

Michitaka Kosaka · Jie Wu ·
Ke Xing · Shiyong Zhang *Editors*

Business Innovation with New ICT in the Asia-Pacific: Case Studies

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Preface

This book is part of a book series of case studies on business innovation in the Asia-Pacific region. The first two books of the series are “Manufacturing Servitization in the Asia-Pacific” and “Entrepreneurship in the Asia-Pacific” respectively. The success of the two books have attracted much attention from both academia and business leaders alike who have strong interest in learning practical analysis on real-life cases of business innovation across different industry sectors as well as economic bodies within the Asia-Pacific context. This has led to the third book of this series to devote on further investigation on emerging trends and patterns of “business innovation with new information and communication technologies (ICTs), such as Internet of Things (IoT), Artificial Intelligence (AI) and Smart Devices, in the Asia-Pacific region”.

Since the beginning of the twenty-first century, the Asia-Pacific region has been playing an increasingly important role in the global economy. As the most populous nation in the Asia-Pacific region, China has been the second-large economy in the world on GDP basis since 2010 and still developing rapidly in various industry sectors including manufacturing, IT services, and social infrastructure. As more developed nations in the region, Japan and Australia still have been maintaining their steady pace in developing knowledge-based and service-oriented economies. They are especially successful in fostering business innovation using new technologies. Meanwhile, the Southeast Asia countries have been following Japan and China, and their economic modernization and industrialization have seen growing interest in and stronger focus on cultivating social innovation.

Now, new generation of ICTs, including IoT, AI, Smartphone and 5G network, have been instigating drastic changes in service solutions in various business fields and creating innovative, sometimes disruptive, business model paradigm. Successful services with new ICT platforms and applications not only adopt appropriate and novel technologies, but also rightly attend to human desires in relation to different cultural characteristics and economic needs. Although there have been abundant case reports and research on business science in the literature, to date, most of them focus on successful business practices with novel ICT solutions in the European Union and North America, with only very limited

Asia-Pacific cases studied. Therefore, it is deemed as necessary to analyze state-of-the-art business innovation in various industrial sectors and nations across the Asia-Pacific region. The motivation for developing new businesses with ICTs for value creation and competency in the competitive market has inspired businesses across the Asia-Pacific region to accentuate their growth strategies more on enhancing quality and sustainability.

There has been significant emphasis, both in technology development and in its application, on incubating innovation and accelerating business expansion with new ICT drives and novel business models. With unique socio-culture, political, and economic situations, the characteristics of successful services and business in the Asia-Pacific are very much different from their American and European counterparts in terms of their states of development, business strategies, management approaches, innovation and hence their paths for value creation in business. “What are emerging trends and patterns of the business innovation using new ICTs in the Asia-Pacific?” is a highly contemporary question concerning business researchers and practitioners with the region as well as around the globe. In order to answer this question, this book presents a number of studies on cases of digital-enabled service innovation and industry transformation. Through in-depth case studies, the book aims to explore main drives for change, to examine key factors for success, and to identify novel strategies, which can help to inform and inspire other business leaders and companies within the region to develop or transform their own business processes and models.

With this in mind, this book presents two theoretical and conceptual analyses and 14 case studies of successful business innovation from the mainland of China, Taiwan, Japan, Australia, Malaysia, and Vietnam. Also, the case studies cover a broad range of fields, including ICT providers, manufacturing, agriculture, education, aging society, social infrastructure, logistics, finance. Following the consistent methodology as applied in our previous book series, in this book, each case study presents detailed information of an organization’s internal and external environments collected through a series of fieldwork and structured interviews. Then, the collected data are further analyzed through the theoretical lenses of service science, knowledge and culture management, organizational management, new business development, management of technology (MOT), and innovation management. These cases are analyzed and compared from the same viewpoints of value co-creation with new ICTs based on service science. It provides insights into the role of new ICT technologies, value co-creation, human desire and social requirement, business model and success factors of business drawn from the analysis. Finally, commonalities and uniqueness in business innovation with new ICTs relevant to industry sectors and social-economic-cultural contexts are clarified and the direction of business innovation with new ICTs in the Asia-Pacific is proposed.

By looking into different case examples of the similar category and comparing those across categories, readers can gain insight into and draw inference from what to do, how to do, and what opportunities to catch for creating new business and developing new companies. For ICT business leaders and ICT users in the region,

the first-hand information from fieldwork presented in the book may help them to develop informed business strategies and policy decisions can be made for effectively fostering digital-enabled business innovation. We also hope that this book can provide practical research materials for scholars focusing on service science, knowledge management, innovation management and information technology.

