information in 2007 to provide a focus for teaching and research on the skills and concepts required by a service-led and information-powered economy. Our major activities include:

- The ISD program runs a Clinic where students gain hands on experience in information service design and consultant practice.
- The ISD program has research initiatives in mobile and location-based services, and systems that facilitate collaboration and knowledge sharing among professional communities.
- The ISD program works to advance service research by hosting a lecture series, organizing an annual symposium, and by hosting visiting scholars. The ISD program also encourages collaboration with other academic, nonprofit, and commercial partners.

http://isd.ischool.berkeley.edu/
Minor in Services Science

The economies of most developed countries are dominated by services, as more than 75% of employment, gross domestic product, and many other macroeconomic measures attributable to the service sector. Even traditional manufacturing companies such as GE (70% services revenue) and IBM (50% services revenue) are adding high-value services to grow their businesses. Information services and business services are two of the fastest growing segments of the service economy. The rise of web services, service-oriented architectures, and self-service systems suggest a strong relationship between the emerging disciplines related to services and the more established discipline of computer science. Improving productivity in services often requires combining technical, social, and business innovations and effective combinations of these often develop naturally together. Cross-disciplinary knowledge and skills relevant to services now seem necessary for most college graduates. The minor in Services Science aims to provide these skills by drawing together cross-disciplinary courses to understand services from management, economics, engineering, and/or cognitive science perspectives. The minor comprises a specific course in services, several service-related courses taken outside the student’s major area, and a project course in which student teams conduct research on aspects of the service sector.

Requirements:

1. MGMT 150 (Services Science and Management)
2. One upper division MGMT project course.
3. Three additional courses, one from each of the following areas (at least two must be upper division): COGS, ECON, CSE.

1. All requirements are for informational purposes only. Please consult the current UC Merced catalog, or your advisor for official requirements.
MGMT 150/COGS 152: What will you learn?

You will learn about service. You will learn what service is, why it is different from other sectors and other jobs, and why it is important. You will learn about problems in service, such as measuring performance, increasing quality, and creating innovation. You will learn how some have recently begun to study service from a variety of different perspectives – including social sciences, cognitive science, management, engineering, and others – to address these problems. You will learn how interdisciplinary research might be effective in studying and understanding service. In the end, you will be able to have an informed and intelligent conversation about the nature of service, how to think about measurement in service, and how to increase innovation in service. And you will be (at least a little more) ready for the workforce you are about to enter.

http://faculty.ucmerced.edu/pmaglio/mgmt150.html
Progress Toward Service Science…

- **Education**
  - 198 courses, programs, or degrees established in 42 countries
  - 12 centers, seminars, or groups established

- **Government**
  - 11+ programs for service research and education in 11 countries
  - $1B+ committed worldwide

- **Industry**
  - SRII established to promote service research and innovation agenda, with $1M in funding from IBM, Oracle, Xerox, Microsoft and others

- **Associations**
  - AIS – Service Science SIG
  - INFORMS – Service Science Section
Service Science Research Centers

- University of Glasgow, Service Innovation Research Center
- Karlsruhe Service Research Institute
- University College Dublin, Institute of International Services Innovation
- Russia’s State University of Management SSME Education and Research Programs
- Tohoku University, University of Tsukuba, Tokyo Institute of Technology, Kyoto University, Seibu Bunri University, Meiji University Fostering Service Innovation joint program
- Karlstad Service Research Center
- Thailand’s SIT Center of Excellence for Service Science
- Virginia Tech, Center for Service, Quality and Innovation
- Berkeley Center for Information Technology Research in the Interest of Society (CITRUS)
- Carnegie Mellon – IT Services Qualification Center
Welcome

The Karlsruhe Service Research Institute (KSRI) develops concepts, methods and technologies for innovators and decision makers, to generate and utilize economic value in a more and more "services-led economy".

We are employing a holistic, interdisciplinary approach to solve business relevant problems along the dimensions "people", "organisation", "information" and "technology".

News

30 April 2008 KSRI receives visit from Thailand
A delegation of the Sirindhorn International Institute of Technology (SIIT) has spent a one day visit to the KSRI. Both parties are now planning a closer cooperation, focusing on the area of "Service Science Management and Engineering" (SSME). You can find more here.

