Exploring the Impact of Organizational Implants of a Manufacturing Company on Service Innovation in the context of big data: A case study of XI'AN SHAANGU POWER

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Abstract—Service innovation has become an important way for manufacturing companies to obtain and maintain their competitive advantages. Organizational implants have been proven to enhance service innovation in manufacturing companies, while the rise of big data offers new opportunities for it. This study aims to explore the impact path from organizational implants of a manufacturing company to service innovation in the context of big data with the application of Single Case Study Method, and XI'AN SHAANGU POWER is selected as research object. The findings are suggested as follows: (1) There are two ways of organizational implants to achieve service innovation for manufactures. One is employee implants, and the other is device implants. (2) Employee implants can create relationship capital, and device implants can generate data resources. (3) Relationship capital has a direct and indirect positive impact on service innovation through professional knowledge acquisition and customer demands mining. (4) Data resources have an indirect positive impact on service innovation through customer demands mining and product technology upgrading.

1 INTRODUCTION

With the emerging of service economy in the world, developing service sector has become an important strategic choice in the New Chinese Economy. At the same time, with the diversity of customers' demands, the down of product profits and the rising of profits of maintenance and other services, more and more manufacturers have started to implement service transformation [1]. In addition, characteristics of the service such as the synchronization of production and consumption and the success depended on customer satisfaction, advance the new request for manufactures to grasp customer needs. Service innovation has become an inevitable choice for sustainable development of the service provider to deal with the increasing of the personalized customer demands. Therefore, how to effectively meet customer needs and open service innovation path, has become an important problem for the manufacturing companies implementing service transformation.

As a manufacturer representative of implementing service transformation successfully, Shaangu's services business margins have continued to rise steadily, and become the main source of profits exceeding products since 2013. Under the guidance of service innovation, Shaangu continue to meet customer diversity demands and create service innovation by organizational implants. This action and result are worthy of in-depth exploration.

The previous studies about Shaangu mainly focused on these topics, for example, the evolution of service transformation process of manufacture, the classification of product service systems, the influent factors of the service transformation process, and so on. These topics prefer to continuous analysis of the transformation node events, less description for relationships between the customer needs and the behavior or measure of the service provider and lake of binding to service innovation practice. In addition, previous research has not focused on the impact of big data on organizational implants and service innovation. Therefore, this study will analyze the service innovation path through organizational implants behavior of Shaangu from the perspective of customer proximity in the context of big data. The results provide theoretical support on establishing service innovation ideas inter-organization boundaries and co-creation values with customers for the

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service-oriented manufactures. The research findings expand service innovation systems paradigm.

2 CONCEPTUAL BACKGROUND

A. Organizational Implants

The term "Organizational Implants" first appeared in the paper of management "External organizational commitment among organizational implants" written by Scott J. Grawe, etc. in 2012. It was defined as "a logistics service provider assigns a representative to work on-site at a customer's facility, and these representatives work alongside the customer's employees to manage logistics operation and assist in logistics planning" [2].Then, Scott J • Grawe mentioned the term again in the study of relationships between logistics service providers and their customers, made empirical tests to the relationship between the organizational implants and logistics service innovation from the perspective of relationship capital, and proved organizational implants had positive effect on service innovation through relationship capital and knowledge exchange [3]. In addition, he pointed out the manufacturing industry need verify the existence of such a relationship phenomenon [4].

It is obvious that the description of organizational implants from Scott J • Grawe emphasizes the employee implants which means the service provider implants employees into the customer business operations site. However, "the material elements of the organization" is defined as "employee, equipment/device and other materials" in <GONG GONG GUAN XI BAI KE CI DIAN>. Thus, in addition to employee implants, equipment or device implants can also be explored. Furthermore, with the increasing market competition, changing customer demands, and the emergence of the digital economy, big data is rapidly sweeping the globe and has become a key component of corporate core competitiveness. Manufacturing companies are becoming more aware that products are used as a service carrier, data is used as a service medium, and the gaps in user needs are continuously explored in the process of use. This is an important change for manufactures facing market competition in the current era.