The completion of this book will not be possible without a concerted effort by a multinational and multidisciplinary team of researchers, practitioners who conducted the case studies and contributed greatly to the writing and translation of the case reports for the book. The names of the authors are acknowledged in the respective chapters. We are also grateful to Springer for providing us with the opportunity to publish the result of our work. Not least, we like to express our sincere gratitude to all the companies and various people who participated in the case studies for assisting so willingly with data collection, case analysis, and case report development.

We hope that this book can stimulate further interest and lead to more exploratory and empirical studies on this important topic for the development of new business and attractive companies across the Asia-Pacific region and beyond. Valuable critiques and approaches for collaborative work will be highly appreciated.

Finally, we'd like to give a special tribute to Prof. Jing Wang. To our great sadness, Prof. Wang passed away on September 2018. Professor Wang was an excellent researcher and educator on supply chain management and service science. He was the initiator for this case study book series and played a leading role in shaping the concepts underpinning the development of this book series. We appreciate his contributions on this book series with great sincerity.

Nomi, Japan/Shanghai, China
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About the Editors



Dr. Michitaka Kosaka received the M.S. and Ph.D. degrees in applied mathematics and physics from Kyoto University, Japan, in 1977 and 1984, respectively. He is currently an Emeritus Professor of JAIST (Japan Advanced Institute of Science and Technology, Japan) and a Guest Professor of Fudan University (China). He had been with Hitachi Ltd. for 31 years, especially with Systems Development Laboratory, where he was a general manager from 2001 to 2005. Then, he joined in JAIST in 2008, where he was a dean of school of knowledge science from 2011 to 2014. His research covers stochastic control theory including Kalman filter, financial information systems, R&D management, knowledge science, and service science. He is a fellow of IEEE, a fellow of SICE and members of several institutes in Japan.



Prof. Jie Wu received the B.S., M.S. and Ph.D. degrees in computer science from Fudan University, China, in 1996, 1999 and 2008, respectively. He is currently a Professor of Fudan University (China). He is also the director of Research Engineering Center of Network Security for Ministry of Education. Dr. Wu's research interests are in Computer Networks and Security. His current work focuses on cloud computing, SDN/NFV and system security. His work has been featured on many real mission-critical application systems. His research is supported by various sources, including the National 863 program, Shanghai science& technology program, etc. Dr. Wu is the recipient of the 1st class of Shanghai Science& Technology Progress Award.



Dr. Ke Xing is a Senior Lecturer and a Program Director at School of Engineering, University of South Australia. He served as a member of Professional Development Committee at Australian Life Cycle Assessment Society (ALCAS) and is a standing committee member of Ecological Development Union International (EDUI) (Australia) (2011 to date).

In his academic career, Dr. Xing is particularly dedicated to incorporate social, economic, and environmental perspectives into tertiary engineering education and training programs to prepare graduates to become professional engineers with specialized knowledge and skills for achieving sustainability in engineering practice. In his research, he also has extensive projects and publications in the areas of resource-efficient product and service innovation, sustainable industry and community transformation, and low-carbon urban precinct system modeling. To date, he has authored over 80 research publications in books, refereed journals and international conference proceedings.



Prof. Shiyong Zhang is a professor of Computer Science School of Fudan University, China. He once worked at British Telecom and British National Computer Center in 1988 and 1993 separately, undertaking conformance testing research as a visiting scholar. He also took a short term advanced information management training class at Stony Brook in United States in 1997. His research focuses on computer networks, its application, security, testing, and evolution. He has published more than 200 papers on core journals, and about 20 books individually or with colleagues. About 20 awards were honored to Prof. Zhang in the light of his achievements in ICT field in China, such as twice the 2nd Prize of Sciences and Technology Advance at China National level, once the 1st Prize of Sciences and Technology Advance at Ministry level, a few times the 1st Prize of Sciences and Technology Advance by Shanghai Municipal Government, etc. Professor Zhang founded an IT company called Fudan Grand Horizon in 1998, and acted as the General Manager for 10 years. By which experience he knows well how to transfer the new ICT innovation to company services products.

