3

Trends in Services Sciences in Japan and Abroad

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1 Introduction

American and European universities are taking a new approach to services. By regarding services as part of science and applying scientific methods to solve problems associated with services, they intend to increase productivity and bring about innovations in services, thereby invigorating the economy. This emerging academic discipline is called "Services Sciences, Management and Engineering," or simply "Services Sciences." The services here refer to the interactive process of creating economic values between the service provider and the user, and include not only the service industry as a tertiary industry but also the service business in the manufacturing sector. This article explains how services sciences have developed (Chapter 2), what services sciences are (Chapter 3), services sciences in European and American universities (Chapter 4), and the current status of this field of research in Japan (Chapter 5), followed by a conclusion (Chapter 6).

2 Background

2-1 U.S. investment in service research as a national strategy

The U.S. Council on Competitiveness published a report (commonly known as the "Palmisano Report"[1]) in December 2004 that emphasizes the importance of national innovation strategy from the three perspectives of human resources, investment and infrastructure. Based on an analysis of the current position of the U.S., the report cites, as the reasons that the country needs innovation, threats from other countries as a result of globalization, a slowdown in research in science and technology, and delays in smooth technology transfer to the manufacturing sector. It also points out the service sector's lack of research investment in innovative business process design, organization and management, despite services' major contribution to the economy. To put it simply, a factor behind this report is a perception that research investment in services should be addressed as part of U.S. national strategy. The report triggered a move toward integrating many recent approaches to services in academia into the term "services sciences."

2-2 Development of the service economy

What kind of role are services given in the global economy? Nowadays, services are increasingly important to the economy. This is evident from two facts: the service industry has grown significantly, and even companies that fall outside of the service industry are more and more reliant on "service-based business."

(1) Development of the service industry

Trends in the working population by industry demonstrate that the workforce in the service industry has increased sharply worldwide. Figure 1 shows the change in the working population in the world's top 10 countries by workforce size over the past two centuries[2]. In developed countries, mainly in Europe and North America, the working population in the secondary (manufacturing) industry increased sharply over the periods of the First Industrial Revolution, which was ushered in by the improvement of spinning machines in England in the late 18th century, and the Second Industrial Revolution, which took place as a result of the increased use of oil and electricity in the late 19th century. However, by the middle of the 20th century,

the service industry had gained momentum in these countries. Unlike Western countries, newly industrializing countries, such as China and India, are shifting directly from the age of agriculture to that of services, without experiencing a period of surge in secondary-industry workforce. In Japan, the workforce in the service industry has grown as much as, or greater than, that in the manufacturing industry since the postwar high-growth period.

Figure 2 shows Japan's gross domestic product by economic activity. The graph demonstrates that the service industry exceeds the manufacturing industry in not only the contribution to the gross domestic product, but also the growth rate. Figure 3 shows the trend in Japan's workforce size by economic activity. According to this graph, the workforce in the service industry continues to increase despite a decline in the total workforce since 1998. "Service industry" here refers in a broad sense to that defined by the Japan Standard Industrial Classification set by the Ministry of Internal Affairs and Communications (Figure 4), which is also known as tertiary industry.

(2) Growth of services in the manufacturing industry

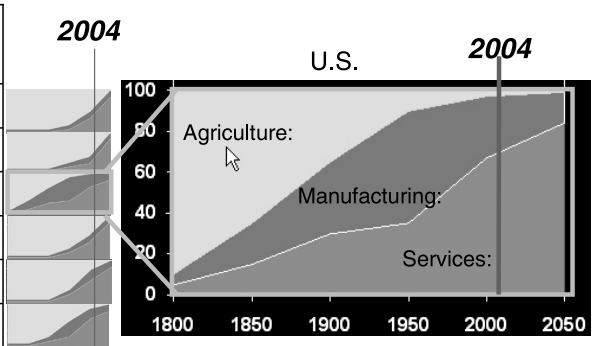
Next, let us examine how services have grown in the manufacturing industry.

