Chapter 2
General Trends of Service Innovation with ICT and Their Impact on Business Innovation

Michitaka Kosaka, Jie Wu, Ke Xing, and Shiyong Zhang

Abstract The general trend of service innovation using ICT and the impact on business innovation is analyzed, which is a basic concept for conducting case studies in this book. First, service and service innovation using ICT are defined. Then service value creation mechanisms with ICTs and successful cases in each generation are illustrated. Then, we show that the ICT revolution significantly influences ICT businesses through investigating the changes of major ICT providers by using Fortune 500 data. A major reason for such changes is the changes to the service value creation mechanism with ICTs and its business model. The most important question in this book is "What are the likely business innovation with new ICT, that is, in the 3rd generation business innovation?" To consider answers to this question, we propose four viewpoints regarding business innovation with new ICTs: (1) expansion of business fields with new ICTs, (2) changes to human desires and social needs, (3) changes in the role of ICT providers, and (4) conversion of new ICTs in the technology space into values in the value space, depending on the organization's culture and abilities.

M. Kosaka (✉)
Japan Advanced Institute of Science and Technology, Nomi, Japan
e-mail: kosa@jaist.ac.jp

M. Kosaka · J. Wu · S. Zhang
School of Computer Science, Fudan University, Shanghai, China
e-mail: jwu@fudan.edu.cn

S. Zhang
e-mail: szhang@fudan.edu.cn

K. Xing
School of Engineering, University of South Australia, Adelaide, SA, Australia
e-mail: Ke.Xing@unisa.edu.au

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2.1 Introduction

Information and communication technologies (ICTs) have been contributing to various service innovations (Cambridge University 2007) and business innovations, through service development and service enhancement, and play an important role in creating value for customers and generating profits for providers. The business innovations with ICT until date can be categorized into three generations (Kosaka and Wang 2016).

The 1st generation is the intranet era. Companies introduced enterprise information systems using hardware such as a mainframe, a database, and terminal equipment and streamlined their work or collected customers' information for creating value for them. Typical examples are point-of-sales (POS) systems in distribution industries (Kunitomo 1997) and online banking systems in financial industries. Here, providing solutions to customers' problems or to meet their requirements are the major businesses of ICT service providers. International Business Machines Corporation (IBM), Fujitsu, and NEC were major players in this generation.

The 2nd generation is the internet era. The internet connects service providers and customers worldwide for 24 h a day, 365 days a year. The internet has brought various types of services, such as service mediators (Doan et al. 2014) and information retrieval services. New hardware equipment, such as personal computers (PCs) and smartphones, and services using such devices are major ICT businesses. In this era, new economy sciences, such as the experience economy (Sundbo and Darmer 2008; Pine and Gilmore 1999), the sharing economy, and the platform economy (Kenney and Zysman 2015; Farrell and Greig 2017) were discussed, instead of the traditional marketing science (Lovelock and Wirtz 2007; Fisk et al. 2008). In ICT businesses, new business players, such as Apple, Google, and Amazon, have become major players instead of IBM.

Currently, the 3rd generation of the ICT revolution, which employs new technologies, such as the Internet-of-things (IoT) and artificial intelligence (AI), is under discussion. These technologies will change services to provide solutions for various issues in the twenty-first century, such as those related to manufacturing servitization (Wang et al. 2016), care for an aging society (Spitzer and Davidson 2013), and agriculture (Li et al. 2013). Service science for business innovation in the 3rd generation should pursue service value creation with new ICT. Service-dominant (SD) logic (Lusch and Vargo 2006; Vargo and Lusch 2004) is one such new service science. "What will be the developments as regards business innovation with new ICT?" is a significant research question in business science.

In this chapter, we analyze the general trend of service innovation using ICT and the impact on business innovation, which is a basic concept for conducting case studies in this book. First, we define service and service innovation using ICT. We illustrate service value creation mechanisms with ICTs and successful cases in each generation. Then, we show that the ICT revolution significantly influences ICT businesses through investigating the changes of major ICT providers by using Fortune 500 data. A major reason for such changes is the changes to the service value

creation mechanism with ICTs and its business model. The most important question in this book is "What are the likely business innovation with new ICT, that is, in the 3rd generation business innovation?" To consider answers to this question, we propose four viewpoints regarding business innovation with new ICTs: (1) expansion of business fields with new ICTs, (2) changes to human desires and social needs, (3) changes in the role of ICT providers, and (4) conversion of new ICTs in the technology space into values in the value space, depending on the organization's culture and abilities. These viewpoints are deeply related to the research framework and research questions described in Chap. 1. All case studies in this book provide answers to five research questions by considering these viewpoints. Further, we present the answers for our main research question by summarizing the results of all case studies in the last chapter.

2.2 Key Concepts of Service Innovation

In this section, we introduce several key concepts of service innovation, which are definition of "service", definition of "service innovation" and trends of service innovation with ICT.

2.2.1 Definition of "Service"

Why is service so important in considering business innovation with ICTs? It is important because creating value for customers by using ICTs is essential in business. If we consider business innovation with new ICTs, many real business innovation cases teach us that business innovation is generated by introducing new value for customers through new services with new ICTs.

First, we define ***"service" as activities of value creation for people or society*** based on the following discussions on service. According to this definition, the term "service" can be applied not only to service industries but also to all human activities in the business or social environment.

1. **Definition of service in a traditional service organization in Japan**

Kagaya is among the most well-known Japanese traditional inns, which provides traditional Japanese hospitality (*omotenashi*) services. Sadahiko Oda, the former chairman of Kagaya and a well-known service practitioner, describes service as an activity that (a) provides professional techniques for achieving the customer's objective, (b) satisfies the customer, and (c) results in compensation. These three factors in service are necessary conditions for successful service businesses and inspire the fundamental philosophy of service science (Kosaka and Shirahada 2013).

2. **Definition of service from the viewpoint of management of technology**

Kameoka (2007, 2010) defined service as an activity to support people or organizations for them to achieve their objectives from the management of technology viewpoint. The definition of service covers services in various industries—not only traditional service industries but also manufacturing or information industries. This concept of service can be transversally applied to various fields, such as service management, service engineering, and social service.

3. **Definition of service from the viewpoint of service-dominant logic**

Vargo and Lusch (2004) proposed a new concept of service, SD logic, arguing that the global economy has been shifting from a goods economy to a service economy. They define service as the application of competences to benefit another entity and a distinct service (singular) as a process related to "services," which are particular types of goods. The SD logic concept has been having a substantial impact on recent service science, and it is particularly important in the manufacturing industry. The value of products is determined by customers on the basis of "value in use". Even products that have excellent functions and perform very well have no value if customers do not want to use such functions or do not need such performance. Vargo and Lusch defined this mindset on service value as "value in use," which is the fundamental concept of SD logic.

4. **Definition of service in this book**

Based on these definitions, in this book we define service as an activity that supports human beings or organizations and enables them to achieve their objectives or desires. We use this definition of service in this book. This definition indicates that most productive human activities for value creation are considered services, and service covers value creation activities in various types of business.

2.2.2 Definition of "Service Innovation"

As the term implies, it fuses the two perspectives of "service" and "innovation". One focuses on innovation in the current service industries. It aims to provide the means to improve the productivity and quality of service industries, such as the hotel and the travel industries. The other focuses on applying service concepts and individual service approaches (Kosaka and Shirahada 2013).