Remote monitoring could refer to the integration of a series of activities such as data monitoring, collection and transmission using computer hardware via wireless or network technology [5]. The importance of remote monitoring technology for servitization had recently been emphasized by Ostrom et al [6]. By providing real-time data about the health, performance, usage and location of a product in the field, remote monitoring technology might mitigate these risks. It can collect and analyze data about products and fleets which enable manufacturers to be more proactive in their maintenance by replacing or repairing a faulty or deteriorating component before it fails, thus preventing losses, disruptions, environment, safety, and other hazards such failure could bring upon customer's business. A growing number of manufacturers had been adopting this technology to support their servitized strategies [5].

According to the description of remote monitoring by previous scholars above, it is not difficult to find that remote monitoring is a kind of behavior across organizational boundaries to provide better service via implanting camera, sensor and other substances smart device to the customer business operations site by manufacturing companies as service providers. This remote service can be achieved through the equipment implanted of organization. And the main core components implanted are smart devices such as cameras and sensors. Therefore, this device implants can be seen as another form of organizational implants.

Brax and Jonsson argued that remote monitoring had enabled development of "remote field service" by which predictive maintenance was enabled through direct information exchange from the machinery being monitored, without customer contact. Nevertheless, it is important to stress that this technology does not and has not replaced traditional "service on-site" [7]. Therefore, as the two different forms of organizational implants in manufacturing companies, both of employee implants and device implants will provide customers better services, but it is impossible to both replace each other.

B. Service Innovation

The concept "Service Innovation" was first proposed by scholars Betz, it refers to introducing the services based on technology into market [8]. After that, there have been different scholars on service innovation to make more clear and detailed explanation for it. Berry et al. thought that service innovation aims to meet customers' demands by adding new services, expanding existing services and improving service delivery [9]. Bendik and Ostrom et approved Berry etc., and pointed that establishing new or improving existing service model, service projects and service processes are also service innovation [6,10]. Zhang and Lu considered that service innovation in a manufacturing company is to improve all of activities with user face-to-face which aims to capture the potential benefits of existing and new products, and using the appropriate information, technical support and consulting services to establish partnerships with customers through dynamic interactions in terms of product quality and service [11]. Wei Jiang et al. considered that service innovation is to improve the service process, service offerings with the use of new technologies and new ideas, to upgrade existing service and to create new value for customers, then ultimately formative competitive advantage of service providers [12]. Zhang Ruoyong thought service innovation is a series of activities of "customer-centric" largely, and the purpose is to create new services to meet the customers' current and potential needs [13].

With the integration of previous views on service innovation above, some conclusions can be summarized as follows. The purpose of service innovation is to satisfy customers' needs, grub the potential benefits, be partner with customers, and thereby generate a competitive advantage of service providers. The result of service innovation is to create new services or improve the existing service or enhance existing service quality and service efficiency. The important tools of service

innovation are information technology and knowledge. Given fundamental purpose of service innovation, it is extremely important to have a good communication and interaction with customers for service provider [14]. Service innovation has become a customer-oriented terminology. Especially it has become a difficult goal to achieve for a single organization. The closer co-operation between service providers and customers is suddenly more important [15].

C. Theoretical Foundations

Based on the above analysis of theoretical concepts, some findings could be described as follows. The definition of previous studies for organizational implants mainly focus on the employee implants, one of the constituent elements of the organization, without considering the equipment or device which is another one of the constituent elements of the organization in the big data context. Beyond that the scope of research is limited to the field of logistics services. The remote monitoring service is a new way to provide better service to customers through implanting cameras, sensors and other smart devices to the customer operation site, connecting with customers through big data, which may be classified as another form of organizational implants, named as device implants. Two types of organizational implants are shown in Figure 1.