Figure 5 shows changes in annual sales between 2002 and 2004 for the U.S. firms IBM

Figure 1 : Growth of the service industry in major developed countries

Top 10 countries by workforce size
(About 50% of the world workforce is in just 10 countries.)
A=Agriculture, G=Manufacturing, S=Services

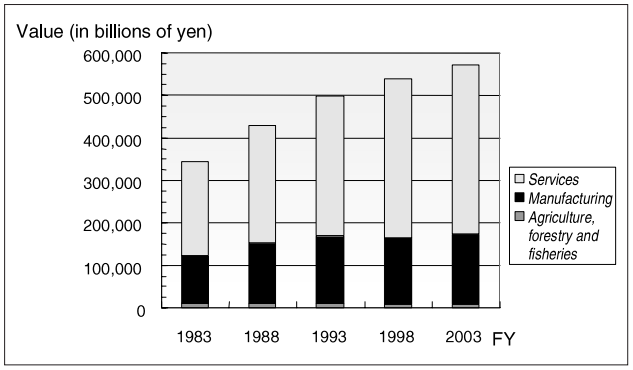
Country	% in world workforce	% A	% G	% S	25 yr % growth (S)
China	21.0	50	15	35	191
India	17.0	60	17	23	28
U.S.	4.8	3	27	70	21
Indonesia	3.9	45	16	39	35
Brazil	3.0	23	24	53	20
Russia	2.5	12	23	65	38
Japan	2.4	5	25	70	40
Nigeria	2.2	70	10	20	30
Bangladesh	2.2	63	11	26	30
Germany	1.4	3	33	64	44



The largest workforce migration in history is taking place. Its factors are concentration in urban areas, global communications, lower labor costs, business growth, and technology innovation.

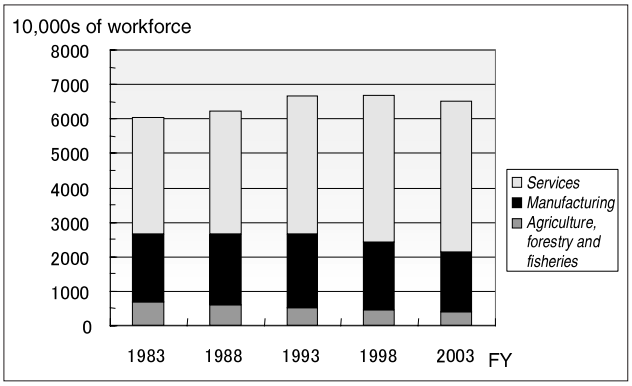
Source : http://www.nationmaster.com

Figure 2 : Japan's gross domestic product by economic activity



Source: Annual Report on National Accounts (the Cabinet Office, Government of Japan) [3]

Figure 3 : Japan's workforce by economic activity



Source: Annual Report on National Accounts (the Cabinet Office, Government of Japan) [3]

and General Electric. The contribution by services increased for both companies. In particular, services came to account for over 50% of IBM's sales in 2004, exceeding the combined sales of hardware and software. These services include systems construction, consulting, systems integration, outsourcing, maintenance, and support services. For General Electric, the sum of the top two sections of the bar ("GECS revenues from services" and "Sales of services") is assumed to represent service-related sales.

The manufacturing industry is undergoing a major transition to services, not just in sales but also in business structure. B. Van Looy et al.'s "Services Management"[6] provides in Chapter 3 a detailed explanation of the recent transformation of business strategy in the manufacturing industry from the perspective of business structure. This literature describes manufacturers' transition from "manufacturing and supplying goods alone" to "providing goods together with added values" and eventually to "promoting service business strategy." Providing goods together with added values refers to combining products with maintenance, usage assistance, information provision, support for user communities, and other services that increase customer values. Promoting service business strategy represents extending the scope of service to support and maintain even competitors' products, in a quest to broaden the service business from the viewpoint of customer value orientation. This move toward more extensive, customer-oriented services

Figure 4 : Classification of the service industry by the Japan Standard Industrial Classification (the Ministry of Internal Affairs and Communications)

