

# Service Development Research for ICT Companies Based on Service Science Analysis

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**Abstract**—Service has emerged as the major element of the modern world's economies, especially in the ICT industry. But the theory of service science is far behind the reality. Service science should provide theoretical basis and analysis framework for the service development. Through analyzing service science theory and current literatures, combining ICT companies' real situation and development challenge, this paper offers several suggestions for service development, and builds the general service portfolio for ICT companies. On the other hand, this application in ICT companies will facilitate service science innovation, education, research application and development.

**Index Terms**—Service Science; Service Development; Service portfolio; Service Innovation;

## I. INTRODUCTION

Agriculture and manufacture used to be the major elements in the world's economies. Nowadays, services will be a dominant position in the global economy. The service-dominant industry structure is evolving in developed countries such as America, Japan and Swiss, while the service industry produces one third of the GDP in the developing countries such as China and India. Services now account for more than 50 percent of labor force in Brazil, Russia, Japan and Germany as well as 75 percent of labor force in the United States and United Kingdom [1].

World economies are changing from goods-oriented to service-oriented, and rapid development of services is driven by service innovation. Service is more and more integrated with other disciplines and other fields, such as management science, social science, engineering science, ICT (Information Communication Technology) science etc. With the evolution of consumer and business processes, service science has become the key factor of world's economies. Relationship between end-users and companies are improved, and this is made possible with the usage of ICT that has become the key enabler that plays a vital role in revolutionizing service through information processing and storage and facilitating of communications [2].

World economies show the trend of increase in complexity and depth, and ICT industry has been more and more important than before. For example, even if in transportation and logistics service, three kinds of ICT

have been supporting the service, leading to service innovation and increase in productivity. 1) Stationary IT. 2) Mobile IT. 3) Embedded IT. Furthermore, rising investment in intangibles, growing emphasis on knowledge management, and outsourcing play major roles in the expansion of service economies [3]. For ICT industry, many companies have already researched service science, such as IBM, Ericsson, GM etc. And they have already made tremendous achievement in service filed and proposed literatures, knowledge and experience.

First, although the services have notable influences to the performance and development of other sectors, there is still not a mature service science theory to guide service-dominant economy. And there is still not an effective method to study the innovation and development of service science.

TABLE I.  
FOUNDATIONAL PREMISES OF SERVICE-DOMINANT LOGIC

Premise number	Foundational premise
FP1	Service is the fundamental basis of exchange.
FP2	Indirect exchange masks the fundamental basis of exchange.
FP3	Goods are a distribution mechanism for service provision.
FP4	Operant resources are the fundamental source of competitive advantage.
FP5	All economies are service economies.
FP6	The customer is always a co-creator of value
FP7	The enterprise cannot deliver value, but only offer value propositions.
FP8	A service-centered view is inherently customer oriented and relational.
FP9	All social and economic actors are resource integrators.
FP10	Value is always uniquely and phenomenological determined by the beneficiary.

Service-dominant logic proposes that all the economical exchanges are based on service and product in merely the tool to deliver and apply resources. S-D logic based on the value-in-use, the roles of producers and consumers are not distinct. Value is co-created in interactions among providers and beneficiaries, through the integration of resources and application of

competences while knowledge and skills are key resources for obtain competitive advantage and create value. Vargo et al. (2008) proposed foundational premises of S-D logic as shown in Table I [4].

Using this model, we can identify Service-Dominant maturation of industry or country.

On the other hand, ICT companies cope with furious competition and complex market environment, so companies need service development to strengthen their business capability and distinguish business from competitors. It is urgent for service development research of ICT industry, and all these research also push service science development.

In recent years, many scholars in universities or enterprises begin to study service science, and many experts carried out a number of analysis and research about service development for ICT industry from many points of view.

This paper makes a deep analysis and research of literatures on service science, and outputs the conceptual content of service science. On the basis of service science analysis, this paper makes a deep service development research, and summarizes service development portfolio for ICT industry. On the other hand, in the developing countries, services ratio is lower than those in the developed countries. This paper also would like to push services development in developing countries, especially for the companies from developing countries.

## II. CHALLENGES AND OPPORTUNITIES OF SERVICE SCIENCE

Anyway, Service science has already achieved the fast development in recent years, and this fast development also makes a deep influence. As a new science, service science is also coping with big challenges. It will be important issue of the future development in service science how to face and solve these challenges.