The first is the conventional viewpoint of service innovation by which new technologies, such as information technology and new hardware technology, are employed to create new value or to improve productivity in traditional service industries, such as the hotel and travel businesses. Determining the ways to apply new technologies and to improve productivity is a major issue in innovation in the service industry. For example, financial industries introduced information and network technology in their business processes, and they implemented various innovations to

improve their productivity. However, these innovations have contributed to increasing the competitiveness in this industry.

The second view involves innovation introduced through value creation activities in business from the viewpoint of SD logic. Recent new services or new businesses, which create new values in products or new services from the perspective of customer value creation, fit this category. This type of service innovation creates new business fields, such as those created by Apple. It emphasizes new value creation by using ICTs to help customers. The rise of Google, mobile phone services, and Integrated Circuit (IC) card applications clearly indicates that such emphasis is needed. In this sense, service innovation is an important business issue in the era of the internet and globalization. We define service innovation as the second view in this book, which yields business innovation through value creation using ICTs.

2.2.3 Trends of Service Innovation with ICT

ICTs have strongly influenced service innovation. From the viewpoint of ICT progress, we can categorize service innovation into three generations, as shown in Fig. 2.1.

The 1st generation service innovation was developed by using intranet information systems with a network and customers' database, and the aim was to enhance the

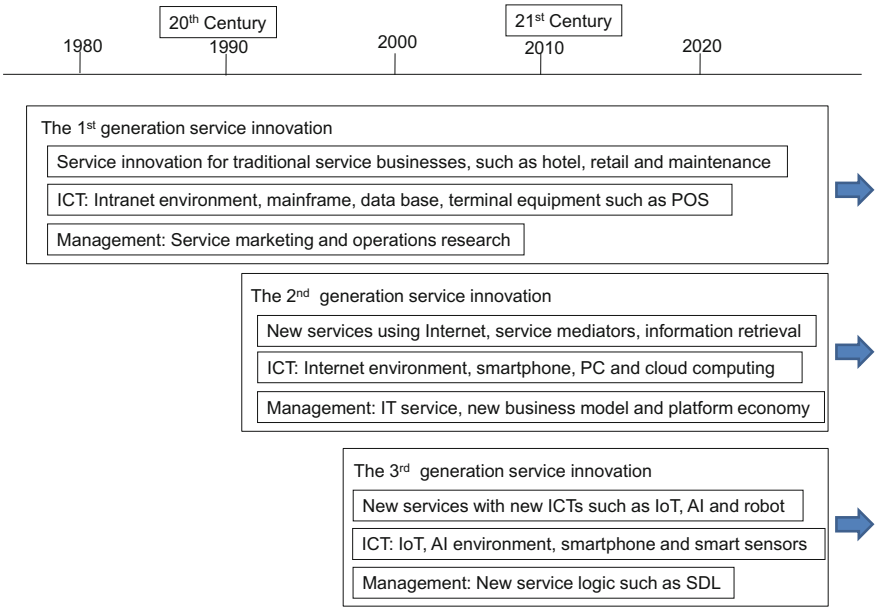


Fig. 2.1 Three generations of service innovation

service quality in traditional service sectors, such as the hotel, transportation, and maintenance sectors. The service marketing theory (Lovelock and Wirtz 2007) was used as a theoretical framework for service value creation.

The 2nd generation service innovation was developed in the internet environment. Service value creation is conducted in the cyberspace, and new business models, such as the long tail model, have been developed. Moreover, the service concept is applied to develop new information technologies, such as service-oriented architecture and web services.

The 3rd generation service innovation has started recently and is based on the new ICTs such as IoT and AI (i.e. deep learning). Meanwhile, new service research, such as SD logic, asserts the importance of value co-creation or resource integration in creating service value. Considering these trends, the research on the 3rd generation service innovation should clarify the role of the new ICTs in service value creation.

Various service sciences and technologies for value creation have been researched and developed for service innovation. These are service marketing (Lovelock and Wirtz 2007) and service management in the 1st generation and IT service management and web service in the 2nd generation. Recently, service system research (Demirkan et al. 2011) and SD logic (Lusch and Vargo 2006) in the 3rd generation have attracted research attention. Such research is deeply related to ICT progress.

2.3 Evolution of Value Creation with ICT in Service Innovation

In this section, we explain the role of ICTs in value creation and discuss successful cases in three generations of service innovation.

2.3.1 The 1st Generation of Service Innovation

1. **Role of ICT in Value Creation**

The 1st generation service innovation was realized based on the service marketing logic and the use of intranet systems. Service marketing mainly consists of operations research and service management. In the twentieth century, research on service marketing generated numerous methods for customer value creation, and most companies introduced their enterprise intranet systems for improving business performance. They utilized online networks and their customer/sales database to create value for customers.

Service value depends on the relationship between the provided service and its context, which shows the necessity of the service for customers. Even if the quality of the service is high, the service value is determined based on customers' needs. Service value is dependent on whether the customers' contexts correspond to the

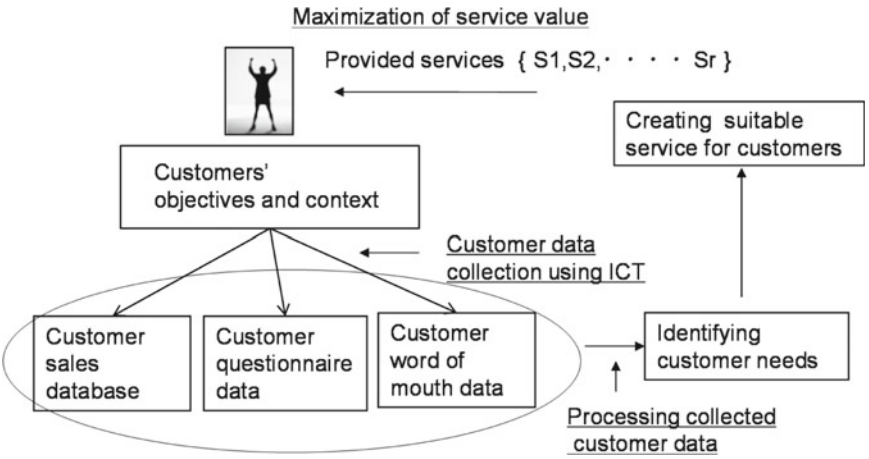


Fig. 2.2 Service value creation process

provided service. Service innovation is pursued to create or enhance service value based on this characteristic of service value creation. That is, the service context should be investigated and the relationship between the service and its context should be clarified. How can we create service value using ICTs? This is an important research question about the role of ICTs in service innovation.

In the 1st generation service innovation, service value was generated by identifying the customers' context using their sales data collected through intranet systems. The service value creation process (Kosaka 2012) is shown in Fig. 2.2. First, the context is determined by using various methods and data. Then, a suitable service corresponding to the context is provided. Various types of data, such as interview data, questionnaire data, and sales data, are utilized for identifying the customers' context. In particular, ICTs, such as data mining, are more powerful methods because these can analyze large volumes of data and ascertain the proper context related to customer requirements in real time.