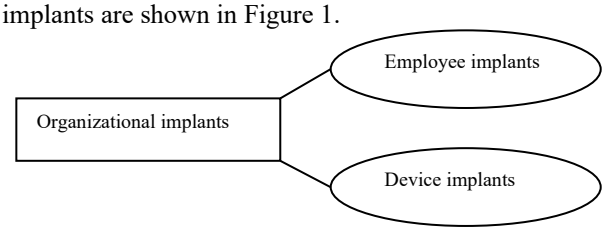

Figure 1 Two types of organizational implants

In summary, it is important for a manufacturing company to achieve service innovation by organizational implants. Therefore, it is significant to clarify the different theoretical paths of service innovation via organizational implants, which specifically means how employee implants could create service innovation and how device implants might achieve service innovation.

3 METHOD

This study is an exploratory research using single case study method which selects SHAANGU POWER as the object. The method of data collection concerns two types of data.

The firsthand data is mainly obtained through in-depth interviews. The members of the research team conducted in-depth exchanges with case company managers through field visits and video conferences. First, an interview outline was prepared in advance based on the research questions. Second, an interview group of three people visited the Shaangu Power Office Building twice, and successively visited the Deputy General Manager, the Minister of Service Industry, and the head of the Remote Monitoring Center. Face-to-face communication with these middle and senior management interviewees was conducted; then, two front-line service staff implanted at customer site were recommended by the manager through a video connection to interview them. Relevant issues are discussed with the interviewees until the interviewees are clear about the research questions and the members of the interview team have the information they need. In addition, during the later collation of interview records, the interview team has kept in touch with the interviewees, and tracked interviews with new interview questions in the form of video conferences to ensure the accuracy of information.

The interview outline is set up in two stages according to the interview phase. The first interview is semi-structured, and the interview outline questions are mainly open-ended. The main purpose of the interview is to understand the services the company currently provide to their customers. The problems mainly involve the business of participating in customer operations, and the understanding of organizational implants and service innovation. The second interview was conducted after collating the results of the initial interview and collecting the information. Interview questions are more concentrated and focus on the relationship between organizational implants and service innovation.

Meanwhile, the channels for obtaining second-hand materials mainly include: (1) data and information introduction and annual reports of the company's official website; (2) relevant data of the industry statistical yearbook; (3) literature related to case company in the CNKI database.

According to the results of data collected, we will further analyze two representative projects about organizational implants and service innovation. We would extract the key variables and build the relationship model between variables, and clarify the theoretical path from organizational implants to service innovation.

4 RESEARCH FINDINGS

A. Company Profile

Shaangu Power was established in 1999, under the Shaanxi Blower Group Co., Ltd. It is in a leadership position in Chinese fan industry. This enterprise provides turbo-machinery systems solutions and system services for the chemical, petroleum, metallurgy, pharmaceutical and other pillar industries. There are about 2,500 employees. The annual turnover is over 4.8 billion and services revenue is accounted for more than 52%.

Shaangu offers full-time nursery services for seven client companies currently. It sends staff to customer enterprises' operation site in long-term to perform regular maintenance, routine maintenance, accident repair, and other maintenance work. This behavior is named "nanny service" in Shaangu. The employees implanted in customer operation site will provide all kinds of services to meet customer requirements immediately. In addition, based on the "nanny service" mode, Shaangu is developing the "butler service". In butler service mode, employees of Shaangu implanted in customer operation site will need stronger abilities in both technology and management to communicate

effectively with customer and provide wider range of services to customer timely.

Shaangu provides remote monitoring services for more than 300 devices in about 120 customers currently. There are about 12 employees of the expert-level to do analysis for the problem diagnosis and monitoring preset scheme. The process of general remote monitoring services is as follows: Firstly, data is collected via the device embedded in product; Secondly, data is imported in monitoring center through a data transmission system; Thirdly, abnormal data is transmitted to the diagnostic center; In the end, diagnostic center will provide a solution to solve the problems on customer operation site.