On the other hand, if we well fix these challenges, it will be good opportunities for big development of service science. Finding opportunities also will promote the service science to become a science in the large extent. Finally, support of the industrial community offers resources guarantee for development of the service science.

### A. Challenges of service science

#### a) Different understandings for definition of service science

Although the concept of service science come from IBM and University only several year, there have been too many different understandings for definition of service science from different research perspectives. There are two words of "service science", and then they are in the following two aspects. One aspect is in understanding to science. Many understandings to science of service science exist in the existing literatures which include facing problems and solutions, the team, and cooperation, etc. Different understanding to the science of service science causes different emphases in method. On the other hand is in understanding to service. At present,

the understanding to service includes department, industry, transfer, theme selection, service management etc.

So at the beginning, we should unify the definition of service science.

#### b) These are not clear about objective and driver of service science

What are the objects of service science? From the concept, service is abstracted from various industries, and it is intermediate process that is connected suppliers with the end customers. We should know what the objects are. This is the same question for the drivers of service science. Both of them are not clear. If we cannot clearly identify objectives and drivers, it will be very difficult to research service development. The service here is an abstract concept.

So secondly, we should clearly identify objective and drive of service science.

#### c) Talent shortage

The present situation of interdisciplinary research in service science leads to the difficulty of the inherent excellent talents into the emerging field. In addition, service science now still is lacking science of academic periodicals and influential international conference, and it is against achievements and communication between researchers [5].

From this point of view, we need more and more scholars and experts to dedicate or participate of service science research. We would like to achieve both theory improvement and practice success in the field of service science.

#### d) Difficulties in multidisciplinary team research

Another challenge in services science is the multi disciplinary nature of the field. This makes it difficult to motivate faculty and researches to work across disciplines [6].

Research on service science, especially in service innovation research need close cooperation of experts and scholars in computer science, social science and cognitive sciences. At present, academia hasn't supported service innovation from scientific research or service support. Universities still follow the basically classification system in original discipline aspect, and researchers are against different disciplines of cooperation [5].

### B. Opportunities of service science

Attention to both knowledge concentrated service and service innovation is the most fundamental reasons for arisen service science, while rapid development of information technology provides research tools for the service science, which promotes the service science to become a science in the large extent.

#### a) Development for theory and knowledge of service science

Nowadays, Ratio of the service industry occupying the GDP was close to 80 percent in the United States. In the Europe countries, services now account for around 70 percent, and service has already become main element of economic growth.

Especially, service takes knowledge, information and innovation as the characteristics, which includes several

service such as communication, finance, business services, education, medical care, digital content Industry, and which became sources of high value-added obtained by the enterprises. These industries realized creating and capturing high value through information exchange, accumulation of knowledge and reuse and business innovation.

In the developed countries, services have already been the main source of economy growth. However in developing countries, such as China, the service industry produces just one third of the GDP. The theory and knowledge of service science should be developed and push the developing countries to fast develop economy.

*b) Urge Development of industry especially ICT companies*

Service science is a new discipline that is driven by the industries, which has inherent urgency and commercial value. The progress of research of the service science research will improve competitiveness of the service enterprises. Therefore, service science is paid much attention and support by the top-level service enterprises. For example, IBM has held seminar and large-scale international conferences taking service science as theme in academic research since beginning of 2002, which invited people coming from the industries and academia to carry on studying and discuss general theories and methods about the service science. IBM cooperated with the universities in education, and actively participated in discussing talent training about service science and related courses including sharing knowledge with the universities, teaching skills, cases studying, teaching materials, etc. At the same time, IBM input a hundred million dollars into the service science in the capital, including earmarks and providing free access for the hardware and software [5].

The research for service science will definitely urge industry development, especially for ICT companies' development.

*c) Support for existing discipline*

As a cross-discipline, it needs some supports of the basic disciplines during development. Not only it can be with the help of some hard science such as computer science and engineering science to carry on simulation and imitation, but also it can build model to evaluate the results by some soft science such as economics and operational research. So to speak, support disciplines needed by service science have been more mature disciplines [5].

### III. EVOLUTION OF SERVICES SCIENCE

In the beginning of 21st century, academic research has moved to using customer relationships as a foundation for a new approach to strategy, which requires managing the customer lifetime values of individual customers, a topic that has received considerable research attention in recent years [7]. Creating Language is a period with nearly a dozen of models of service emerging, and the concept of a service system beginning to take hold to unite the many perspectives.