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Chapter 1

Overview: Perspectives and Structure



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

Abstract ICT has been playing an essential role in value creation for customers and in profit generation for providers, contributing to various service innovation and business innovation. Now, digitalization using Internet of Things (IoT) and Artificial Intelligence (AI) provides solutions to address a wide range of challenges in our society, which is transforming services and businesses in the twenty-first century. “What is the direction of the business innovation using new ICTs?” is a highly relevant question concerned by business researchers and practitioners. The main aim of this book is to clarify patterns and trends of business innovation using new ICT technologies and platforms, such as IoT, AI, cloud computing, 5G network, and smart devices. These are analyzed through a series of case studies on successful trials and advanced business models in the industry sectors that have been experiencing rapid changes over the recent decade in the Asia-Pacific region.

1.1 Introduction

ICT has been playing an essential role in value creation for customers and in profit generation for providers, contributing to various service innovation and business innovation. Now, digitalization using Internet of Things (IoT) and Artificial Intelligence (AI) provides solutions to address a wide range of challenges in our society,

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which is transforming services and businesses in the twenty-first century. “What is the direction of the business innovation using new ICTs?” is a highly relevant question concerned by business researchers and practitioners. Creating new value added in business innovation depends not only on adopting state-of-art technologies and novel technological solutions, but also on addressing pressing societal needs and business requirements contextualized to cultural characteristics and economic circumstances of a nation or a region (Wang et al. 2016, 2019). Therefore, the innovation with new ICT technologies in the Asia-Pacific region is very much different from those cases observed and analyzed in American and European in terms of state of development, business culture and strategies, management approaches, consumer behavior, and hence paths for value creation in businesses. Now, the Asia-Pacific region has demonstrated the highest contribution to and potential of economic growth in the world through business innovation with new ICTs.

With this in mind, the main aim of this book is to clarify patterns and trends of business innovation using new ICT technologies and platforms, such as IoT, AI, cloud computing, 5G network, and smart devices. These are analyzed through a series of case studies on successful trials and advanced business models in the industry sectors that have been experiencing rapid changes over the recent decade in the Asia-Pacific region.

1.2 Business Innovation with New ICT

To identify directions of business innovation with new ICTs, a framework based on the concepts of Technology Space and Value Space is introduced to define perspectives and questions for the case analysis in this book. In order to facilitate business innovation, it is important to transform new functions of technologies into new business values, which satisfy customer desires and social needs. This transformation depends on an organization’s corporate culture, business model, capabilities and resources. There can be many ways for realizing business innovation with new ICTs, which are traditional ICT providers’ approaches, venture business approaches, new communities’ approaches and so on.

Based on such perspectives, five subsidiary questions are set up to probe characteristics of business innovation in each of the case studies and to address the major research question on clarifying trends of business innovation with new ICTs in the Asia-Pacific.

1.2.1 *Concepts of Technology Space and Value Space*

An n -dimensional Euclidean space is a logic in mathematics and is applied in various fields such as stochastic space in stochastic control or observation space in Kalman

filter. By adapting such concept for the business field (Belal et al. 2012), a Technology Space and a Value Space are defined for capturing and interpreting features of innovation or value creation using new technologies as shown in Fig. 1.1. In this diagram, the Technology Space encompasses all extant forms of ICT and can expand and evolve with development/inclusion of new technologies. The Value Space is formed based on correlations between societal needs or desires of customers and functions provided by deploying pertinent technologies, which can also evolve due to the expansion of the Technology Space. Business innovation with new ICT is created by mapping of Technology Space into Value Space.

By using the concepts of Technology Space and Value Space for interpreting the relationship between new technology and innovation, it is found that;

1. Customer value with new ICTs is created through transforming technologies in the Technology Space to services or products required by customers. This transformation is done by a company’s business activities which depend on its business model, value proposition and organizational culture.
2. The Technology Space for ICT has been expanding due to new technology development all over the world and along with the generational trends of technological evolution, i.e. intranet technologies, internet technologies and new ICTs such as IoT and AI. This expansion is a source of innovation, leading to new businesses and business models corresponding to contemporary customer requirements.
3. All companies can utilize technologies in the ICT Technology Space. However, the Value Space depends on the transformation of ICT technology to cater for customers with provision of products or services. Such a transformation and its success are highly dependent on, and coupled with, a company’s business strategy and business model. For example, successful companies such as IBM in the intranet-based information system business cannot transform internet technology to meet new customer requirements which are satisfied by Google and Apple in the internet era. This transformation from the ICT Technology Space to the Value Space is the key for business innovation using ICT technology.

