

服务系统理论架构与建模^①

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Theoretical Framework and Modeling of Service System

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Abstract: This paper proposed a theoretical framework of service system based on the theory of system science, and studied some related notions, such as the composition of a system, the relationship between systems, the system hierarchy structure, the evolution of a system, etc. In the next section, we discussed the modeling of service system and the future research work.

Key words: service system; modeling; system science; business process modeling (BPM); system hierarchy structure

1 Introduction

People engaged in various activities to satisfy all kinds of requirements in human society.

In the case of lack of material, People paid more attention to material production: reducing costs, improving efficiency, adapting to the market demand and environment protection and so on; While in rich material age, people concentrated on the non-material needs: the satisfaction of spirit, the development of personal qualities and the comfort and convenience of life. So the economic formation of society transformed from the Industry to Service Industry.

After some research and practice on non-material needs of individuals, people then concerned about the activities in organization and between organizations, which have the general characteristics of services. Especially, when IT (information technology) becomes the main communication tool in life and work, some rela-

ted research areas, such as organizational reform, process reengineering and services outsourcing become today's main topics.

In this paper, based on the concept of system, we take the service provider as a system, study the general characteristics and make a general description of service system modeling.

2 Related Literature

In recent years, there are more and more definitions and descriptions of service system.

After analyzing a large number of literatures, Paul P. Maglio et al present his opinion: Service systems are value-creation networks composed of people, technology, and organizations^[1]. The pattern of service has been transformed from provider-customer traditional mode into a complex social technical system.

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James M. Tien and Daniel Berg applied the system engineering approach to do the analysis and research in service sectors : a number of service systems engineering methods are identified to enhance the design and production/delivery of services, especially taking advantage of the unique features that characterize services – namely, services, especially emerging services, are information driven, customer-centric, e-oriented, and productivity-focused^[2].

Wei-Feng Tung and Soe-Tysr Yuan identify that the service systems is e-service^[3]. Service systems, in general, are made up of large numbers of interacting consumers and producers who co-produce value.

Tong Mo, et al established a service system theory frame from an ecological system (ecosystem) perspective and analyzed the service system's static structure and dynamic mechanism from both macro and micro angles^[4].

Stephen L. Vargo, et al proposed a perspective that service systems together create value : Service systems interact through mutual service exchange relationships, improving the adaptability and survivability of all service systems engaged in exchange, by allowing integration of resources that are mutually beneficial^[5].

Professor Robert J. Glushko(University of California, Berkeley)made the report “A Systems Approach to Service Science Research” in Service Science Faculty Workshop held in National Tsing Hua University, he thought that Traditional concepts of service management and design emphasize person to person interactions, it is inadequate for understanding today's more complex mix of services that include self-service, multichannel services, and intra and interenterprise automated services.

The abovementioned demonstrated the various points of service system. Generally speaking, most scholars tend to view the service provider and recipient as a system, who create and share common values and interests in the interaction.

3 The Theory of Service System

To make an accurate definition of service system is very difficult, but we can describe the characteristics of

the system. Karni and Kaner provide a general definition of a system, and then specify the distinctive characteristics of a service system: A system is an organized set of objects which process inputs into outputs that achieve an organizational purpose and meet the need of customers through the use of human, physical, and informatic enablers in a sociological and physical environment^[6]. It is architected as a set of nine interlinked classes of objects:

- (1) customers - those benefiting from the system (or otherwise affected by it);
- (2) goals - aims, purposes or central meaning of the system and the organizations;
- (3) inputs - physical, human, financial, or information entities to be processed by the system;
- (4) outputs - physical, informational or human entities after processing by the system;
- (5) processes - transformations for obtaining outputs from inputs;
- (6) human enablers - human resources owning and/or operating the system;
- (7) physical enablers - physical resources which aid in operating the system;
- (8) informatic enablers - information and knowledge resources supporting the system;
- (9) environment - physical, economic, technological, social, ecological or legal factors influencing the system.