Thus, the role of ICTs in the 1st generation service innovation is to understand the customers' context related to the provided services. If organizations can identify the appropriate relationship between a service and its context, they can provide high service value to customers, as shown in Fig. 2.2. Several examples, such as the 7-Eleven POS system, show the effectiveness of ICTs in improving organizations' service productivity and their profit.

2. Examples of Successful 1st Generation Service Innovation

The many examples of successful 1st generation service innovation include the POS systems in distribution industries and yield management systems in airline companies and hotels, which we discuss next.

(1) **POS system in 7-Eleven convenience stores** (Kunitomo 1997)

The POS system of 7-Eleven is a successful example of improving service value by using ICTs. This system is used to predict customers' needs at any time in each store by analyzing POS sales data, and suitable products satisfying their needs are provided from the distribution center to each store. This means that the ICT reveals the customers' context related to their product purchases. This system can improve service productivity by providing goods with large variety and small quantity.

(2) **Yield management system in airline companies** (Belobaba 1987)

In airline companies, yield management systems have been introduced to optimize profit. The system provides optimal price planning by changing prices according to the low and high seasons. This planning is performed by combining mathematical optimization methods in operations research and the customer sales database.

2.3.2 The 2nd Generation of Service Innovation

1. **Role of ICT in Value Creation**

The 2nd generation service innovation was developed owing to the internet, which resulted in a global business environment of 24 h and 365 days a year. Services have changed dramatically, and service value has been created at anytime and anywhere in the cyber space. Therefore, new service business models using the internet were developed.

In the 2nd generation service innovation, the essential value creation is to connect new service providers and new customers for achieving their objectives, as shown in Fig. 2.3. Based on the new value creation, various new service business models, such as the long tail model and the service mediator model, were developed in the internet environment. As shown in Fig. 2.3, the relationship between new services and new customers' contexts can be revealed in the internet environment by removing the restriction of time and space. In this business model, service providers do not examine customers and their needs directly. The mediator has the important role in service value creation. This is the significant change in service value creation in the 2nd generation service innovation.

2. **Examples of Successful 2nd Generation Service Innovation**

In the 2nd generation of service innovation, the long tail business model and the service mediator business model are representative examples of new service models.

(1) **Long tail business model** (Elberse 2008)

Services in the internet environment can be accessed from all over the world. This accessibility means that the number of customers and service providers is potentially unlimited. A business focusing on a specific customer target can survive by collecting

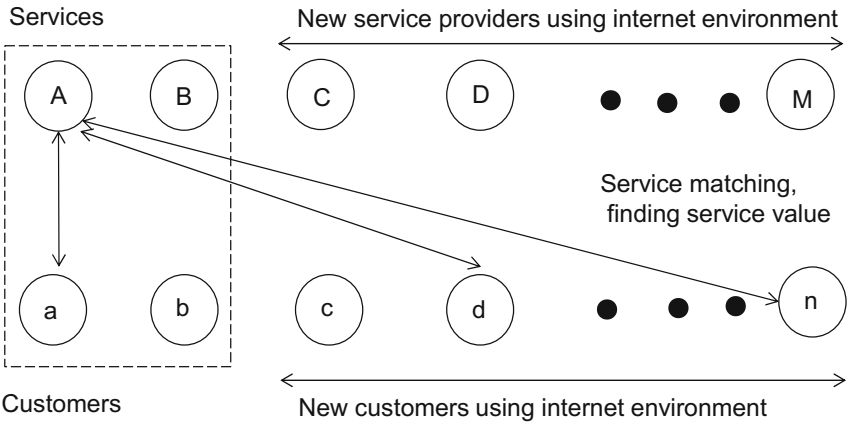


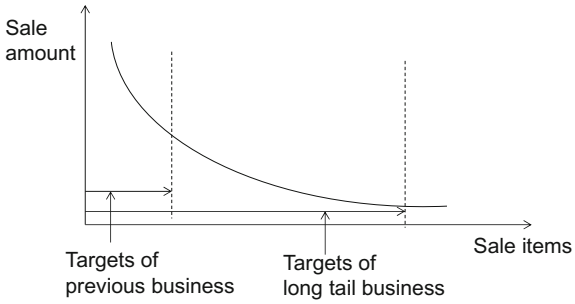
Fig. 2.3 Service value by connecting in the internet environment

customers worldwide. This business model is termed the long tail business model and is illustrated in Fig. 2.4. The success factor is the connection in the internet environment between specific services and customers who want them. One successful example is that of global science publishers, such as Springer. They hold various types of digital content and provide them to specialists through the internet or a "book-on-demand service".

(2) **Internet service mediator**

The internet environment has various customers and service providers. They have no knowledge about the services provided and the types of customers. Therefore, new service value is generated by connecting customers to suitable services (Doan et al. 2013). This is the connecting service value that the internet service mediators provide, as shown in Fig. 2.5. Among the many examples of successful internet service mediators, a representative example is Airbnb (www.airbnb.com), which connects lodgings all over the world to travelers who have interests on them.

Fig. 2.4 Long tail business model



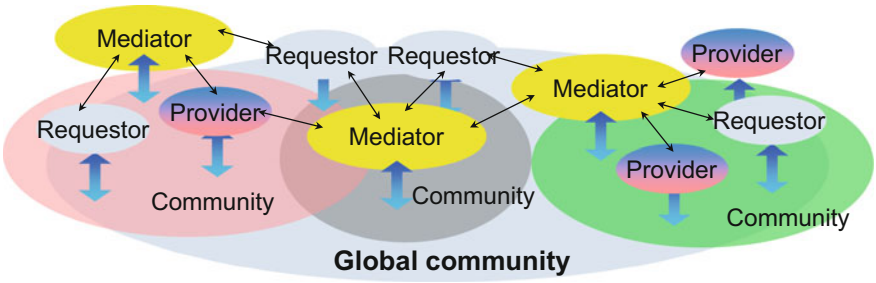


Fig. 2.5 Service mediator in the global internet community

2.3.3 The 3rd Generation of Service Innovation

1. Role of ICT in Value Creation

Two important trends are visible as regards the 3rd generation of service innovation. One is the appearance of new service sciences, such as SD logic (Lusch and Vargo 2006) and service systems (Demirkan et al. 2011). SD logic claims "*our economy is a service economy and that value is co-created between providers and customers by resource integration*", as displayed in Fig. 2.6. All resources related to providers and customers are integrated and optimized for service value creation.

Another important trend is the emergence of new ICTs, such as IoT, deep learning, and cloud computing. All systems and devices are connected in the internet environment, and various types of data and AI technologies, such as deep learning, are utilized for service value creation through resource integration. These two important

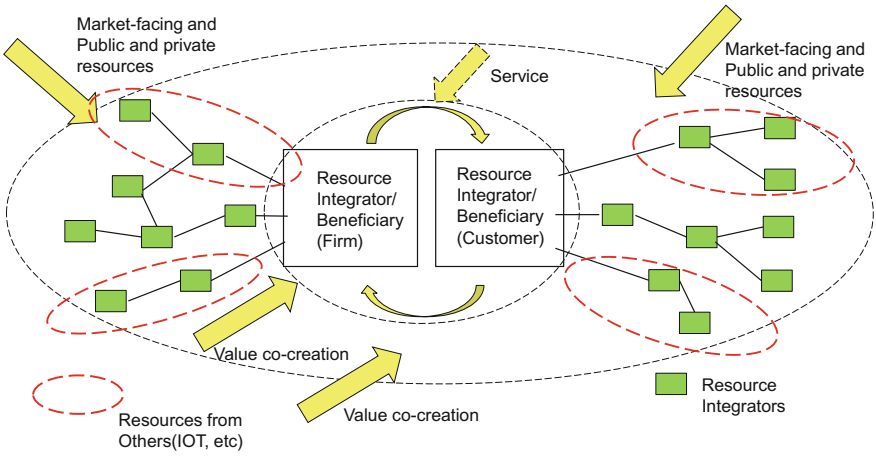


Fig. 2.6 Resource integration in service-dominant logic

trends are effective in providing solutions to recent issues, such as facilitating manufacturing servitization, conducting agriculture using ICT, and ensuring a healthy aging community, where the optimization of service systems by using advanced technologies is expected. This is the direction of the 3rd generation service innovation, which yields service value by optimizing service systems using advanced ICTs.