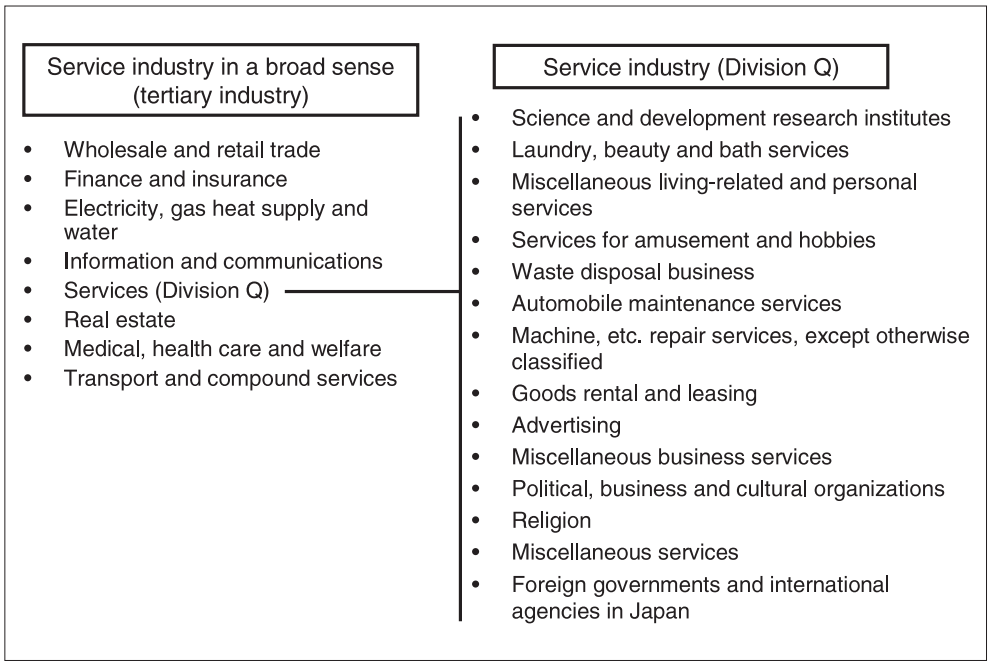
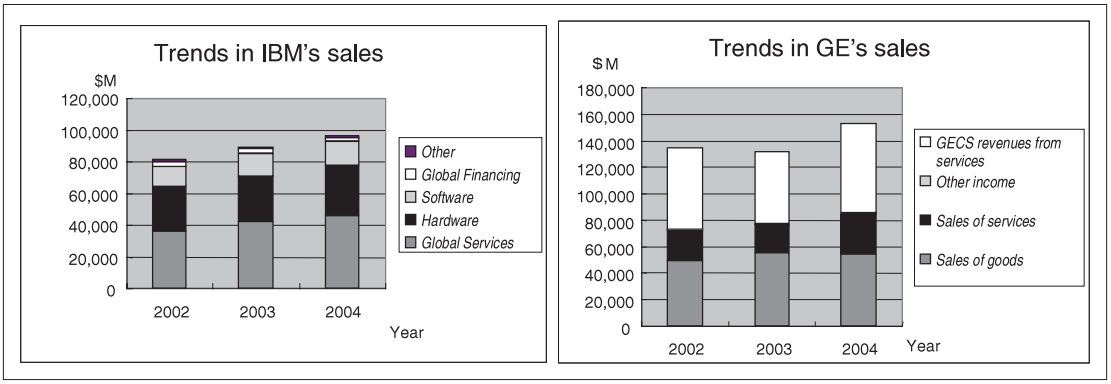


Figure 5 : The contribution of services to sales at IBM and GE



Source: Consolidated financial statements, IBM, 2005 [4], Statement of Earnings, General Electric, 2005 [5]

Table 1 : Definitions of services [9,16]

• An activity or series of activities provided as a 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)

has become common in many manufacturing industries, including those that produce automobiles and electrical and electronic products.

The above discussion suggests that the importance of services to companies in the global economy is rapidly increasing, both quantitatively and qualitatively, in manufacturing and service industries alike.

2-3 Factors behind development of the service economy

There are several reasons for the development of the service economy: With increased personal incomes, people are more willing to pay to have their chores done by somebody else; the growth of dual-income families and an aging population have led to the emergence of new assistance businesses; technological development, such as advances in the Internet and communications technologies, has dramatically changed the quality and quantity of available services; introduction of advanced products has sharply increased demand for support and maintenance; and companies have begun outsourcing business processes as a result of consolidation of their business sectors into components for selection and concentration on core competence[6].

From a broader perspective, some experts argue that the reason for service economy development is a transition from an economy that centers on the ownership and trade of land and natural resources to one that is driven by knowledge, skills and other human assets. This argument is described in detail by S.L. Vargo, R.F. Lusch et al. in "Evolving New Dominant Logic for Marketing"[8].

3 Services sciences

3-1 The definition, characteristics and issues of services

As mentioned in Chapter 2, there are two types of services: services constituting tertiary industry and services in manufacturing industry. Although many experts have attempted to define services by addressing the essence of services as an economic activity so that the definition can apply to both types of services and cover diverse tasks in the service industry, none of their definitions have gained general approval. Table 1 lists examples of these definitions.

Likewise, many researchers have taken diverse approaches to characterizing services[2, 6-9], and their research papers commonly cite intangibility, simultaneity and heterogeneity. They point out that these characteristics of services are attributable to difficulties that are nonexistent in product-based economic activities.