As a theoretical foundation, we need to understand its composition, border, type, feature, hierarchy and the evolution process from the system point of view, which will be the premise to further analysis and solve the problem.

3.1 Components of service system

A service system must contain the related components which together complete the service.

While the border is not changing, the service system is not closed, it involves the input and output and can achieve some kind of functions. Besides, a set of process from input to output and the resources to support the successful completion of the process are needed(see Fig.1).

(1)Service Processes

The most basic component of a system is the service process, a series of activities to realize the service

function. It was also divided into Front Stage and Back Stage: The Front Stage is the region for customer to interact with each other and the Back Stage is another part of the process.

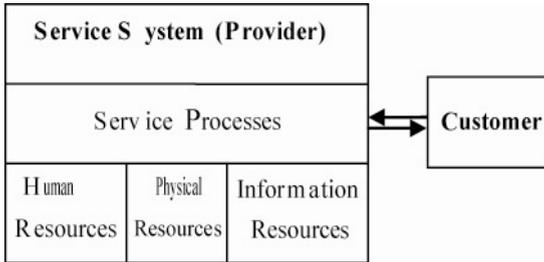


Fig.1 Service system framework

(2)Support Resources

There are many resources to implement the activities, including human resources, material resources, information resources, etc. Human resources contain two types of persons: the manager and the employee. Some material resources as part of the service take place with the transfer of ownership, such as the replacement parts in maintenance, the food in restaurants; and another part is necessary in the process which remains in the place after the end of the service, such as the maintenance tools, the dining tables of restaurants. Information resources are rich and varied, such as files, communications, knowledge.

3.2 Relationship between systems

When the interaction takes place between systems, there are two major roles: service providers and service recipients. For the same system, it can be a service provider or a service recipient.

Generally speaking, a service system is made up of three types: person, organization and machine. The information system as well as other Mechanical Systems is involved in "Machine" which mainly refers to non-human services provided by the system, such as vending machines, ATM machines and so on. Table 1 gives the various combinations between them.

According to Wei-Feng Tung and Soe-Tysr Yuan's analysis, there are three types of interaction between the service providers and consumers:

(1)Mutualism. Mutually beneficial interactions between the providers and the customers. The specific partner (i.e. it is a fixed relationship between the provider

and the consumer) is necessary for the value co-production.

Table 1 Relationship types

Type	Example
P2P	Family Doctor to Patient
O2P	Restaurant to Client
P2M	Person to ATM
O2M	Enterprise to CRM
O2O	Accounting Firm to Company
M2M	Web Searching Engine to Web Site

(2)Collaboration. Mutually beneficial interactions between the providers and the customers. Comparing with mutualism, the specific partner is unnecessary (i.e. it is not a fixed relationship between the provider and the customer) for value co-production.

(3)Commensalism. One-sided (provider or customer) has the benefit when they build the symbiotic relationship.

The three relations described the degree of service provider and consumer contact with each other, as well as the degree of dependence. That provides us with a possible approach to analyze the system evolution.

3.3 Hierarchy of service system

The structure of service systems is hierarchy. An enterprise can be seen as a system which can be divided into different sub-systems, such as R & D systems, finance systems and so on. These sub-systems can also be divided into subordinate sub-systems. Of course, the smallest service system can be just a person and a machine, while the largest service system is the Global Economic Community.

Broadly speaking, the traditional business organizations have the pyramid-pattern structure, while the modern organization structure emphasizes too much on process, flat and the flexibility. If we try to view the organization as a system, businesses can operate more effectively.

