Services Science: A New Field for Today's Economy

Linda Dailey Paulson

Agriculture and manufacturing used to be the major elements of the modern world's economies. Now, services are a critical element, a trend also affecting the developing world, albeit to a lesser degree.

As Figure 1 shows, services now represent 80 percent of the US economy. According to IBM, China's service sector has grown 191 percent during the last 25 years and now makes up about 35 percent of the nation's economy. And services account for more than 50 percent of the economies in countries such as Brazil, Germany, Japan, Russia, and the UK.

Because of their importance, services, their development, and their delivery have become popular discussion topics at universities and corporations.

And this has led to the development of services science, a discipline concerned with finding ways to increase productivity and innovation in services-related industries and tasks by applying scientific means and methods.

Universities throughout the world—most notably in North America, Europe, and Australia—are offering courses and graduate-level certification in services science, with the long-term goal of establishing degree programs. Participating schools include the US's Massachusetts Institute of Technology and University of California, Berkeley; Switzerland's École Polytechnique Fédérale de Lausanne; Italy's Bocconi School of Management; and the UK's University of Manchester.

Companies—including Accenture, Electronic Data Systems (EDS), Hewlett-Packard, and IBM—are touting the discipline's benefits and supporting the development of workers with skills in computer technology and other fields, such as management science, organization theory, technology management, engineering, and the social sciences.

However, as a formal discipline, services science is so new that proponents are still trying to determine exactly what it is.

ABOUT SERVICES SCIENCE

Some services science proponents say that the field's practices and precepts have been around for 20 years. However, they add, work on formalizing it into a focused discipline didn't begin until 2004, when IBM hosted meetings on the subject for a number of universities and corporations.

IBM has been a leader in promoting services science, said Bob Glushko, adjunct professor at UC Berkeley's School of Information and a founding faculty member of the school's Services Science, Management, and Engineering program.

The corporation began expanding its own services science research after determining that it was not spending much R&D money on services even though this was the fastest growing part of the company's business, noted Jim Spohrer, director of services research at IBM's Almaden Research Center.

Defining services science

Services science is a multidisciplinary field that seeks to bring together knowledge from diverse areas to improve the service industry's operations, performance, and innovation. In essence, it represents a melding of technology with an understanding of business processes and organization.

"It's a shift from a technology-centric view to a holistic view that encompasses both technology and business," said University of Manchester lecturer Liping Zhao.

Professionals need new skills and education in a variety of fields to yield the best results in service industries, according to EDS Fellow Mary Ann Wangemann.

It is critical to develop and foster a broad perspective that includes research from many areas, including economics and law, said Spohrer.

Driving forces

Services science is interested in both relatively simple service businesses such as fast-food restaurants and more sophisticated operations such as healthcare companies, noted professor Bill Rouse, chair of Georgia Tech University's School of Industrial and Systems Engineering and director of its Tennenbaum Institute.

Technology and business. One key driving force has been the way technology, particularly related to
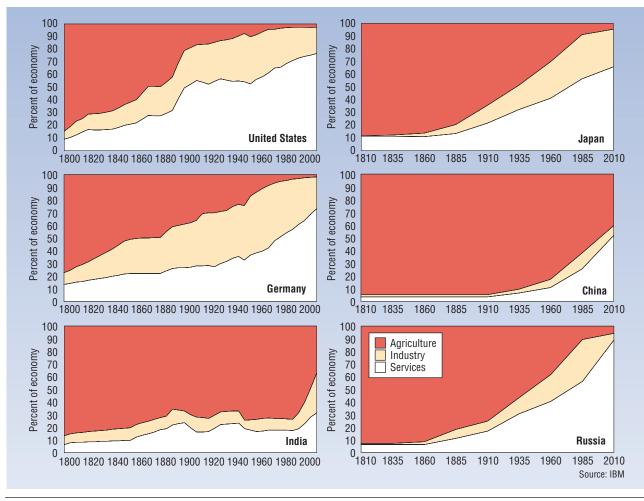
Figure 1. Services represent a growing segment of the developed and developing worlds' economies.

communications, has improved the operations of service-oriented businesses. Technology has even made many services possible, such as those offered by companies like eBay and Google, explained professor Mary Jo Bitner, academic director of Arizona State University's Center for Services Leadership.

Companies need to understand how technology and business practices can intersect to get the most out of each, enabling business objectives and ultimately making processes more effective, said Steven G. Allen, associate dean for graduate programs and research for North Carolina State University's College of Management.

Businesses could use technologies such as knowledge management and data mining to get targeted analytical information they can use to eval-

uate their operations. For example, companies could analyze the records of service centers to determine how to better solve customer problems or even create online self-help portals.

Also, services science research could yield models, methodologies, processes, and software tools that create and deliver services more efficiently. For example, EDS has a tool that applies advanced analytical methods to sales information to identify, retain, and get even more business from the most profitable customers.

However, there is a lack of overlapping skills at the juncture of business and IT, said Arizona State's Bitner. Thus, she pointed out, IT needs people who understand how their company works and how to use technologies to help the business improve the way it delivers services. Likewise, she said, "Business stu-

dents should know more about technology."

Thus, she stated, colleges must examine and revise both their business and technology curricula so that they become more cross-disciplinary and less homogeneous.

Reuse. Companies can utilize technology to find patterns in the way they have successfully delivered services and interacted with customers. The companies could then repeat those patterns with multiple customers.