"Intangibility" refers to the state whereby the things to be provided as a result of the provider's activities are effects that are unable to be physically handled. This translates into the economic value of the provided things being less concrete than that of tangible products. As a consequence, it is more difficult to price and manage services, define and measure productivity, and evaluate quality in order to be accountable to users.

"Simultaneity" implies that production and consumption are interactive and concurrent processes. For example, medical practice and education are services that primarily consist of personal communication. Such economic activities require the simultaneous involvement of the provider and the user of the service, such as a doctor's diagnosis concurrent with a patient's consultation, and a teacher's guidance concurrent with a student's learning. In this model, unlike that in which a product is made and subsequently delivered to the user, the user is part of the economic activity, and the reliance on users or consumers is significant. This raises the issue of how to improve the user's capacity to effectively use services. In other words, the service provider needs to consider user-side innovation (demand

innovation) as well as its own innovation. Simultaneity causes another problem: inability to inspect the quality of services before they are delivered to users. Furthermore, the need for simultaneous existence of the producer and the user can make geographical distance a key factor. In this regard, companies that pursue globalization to strengthen their price competitiveness should address services from a different perspective than that applied with respect to products.

"Heterogeneity" refers to the idea that the same services can have different effects and elicit different responses, depending on the provider, the place of provision, and the user's mental state and environment. This underlines the importance of improving the quality of the front end, i.e., those who directly interact with users. However, being heterogeneous also implies the possibility of differentiation. Depending on the types of services, companies should decide which model to pursue: one for providing standard, uniform services or another aimed at differentiation.

3-2 Services sciences

(1) The targets of services sciences

Services sciences have three objectives. First, to provide methods for scientifically analyzing services, efficiently managing services, and maximizing the productivity of services through engineered production processes. Second, to solve problems arising from the characteristics of services that were discussed in Section 3-1, and consequently to improve productivity. Third, to explore a framework for systematically developing innovation. The research division of IBM, which originated this academic discipline, uses the term "services sciences" to refer to "Services Sciences, Management, and Engineering." The services referred to include both the service industry and services in the manufacturing industry.

Japan's high postwar growth has been dependent on an economy in which people produce goods and sell them. However, a parallel economic stream that provides services and pursues values has grown to the point where it accounts for an essential proportion of both the global and the Japanese economies.

In other words, stimulation of the service economy can contribute significantly to global and Japanese economic revitalization. Experts agree that services sciences should be promoted as a framework for systematically addressing stimulation of the service economy.

(2) Research issues in services sciences

What should be researched in services sciences is still under debate and thus remains largely undefined. The most important issue at this point may be deciding what to research in order to improve productivity and enable innovation in services. However, there are several emerging topics in the field of services sciences.

(A) Service innovation management

A major research issue is searching for methods of systematically creating innovation in services to improve service productivity and of developing new business seeds, and proposing practical applications for such methodologies. Seeking innovation in business processes through which services are actually provided is another key issue. This will include research into legislation because dynamic changes in business processes and the advent of unconventional business processes are expected.

(B) Technology to improve service efficiency

Clarifying the role of technology in services is considered to be a major research issue. This consists of two aspects: how to exploit existing technologies, and what kinds of new technologies will be needed. For example, research into technologies such as ubiquitous computing, robotics and networks should originate from awareness of the service context, i.e., how people use a given technology, rather than follow conventional technology-driven development models. Resulting technologies are expected to become key elements of services.

(C) Setting the price of services

Since services are intangible and vaguely defined, their values tend to be determined from the user's point of view. This makes the pricing of services more difficult than that of products, whose performance is explicitly

defined by physical and objective specifications. For this reason, establishing a pricing method that is convincing for both the provider and the user is essential. Research should be conducted on methodologies and tools to dynamically price services, based on information from the market, users and competitors. At the same time, research is also needed on how to quantify (digitize) personal feelings and relate them to mathematics and economics. This is because the final value of services is assessed in relation to the user's satisfaction, and this highly subjective factor needs to be incorporated into the pricing model.

(D) Measuring productivity in services

Defining the productivity of services is a challenging task because services produce intangible output and therefore it is often difficult to identify what has been produced. Research is needed on models and methods to quantify the effects of services and estimate the investment that has actually been made to implement the applicable services.

(E) Testing services

Since the production and consumption of services tend to be simultaneous, their effects cannot be tested before consumption. If the positive and negative effects associated with services can be projected by computer simulation or other technologies, services of higher quality may be provided. The development of prior testing methods to improve service quality is a prospective research issue.