In particular, IoT appears to be an important factor in revolutionizing new service businesses as well as those changed by the internet during the 2nd generation service innovation. New technologies have been applied in several branches of the 3rd generation service innovation. By using IoT, we can understand the changing context of users in real time. Further, AI technologies, such as deep learning, can optimize service according to the changing context. Value co-creation between providers and customers can be performed through resource integration using IoT and AI. The most important aspect is to create high service value by optimizing the service system. From the viewpoint of service value, the relationship between the provided service and its context is to be retained at the optimum level by using advanced technologies, such as IoT, AI and robots.

2. **Example of Successful 3rd Generation Service Innovation**

The 3rd generation service innovation has just commenced. Therefore, limited examples are available. However, as an example, machine-to-machine (M2M) technologies have already been used in the construction machine industry.

(1) **Utilization of IoT in construction machine industry**

Komatsu Ltd. (Sumi and Kitatani 2013) and Hitachi Construction Machine Co. (Matsuda and Kosaka 2016) install sensors in their construction machines worldwide and collect operation data of each machine, as shown in Fig. 2.7. They use the data to enhance their services, such as maintenance services, and in various applications and services in the cloud computing environment. Moreover, they are developing the automatic control system. These trends seem to establish ICT infrastructure for manufacturing servitization of the construction machine industry. This is an example of successful 3rd generation service innovation.

3. **Direction of Change**

Concerning the direction of the 3rd generation service innovation, Prof. Murai, who is a pioneer of internet technology in Japan, stated:

> The development of internet has matured and completed once. Internet is just communication among people. However, IoT can connect everything such as sensors, cameras and controllers with the Internet. We can share and utilize IoT hardware resources for creating new services. The utilization of IoT has serious problems such as privacy issues or data ownership issues. However, IoT can change the concept of service and our society has been developing according to the progress of ICT technology. (cited from Murai 2015)

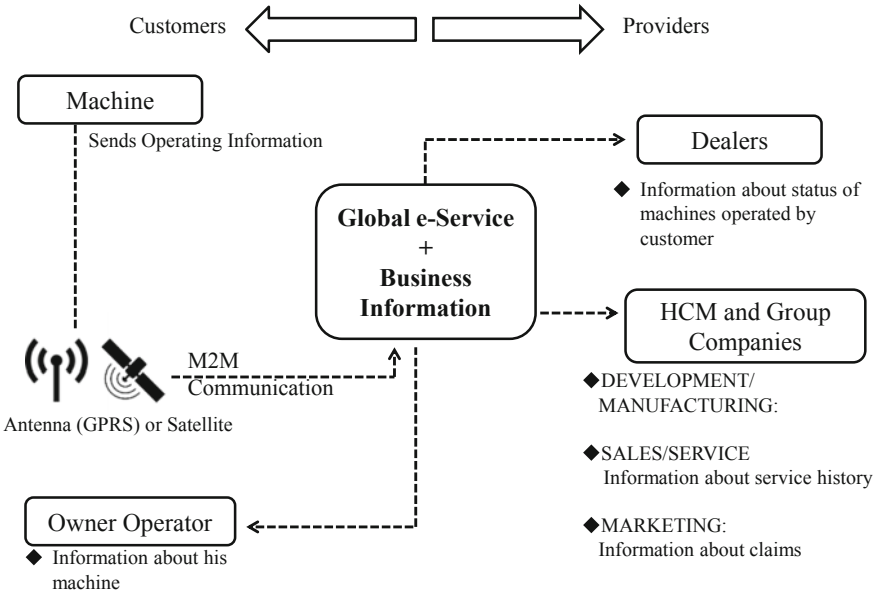


Fig. 2.7 Global e-service of Hitachi Construction Machine Co. *Source* Matsuda and Kosaka (2016, p. 83)

In addition, Porter and Heppelmann (2014) highlighted:

> Now, in the third wave, IT is becoming an integral part of the product itself. Embedded sensors, processors, software, and connectivity in products (in effect, computers are being put inside products), coupled with a product cloud in which product data is stored and analyzed and some applications are run, are driving dramatic improvements in product functionality and performance. Massive amounts of new product-usage data enable many of those improvements.
>
> The third wave of IT-driven transformation thus has the potential to be the biggest yet, triggering even more innovation, productivity gains, and economic growth than the previous two. (cited from Porter and Heppelmann 2014, p. 5)

2.4 Discussion: What Has Occurred?

2.4.1 Change of Major Business Players

We consider the revolution of the ICT/electronics business due to service innovation through ICTs by investigating the transition of the top 10 companies in the ICT/electronics business in the Fortune 500. What is the Fortune 500?

> The Fortune 500 is Fortune magazine's yearly list of 500 of the largest companies ranked by total revenues for their respective fiscal years. The list is compiled using the most recent

Table 2.1 Top 10 ICT/electronics companies in Fortune 500

	2000	2005	2010	2015	2018
1	GE(9)	GE(9)	GE(13)	Samsung(13)	Apple(11)
2	IBM(16)	IBM(20)	HP(26)	Apple(15)	Samsung(12)
3	Siemens(21)	Siemens(21)	Samsung(32)	GE(24)	Amazon(18)
4	Hitachi(23)	Hitachi(23)	Siemens(40)	Hon hai(31)	Hon hai(24)
5	Panasonic(24)	Panasonic(25)	Hitachi(47)	HP(53)	GE(41)
6	Sony(30)	HP(28)	IBM(48)	Siemens(63)	Alphabet(52)
7	Toshiba(38)	Samsung(39)	Panasonic(65)	IBM(82)	Siemens(66)
8	HP(44)	Sony(47)	LG(67)	Amazon(88)	Microsoft(71)
9	Fujitsu(45)	Toshiba(72)	Sony(69)	Hitachi(88)	Hauwei(72)
10	NEC(51)	Dell(84)	Toshiba(89)	Microsoft(95)	Hitachi(79)
					Alphabet:Google

figures for revenue and includes both public and private companies with publicly available revenue data. To be a Fortune 500 company is widely considered to be a mark of prestige. (https://www.investopedia.com/terms/f/fortune500.asp)

Table 2.1 shows the transition of the top 10 companies in the ICT/Electronics business every five years from 2000 to 2018.