3.4 Evolution of service system

The service system develops mainly with the changing market environment and the application of new technologies which is the primary driving force of the system evolution. To the service industry, the communication technology has brought a service expansion and service revolution. In particular, the application of infor-

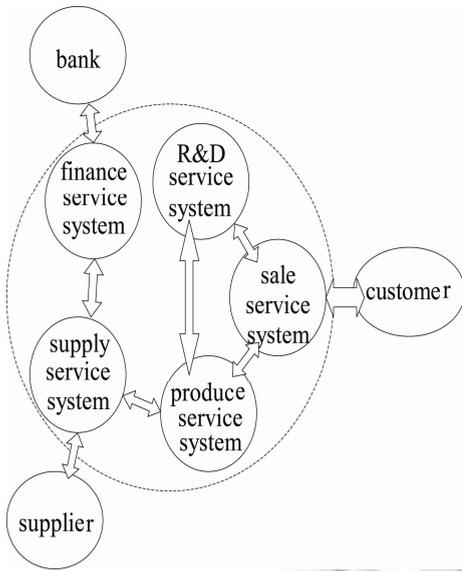


Fig.2 Hierarchy of service system

information technology led to the new service model, which is the main area that we are trying to explore (see Fig. 3).

- (1) the person-to-person service
- (2) the organization-to-person service
- (3) to increase the services between organizations
- (4) to increase the services between organization and machine (non-human service system)
- (5) to increase the service between machines

Due to the rapid development of communication technologies as well as specialized division of labor, the productivity is on the fast increase and enterprises pay more attention to their own core strengths, so that a large number of minor works have to be delivered to outsourcing business. As a result, the service networks are prosperously developing and the social wealth will increase with the productivity improving(See Fig.4).

- (1) a simple service system
- (2) a complete function system
- (3) a services system applying the outsourcing services
- (4) the development of service networks after application of a large number of outsourcing services

4 Service System Modeling

At present, service system modeling mainly includes the business process model, the value model and the

information flow model. There is lack of the systematic structure analysis and the system performance evaluation model which must be built based on the theory of service system.

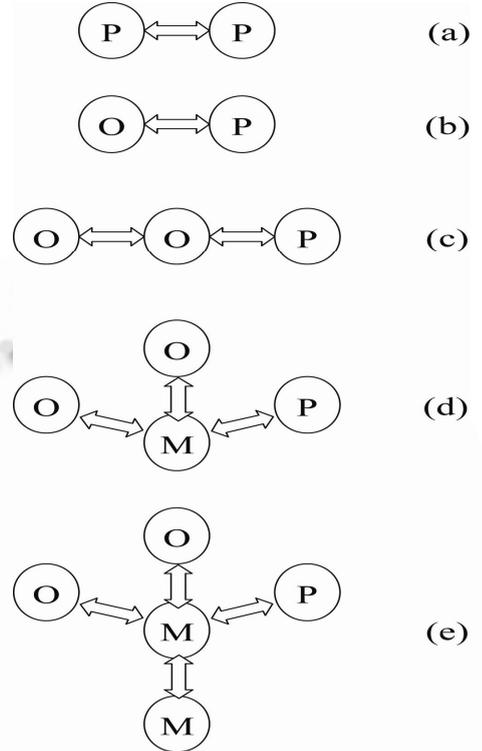


Fig.3 Service system evolution(I)

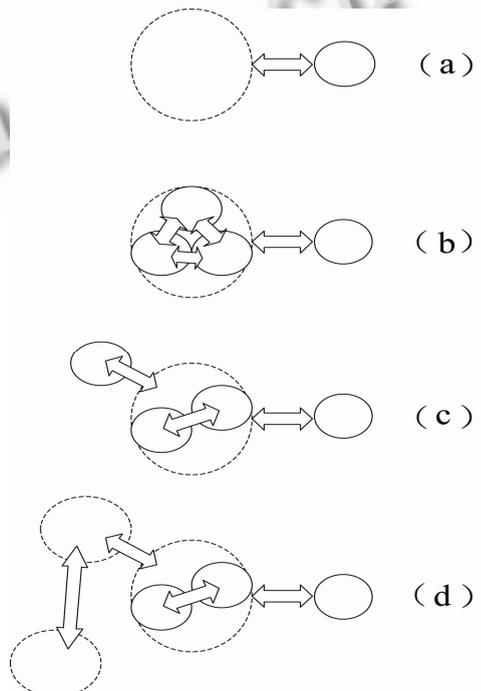


Fig.4 Service system evolution(II)

4.1 Business process modeling (BPM)

Business process model reflects the structure of the process and provides the manager with an analysis approach to improve the efficiency and quality of the process. At present, this is the mainstream research area.