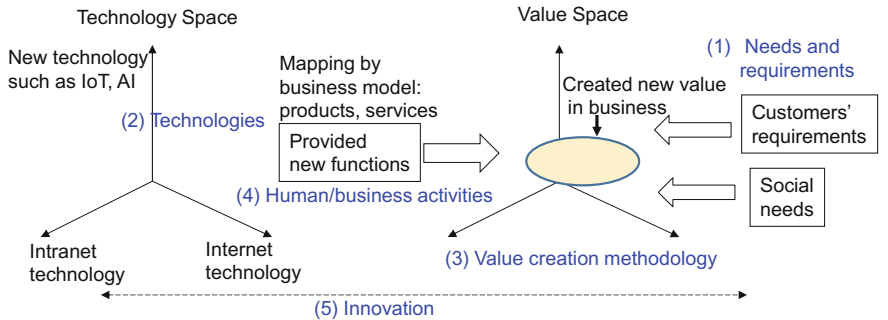


Fig. 1.1 Technology space and value space

1.2.2 *Perspectives for Analyzing Business Innovation with New ICT*

Based on the concepts and perspectives discussed above, business innovation with new ICT can be analyzed from five perspectives as shown in Fig. 1.1, i.e. needs and requirements, technologies, value creation methodology, business/human activities, and innovation. These lead to a set of questions that need to be answered for identifying directions of business innovation.

1. **Needs and requirements:** What are issues and desires in a society or a business that drive needs for utilization of ICT? What are new application fields for innovative ICT products or services?
2. **Technologies:** What technologies and functions are utilized in order to address the issues or needs?
3. **Value creation methodology:** What are value creation methodologies, considering the optimization of total system, collaboration among businesses or industries, and value co-creation between providers and users? What is the role of ICT in value creation?
4. **Human/business activities:** What are relations among human/business (including employee, organizational culture, leadership, etc.) activities and ICT system, the relationship among users, ICT providers, and other stakeholders (i.e. collaboration)? What are suitable business models?
5. **Innovation:** How have consumer, business and/or societal needs changed? How and in what forms do innovations in ICT products and services, business models, business eco-system, and customer/end-user engagement help to address such needs?

1.3 A Case Study Approach

In order to answer these questions and analyze business innovation with new ICTs in the Asia-Pacific, the case study approach is very effective and reasonable, as the truth of successful innovation exists and can be revealed only in real cases of successful business innovation. Such analyses are useful for readers, both professionals and academia alike, and can contribute to both knowledge and practice of innovation in the region. Also, this book presents, compares and analyzes various cases of business innovation using new ICT, such as IoT, cloud technology and AI, in the Asia-Pacific from the viewpoints of value creation in the practical business environment.

It is postulated that business innovation generally needs to create new values for customers or societies by using new technologies. Therefore, from the viewpoint of value creation with new ICTs, the case studies collect and analyze information related to the following aspects of the targeted companies and their ICT applications;

1. Outline of the company or society, organization, history of the company

2. Background and the objective of new approach such as
Business issues, human desire, social requirements, business strategy,
3. Outline of total system, total services
Relationship among customers, providers, system, service, community, etc.
4. Created new service, new value
What is new compared with previous situation
5. Process of developing new system, new service new business
Difficulties of development, How to solve the difficulties
6. Role of new technologies and how to solve technology issues such as privacy,
ethical issues
7. How does the new business or the new service change business or society, or
human life?
Business model innovation, social innovation.

In each case, detailed information about the company's internal and external environments are collated through a series of fieldwork and structured interviews. After collecting enough data, the collected data are further analyzed to reveal main factors of successful business innovation in the Asia-Pacific region by applying relevant theories related to Service Science (Cambridge University. 2007; Lusch and Vargo 2006) and innovation management. Especially, these cases are analyzed and compared from the viewpoints of value creation for people and societies considering culture or business situation.

Figure 1.2 shows the approach for analyzing case studies in this book, consisting of five parts that probe characteristics of business innovation with new ICT applications from both theoretical and practical grounds, as well as viewpoints of stakeholders.