14 April 2008 WiWi-Talents Program
In cooperation with named partners from economy and science WiWi-online is searching for talented students of Business Sciences, Economics or Business Mathematics. Candidates are expected to show excellent performance in their studies as well as extra-curricular commitment, combined with goal-oriented career planning. You can find more information here.

09 April 2008 IBM seeking to employ student trainees
You are a student of Computer Science or Information Engineering and Management? You are interested in semantically backed modelling of complex IT services and are looking for a nine month employment as a student trainee from April or May 2008? Then continue to read here (partially in German). Old News
Center for Service Management & Engineering, (CSME)

Breakthrough initiative: Launching in collaboration with IBM, Research Centre for Service Management and Engineering, first of its kind in the world.

S P Jain Institute of Management and Research launched the Center for Service Management & Engineering, (CSME), in collaboration with IBM, at the institute’s campus on the 16th of July 2008 in response to the growing importance of services in the world economy. SPJIMR has a rich tradition of applying knowledge to real-life management problems and thereby helping the society on the different walks of life. On the other hand, IBM brings in the rich experience in leading service delivery across the globe on every possible business function.

"Employment growth will be concentrated in the services sectors of the global economy. Service design, development, marketing, and delivery all require methods to make service businesses more efficient and scalable. Practitioners need depth and breadth in combinations of technology, business, and organizational studies. As a forward thinking institution, advocating pedagogical innovations based on commitment to simple but practical objectives, namely 'influencing practice' and 'promoting value-based growth', we at S P Jain are delighted to partner IBM towards nourishing productivity, quality, and learning and innovation rates across the service sector," commented M L Srikanth, Dean, S.P. Jain Institute of Management and Research at the launch of the Centre.

The center will simulate and analyze innovative service delivery related processes, people and other resources in areas of Manufacturing, Retail, Telecom, Banking & Financial Services and Technology Services. This centre also has an objective of addressing the gap of a formal practice and education in Services Science Management and Engineering (SSME) for the services innovation led economy of the 21st century.
# Service Science

## Discipline Classification System

### A. General
1. Service Science Education
2. Research in Service Science
3. Service Science Policy
4. History of Services
5. Case Studies
6. Miscellaneous

### B. Service Foundations
1. Service Theory
2. Service Philosophy
3. Economics of Services
4. Theoretical Models of Services
5. Mathematical Models of Services
6. Service Complexity Theory
7. Service Innovation Theory
8. Service Foundations Education

### C. Service Engineering
1. Service Engineering Theory
2. Service Operations
3. Service Standards
4. Service Optimization
5. Service Systems Engineering
6. Service Supply Chains
7. Service Engineering Management
8. Service Systems Performance
9. Service Quality Engineering
10. New Services Engineering
11. Computer Services
12. Information Technology Services
13. Service Engineering Education

### D. Service Management
1. Service Marketing
2. Service Operations
3. Service Management
4. Service Lifecycle
5. Service Innovation Management
6. Service Quality
7. Human Resources Management
8. Customer Relationship Management
9. Services Sourcing
10. Services Law
11. Globalization of Services
12. Service Business Education

### E. Human Aspects of Services
1. Service Systems Evolution
2. Behavioral Models of Services
3. Decision Making in Services
4. People in Service Systems
5. Organizational Change in Services
6. Social Aspects of Services
7. Cognitive Aspects of Services
8. Customer Psychology
9. Education in Human Aspects of Services

### F. Service Design
1. Service Design Theory
2. Service Design Methodology
3. Service Representation
4. Aesthetics of Services
5. Service Design Education

### G. Service Arts
1. Service Arts Theory
2. Traditional Service Arts
3. Performance Arts
4. History of Service Arts
5. Service Arts Education

### H. Service Industries*
1. The Service Industry
2. Utilities
3. Wholesale Trade
4. Retail Trade
5. Transportation and Warehousing
6. Information Services
7. Finance and Insurance
8. Real Estate and Rental
9. Professional and Technical Services
10. Management Services
11. Administrative and Support Services
12. Educational Services
13. Health Care and Social Assistance
14. Arts, Entertainment, and Recreation
15. Accommodation and Food Services
16. Public Administration Services
17. Other Service Industries