The emergence of Services Science or SSME is a story

TABLE II  
EVOLUTION OF SERVICES SCIENCE FROM 1950s TO PRESENT

1950s	<ul style="list-style-type: none"> <li>Service is the fundamental basis of exchange.</li> </ul>
1960s	<ul style="list-style-type: none"> <li>Victor Fuchs first introduced the term "service economy"</li> </ul>
1970s	<ul style="list-style-type: none"> <li>Research work in the focused in the areas of economics and health care</li> </ul>
1980s	<ul style="list-style-type: none"> <li>Research focused on the differences between manufacturing operations (goods) and service operations (services)</li> <li>Shostack identified characteristics that distinguish services from manufacturing</li> </ul>
1990s	<ul style="list-style-type: none"> <li>Service marketing and service operations become distinct from product marketing and operations</li> <li>Research emphasized on service quality measurement, customer satisfaction measurement, and complaint management systems</li> <li>SERVQUAL was developed by researchers based on the "Gap Model"</li> </ul>
2000-present	<ul style="list-style-type: none"> <li>Models for making service financially accountable evolved from the focus on service quality measurement, customer satisfaction measurement, and complaint management systems</li> <li>Increased attention to direct contact with individual customers, storing and analyzing individual customer data, and using that information to serve individual customers better</li> <li>Increased in quantitative research, broadening, deepening and sharpening of the research, continued globalization and multi-disciplinary research and expanding topic areas 2000 - Present</li> <li>Academic research has moved to using customer relationships as a foundation for a new approach to strategy</li> <li>Increased in the emergence of models of service</li> <li>Rapid expansion of literature worldwide and increasing numbers of conferences and centers worldwide related to services science</li> <li>The service-dominant logic view is gradually replacing the traditional view of service versus product</li> <li>More top universities offer academic courses related to Services Science</li> </ul>

of gradual identification of numerous areas of study: service economics, service marketing, service operations, service management, service engineering, service computing, service sourcing, service human resource management, service design and many more. This field is expanding rapidly with an expansion of literature worldwide and increasing numbers of conferences and centers worldwide with IBM and industries' Service Science, Management and Engineering (SSME) Initiative seeking to strengthen the industry, academic, government ties. The service-dominant logic view is gradually replacing the traditional view of service versus product, with a view of service as a value co-creation that involves big things and actions, as well as information and other resources [1]. The summary of the evolution of the field is shown in Table II.

SSME is gaining visibility and attracting the attention of leading university researchers, teaching faculty, industry and government officials. The explosion of service research has been facilitated by the introduction of several influential academic centers for service research. More than many academic fields in business,

service research is often influential in leading business thought and changing business practice [8].

During a conference held at the IBM Palisades Conference Center in October 2006, some key factors driving the need for some key factors driving the need for service science and education were identified. There are several conclusions [9]:

a) *Innovation should be treated as a culture and not department.* Service innovation should also be seen as a test of leadership for the academy, government, and industry. There has been growing needs for service innovations because services are currently not seen as being innovative.

b) *Government and institutional advocacy should participate in giving support as catalyst in promoting the growth of service science.* Besides education, government and industries play a part in contributing to the success of services science.

c) *The global economy is at a tipping point.* Factors that stimulate the tipping point of the global economy are mainly technological advances such as network ubiquity and a new state of openness, from sharing of personal information to sharing of technological and transactional specifications. Business designs progresses through horizontally-integrated processes that permit for dynamic revolution with limited interference to the business which contributes to the emergence of a new view of profits growth and customer equity as key corporate metrics.

d) *There should be increased and continued need for domain experts and new demand for people who have focused knowledge in one or two domains and spectral knowledge about related domains.* Businesses should be in demand for people skilled at fusing their technical competency with industry specific knowledge and business-process expertise. More T-shaped people are needed to study, work and innovation services.

e) *Evolution of new institutional forms* where streamlining of the financially viable scene throughout the formation and proliferation of entrepreneurial capitalism should be done.

f) *The condition of services curriculum and research,* established through a rush of services programs at the masters level and samples of program development and evolution should also be taken into consideration.

g) *There should be arising needs for an integrated research program* that engenders a more articulate and standard classification and language around services.

h) *Increasing needs for skilled and hireable people* which focus on the urgent need for graduate education in service.