The companies listed in this table can be classified into the following three categories:

Category 1: Companies who deal with only ICT products and services, comprising hardware such as the mainframe and database, the software, solutions, and services. These are related to the 1st generation service innovation. IBM, HP, Fujitsu, and NEC belong to this category.

Category 2: Companies who deal with not only ICT products and services but also industrial products and solutions, such as transportation, manufacturing, and social infrastructure. GE, Siemens, Hitachi, and Toshiba belong to this category.

Category 3: Companies who deal with hardware, such as smartphones, and internet and mobile services related to the 2nd generation service innovation. Apple, Amazon, Google, Samsung, and Huawei belong to this category.

Before 2000, the 1st generation service innovation was the major business target for ICT providers. From 2000 to 2010, these targets related to ICTs shifted from the 1st generation service innovation to the 2nd generation service innovation. After 2015, the 2nd generation service innovation has become key to ICT business. Through analyzing Table 2.1, we can summarize the trends of major companies in the ICT/electronics business as follows:

1. The Category 1 companies in the Fortune 500 have been descending in position according to the transition of the major business target from the 1st generation to the 2nd generation. In particular, the rank of IBM, which was a successful company in the 1st generation, has been decreasing from 2000 onward, and this expresses the characteristics of the Category 1 companies clearly.

2. The Category 2 companies, such as GE, Siemens, and Hitachi, retained their positions in the top 10. Their businesses were active in both the 1st and 2nd generations.
3. After 2015, most major business players are the Category 3 companies. They deal with smartphones, internet and mobile services, and network hardware related to the internet. US companies, such as Apple, Google, and Amazon, and Asian companies, such as Samsung, and Huawei, are listed in the top 10.
4. Companies in Category 2 and Category 3 deal with not only services and solutions but also have a strong product business. Technological progress has introduced new hardware products that provide new functions for creating new value through new services. The emergence of a new hardware product changes the related service and promotes service innovation and business innovation. The current business situation related to smartphones demonstrates the validity of this claim. Service innovation depends on not only the service logic and service business but also on the revolution of hardware products owing to technology development. This fact reveals the importance of the hardware product business in service innovation.

2.4.2 Reasons for the Changing Major Players: Observations from the IBM Case

1. **Business Strategy of IBM**

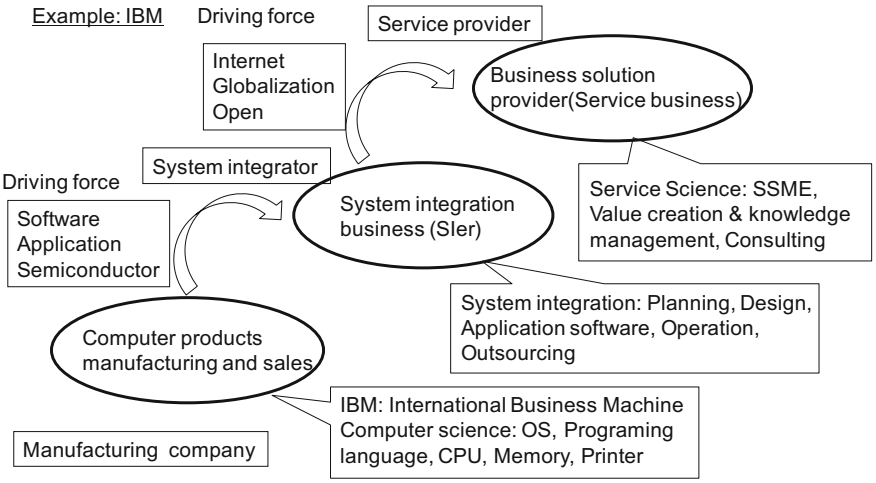


Fig. 2.8 Servitization in IBM business. *Source* Kosaka and Shirahada (2013, p. 8)

IBM is the representative company for the 1st generation service innovation. Figure 2.8 outlines IBM's trend in the information system business, which is applicable to Fujitsu, NEC, and the other information companies in Category 1.

IBM was originally involved in manufacturing and sales of computer products. IBM shifted from being a manufacturing company to a system integrator because of the driving force of software technology, the importance of applications, and the development of semiconductor technology. System integration needs system engineering, such as planning, system design, application software, project management, and operation. Then, it shifted from being a system integrator to a business solution provider owing to certain driving forces, such as the internet and the trend toward globalization and open innovation. IBM understood the importance of service and proposed the concept of service science, management, and engineering, which emphasized the necessity of intensive research in service science.

IBM considers it important for a service business to solve customers' issues, create service value for them, and satisfy their requirements. Therefore, it has strengthened its service activities at the customer contact point to ensure value co-creation. It sold its hardware product business, which manufactured products such as PCs and storage systems, since the profitability was less than that of services or solutions and outsourced its system development business. It shifted from the products and system business to the service business. Thus, IBM shifted their management resources to the upstream of their business and to the left-hand side of the smile curve shown in Fig. 2.9. In the 1st generation, this business strategy was very reasonable. However, the business situation has largely changed owing to the emergence of smartphones and the internet and mobile services. In the 2nd generation, customers created service value by themselves and shared their ideas in communities with the same value standard. Therefore, IBM's business strategy has not covered new service business related to service innovation with new ICTs, such as smartphones.

2. **From the Viewpoint of Customer's Total Value**

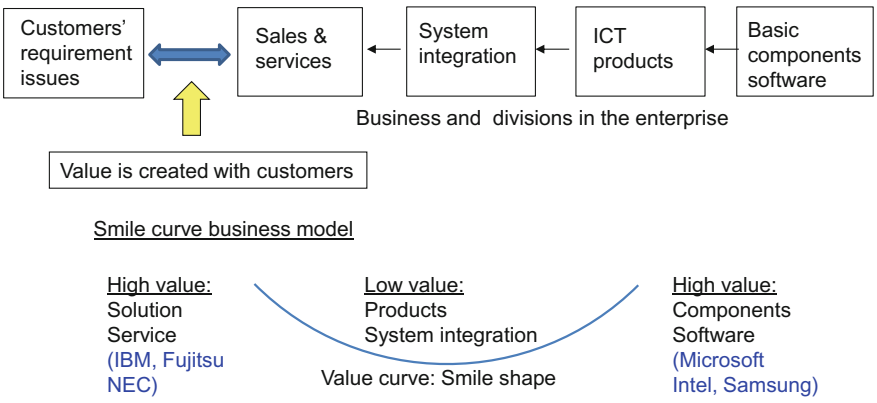


Fig. 2.9 IBM's shift to becoming a service company and the related smile model

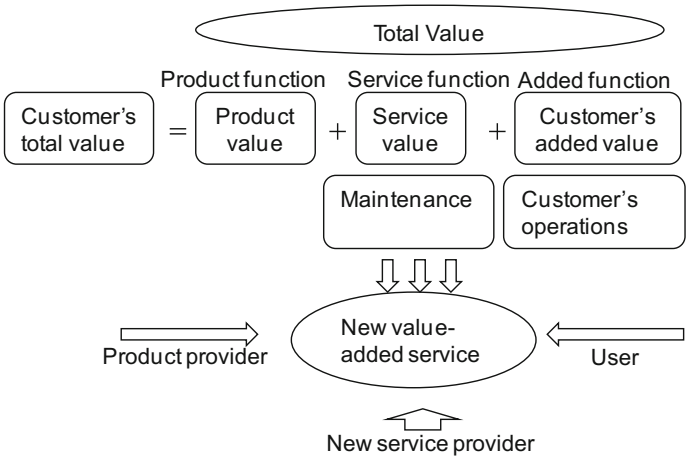


Fig. 2.10 Customers' total value as defined by Kameoka (2007)

Figure 2.10 illustrates Kameoka's (2007) definition of the concept of total customer value. The total value of customers consists of the product value, the service value provided by service providers, and the customers' added value. Hence, service innovation developers should consider these three factors.