B. Employee Implants and Service Innovation

Shaangu had a project cooperation and provided a full range of managed services for Baosteel Ningbo Steel. It assigned employees of project teams to Ningbo Steel's operation site in all of the project cycle. The employees of project teams were implanted in the Ningbo Steel, worked together with its staff on the operation site in all working time and contacted with them directly every day. Therefore, the friendship between both employees was constructed and the trust between them was deepened. Employees of Shaangu with communication skills have professional knowledge about product that is customer's equipment operating in Ningbo Steel's production line site. Employees of Ningbo Steel have heterogeneous knowledge and information that is different from employees of Shaangu. As time goes on, with in-depth communication between employees, the relationship capital was created between Shaangu and Ningbo Steel. The specific relationship demonstration is shown in Figure 2.

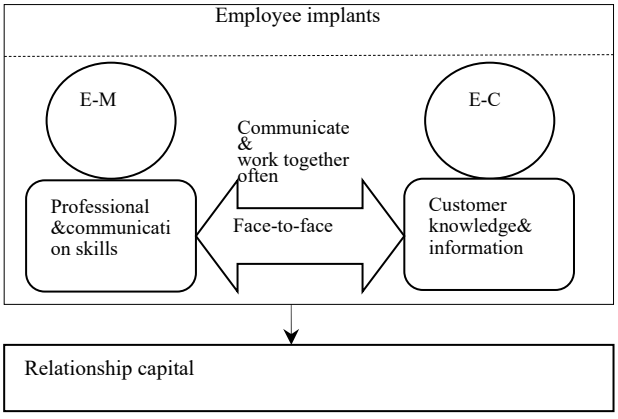

Figure 2 Employee implants and relationship capital

Note: E-M refers to the employees of the manufacturer (Shaangu); E-C refers to the employees of the customer company (Baosteel Ningbo Steel).

Finding 1: Employee implants can create relationship capital.

Meanwhile, relationship capital increases with deepened friendship between the implanted employees of manufacture and employees of customer. The implanted employees can get more accurate information about the customer company from the employees of customer through informal communication, then the manufacture can design new services or advance existing operation processes to satisfy the customer's next potential demand, which also means service innovation is generated.

Finding 2: Relationship capital can create service innovation directly.

In addition, with the enhancement of relationship capital between the implanted employees of manufacture and employees of customer, the implanted employees can become familiar with professional knowledge, skills and machine usage habits of customer employees. Combining with the professional knowledge and addressing to the machine usage habits, the implanted employees can help customer improve their machine-related service process, which is also a kind of service innovation.

At the same time, with the enhancement of relationship capital, more frequent communication, the observational learning on customer operation site and the deepened of friendship, the implanted employees can identify the customer's potential demands for services that may exist in the customer enterprise operational processes. Then the manufacture can develop new services to deal with the potential demands for mining customers. Thus, service innovation has occurred.

Finding 3: Relationship capital can create service innovation indirectly through professional knowledge acquiring and customer demands mining.

C. Device Implants and Service Innovation

Shaangu provide remote monitoring services for the Yongsan steel. The monitoring center in Shaangu will receive real-time data updates from Yongsan's monitored device operating-state every ten minutes. The accumulation of these real-time data will generate a big data pull. The monitoring center makes statistical analysis for the big data to measure the possible exception of operational machine and forecast customer potential demands. In this way, it can effectively prevent incident and better control it in order to avoid abnormal stop production losses caused to the customer.

In addition, Shaangu remote diagnosis center can judge the frequent problems part by an accumulation of data analysis, and then carry out a deep analysis of problems to upgrade the machine product design. Meanwhile, after analyzing the existing problems, if the technical aspects of product have no problem, the diagnosis center will come to find out the problem from the operating habit of customer employees, and provide appropriate staff training or other new services to solve these problems.

Thus, Finding 4 and Finding 5 can be derived. The specific relationship demonstration of device implants and data resources is shown in Figure 3.

Finding 4: Device implants can create data resources.