#### IV. OVERVIEW OF SERVICE SCIENCE

Some academicians are concerned about the term "Science" whether services science is a science [10]. Henry Chesbrough of UC Berkeley's Haas School of Business said that services science should not be called a science now because it has not developed the taxonomies, definitions, and other common features that sciences require [11].

##### A. Concept of Service Science

From concept point of view, the concept of service science did not come from Governments or Government Research Institution in the first place, the concept firstly offered by IBM and the University of California at Berkeley. In 2002, IBM's madden (Almaden) research center and the UC Berkley joint team of experts offered the concept of service science. In 2004, IBM CEO Palmisano put forward formally the concept of service science in a report title for the Innovation in the United States. At the same year, American Competition Council promulgated a report firstly brings forward the concept of service science which put the concept to comprehensive attention. In 2005, IBM renamed service science as service science management and engineering by combining scientific research contents and methods. IBM thought SSME as combination of service science, service management and service engineering [5].

Service science is the base of service science research. Although there are some differences between the concepts, above concepts comprehend the service science in two similar points. Firstly, it studies the frame of service system from the perspectives of abstraction, process and environment from three different aspects, secondly, it emphasizes the integration of service system. This paper insists that service system is an organic unity composed by the phases in the creation process of service value. It is open and integral. The basic frame is showed in figure 1 [4].

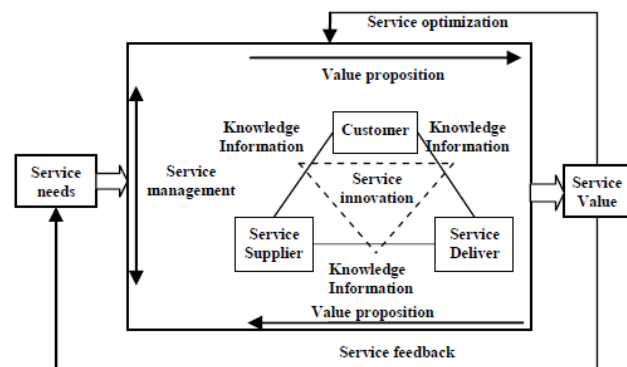


Figure 1. Service system of service science

##### B. Definition of Service Science

From definition point of view, there are many different understandings for definition of service science from different research perspectives. Summarizing all different definitions, there are four different understandings: Disciplines orient definition; Systems orient definition; Value orient definition; Content orient definition [4].

a) *Disciplines orient definition:* Bitner (2008) proposed that service science is the synthesized utilization of operation research, engineering, computer science, mangement and cognitive science. Through continuing to optimize service innovation by knowledge, emphasize the multi-discipline nature of service and accelerate service development, we can advance service efficiency and performance [12].

*b) Systems orient definition:* Maglio (2008) proposed that service science is the study of service system, in order to build a basis for systematic service innovation. The general service science is the study of how one system uses its resources to benefit itself and another system reciprocally. Service science explains the category of service science as well as how service systems evolve and interact of co-create value, in order to advance the ability to design, improve and scale service system. The main function of service science is to explain the origination and development of service science. At the same time solve the problem that how to optimize investment to advance service quality and cultivate service talents [13].

*c) Value orient definition:* Vargo et al. (2008) studied service science from the view of how to create value, emphasized the interaction of value creator composed by many service systems, proposed that service scienc is the study of value co-creation by complex resources [14].

*d) Contents orient definition:* Cai et al. (2008) proposed that the competitiveness of service providers not only depends on the service competency but also on the usabel service resources. Accordingly, they proposed the three-layer service science framework which includes service needs, service competencies and service resources [15].

### C. Objective of Service Science

From objective point of view, the service here is an abstract concept. From the concept, service is abstracted from various industries, and it is intermediate process that is connected suppliers with the end customers. Therefore, the three constitutions of the study object of service science are suppliers, customers and interactive behavior [5].

#### a) Suppliers

Human, equipment and technology resources of the suppliers are researched, then to analyze the gap between the ideal levels, in order to obtain executable scheme of these resources. The study on service provider also include the improvement of business model, estimating service output by mathematical method and the simulation result of service application of computer, etc.

#### b) Customers

From social science and cognitive science, the study on customers includes service individuation, customer to choose, customer satisfaction, customer preference, customer psychology, customer in production and different types of customer characteristics, etc.