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Call to Create National Service Innovation Roadmaps (SIR) Reports

Service Innovation
- Growth in service GDP and jobs
- Service quality & productivity
- Environmental friendly & sustainable
- Urbanisation & aging population
- Globalisation & technology drivers
- Opportunities for businesses, governments and individuals

Service Systems
- Customer-provider interactions that enable value cocreation
- Dynamic configurations of resources: people, technologies, organisations and information
- Increasing scale, complexity and connectedness of service systems

Service Science
- To discover the underlying principles of complex service systems
- Systematically create, scale and improve systems
- Foundations laid by existing disciplines
- Progress in academic studies and practical tools
- Gaps in knowledge and skills

Stakeholder Priorities

Education
- Skills & Mindset

Research
- Knowledge & Tools

Business
- Employment & Collaboration

Government
- Policies & Investment

The white paper offers a starting point to -

Develop programmes & qualifications

Encourage an interdisciplinary approach

Develop and improve service innovation roadmaps, leading to a doubling of investment in service education and research by 2015

Glossary of definitions, history and outlook of service research, global trends, and ongoing debate

“Succeeding through Service Innovation” Whitepaper: A Framework for Progress
(http://www.ifm.eng.cam.ac.uk/ssme/)

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Service is the application of competence for the benefit of another entity.

- A **service system** is a dynamic value co-creation configuration of resources, including people, organizations, shared information (language, laws, measures, methods), and technology, connected to other service systems by value propositions.

A. **Service Provider**
   - Individual
   - Organization
   - Public or Private

B. **Service Client**
   - Individual
   - Organization
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Forms of **Service Relationship**
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C. **Service Target**: The reality to be transformed or operated on by A, for the sake of B
   - People, dimensions of
   - Business, dimensions of
   - Products, goods and material systems
   - Information, codified knowledge

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Resources are the building blocks of service systems

<table>
<thead>
<tr>
<th>First foundational premise of service science:</th>
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<tbody>
<tr>
<td>Service system entities dynamically configure four types of resources</td>
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<tr>
<td>The named resource is Physical or Not-Physical (physicists resolve disputes)</td>
</tr>
<tr>
<td>The named resource has Rights or No-Rights (judges resolve disputes within their jurisdictions)</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Physical</th>
<th>Rights</th>
<th>No-Rights</th>
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<tbody>
<tr>
<td>1. People</td>
<td>2. Technology</td>
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<table>
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<tr>
<th>Not-Physical</th>
<th>Rights</th>
<th>No-Rights</th>
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<tbody>
<tr>
<td>3. Organizations</td>
<td>4. Shared Information</td>
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operant operand

Formal service systems can contract
Informal service systems can promise/commit

**Trends & Countertrends (Evolve and Balance):**
- Informal <> Formal
- Social <> Economic
- Political <> Legal
- Routine Cognitive Labor <> Computation
- Routine Physical Labor <> Technology
- Transportation (Atoms) <> Communication (Bits)
- Qualitative (Tacit) <> Quantitative (Explicit)
Value propositions are the building blocks of service system networks

**Second foundational premise of service science:**

Service system entities calculate value from multiple stakeholder perspectives

A value proposition can be viewed as a request from one service system to another to run an algorithm (the value proposition) from the perspectives of multiple stakeholders according to culturally determined value principles.

The four primary stakeholder perspectives are: customer, provider, authority, and competitor.

