

Bill Hefley  
Wendy Murphy  
*Editors*

Service Science: Research and Innovations In the Service Economy

# Service Science, Management and Engineering

Education for the 21<sup>st</sup> Century

 Springer

Bill Hefley and Wendy Murphy (Eds.)

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# Service Science: Research and Innovations in the Service Economy

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## Preface

If you look at IBM's business last year, services revenues were roughly over 50%, while systems (hardware) and software revenues were around 25% and 20% respectively. But services constituted around one-third of the company's profit, for a very simple reason. Systems and software products leverage technology assets and apply engineering principles to improve quality, scale-up capacity, and achieve higher productivity and profit margins. Services, on the other hand, have historically been significantly more labor-based, less prone to economies of scale, subject to higher quality variations, and generally less productive and profitable.

The picture is similar across most businesses around the world. Services are an increasing portion of their revenues, but they are more labor-intensive than their product-based revenues and therefore not as profitable.

Another way to appreciate the increased importance of services is to look at the three main sectors into which economies are usually grouped - the service, industrial and agriculture sectors. The service sector already accounts for more than 75% of the labor force in the US and UK, with the industrial sector being around 20% and agriculture in low single digits. In other developed countries like Japan, Germany and France, services are more than two thirds of the labor force, and in Brazil, Russia and South Korea they are well over fifty percent. While huge progress has been made in the productivity of the industrial and agricultural sectors, the service sector has lagged far behind.

A few years ago we started a major initiative across IBM's technical community to better understand the nature of services, with particular focus on how to improve their productivity at IBM and in our clients' businesses around the world. We wanted to bring to bear on services the kinds of engineering, scientific and management disciplines that have been so successful in systems and software in the IT industry, as well as in the industrial and agricultural sectors of the economy. We therefore gave our initiative the somewhat unwieldy though academically inclusive name of Services Sciences, Management and Engineering, or SSME. Over time we decide to use the term Services Sciences.

What are services – anyway? It is very interesting that while services are increasingly important to so many companies as well as the dominant sector of the economy, its nature is not well understood. A while back *The Economist* defined a service as anything sold in trade that cannot be dropped on your foot<sup>1</sup>.

Beyond something that you cannot drop on your foot, we can all agree that services is all about people and organizations performing tasks for each other, such as providing medical treatment, selling products and solutions and making sure customers are satisfied. As we

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1 Lane, P. World Trade Survey: The wired trade organization. *The Economist*, v 349, Issue 8088, pg. S16, October 3, 1998.

continue to standardize and automate back-office operations, it is not surprising that the front-office, market-facing activities involving people, - i.e., services – have become the largest and fastest growing components of any business, not just businesses in the service sector, but also those in the industrial and agricultural sectors. Every business has markets and deals with people as employees, customers and partners. Thus, to a greater or lesser degree, every business is in services.

There is a very serious economic imperative for addressing the productivity of services. It is practically impossible to improve the profit margins of a business or the standard of living of a country or region without significantly improving the productivity of services. But beyond the economic imperative, why do we think that the time is ripe to establish the new discipline of Services Sciences? Let's address this question by looking at the evolution of information technology (IT) over the last forty years or so.

At first, IT was primarily applied to automate back office, highly repetitive and fairly standardized tasks, such as financial transactions, payroll, and inventory management. The *machine-like* nature of these tasks made it possible to develop *data processing* applications that no longer required a human in the loop unless there was a problem.

As time went on, IT was increasingly applied to interactive applications that enabled people to do for themselves tasks that previously required human assistance. For example, the advent of ATMs in the '70s, allowed people to get money on their own without having to go to the bank and queue up in front of a teller. Word processing applications in the 1980s enabled people to type or at least edit their own documents without requiring the services of a professional secretary.

Customer self-service was arguably the commercial killer-app of the Web in the '90s. It seemed almost magical how easy it was to now do for yourself so many activities that previously required a trip to a store or office, or at least a phone call during office hours. All of a sudden you could track the status of your packages, access tax information, check the weather of any city in the world or buy a book with nothing more than a browser and an Internet connection.

Beyond back-office automation, personal productivity and customer self-service, I believe that recent advances in IT are now enabling us to apply technology to significantly improve the productivity of services, and is thus ushering us into the next major phase in the evolution of work.

Many services essentially involve people interacting with each other - e.g., health care providers and patients, teachers and students, financial advisors and clients. It has been very difficult to apply IT to these activities because the human interactions are an essential part of the work, and the unstructured, highly variable nature of these interactions defies automation, no matter how powerful the computers are.

But the emergence of social networks, Web-based collaborative platforms, wireless communications, mobile devices and Internet-enabled sensors of all sorts over the last few years has enabled us to apply IT to these people-oriented social systems. The aim is not to get people out of the loop, but to make the overall service experience more productive and of higher quality – that is, more satisfying for both clients and providers.

This first volume in the book series *Service Science: Research and Innovations in the Service Economy* is a compilation of position papers collected for IBM's 2006 conference "Service Science, Management, and Engineering – Education for the 21<sup>st</sup> Century". The conference was organized to collect and share current thinking about Service Science, and to promote the advancement and development of the discipline. You will find this text organized around three areas of thought: creation of a new discipline, status of educational offerings and services research planned or in progress.