(F) Risk management for service projects

Construction of information systems is a critical service in today's society, but managing such projects has become extremely difficult because of advanced and complex technology, diverse and complicated user demands, and intensifying market competition. Research to predict and resolve project risks, the most serious threat in managing such strenuous service projects, through collective application of mathematics, organization theory, human science, economics and other disciplines, is recognized as a concrete research issue in services sciences.

(G) Methodologies and tools to improve quality and efficiency in business services (Business process modeling)

To improve business services in terms of both quality and efficiency, a scientific framework is necessary in order to comprehensively analyze the business operations of the company or office for which services are provided. One example of such a framework is a technique that divides a company's overall operations into components, with no overlaps or omissions, and formulates the workflow between individual components. This technique applies a component technology used in software development and splits a business model into components in order to express it as a model. This serves as a tool for determining the components to which services should be directed for greater effectiveness and what kind of impact services will have on key performance indicators (KPI). Such business process modeling is expected to become increasingly important as a research area.

(H) Operations research (OR) and total optimization

Operations research (OR) is a field of research that originated in the U.S. and the U.K. during the Second World War in the quest for improved efficiency of military operations. Today, it is utilized as a branch of management science for identifying objective grounds for decision-making, and provides many tools for realizing mathematical precision. Although OR is considered to be a key element of services sciences, services usually include many components that cannot be expressed as mathematically precise models and thus cannot be solved by OR. Some such components involve human factors while others are associated with social or business practice and regulations. An important research issue in this regard is methodology to optimize all the service components, including those that can be solved by OR-based mathematical models and those that are closely linked to humans or society/business.

(I) Computational organization theory

The economic value of services is highly

dependent on humans. Given that a company is driven by an organization consisting of humans, this translates into the concept that the economic value of services is highly dependent on organizational behavior. Therefore, it is essential in discussing service productivity and quality to study a framework for scientific analysis of organizational behavior on both provider and user sides. An emerging approach to this need is computational organization theory, an area of research that uses computers to simulate organizations and examines organizational performance. This area is highly likely to continue developing in services sciences.

(3) Services sciences as knowledge integration

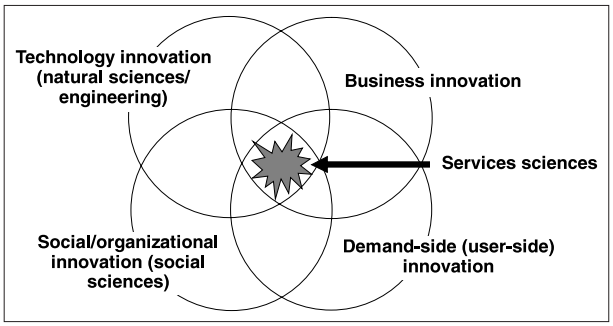
A comprehensive review of the key research issues listed in the previous section leads to the following findings concerning potential core academic disciplines of services sciences:

- Mathematics assumes a major role in modeling the real world and deriving solutions.
- Information science assumes a major role of providing tools for collecting, accumulating and analyzing data for real-world assessment.
- Social sciences, such as economics, law and organization theory, are essential for acquiring real-world knowledge.
- There is a need for an academic discipline to deepen our understanding of humans, for the purpose of analyzing personal satisfaction and other feelings.
- Practical business knowledge and experience must be harnessed adequately.

A new knowledge structure to integrate these academic disciplines and findings is needed, and this is exactly what services sciences provide.

In summary, services sciences are significant in that they are aimed at creating innovation in services by fusing all the knowledge and methodology derived from business, natural sciences, engineering, and social sciences, as well as the demand-side (consumer-side) innovations explained in Section 3-1 (see Figure 6). Services sciences are, in effect, a "multidisciplinary" discipline, and American and European universities are already considering the introduction of curricula in line with these requirements.

Figure 6 : Services sciences as knowledge integration



4 Progress of services sciences in American and European universities

Some American and European universities already recognize services sciences as an academic discipline and teach them as part of their curricula[10].

Table 2 lists overseas research organizations related to services sciences. Naturally, many of them are in the U.S. and the U.K., where university education is advanced, but some are in Scandinavia, where interest in social systems is traditionally strong; China, which has a rapidly developing economy; Singapore; and other parts of Asia.