In the era of the 2nd and the 3rd generation service innovation, new products, such as smartphones and IoT, have become more sophisticated and new product values have been introduced. The new functions of innovative products are key factors in creating new services. The services provided through the internet have also become more important in customers' total value. Service providers offer many services to customers' smartphones through the internet environment. Customers can select the desired service to achieve their objectives and gain satisfaction. Further, their added value has been increasing. They can create suitable services by themselves based on their experience in using the various functions of smartphones and the services in the internet environment. Thus, new technologies introduce innovative products that can change the value creation mechanism and promote business innovation. Major business players, such as IBM and Fujitsu, could not provide cheap, high-quality smartphones to the market and catch up with the business revolution caused by customers' self-service creation with smartphones.

New value-added services are co-created by product providers, new service providers, and users, as shown in Fig. 2.10. This consideration means that not only service providers but also product providers and customers have important roles in service value creation. Traditional companies in service industries, manufacturing industries, and information industries should consider this aspect of value co-creation in business with new ICTs. Moreover, new economy logics, such as the experience economy, the sharing economy and the platform economy have been discussed as regards business innovation in the new ICT business environment.

2.4.3 *Importance of Business Model: Observation of Japanese ICT Companies*

Next, we investigate Japanese cases in the 1st generation and the 2nd generation. In 2000, six Japanese companies were listed in the top 10 of the Fortune 500 in this business field, as shown in Table 2.1. These companies were mainly in the consumer electronics and ICT businesses. At present, the consumer electronics business has shifted to the smartphone business, and Apple and Samsung have become major players. Regarding the ICT business, most Japanese ICT companies have followed an IBM-style business strategy. Consequently, most of them could not catch the global business trend in the 2nd generation service innovation related to the internet and smartphones.

Most major Japanese companies developed internet technologies, such as security solutions, networks, and related applications, in their research laboratories. They had enough technologies related to the internet and attempted to create new businesses using the internet. We consider two types of Japanese internet business: (1) expansion of an existing business field (B to B) and (2) creation of a new business field (B to C).

1. **Expansion of an existing business field (B to B)**

There are several examples related to the successful expansion of an existing business field using the internet. A typical example is an internet banking system. Hitachi, Fujitsu, and NEC have banks as customers. Banks wanted to expand their services using the internet environment. For satisfying banks' needs, Japanese ICT providers developed internet banking systems. This is a successful case that uses the internet but is just an expansion of a 1st generation service innovation. Another example of a successful expansion is Hitachi's TWX-21, which provides B-to-B internet services. TWX-21 links approximately 66,000 companies in 400 industries globally to accelerate corporate collaboration (https://www.twx-21.hitachi.ne.jp/contents/outline/about/index_en.html). TXW-21's business field is B to B, and therefore, this successful example is considered the expansion of an existing business field.

2. **Creation of a new business field (B to C)**

In Japan, Fujitsu, NEC, and NTT started the internet service business of B to C. As its B-to-C internet service, Fujitsu started Nifty (https://www.nifty.com/), NEC started BIGLOVE (https://www.biglobe.ne.jp/), and NTT started i-mode. These services were provided to Japanese customers but have not become major businesses, because these companies' business models are strongly influenced by the traditional B-to-B business model and they could not change it to the new B-to-C business model. However, there are several successful venture companies, such as Kakaku.com. (https://corporate.kakaku.com/?lang=en), whose sales and operating income in the 2018 fiscal year amounted to approximately JPY54.8 billion and JPY25 billion, respectively. Thus, successful companies achieve high business performance.

Kakaku.com's president's message shows that the company is very active and flexible in reacting to environmental change:

> We established a successful new business. Since its founding in 1997, Kakaku.com, Inc. has offered Internet services that enrich people's daily lives, continuously broadening the scope of business activities to include shopping, food, travel, cinema, real estate, and other fields. The Kakaku.com Group currently provides more than twenty services in Japan and overseas, and the Group companies continue to work as one to provide even more valuable services. Although the Internet market has continued to rapidly develop over the past twenty years, it is now poised to enter a new period of transformation, and the pace of change is likely to further accelerate. For the Group to continue to contribute to society in such a rapidly changing market environment, I think it is important for us to create innovation while we ourselves flexibly and rapidly change.

Thus, most successful companies in the 2nd generation service innovation have a different value sense and different corporate culture from that of traditional and successful companies in the 1st generation service innovation.

2.5 Emerging Trend of the 3rd Generation Service Innovation

What will occur in business owing to the 3rd generation service innovation? This is an important research question in business innovation research. We hypothesize that the following three important factors change the business owing to the 3rd generation service innovation: (1) expansion of the business field using new ICTs, (2) changes in human desires and social needs, and (3) changes in the role of ICT providers.

2.5.1 Expansion of Business Fields with New ICTs

Figure 2.11 shows the expansion of services and businesses using ICTs from the 1st generation to the 2nd and 3rd generations.

In the 1st generation, IBM, Fujitsu, and NEC expanded their business by conducting the enterprise information system business or information service business. Following the emergence of the internet and smartphones, the 2nd generation service innovation has been growing and new business has been developing. The internet connects people world over, and using intelligent equipment, such as smartphones, people can create a desired service by themselves. In the 2nd generation, the major players are Apple, Amazon, and Google, which are new players in the ICT business and have a different business model from that of major players in the 1st generation. They have expanded their business with new ICTs such as smartphones.

In the 3rd generation service innovation, everything is connected in the internet environment and the following attributes are expected to result in business innovation:

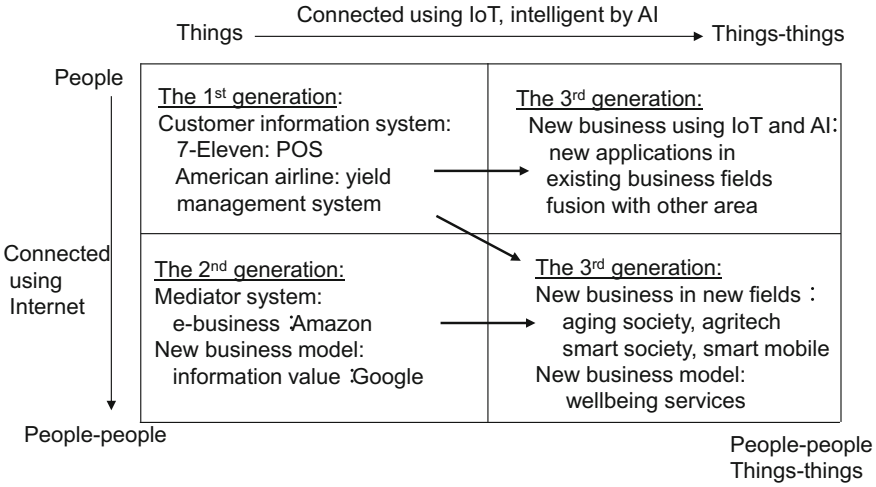


Fig. 2.11 Expansion of service/business by new ICTs

1. Utilization of new sensing data by IoT: By using various new sensors and collected data, an information system can expand the application field from business information systems to various applications, such as those for agriculture, health care of aging people, and the automobile industry.
2. Cross-industry data analysis: By integrating data in different business fields, new knowledge creation is expected to lead to new business opportunities.
3. Automatic decision-making: By applying AI, we can reduce human power in decision-making or replace human labor. This is very helpful in the business environment in Japan, which is undergoing a decrease in the number of young people and an increase in the elderly population.
4. Intelligent social infrastructure: By using technologies such as IoT and AI, social infrastructure systems, such as transportation, auto-driving, secure and smart societies, and new financial/payment systems, become more intelligent.