Irving Wladawsky-Berger  
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IBM  
September 2007

## Executive Summary

Service Science, Management, and Engineering (SSME) has come a long way in a short time. Just three years ago, no one had heard of SSME. And now here is a volume that collects papers prepared for an SSME conference held at the IBM Palisades Conference Center in October, 2006, which contains more than 55 papers from 56 institutions and 14 countries aiming to define the discipline, describe the education, and discuss the research relevant to SSME. How did we get here?

We first heard the term *service science* from Professor Henry Chesbrough of UC Berkeley in early 2004 [3, 4]. He reminded us that IBM had been instrumental in helping to establish the field of computer science sixty years earlier, when IBM found its business dependent on computers after World War II [1]. Chesbrough suggested now IBM ought to pay the same kind of scientific attention to our service business (see also [2]). In 2004, three public events began the journey. First in April, IBM Research held the Almaden Institute in San Jose, California, on “Work in the Era of the Global Extensible Enterprise” where Chesbrough conducted a breakout session to discuss the idea of creating a service science with some of the assembled academics.<sup>1</sup> Most were skeptical. Second in May, IBM Research held a conference on the “Architecture of On Demand Business” in Yorktown Heights, New York, where the head of IBM Research, Paul Horn, and the head of IBM Business Consulting Services, Ginni Rometty, opened the conference by describing the need for a science of service. This meeting resulted in a white paper on the topic ([11]; see also [10]). Third in November, IBM Research held a conference on “Service Innovations for the 21<sup>st</sup> Century” in San Jose, California, where specific research and educational agendas for service innovation were discussed by academics from many related areas.<sup>2</sup> Eventually, the scope of service science came to include engineering discipline and management discipline as well, and we started referring to the idea broadly as SSME.<sup>3</sup>

Despite all this talk of a new science of service, there were already deep academic literatures on specific aspects of service – angling in on it from disciplines such as marketing, operations, management, engineering, and computing, among others. For instance, since even before Shostack’s seminal paper on service marketing [14], there had been much thinking, research, and teaching on service from a marketing perspective (see [7] for a review). There is also a long tradition of focusing on service in the operations and management areas, for instance, connecting operational factors that affect quality to customer loyalty and service orientation [8]. More recently, there has been some focus on service engineering from the industrial engineering perspective [17], and there has been some focus on service computing from the computer science perspective [13]. And of course, there is a much longer tradition of service thinking in economics as well (see [5]). We will not review any

1 <http://www.almaden.ibm.com/institute/2004>

2 <http://www.almaden.ibm.com/asr/events/serviceinnovation>

3 <http://www.ibm.com/university/ssme>

of this – or other disciplinary work on service – here. The point is that efforts in each area proceeded independently (for the most part).

At IBM, we saw the need for new skills and for on-going innovation in our service businesses. And we didn't see the issues breaking along standard disciplinary lines. Knowledge-intensive service activities depend critically on people working together (organizations) and with technology (tools) to create value, and so service innovation means creating efficient, effective, and sustainable configurations of people and technology that create value both *for* clients (back stage activities) and *with* clients (front stage activities). One can invest to improve service activities by improving the people through increased education or through organizational or incentive changes. One can invest to improve service activities by improving the technology that workers and customers use or that provides back stage service activities, making systems faster or adding more features. One can invest to improve service activities by enhancing the value propositions between clients, providers, partners, and employees, changing the risk-reward profile to encourage better relationships and more long-term value. However, no one can achieve continuous and sustainable improvements – or effective and lasting innovation – without doing all of these. Recently, we've come to view *service systems* – value-co-creation configurations of people, technology, and organizations connected internally and externally by value propositions and shared information – as the basic unit of analysis for understanding knowledge-intensive service activities [15]. We have to break down disciplinary barriers to create an integrated understanding of service systems and service innovation.

Recognizing the growth of knowledge-intensive service activities in national economies and corporate revenues, SSME began as a call to action for industry, academics, and governments to focus squarely on service system innovation. For instance, following the idea that service systems depend on people, technology, and business value, it seemed to us that service education has to be interdisciplinary education [12], combining aspects of social and cognitive science, technology and engineering, and business and management. An effective service innovation professional easily speaks the languages of organization, technology, and business value together. A number of others began to take SSME's call to action seriously and have begun to describe opportunities for cross-disciplinary research and education in service (e.g., [6, 9, 16]). The IT service industry has begun to take it seriously too, with the formation of the Service Research and Innovation Initiative, an industry and academic consortium aimed at raising the profile of service research.<sup>4</sup> A growing number of nations have also established programs to study and advance service system innovation, or have approved legislation that specifically calls out the emerging study of service science.<sup>5</sup>

4 <http://www.thestii.org/>

5 See the America Competes Act, US HR 2272, Section 1106.

In the end, we're all just students of service. Service systems are evolving rapidly driven by information technology advances, new business models, globalization, and demographic trends. We can point to some issues and some problems, and we can help sound the call to action. But answers and a solid scientific foundation will take time to emerge. We think this volume marks another important step along the way toward understanding service systems and service innovation. So SSME has come a long way in a short time, but it's only just begun. What will it be like in twenty years? Let's find out!

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IBM Almaden Research Center

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