#### c) Interactive behavior

The study on interactive behavior includes analysis of service process and management, service efficiency, the maximum service models, etc.

### D. Driver of Service Science

From driver point of view, Service Science is driven by three forces: service dominated economy, service innovation and infusion of business, technology and people. These three drivers of service science are interrelated. Growing need for service innovation is the key driver of service science. Service innovation is

enabled by infusion of resources (technology, people, business and shared information) of service system. Service innovation is the main driving force of the service dominated economy. Service science is dynamic and evolving. Its theoretical foundation is service system, which is evolving from information system and work system with the scale, complexity and innovation of the system getting increased. The mindset for service science is service- dominant logic (SDL), shifted from goods dominant logic (GDL) [16].

Service science is aimed to educate or train T-shaped professional as adaptive innovators, who are grounded in their home disciplines but have strong communication skills to interact with specialists from a wide range of disciplines. The development of service science needs joint efforts from stakeholders, such as government, business and academia. Research and education are challenged to bridge the knowledge and skill gap, to promote service science, and to benefit the increasingly complex world economy [16].

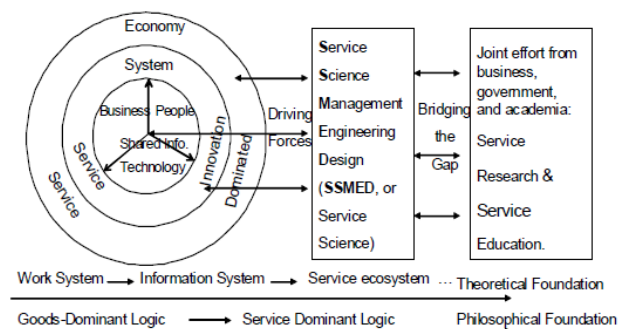


Figure 2. Framework model of drivers of service science

Through analysis of concept, definition, object and driver of service science, we can see that the purpose of research on service science is to improve the efficiency and quality of service, create the service value and urge enterprise and industry development. The emphasis is about business, especially for enterprise capability. The point is how the enterprises (Suppliers) match customers' need, provide suitable service solution and achieve enterprise development target.

IBM is an ICT company, and IBM firstly offered the concept of service science. It means that enterprises, especially ICT enterprises, are more urgent to promote service science research and development. ICT companies have the more strong desire to develop service market and achieve more business and profit according to service science analysis. We can find that it will be more valuable for companies.

## IV. CURRENT SITUATION STUDY OF SERVICE DEVELOPMENT FOR ICT COMPANIES

### A. The significance of service development study for ICT companies

In the 21th century, people will pursue quality life, and global industrial structure clearly transformed to accelerated industrialization service of economic back

that this has become a typical characteristics of global economy in the 21<sup>st</sup> century. From Figure1, we can manifestly see this trend not only in developed countries, but also in developing countries.

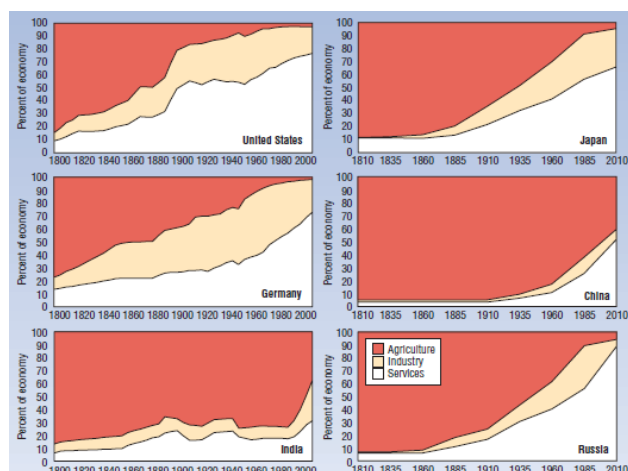


Figure 3. Services represent a growing segment of the developed and developing worlds' economies.

One important key driving force has been the way technology, particularly related to communications, has improved the operations of service-oriented businesses. Technology has even made many services possible, such as those offered by companies like eBay and Google [17]. ICT companies are the important driving force, so service development of ICT companies themselves are also important.