Figure 2.11 shows that in the 3rd generation service innovation, major players in the 1st generation and the 2nd generation will expand their existing business fields by applying new ICT technologies, such as IoT or AI. Further, new business players are expected to emerge, similar to Google and Amazon in the 2nd generation service innovation, who will develop new business fields and new business models.

2.5.2 Changes in Customer Desires and Societal Needs

A value is created by the relationship between functions using technologies and human desires or social needs. Therefore, the two major factors for new value creation are new ICT technologies and new requirements owing to changes in human desires

or social needs. These are always changing with the times. Concerning the change of users' ICT literacy, people all over the world use smartphones. They retrieve and use information from the internet for creating value by themselves. Social infrastructures, such as payment and transportation systems, are changing on the premise of services through smartphones. Another example is the change in the automobile industry owing to social requirements, such as CO_2 reduction, or the emergence of the sharing economy. New technologies or new services have been developed in the automobile industry for satisfying such new needs. Thus, new needs or new requirements are major factors for business innovation.

Concerning changes in human desires, "Maslow's hierarchy of needs" describes the five stages of desire growth in humans, which uses the terms "physiological," "safety," "belonging and love," "social needs" or "esteem," and "self-actualization" to describe the pattern of human motivations. According to the progress of ICT technology and its applications, human beings want to realize their needs in the higher stages of Maslow's hierarchy by using ICTs, as shown in Fig. 2.12. Recently, service research has been expanding its research target from consideration of ways to make more money in the traditional service marketing to investigate the pursuit of human happiness in wellbeing services. This direction of service research should be considered in business innovation based on the 3rd generation service innovation.

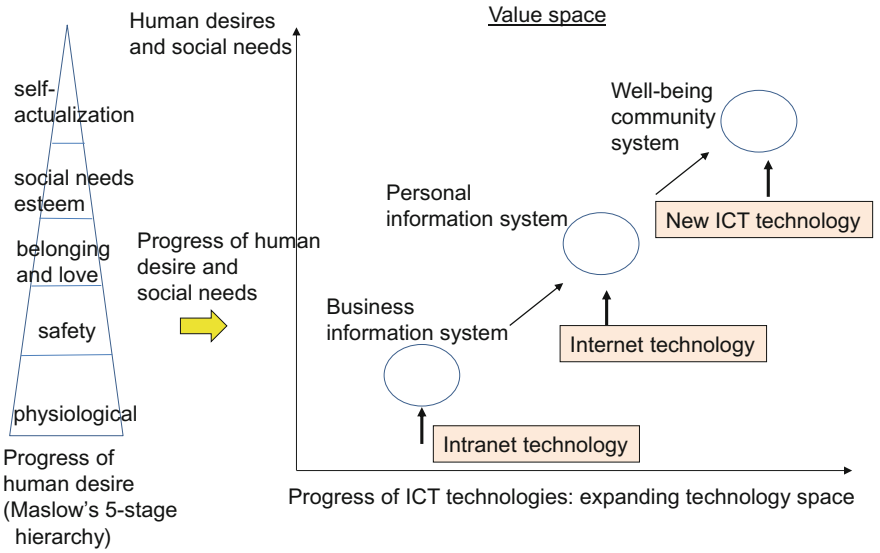


Fig. 2.12 Progress of value using ICT in the value space

2.5.3 Changes in the Role of ICT Providers

Many new technologies have been developed in the 3rd generation, including IoT or sensors as the device layer, 5G network technology as the network layer, AI or block chain as the processing layer, and cloud computing technology for user's applications. Thus far, ICT providers have provided these technologies to customers as a product or a service. However, users' literacy on ICTs has advanced further, and they or their communities want to make desirable services by themselves. Moreover, various resources, such as big data or application software, have begun to be shared in the internet environment. In such an ICT business environment, what is a suitable business style for providing ICT technologies to customers? One direction of the ICT business is to provide a platform with an easy-to-use interface through the cloud computing environment. IBM (https://www.ibm.com/cloud), Fujitsu (https://www.fujitsu.com/us/), and NEC (https://www.nec.com/) as successful companies in the 1st generation, and Google (GCP: Google cloud platform) as a successful company in the 2nd generation, have considered this direction.

We should investigate further about the role of ICT companies in the 3rd generation. In the 3rd generation, further open innovation is needed, and ICT technologies and resources, various types of data, and knowledge on creating service value are shared among a community with the same value standard. That is, the community creates the service value required in the community by themselves. In such a business environment, ICT providers are expected to prepare the value creating platform by sharing various resources with an easy-to-use interface, as shown in Fig. 2.13.

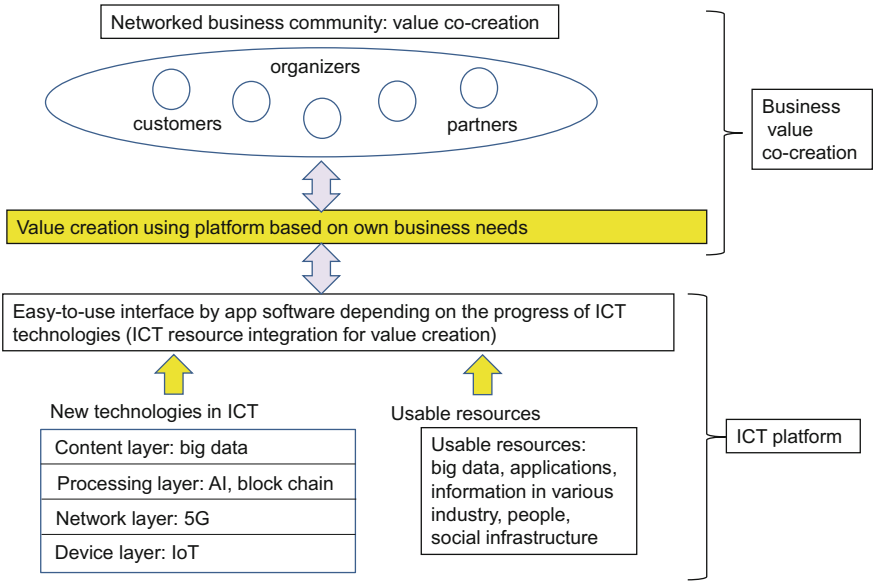


Fig. 2.13 Platform for the 3rd generation service innovation

2.5.4 *From Technology to Value Creation*

The mapping of technologies in the technology space into business values in the value space, which is discussed in Fig. 1.1 in Chap. 1, is the key to business innovation with new ICTs. This mapping is performed by providing new products or new services. Therefore, this mapping depends on the business model or business strategy of companies. Even if the same technology is applied for creating value, the value space and created values differ according to the companies' business fields and business models. Hence, the business model, the business strategy, and the application fields are critical factors in creating value with new ICTs. When new technologies create a new business field, a new mapping method suitable for that field should be considered. This fact can be demonstrated by explaining the change of major players from the 1st generation to the 2nd generation, as described in Sect. 4.