Table 3 shows part of the curriculum[11] for the Operation Research and Management Science major at the University of California, Berkeley, in the U.S. This curriculum is designed to teach multiple fields of study, such as economics, mathematics, praxeology, accounting, sociology, and mathematical programming, in an integrated manner, and is close to the objective of services sciences.

Table 4 shows the curriculum[12] for service operations management at the business school of the University of Texas. The curriculum not only covers the services' economic, sociological and business aspects, such as management and development, but also includes methodologies in applied mathematics and operations research that are essential for real-world strategy planning and service operations, such as queuing theory, demand forecasting, facility location, and

Table 2 : Overseas programs related to services sciences [16]

America (including Canada and Brazil)
- Center for Service Leadership, Arizona State University, USA
- The Center for Hospitality Research, Cornell University, USA
- Relationship Marketing, Emory University, USA
- Center for Services Marketing, University of Maryland, USA
- Operations Management of Services, California State University, Northridge, USA
- Services Management & New Service Development, University of Texas, Austin, USA
- Services Management, Brigham Young University, USA
- Fishman-Davidson Center for Service and Operations Management, Wharton, University of Pennsylvania, USA
- Service Operations Management, San Jose State University, CA, USA
- Managing Service Operations, DePaul University, USA
- Service Operations Management, University of Calgary, Canada
- Management of Services, University of Western Ontario, Canada
- Service Operations Management, Universidade Federal, Rio de Janeiro, Brazil

Europe
- Center for Relationship Marketing and Service Management, Hanken, Finland
- CTF, Centrum för Tjänsteforskning (Service Research Centre), University of Karlstad, Sweden
- Centre for Service Management, Cranfield School of Management, UK
- Service Management, University of Buckingham, UK
- Service Management, Warwick Business School, UK
- Service Management and Strategy, London School of Business, UK
- Service Engineering, Technion, Israel

Asia
- Service Management Research Program, Nankai University, PR China
- Productivity Management, City University of Hong Kong
- Relationship Marketing, University of Auckland, New Zealand
- School of Services Management, Nanyang Polytechnic, Singapore

Others at
http://www.servsig.org/Syllabi/Service_Operations_Management_Syllabi.pdf

Table 3 : An excerpt from the Operations Research Management Science course curriculum at the University of California, Berkeley [11]

(1) Decision-making in Economic Systems
Macroeconomic Theory; Advanced Microeconomic Theory; Economic Statistics and Econometrics; Engineering Statistics, Quality Control and Forecasting

(2) Decision-making in Industrial and Service Systems
Production Systems Analysis; Service Operations Design and Analysis; Logistics and Supply Chain Management; Linear Programming; Engineering Statistics, Quality Control and Forecasting

(3) Decision-making in Societal Systems
Sociological Theory; Introduction to Sociological Methods, Intermediate Sociological Methods; Engineering Statistics, Quality Control and Forecasting

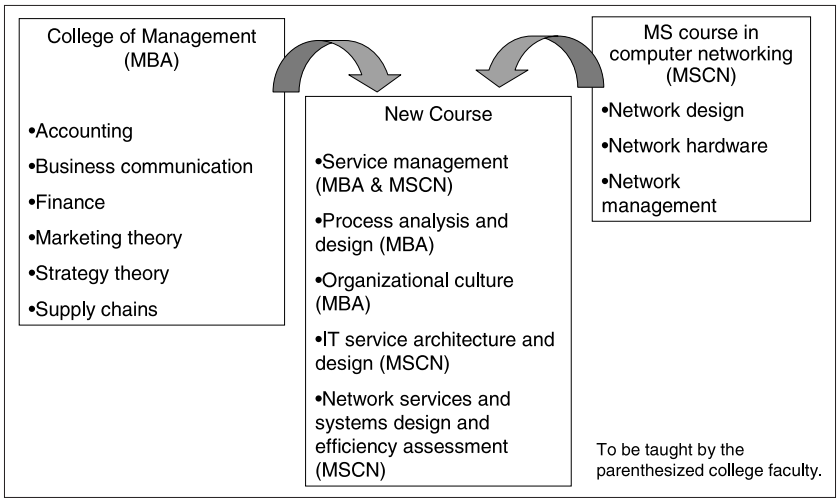
(4) Algorithmic Decision-making
Data Structures; Efficient Algorithms and Intractable Problems (algorithm design theory); Computability and Complexity; Combinatorics and Discrete Probability

(4 credits each)

Table 4 : An excerpt from the Service Operation Management course curriculum prepared by Professor James A. Fitzsimmons at the University of Texas [12]

• The role of services in an economy	• Managing capacity and demand
• The nature of services	• Managing facilitating goods
• Service quality	• Service strategy
• New service development	• Vehicle routing
• The supporting facility	• Managing service projects
• Service facility location	• Quality and productivity improvement
• The service encounter	• Growth and global expansion
• Internet services	• Walk-through-audit presentations
• Forecasting demand for services	• Exam
• Managing waiting lines	
• Queuing and capacity planning	
• Exam	(Each line represents one session.)