From another point of view, we can also consider that services can be divided into 2 broad categories that can help to balance the complexity level of the decisions [18]:

a) *Information based services*: this type of service can be delivered electronically. By definition is also known that ICT improves this type of service productivity continuous. They are related to 70% of the GDP.

b) *Traditional services*: this kind of service needs to be delivered locally because it is labor-intensive, and can usually achieve limited productivity development. It counts for 70% of the employment.

As mentioned above, the service development of ICT companies is very important and significant.

#### B. The main ICT companies' current situation of service development

ICT industry is one key driving force in global economy development, and some ICT leader companies drive ICT industry development, such as IBM, Ericsson, Nokia-Siemens etc. The paper will analyze these ICT leader companies and their service development situation.

IBM first offered service science concept, and nowadays IBM is still the leader in service-oriented economy. We can see the importance of service in the current and future from IBM performance. The following figure displays the IBM sales structure which to accelerate the process of transfer service.

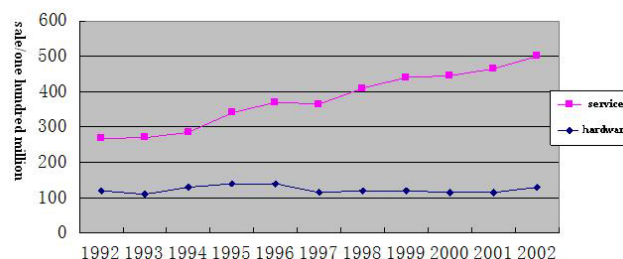


Figure 4. IBM sales variation structure drawing.

IBM has a broad range of business and technology services that deliver business results. IBM service portfolio include: IT services, Business consulting, Additional services, Small & medium business services, Training and outsourcing services. As an IT company, IT services and Business services are the Top 2 services in IBM. IT service achieve a big market share, because they focus on IT managers and CIOs demand and solve IT risk of all kinds of companies all over the world. Business consulting services lead high profit market development and support other services development.

We can see another famous CT company which is Ericsson. Ericsson is the biggest Telecom Communication equipment provider. The first half year of 2010, Ericsson Professional Services revenue accounted for around 40 percent of total corporation revenue, and especially Professional Services revenue accounted for 30.5 percent of total corporation revenue. Ericsson's Global Services portfolio includes consulting, system integration, network roll out, customer support, learning and managed services. Ericsson Global Services focuses on supporting operators in growing their business by improving net subscriber revenue, by becoming more operationally efficient, and by seamlessly evolving their network to meet current and future demands.

Ericsson is a world-leading provider of telecommunications equipment and related services to mobile and fixed network operators globally. Over 1,000 networks in more than 175 countries utilize Ericsson network equipment and 40 percent of all mobile calls are made through Ericsson systems. Ericsson are one of the few companies worldwide that can offer end-to-end solutions for all major mobile communication standards. From Table 1, we can see that Ericsson total Net sales revenue is down, but Professional Service revenue is

TABLE III  
PROFESSIONAL SERVICE REVENUE OF ERICSSON

Year	Net sales (Billion USD)	PS Revenue (Billion USD)	Ratio of PS Revenue /Total Revenue
2010	31.19	12.3	39%
2009	31.68	12.2	38%
2008	32.05	7.5	23%
2007	28.83	6.6	23%
2006	27.58	5.0	18%

increasing. Professional Service Ratio is also increasing year by year. Depending on service development, Ericsson can still keep No 1 position in the Telecom Equipment field.

Nokia Siemens Networks is also a leading global enabler of telecommunications services. From Table IV, we can see that Nokia-Siemens Professional Service Ratio is very high, and PS revenue accounted for 46 percent of total corporate revenue in Y2010. In recent years, almost half of revenue comes from Professional Service in Nokia-Siemens. We can see that Nokia-Siemens has already made the clear Service Development strategy, and this company has already made the service as core business.

TABLE IV  
PROFESSIONAL SERVICE REVENUE OF NOKIA-SIEMENS

Company	Net sales (Billion USD)	PS Revenue (Billion USD)	Ratio of PS Revenue /Total Revenue
2010	18.79	8.6	46%
2009	18.55	8.3	45%

Huawei is a leading telecom solutions provider which HQ locates in China. Through continuous customer-centric innovation, we have established end-to-end advantages in Telecom Networks, Global Services and Devices. With comprehensive strengths in wire line, wireless and IP technologies, Huawei develops quickly recent years. Their products and solutions have been deployed in over 140 countries and have served 45 of the world's top 50 telecom operators, as well as one third of the world's population. From 2009, Huawei begin to