The objects input and output are generally not the same by this analysis approach. We can better analyze the efficiency and quality of a series of activities which can be evaluated according to the objective standards; But there is hardly an objective and quantitative criteria, so the evaluation of the output quality and efficiency in a service-oriented process becomes very difficult.

As a result, we should adopt a closed process to conduct modeling and analysis, but not any partition process (see Fig 5) on the basis of service system theory. Otherwise, the different stakeholders (customer, employee, manager and stockholder) stand on the different point of views, the evaluation and analysis of a process can not be unified.

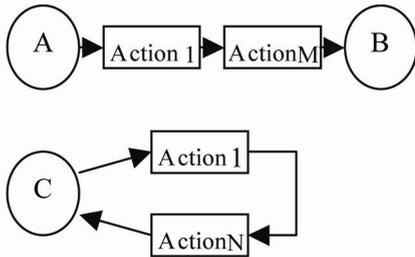


Fig.5 Open process and closed process

4.2 Value modeling

The value model includes the Service-Profit Chain model^[7], the value network model^[8], the value co-creation model^[5], etc. Some of the models have become the core business in consulting firms.

From some aspects of value, the characteristics of a system are analyzed in these models, which is a good tool to analyze the ways and means to create system value.

4.3 Information modeling

Information flow model involves the exchange of information, feedback and control model^[9]. Some research shows that the business value can be reflected by the information flow model^[10].

Information flow modeling can be a simulation of information flow inside the system or between systems, and it is important for service system modeling as most

of the relations are based on information.

4.4 Structure modeling

System structural modeling is the most difficult form of a simulation, especially in a complex system. At present, the software system structural modeling is very common, but the approach to the social system structural modeling is still evolving.

4.5 Evaluation modeling

Because the evaluation index of service business is difficult to quantify, the service system evaluation model is rather difficult to build.

With the evaluation of the process or the results, we can not very well reflect the system operating conditions^[11].

According to the Taguchi quality loss approach, using Monte Carlo simulations technology to evaluate the quality of the service delivery process may be an appropriate way.

Generally speaking, if we just model the process, we can't make an analysis of the overall system performance and efficiency. As a system, the structural modeling is necessary and through the establishment and analysis of the relationship among various elements of the system, we can find the core elements of evaluation to improve and optimize the system's performance.

5 Discussion and Future Work

In the traditional sense, the service is often seen as a behavior, a process or a result. As for computer science researchers, service and information systems are always linked. They study the service behavior, style or the results from the perspective of management, or the realization of system function and optimization from the perspective of software engineering. But they hardly think of the service operations and management from the system of scientific point of view. If based on the theory of service science, we will be able to define the relevant concepts and their extension and lay the foundation for the service science with different methods and techniques in an overall integration framework. Future work will be the following three areas:

Firstly, the characteristics of a service system have to be further studied, such as the relationship between the

whole and part (related to the emergence of a whole), self-organizing systems and so on. Service system is a complex system consisted of the organization system, information system and physical system, the core elements of the system operation and the relationship between them, and the motility mechanics of the system evolution will be the focus in future research.

Secondly, the specific research approach of service system should be built. At present, the research methods are mainly from other disciplines, such as sociology, psychology, and some natural systems science. It is expected that the unique methods of service system will be built after the absorption, digestion and integration of other disciplinary approaches.

Thirdly, do the application study, such as the outsourcing decision-making research. In today's fast-changing market, companies need to maintain their competitive advantages so that they have to outsource a large number of works which are not the advantages. However, outsourcing is often the big problems that the leadership must take into account. Tim R. Holcomb and Michael A. Hitt proposed a synthesized model after integrating transaction cost theory (TCT) and the resource-based view (RBV)^[12]. However, it is difficult to establish a quantified model for both of them as the transaction costs can not be accurately calculated and the optimization of resource allocation is difficult to assess. So we can build a strategic outsourcing decision-making model based on the theory of service system.

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