Figure 7 : An excerpt from the NC State University proposal for services science programs [13]



transport routing.

Figure 7 is an excerpt from North Carolina State University's proposal to create new services science programs (the source listed as Reference[13]). This document was jointly prepared by the Colleges of Management and Engineering with a view to setting up a new academic course named "Services Sciences" across the two colleges. The new course will take organizational, technological, and process-oriented approaches to services, covering service management, process analysis and design, organizational culture, IT service architecture and design, and network services/systems design/efficiency assessment. The proposal states that "this course aims to provide precise analytical methods that are key to service efficiency improvement and service innovation," and seeks to create programs, including a doctoral course, for nurturing the human resources that are essential in the service economy era.

One example of academic programs centered on the service industry is at Cornell University's School of Hotel Administration[14]. Students at this school learn management and organizational behavior, human resources management, managerial communication, law, food and beverage management, operations, facilities management, planning and design, marketing/tourism/strategy, information systems, finance, accounting, and real estate, as well as gaining basic knowledge in human, social and physical sciences. While this school is inclined toward practical learning, if this program leads to innovation in the hotel industry it may become a model for education in services sciences.

References 18 to 24 at the end of the report are documents describing other overseas activities in services sciences.

5 Current status in Japan

5-1 Efforts by Japanese universities

As of October 2005, only a handful of Japanese universities officially incorporate services sciences in their curricula. One is the Japan Advanced Institute of Science and Technology (JAIST), which has launched a new course centered on services sciences. Table 5 shows the course syllabus. JAIST regards services sciences as a key area of next-generation Management of Technology (MOT) and declares that this course is aimed at helping students to deepen their understanding of the basic notion of and latest theories on services and to acquire practical knowledge in "service innovation," and at cultivating broad-based human resources for innovation[15].

Other examples can be seen among Japanese business schools that offer MBA programs. Students learn about and conduct research on service management from marketing perspectives. One such school is Hitotsubashi University's Graduate School of International Corporate Strategy.

5-2 Current status and challenges for Japan

(1) Services Sciences Symposium

A symposium on services sciences was held in Tokyo on September 8, 2005. The event was hosted by IBM's Tokyo Research Laboratory[16].

The symposium attracted 45 participants from three government agencies (Ministry of Education, Culture, Sports, Science and Technology, Ministry of Economy, Trade and Industry, Japan Science and Technology Agency) and eight universities (Tokyo, Hitotsubashi, Waseda, Keio, Tsukuba, Miyagi, Tokyo Institute of Technology, JAIST), and nine companies (NEC, Hitachi, NTT, NTT DoCoMo, CSK, Mitsubishi Corporation, Fujitsu, Toshiba, IBM; including participants from in-house laboratories).

In light of the topics discussed during the symposium, the current status and key issues for Japan are summarized below:

(A) Need for innovation in services

Despite their increasingly important role in the economy, services are not as productive as manufacturing. Innovation in services is critical to continuous improvement in service productivity. To enable innovation, a problem-solving knowledge structure needs to be constructed to link industry-specific knowledge with scientific knowledge.

(B) Need for service-oriented education

Japan must improve the productivity and quality of its services. From an educational viewpoint, productivity improvement requires motivation and cultivation of a spirit of challenge. The key to raising service quality is developing the service skills of people working in the front line. This suggests a need for Japan to incorporate service-oriented perspectives in its education, which traditionally focuses on manufacturing skills development.

(C) Need for scientific approaches to problem-solving in the service industry

In industries such as health care and tourism, laws and regulations often inhibit the development of new business processes. Other sectors of the service industry also face problems, such as the difficulty of pricing or obtaining patents for services and dependence on experience-based management styles. For further development of the service industry, scientific approaches to solving these problems should be devised.