TABLE V  
PROFESSIONAL SERVICE REVENUE OF HUAWEI

Year	Net sales (Billion USD)	PS Revenue (Billion USD)	Ratio of PS Revenue /Total Revenue
2010	28.52	4.9	13%
2009	21.8	N/A	N/A

launch financial report, and it has already been the famous telecom provider in the world. From financial report of Y2010, we find that Huawei total revenue is much higher than Nokia-Siemens, but Huawei Ratio of PS is much lower than Nokia-Siemens. According to Ericsson and Nokia-Siemens, Huawei should take more care of Service Development very much. If Huawei would like to be a global leading telecom solution provider, Huawei should have the clear strategy plan about Service Development.

From analysis of IBM and Ericsson, we can find some similar qualities. Firstly, both of them focus customers' pain points and solve their problems through service solution. Which customers face big challenges means we

have opportunities. ICT Company can solve customers' problems and demands through products, process, tools, and management and so on. We can define all of these things as service solution. Secondly, both of them offer consulting and learning services, and consulting services are high profit and can lead business development. Through consulting services, ICT Company can sit together with high-level customers and discuss strategy issues. For sure, this will push business development. Thirdly, from revenue contribution point of view, IT service, managed services and system integration services account for big share of total revenue. These traditional services' increase will be continued and smooth.

Another point of view, West companies such as IBM or Ericsson or Nokia-Siemens, have already begin to change to Service-oriented companies. They develop business and profit more coming from service, and Service Development has been their core business. East companies such as Huawei or ZTE, they do not make Service as the core business. What they develop more come from equipment and low labor cost. However, according to competitive intensity, these east companies should also take more care about high profit Service Development.

### C. The measures and suggestions of ICT companies service development

From the above analysis, this paper proposes the following recommendations of ICT companies' service development.

a) *Customer Centric*: Firstly, we should identify who are our key customers. We can certainly define that all kinds of companies are our customers, but we should identify who are key customers, and what are the different strategy for different customers. Secondly, we should focus customers' pain points and demands. We should be proactive and deeply seek customers' challenges, and provide solution based on customers' demands. It will be a big problem for ICT companies if they just provide services according to their current technology, products and process. Customers' demands are crucial for ICT companies, and it will be a disaster if ICT companies are just technology-oriented, such as Iridium Communications Inc.

b) *Technology progress*: On the other hand, all the ICT companies are High-tech companies. Service science is the multi-discipline, and it includes engineering, economics, management and cultural sciences, sociology, and law. It is also an integration of many service disciplines such as service systems and value propositions, service economics, service marketing, service operations, service management, service engineering, service computing, service design, service measurement, service sourcing, service governance, and service innovation [1]. All of engineering, computing, design etc are relative with technology. ICT companies deeply understand customers' demand, then they should make technology progress to guide and match customers' needs.

c) *Interactive Behavior*: In service system, resources are applied (including competences, skills, and knowledge) to make change that have value for another system. Resources in service system belong to two distinct groups: operant resources and operand resources. A service system includes at least one operant resource. Operant resources can act on other resources to create change, value and effect. Operand resources are operated on. Determination of which resources are operand or operant depends on the context [16]. This paper insists customer-oriented and technology progress. Besides, ICT companies should take care other resources, such as industry political and economic environment, competitor strategy & competitive situation, themselves competence, customers consumer behavior. If ICT companies want to breakthrough and deeply develop one service market, they have to take care these issues and consider interactive behavior.

d) *Clear strategy and portfolio*: Johnson and Scholes define strategy as follow: "Strategy is the direction and scope of an organization over the long-term: which achieves advantage for the organization through its configuration of resources within a challenging environment, to meet the needs of markets and to fulfill stockholder expectations". In ICT companies, Service is a business unit, so we should consider this business unit strategy. Business unit strategy is concerned more with how a business competes successful in a particular market. It concerns strategy decision about choice of products, meeting needs of customers, gaining advantage over competitors, exploiting or creating new opportunities etc. Service portfolio is the tangible expression of service strategy. From analysis of IBM and Ericsson, we can make a general service portfolio. 1) System Integration: This service solution includes network rollout, IT design & integration etc. These services will be fulfilled before Preliminary Acceptance Certificate. 2) Assurance services: This service solution includes technical support, spare parts support, software update/upgrade, network outsourcing etc. These services will be fulfilled after Preliminary Acceptance Certificate. 3) Consulting services: This service solution includes business consulting, certification, training etc. These services are about knowledge transfer services.