<table>
<thead>
<tr>
<th>Stakeholder Perspective (the players)</th>
<th>Measure Impacted</th>
<th>Pricing Decision</th>
<th>Basic Questions</th>
<th>Value Proposition Reasoning</th>
</tr>
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<tbody>
<tr>
<td>2.Provider</td>
<td>Productivity (Profit)</td>
<td>Cost Plus</td>
<td>Can we? (deliver it)</td>
<td>Model of self: Does it play to our strengths? Can we deliver it profitably to customers? Can we continue to improve?</td>
</tr>
<tr>
<td>3.Authority</td>
<td>Compliance (Taxes and Fines)</td>
<td>Regulated</td>
<td>May we? (offer and deliver it)</td>
<td>Model of authority: Is it legal? Does it compromise our integrity in any way? Does it create a moral hazard?</td>
</tr>
<tr>
<td>4.Competitor (Substitute)</td>
<td>Sustainable Innovation (Market share)</td>
<td>Strategic</td>
<td>Will we? (invest to make it so)</td>
<td>Model of competitor: Does it put us ahead? Can we stay ahead? Does it differentiate us from the competition?</td>
</tr>
</tbody>
</table>
Access rights are the building blocks of service system ecology

Third foundational premise of service science:

The access rights associated with customer and provider resources are reconfigured by mutually agreed to value propositions relationships

Access rights
- Access to resources that are owned outright (i.e., property)
- Access to resources that are leased/contracted for (i.e., rental car, home ownership via mortgage, insurance policies, etc.)
- Shared access (i.e., roads, web information, air, etc.)
- Privileged access (i.e., personal thoughts, inalienable kinship relationships, etc.)

service = value-cocreation

Provider

S (substitute)

Competitor

Customer

Authority

provider resources

Customer resources

 Owned Outright
 Leased/Contract
 Shared Access
 Privileged Access

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Grand Challenge: Laws of Service?

- Computational power doubles at a predictable rate.
- Are there analogous capability-doubling laws that apply in services?
- Suppose that traces of human activity in particular service systems double at some rate, and that these human activity data lead to specific opportunities for improved or increased service productivity or quality.
- Consider Amazon.com: The quality of recommendations depends on accurate statistics – the more purchases made, the better the statistics for recommendations.
- Three improvement “laws” that might be applicable in services:
  - The more an activity is performed (time period doubling, demand doubling), the more opportunities to improve.
  - The better an activity can be measured (sensor deployment doubling, sensor precision doubling, relevant measurement variables doubling) and modeled, the more opportunities to improve.
  - 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.
Understanding service systems

- **Service**
  - Service is the application of competences for the benefit of another entity

- **Service System**
  - Value co-creation configurations of integrated resources: people, organizations, shared information and technology

- **Service Science**
  - Service science is the systematic study of service and service systems

- **SSME**
  - SSME is a discipline that brings together scientific understanding, engineering principles, and management practices to design, create, and deliver service systems
Service Science, Management, and Engineering

What is SSME?

Service Science, Management and Engineering (SSME) is a new multi-disciplinary research and academic effort that integrates aspects of established fields such as computer science, operations research, engineering, management sciences, business strategy, social and cognitive sciences, and legal sciences.

Global markets are shifting from agriculture and manufacturing to service-based economies and the U.S. Bureau of Labor Statistics' employment projections forecast that employment growth will continue to be concentrated in the service providing sector of the economy. With major industrialized nations now more than 75% services and developing nations close behind, governments and industry need talent and skills in the service area.

Service design, development, marketing and delivery all require methodologies and techniques to make service businesses more efficient and scalable. Both depth and breadth is needed in technology, business, and organizational studies, even at the undergraduate level.

The goal of the SSME discipline is to make productivity, quality, sustainability, learning rates and innovation rates more predictable across the service sector. We hope the resources on this site help you to better understand and to engage in the evolving Service Science, Management and Engineering discipline.

SSME roadmap

Service as a science is evolving. The call-to-action for a multi-year project has been heard. Over time, we will make more materials available to you for the development of courses, case studies and degree curricula. In the meantime, here are some steps you can take to begin the journey into Service Science, Management, and Engineering:

1. Learn about service as a science
   - Visit the SSME IBM Research Web site
   - Visit the Service Research & Innovation Initiative (SRII) Web site
   - Read selections from the recommended reading list
   - Attend SSME-related conferences
   - Use service-related materials to create your own coursework

Related blogs

- Jim Spohrer on SRII.Net Services Innovation Community
- Scott Sampson on Services Management Archive

IBM Academic Initiative | Skills for the 21st century
The Future of Service Science

Paul P. Maglio
IBM Almaden Research Center and UC Merced
October 8, 2008