Firstly, the directions of business innovation with new ICT from theoretical and conceptual perspectives are discussed in Part 1. By analyzing the general trend of service innovation using ICTs and its impact on business innovation, a new concept of the 3rd generation service innovation, powered by novel ICT solutions, and a

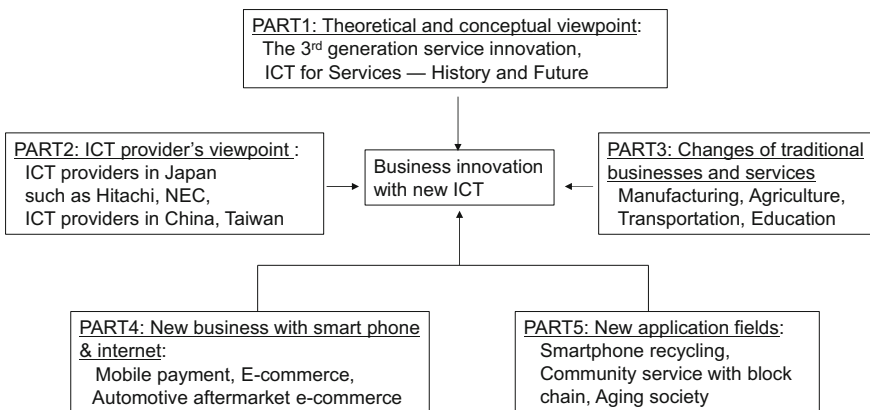


Fig. 1.2 A case study approach for analyzing business innovation with new ICTs

framework for analyzing changes in business model and value creation methodology with new ICT are presented (Chap. 2). Then, the history and the future of ICT-enabled services, as well as how their generational progress influences ways of life and businesses development/operations are examined through surveying extant literature and considering new ICTs' capabilities for innovation (Chap. 3).

Thereafter, fourteen cases studies of different types of business innovation are selected from Mainland China, Taiwan, Japan, Malaysia, Vietnam, as well as Australia. Each case examines social needs and human desires, new value created, roles of new technologies, processes and difficulties in developing new businesses, the relationship among customers, providers and stakeholders, value chain co-creation and optimization, factors of success, and business models. Corresponding to the perspectives of analysis as depicted in Fig. 1.2, these case studies are categorized and clustered in four parts: (1) four case studies from ICT providers' perspectives (in Part 2), (2) four case studies from changes of traditional businesses and services (in Part 3), (3) three case studies from new business with smartphones and internet (in Part 4), and (4) three case studies from new application fields with new ICT solutions (in Part 5). Collectively, they render practical lenses to reveal key attributes and roles of developing/deploying ICT products and services in innovating businesses and transforming industries within the Asia-Pacific region.

Finally, the last chapter of the book summarizes all findings of each case study and examines them through the theoretical lens of value creation in Service Science. Grounded on such analysis, the directions of business innovation with new ICT in the Asia-Pacific are suggested. By looking into different case examples and comparing those across categories, readers can gain insight into and draw inference from what to do, how to do, and what opportunities to catch for creating new business and developing new companies. For business leaders and innovators in the region, the first-hand information from fieldwork presented in the book may help them to develop informed business strategies and policy decisions can be made for effectively fostering business innovation. We also hope that this book can provide practical research materials for scholars focusing on business innovation, innovation management, IoT&AI applications and service science.

1.4 Outline of Selected Cases

To provide an overview of the case studies presented in this book, the topic, the context and the focus of analysis of each case and the respective chapter are outlined as follows:

1.4.1 Part 2: Case Studies from ICT Providers' Perspectives

Case 1: Hitachi's social innovation business (Chap. 4)

Hitachi is a unique company which has accumulated manufacturing expertise, ICTs and operational technologies since its founding more than a century ago. Hitachi is now evolving its Social Innovation Business through digital technology and accelerating collaborative creation with customers by Lumada, an open IoT platform that condenses a wide range of solutions and use cases. This case shows how Hitachi embeds its knowledge into Lumada and creates new values with customers.

Case 2: NEC's "Digital inclusion" (Chap. 5)

NEC has been one of the leading ICT companies in Japan. Its business covers public, enterprise, telecom carrier, and system platform areas around the world. NEC views a society in which digital technologies permeates all areas of life as the "Digital Inclusion" society, and endeavors to realize a society that creates a brighter future for all. This case introduces successful examples of social value creation leveraging NEC various assets such as well-being factory, smart cities, smart stores.

Case 3: Advantech in Taiwan (Chap. 6)

Advantech is the world No.1 industrial PC manufacture. Since 2015, Advantech has launched an ambitious project in taking the lead in establishing IoT service ecosystem. It works with domain-specific solution integrators to build IoT analytics platforms that incorporate devices, cloud storage, and AI techniques in domains such as factories, hospitals, cities, and transportations. This case investigates the co-creation process, the business models, the current difficulties, and the strategies in their business.