## V. CONCLUSION

Service science research has already been hotspots in these years. It will accelerate a new discipline system development in service-dominated global economy. Service development research in special industry is also very important.

Firstly, this paper collected and analyzed the challenges and opportunities of service science. Service science has three big challenges: a) Different understandings for definition of service science; b) These are not clear about objective and driver of service science; c) Talent shortage; d) Difficulties in multidisciplinary team research. And for sure service science has many opportunities, especially there are two big opportunities: a) Development for theory and knowledge of service

science; b) Urge Development of industry especially ICT companies.

Secondly, this paper collected and analyzed the evaluation of service science, especially from 1950s to present, and had a description of what is SSME (Service Science, Management and Engineering). Through this research, we can easily understand the history of service science, and the reason of the emergence of service science discipline.

Thirdly, this paper collected and analyzed the concept, definition, objective and driver of service science, then studied the current situation of service development for ICT companies through several world famous corporations such as IBM, Ericsson, Nokia-Siemens, Huawei. By addressing several world famous ICT companies, this paper offered four suggestions for service development: a) Customer Centric; b) Technology progress; c) Interactive Behavior; d) Clear strategy and portfolio. However, prospect of the service science is very vast, and it will attract more and more people's eyes. Further efforts are expected in this research area.

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## REFERENCES

- [1] IfM and IBM, "Succeeding through Service Innovation: A Discussion Paper", Cambridge, United Kingdom: University of Cambridge Institute for Manufacturing, 2007.
- [2] Seyed Hossein Siadat, Veronica Clement Buyut, Wardah Zainal Abidin, "The Evolution of Services Science" 2008 IEEE.
- [3] J. Sheehan, Understanding service sector innovation, Communications of the ACM, July 2006/Vol. 49, No. 7 pp43-47.
- [4] Xuejun Wang, Guoxian Bao, Xudong Jia, "A Brief Study on the Research of Service Science Theory", 2010 International Conference on Service Sciences, pp248-249.
- [5] Yingji Jin, Yan Chen, Junxin Cao, "The challenges and opportunities of Service Science", 2010 IEEE.
- [6] M. J. Bitner, S. W. Brown, M. Goul, S. Urban, "Services Science Journey: Foundations, Progress, Challenges", Cambridge Service Science, Management and Engineering Symposium, Moller Center, Churchill College, Cambridge, UK, 14-15 Jul. 2007.
- [7] R. T. Rust, C. Miu, "What Academic Research Tells Us About Service Science", Communications of the ACM, Jul. 2006.
- [8] Seyed Hossein Siadat, Veronica Clement Buyut, Wardah Zainal Abidin, "THE EVOLUTION OF SERVICES SCIENCE", 2008 IEEE.
- [9] Services Science, Management and Engineering: Education for the 21st Century, IBM Almaden Research, October 2006.
- [10] L. D. Paulson, "Services Science: A New Field for Today's Economy", Computer, vol. 39, no. 8, pp. 18-21, Aug. 2006.
- [11] H. Chesbrough, J. Spohrer, "A Research Manifesto for Service Science", Communications of the ACM, Jul. 2006.
- [12] Bitner, et al. Service science, management and engineering education for the 21<sup>st</sup> century. Springer US: Springer, 2008, pp227-234.

- [13] Maglio, P.P., Vargo, S. L., Fundamentals of service science [J]. Journal of the Academic Marketing Science, 2008, 36(1):18-20.
- [14] Vargo, S. L., Lusch, R. F. Service-dominant logic: Continuing the evolution [J]. Journal of the Academy of Marketing Science, 2008, 36(1), 1-10.
- [15] Cai H, Yeh J, Su H. Relooking at services science and services innovation [J]. Service Oriented Computing and Applications, 2008, 2(1): 1-14.
- [16] Kejing Zhang, Biao Ma, Pingjun Dong, "Drivers and Implications of Service Science", 2009 IEEE.
- [17] Linda Dailey Paulson, "Services science: A New Field for Today's Economy", 2006 IEEE Computer Society.
- [18] V. Zeithaml, M.J. Bitner, e D. Gremler, Services Marketing, McGraw-Hill/Irwin, 2008.



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