Figure 2.14 shows the relationship between the technology space, the value spaces, and the conversion methods of business categories explained in Fig. 1.1. The technologies in the 3rd generation are converted to different value spaces depending on the business model of each business category. We should ascertain the conversion method that is suitable for the target company in creating value for customers and societies in the 3rd generation.

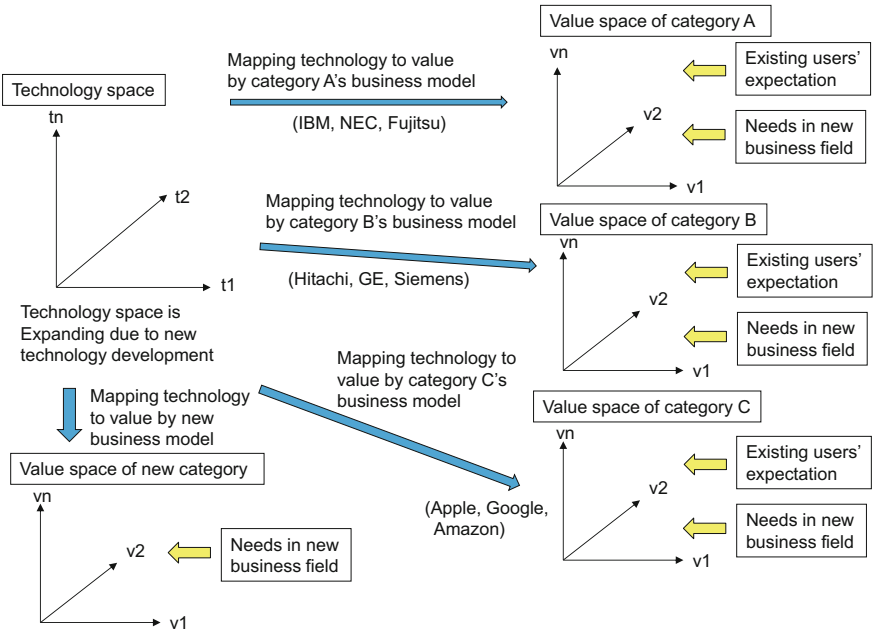


Fig. 2.14 Mapping from technology space to value space

2.6 Conclusion

In this chapter, we discussed the 3rd generation service innovation using new ICTs, such as IoT and AI. ICT technologies have brought about an extensive revolution in the ICT society of the 2nd generation service innovation. What revolution can we expect in the 3rd generation? This is a significant and common research question not only for researchers in the fields of information science, technology management, service research, and business management, but also for businesspeople seeking a future big business. To answer this question, we propose important viewpoints: (1) expansion of business fields with new ICTs, (2) changes in human desires and social needs, (3) changes in the role of ICT providers, and (4) conversion of new ICTs in the technology space into values in the value space depending on the organizational culture and abilities, which influence the business innovation of the 3rd generation.

References

Belobaba PP (1987) Survey paper—airline yield management an overview of seat inventory control. Transp Sci 21(2):63–73

Cambridge University (2007) Succeeding through service innovation: a service perspective for education, research, business and government. A white paper based on Cambridge service science, management and engineering symposium. Cambridge University

Demirkan H, Spohrer J, Krishna V (2011) The science of service systems. Springer, New York

Doan MC, Shirahada K, Kosaka M (2013) Service mediator model for value co-creation based on service dominant logic. J Serv Sci Manage 6(1):11–19

Doan MC, Le ND, Kosaka M (2014) A new service mediator for human resource management. Int J Knowl Syst Sci 5(3):1–17

Elberse A (2008) Should you invest in the long tail? Harvard Bus Rev 1–10

Farrell D, Greig F (2017) The online platform economy has growth peaked? The report of the JPMorgan Chase Institute

Fisk RP, Grove SJ, John J (2008) Interactive services marketing. Houghton Mifflin Company, Boston

Kameoka A (2007) Service science. NTS, Tokyo (in Japanese)

Kameoka A (2010) Services science empower next generation MOT: just-in-time innovation management by service layer integrated strategic road mapping. In: Hefley B, Murphy W (eds) Service science, management and engineering: education for the 21st century (Service science: research and innovations in the service economy). Springer, New York, pp 363–364

Kenney M, Zysman J (2015) Choosing a future in the platform economy: the implications and consequences of digital platforms. In: Kauffman foundation new entrepreneurial growth conference (discussion paper) at Amelia Island Florida

Kosaka M (2012) A service value creation model and the role of ethnography. In: An ethnography of global landscapes and corridors. InTech, Rijeke, Croatia, pp 109–130

Kosaka M, Shirahada K (2013) New trends in service science and education for service innovation. In: Progressive trends of knowledge and system based science for service innovation. IGI Global, pp 1–21

Kosaka M, Wang J (2016) A conceptual model of optimizing service system for the 3rd generation service innovation. In: Knowledge and systems sciences, volume 660 of the series communications in computer and information science. Springer, Berlin, pp 68–81

Kunitomo R (1997) Seven-Eleven is revolutionising grocery distribution in Japan. Long Range Plan 30(6):877–889

Li M, Zhu Z, Chen G (2013) Information service system of agriculture iot. Autom J Control Meas Electron Comput Commun 54(4):415–426
Lovelock L, Wirtz J (2007) Services marketing, 6th edn. Pearson Prentice Hall, Upper Saddle River
Lusch RF, Vargo SL (2006) The service dominant logic of marketing. M. E. Sharpe Inc., Armonk
Matsuda F, Kosaka M (2016) Hitachi Construction Machine Co., Ltd.—M2M and cloud computing based information service. In: Manufacturing servitization in the Asia-Pacific. Springer, Berlin, pp 75–92
Murai J (2015) The next industrial revolution will be driven by the internet of things. Diamond Harvard Bus Rev 28–37 (in Japanese)
Pine BJ II, Gilmore JH (1999) The experience economy. Harvard Business School Press
Porter ME, Heppelmann JE (2014) How smart, connected products are transforming competition. Harvard Bus Rev 3–23
Spitzer WJ, Davidson KW (2013) Future trends in health and health care: implications for social work practice in an aging society. Soc Work Health Care 52:959–986
Sumi T, Kitatani T (2013) Trends and issues in service business innovations in Japanese manufacturing industry. In: Progressive trends of knowledge and system based science for service innovation. IGI Global, pp 237–257
Sundbo J, Darmer P (2008) Creating experiences in the experience economy. Edward Elgar Publishing
Vargo SL, Lusch RF (2004) Evolving to a new dominant logic for marketing. J Mark 68:1–17
Wang J, Kosaka M, Xing K (2016) Manufacturing servitization in the Asia-Pacific. Springer, Berlin