Case 4: NEXTTAO in China (Chap. 7)

NEXTTAO is a leading new retail solution and platform provider emerging from China. Based on the cutting-edge unified commerce platform, NEXTTAO provides real-time retail solutions to brand companies in apparel, cosmetics and other fashion industries. NEXTTAO accelerates digital transformation by leveraging innovative data technologies and rich experience in new retail.

1.4.2 Part 3: Case Studies on Changes of Traditional Businesses and Services

Case 5: Industry 4.0 transformation in the city of Salisbury (Chap. 8)

This case has strong industrial footprint in the manufacturing sectors and sees Industry 4.0-inspired technology advancement and business innovation playing a defining role to reshape the industry structure of the region. This case presents a systematic analysis on barriers and challenges faced by, capability and readiness

of, as well as potential strategies for local manufacturing firms (most of which are SMEs) in adopting digital innovation toward Industry 4.0 transformation.

Case 6: Agricultural ICT (Chap. 9)

Agricultural business has been globally noticed as an important application fields of new ICT such as IoT and AI, which are expected to solve yield optimization, crop protection improvement, food supply chain optimization. Three case studies are conducted, which are Fujitsu case (in Japan) as an existing big ICT company, Spread case (in Japan) as a plant factory venture company, MimosaTEK case (in Vietnam) as an IoT venture company.

Case 7: Transportation services in East Japan Railway company (Chap. 10)

Railway business is one of important social infrastructure which provides “transport” as a core service. In the past, railway operation and maintenance work had been labor-intensive. JR-East have started innovation of operation and maintenance applying IoT to realize more efficient management and high level service. This case introduces some successful topics of IoT applications in JR-East.

Case 8: Higher vocational education with new ICT in China (Chap. 11)

This case takes higher vocational education in China as an example to study the effect of IoT on the education. By conducting a comprehensive case study on Wuxi Vocational Institute of Commerce, this case reveals some fundamental findings that we believe are instructional and helpful in reforming teaching and learning in the education.

1.4.3 Part4: Case Studies on New Businesses with Mobile Devices and Internet

Case 9: Mobile payment of China UnionPay (Chap. 12)

Mobile payment is one of the most popular FinTech applications in China. In order to achieve the balance of financial security and user experience, TEEI (Trusted Executive Environment Integration) and Payment Tokenization technologies are developed and deployed on mobile phones. Security data is stored and processed in TEE to ensure financial security while general data is processed in REE (such as Android and iOS) to achieve good user experience.

Case 10: Automotive aftermarket e-commerce of Sparke Autoparts (Chap. 13)

This case is an industrial internet company specializing in automotive aftermarket transactions and services. Its B2B service platform is the first in Malaysia, forming a closed loop of auto parts trading services from part search, quotation, payment and delivery. Its industry-leading online transaction solution is expected to make Sparke Autoparts a leader in transforming and consolidating the traditional, fragmented auto parts industry in Malaysia.

Case 11: E-service innovation in Malaysian (Chap. 14)

With the rapid growth of the internet usage in Malaysia, consumers are now starting to purchase product and services via online medium. This case focuses on how Malaysian consumer value online services as alternatives of getting service. Two online services, e-hailing and e-hypermarket are studied, and found that the gathered consumer value help industry in providing better e-service.

1.4.4 Part5: Case Studies on New Fields of Application with New ICT

Case 12: Mobilephone recycling of Aihuishou (Chap. 15)

This case is the biggest digital devices recycling and exchange company in China. It has more than 30 M users, deal with more than 10 M devices every year. Unlike other recycling company, Aihuishou develops own recycling and exchange platform, users and resellers can sell or bid second-hand devices (like mobile phones, notebooks) through the platform. The platform applies intelligent algorithms to ease the process.

Case 13: Public services with blockchain in regional communities (Chap. 16)

This case is service innovation in regional communities by blockchain technology. One of the important characteristics of blockchain is the activation of the interaction. This case examine how blockchain make effective use of local assets in the city and improve interaction among citizens. The possibility of multi-faceted service innovation enabled by blockchain is discussed.

Case 14: Life care system for aging society in a local city in Japan (Chap. 17)

Currently, Japan is rapidly aging. Towards solving issues in aging society, the community-based integrated healthcare system is introduced in Japan. This case is to provide elderly people living at home with appropriate health, medical and welfare services. This case shows a system of sharing information about the elderly at home among multi-stakeholders such as families, home-care workers, caregivers, nurses, doctors and nursing care centers.

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Part I
Concepts and Frameworks for Cases
Analyses from Service Science Perspectives

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.

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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