Studies like this could identify the various component parts of specific services—such as consulting—that companies could reuse to create the illusion of offering multiple customers a customized product without having to build each offering from scratch, explained HP Fellow Umesh Dayal.

More rigor. "Engineering research to date has given little attention to issues such as staffing, work processes, and man-machine interaction. We just do not have reliable statistics of productivity in the service sector," said North Carolina State's Allen.

"There are lots of stories but no rigorous quantitative, theoretical analysis," he explained. "With the massive increase in computing power, we now have mathematical models that can be developed. There ought to be a way to be more rigorous about this."

Human behavior. Although technology is a key element of services science, a better understanding of human behavior is also critical, said Matthew Realff, director of the US National Science Foundation's Service Enterprise Engineering program, which promotes and finances university research in services science.

Thus, he said, the field also calls on the resources of social sciences such as psychology and sociology, as well as anthropology, which could provide useful information about the way people and groups work and interact.

Understanding these factors is an important aspect of services science, agreed EDS's Wangemann. Services scientists will possess the "skills and understanding of technology and how to apply them to get data at a granular level, and they will also be able to manage people and productivity," she explained. They will blend skills in areas such as human performance, human capital management, contract law, information-systems knowledge, and other IT-related concepts, she added.

SPREADING THE WORD

Academics, companies, and government agencies are promoting, teaching, and adopting services science in various ways.

In academia

Colleges and universities—primarily through their business and engineering schools—are increasingly adding services science courses, particularly at the graduate level. In some cases, the subject matter, the students, and even the teachers come from different departments.

According to Rouse, Georgia Tech, via its industrial and systems engineering program, offers classes on topics such as sociotechnical systems—how people, organizations, and technologies integrate to perform work—and change management—how people and organizations address and pursue change.

> ## Services science melds technology with an understanding of business processes.

Glushko said UC Berkeley has courses on the information and services economy that address how corporate change and innovation relate to economics, engineering, law, and organizational sociology. He said the school also has classes on service design, focusing on the services life cycle and how it relates to IT, computer science, operations research, business strategy, accounting, and finance.

UC Berkeley and North Carolina State offer a services science certification for students receiving master's degrees in other areas.

However, services science is such a new discipline that schools aren't offering degree programs in the field yet.

It can be difficult to encourage university administrators to adopt multidisciplinary programs because academic departments often don't want to give up faculty positions for such efforts, Glushko explained.

In addition, Georgia Tech's Rouse noted, academia is organizationally conservative and thus resistant to change.

In business

Corporations interested in services science have been actively working with academics to foster the field.

For example, IBM has sponsored services science workshops and conferences such as the Architecture of On Demand Business summit. It has also awarded grants to academic researchers, developed course materials, and worked with business-academic consortia.

IBM and other companies also do their own services science research.

According to EDS's Wangemann, her company has been working with numerous universities, including the UK's Cambridge University and London School of Economics, and Germany's Technische Universität Darmstadt.

Companies such as EDS and IBM have made a point of hiring people who have taken courses or received certificates in services science. Glushko noted that IBM selected one of his graduate students as an intern at the Almaden Research Center and is eager to hire her when she graduates.

Businesses are also employing services science principles in their operations. According to Wangemann, EDS used them to upgrade the Commonwealth Bank of Australia's teller systems in 10 months without any lapse in service.

STUMBLING BLOCKS

The new field's name might put off potentially interested academics because real scientific fields don't need to include the name "science," said the University of Manchester's Zhao. "Any subject that has 'science' in its name is not science," she contended.

It's important that academics become involved because the field should "adopt a scientific and systematic approach and have a clear set of principles and goals," she said.

According to Henry Chesbrough of UC Berkeley's Haas School of Business, the field should not be called a science now because it has yet to develop the taxonomies, definitions, and other common features that sciences require.

North Carolina State's Allen said academics may be wary of services

science because they are concerned it may turn out to be just a fad or buzzword.

Also, Glushko added, many academics may not want to go into a field that has little history and no journals, doesn't yield much grant funding, and is unlikely to lead to a tenured position.

What might change this is the development and demonstration of challenging problems of interest to both the university and the corporation, he said.

However, Chesbrough added, the lack of adequate research funding could hold back services science. For example, he said, services represent 80 percent of the US economy, but services science gets a very small percentage of overall government research funding.

I t's too early to determine how services science will fare as a formal discipline, stated the NSF's Realff. Observers have varying opinions on the field's future.

For example, Rouse predicted, services science is more likely to prosper as a cross-discipline approach.

Allen said, "I think services science has a good shot at success because it addresses a long-standing concern of employers: training students with a mix of technology and management skills."

According to IBM's Spohrer, there's wide agreement that service innovation is important.

Nonetheless, Rouse said, more funding is needed to kick-start services science as an academic discipline. If this occurs, he explained,

the field will spur people to ask questions that result in creating a knowledge base that can be used to develop tools, methods, and precise answers to pressing questions.

In the long run, Chesbrough stated, the service economy won't progress unless "we start treating it as a field worthy of study itself rather than as an adjunct to existing fields." ∎

Linda Dailey Paulson is a freelance technology writer who is based in Ventura, California. Contact her at ldpaulson@yahoo.com.

Editor: Lee Garber, *Computer,* **l.garber@computer.org**