(D) Importance of the process of making things

It is risky for those discussing future economic development to overemphasize the service aspect. Since most services are processes that involve the provision of both goods and information, excellent services are highly reliant on the stability of the processes through which goods and information are provided (operational stability). Discussing excellent services with no consideration of operational stability will lead to "armchair theories." In any debate on new growth possibilities for the Japanese economy, which has been driven by the manufacturing industry, it is important to be aware that both production and

Table 5 : Services Sciences course syllabus

(1) What are services?: Outlining the basic notion of services
(2) The necessity for services sciences and future directions: Basic notion of services sciences
(3) The structure and challenges of the service industry and a service society
(4) "Innovation as something to feel" —Innovation processes in the service industry— "Service innovation"
(5) Approaches to and theories of services sciences (1)
(6) Approaches to and theories of services sciences (2)
(7) Services sciences research in Europe and the U.S.
(8) Case study: Service innovation cases
(9) Services sciences discussion by field (law and services; service management)
(10) Lecture on service property research etc. by a guest from a service excellence company (1) — hotel operator (tentative)
(11) Lecture by a guest from a service excellence company (2) – food manufacturer (call center) (tentative)
(12) Service innovation processes (group discussion)
(13) Research presentation by group (1)
(14) Research presentation by group (2)
(15) Challenges and strategies for services sciences and service innovation (summary discussion)

Source: Provided by Vice President Akio Kameoka, MOT Course, the Japan Advanced Institute of Science and Technology

services are processes that take place over the course of time.

(E) Improving the international competitiveness of Japanese services

While Japan's service industry is comparable in quality to that of any other country, few Japanese service providers have successfully globalized. Strengthening the international competitiveness of Japanese services is a critical issue.

(2) Japan Society for Science Policy and Research Management 20th Annual Academic Conference

The Japan Society for Science Policy and Research Management held its 20th Annual Academic Conference on October 22-23, 2005, at the National Graduate Institute for Policy Studies. Table 6 lists the session titles that include the term "service," which have been extracted from the conference program[17].

Several university researchers included the term "services sciences" in their lecture session titles, suggesting that Japanese universities are beginning to show an interest in this area of research. At the same time, the list implies that innovation is attracting as much attention as services, and services tend to be discussed in connection with technology. Another recognizable trend is that the Japanese academic community is inclined to analyze Japanese research into services in comparison with overseas research, probably because this research area originated in Western countries.

In the program, most of the sessions on service research came under the category of "Toward the Next Stage of Interdisciplinary Research." This fact demonstrates that service-related research and services sciences are regarded as typical interdisciplinary research areas.

Table 6 : Service-related lecture sessions at the Japan Society for Science Policy and Research Management 20th Annual Academic Conference

- Promotion of service innovation in Japan: A discussion centered on IT & solution services
- The role of technologists who promote knowledge service businesses based on services sciences and their path to techno-producers
- Services by services sciences: Integrated strategy road mapping for technology innovation
- Approaches to establishing services sciences: An approach from interdisciplinary science; Organizational structure issues toward the development of information society: Need for Japanese services sciences
- Verification analysis of innovation in communications services
- Study on the penetration process of service-led innovation
- Growth of corporate competitiveness by approaches in services sciences

6 Conclusion

The provision of services requires a certain amount of human involvement and appeals directly to human feelings, with the aim of delivering personal satisfaction. This characteristic of services makes their economic value highly dependent on human factors, such as the culture, customs and sense of values of the country in which services are offered. However, the types of services that have developed in the Western value structure as an economic act under explicitly defined contracts to offer resources, to teach and provide knowledge and skills, or to support business operations are likely to grow further within the world economy and to become a steady driving force for globalization.

To maintain the development of its economy, Japan should establish a policy of pursuing scientific methods to invigorate the service economy. This is exactly where services sciences come into play. The key is to establish a new academic discipline aimed at achieving the following goals: providing methods for scientific analysis of services, efficient management of services, and maximization of service productivity through engineered production processes; solving problems originating from the nature of services in order to improve productivity; and developing a framework for systematic development of innovation.

To this end, Japan should promote joint service research between industry, academia and government in order to identify problems and discuss their solutions, and foster through such research the human resources needed for service innovation. Another major issue for Japan is how to provide school education for the service economy.

Although services sciences are still an emerging field of research, their scope is expected to continue expanding. Since the role of services sciences is to solve problems, improve

productivity, and formulate a framework for innovation, new research issues will continue to emerge as services transform and expand over time.

Services sciences are likely to be established initially for services to the business sector, where formal definition of problems is relatively easy and the information required for problem solving is readily available. Examples of such services are those in the manufacturing, information technology and finance sectors. Subsequently, services sciences will be applied to services to individuals in such areas as tourism, health care and welfare, where there is greater human involvement and definitions are difficult to formalize.

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