Finding 5: Data resources can create service innovation indirectly through customer demands mining and product technology upgrading.

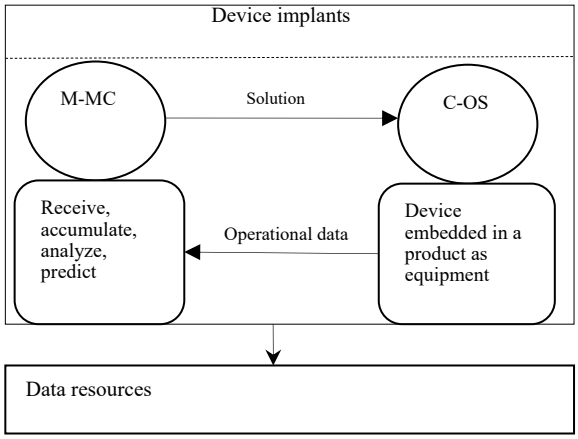

Figure 3 Device implants and data resources

Note: M-MC refers to the monitor center in manufacturing company (Shaangu); C-OS refers to the operation site in customer company (Yongsan Steel).

To sum up, given to the analysis of Shaangu, it could be seen that there are two ways of organizational implants to achieve service innovation for manufactures. One is employee implants, and the other is device implants. Employee implants can create relationship capital, and device implants can generate data resources. Relationship capital has a direct and indirect positive impact on service innovation through professional knowledge acquisition and customer demands mining. Data resources have an indirect positive impact on service innovation through customer demands mining and product technology upgrading.

The specific multiple paths are shown in Figure 4.

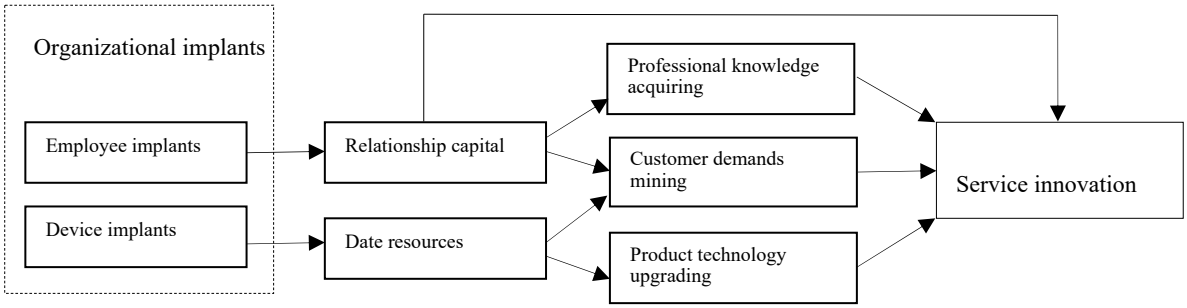

Figure 4 Path model from organizational implants to service innovation

5 CONCLUSION

This study explored the relationship paths from organizational implants to service innovation of a manufacturing company in the context of big data. Taking Shaangu power as a study subject, the specific project events about organizational implants were analyzed. The results extend the original definition of organizational implants from scholar Scott J. Grawe, find out the intermediate variables such as relationship capital, data resources, professional knowledge acquiring, customer demands mining, and product technology upgrading etc. between organizational implants behavior and service innovation outcomes, and identify the specific relationship paths of these variables. Finally, five findings are suggested. These findings can provide theoretical reference for service-oriented manufacturing companies to achieve service innovation better.

Due to limitations of single case study, the presence of this study may have some limitations as follows: the subject of this case study Shaangu power is in the leader level position of blower power industry. The costs and other difficulties of organizational implants may be not a problem for it but may be not easy for other small and medium manufacturing enterprises. Therefore, whether this service innovation mode is suitable for other service-oriented manufacturing companies is still a problem to be verified by much more samples. Future researches could consider overcoming limitations in this study and focus on other aspects of organizational implants and service innovation applying other study methods or from other perspectives.

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