

INFORMATION REQUIREMENTS AND MANAGEMENT FOR SERVICE BASED BUSINESS MODELS

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Abstract: Anticipated scarcity of natural resources and concern for the sustainable development forcing manufacturing industries to emphasise on conservation of resources on one hand. On the other hand high competition in the manufacturing industry is forcing companies to look for innovative value propositions. Service based business models are emerging business solutions that fulfil the functional needs of customers. Such business approach demands extensive and sophisticated information collection, sharing and management systems. However, there are evidences of knowledge gap when it comes to defining information requirements, information management and sharing systems needed to adopt such business models. The objective of this paper is to provide an overview of research done in the area of service based business models in terms of information management and communication systems. The paper also includes result of two case studies done in two different manufacturing companies with the purposes to understand information requirements to adopt service based business models.

Keywords: Resource conservative manufacturing, service based business models, product service systems, information requirements, information management

1. INTRODUCTION

It is estimated that the worldwide population will become double in 2072 (The World Bank, 2011) which will result in a five times increase in the GDP per capita. This double population will cause ten times increase in resource consumption and waste generation (Kumar *et al.* 2005). By contributing 30.7 % to the total world GDP and employing a 0.7 billion workforce worldwide (estimated in 2010) (Central Intelligence Agency, 2011), the manufacturing industry serves as one of the main driving forces in economic growth and improvement of living standard. Indeed, at the same time, the manufacturing industry is a major consumer of the material and the energy and generating significant amount of waste. In 2008, about 14% of the total 2652 million tonnes of waste generated in EU-27 countries came from the manufacturing industry (European Union, 2010). In addition, manufactured goods at their end of life also create huge amount of wastes. In this situation the manufacturing industries have no option but to conserve resources during manufacturing and recover tangible and intangible resources at the end-of-life of products. Resource Conservative Manufacturing is a concept which proposes a framework to conserve resources by integrating product design, supply chains, business models and technological infrastructure. The concept envisages product multiple lifecycles but not limited to only product reuse and remanufacturing but to evaluate all possible forms of closing the loop including product level recycling, component level recycling and material level recycling (Rashid *et al.*, 2013; Asif, 2011). One of the cores of this concept is to integrate innovative business models that ensure that products return to the original equipment manufacturers (OEMs) at the end of their use or functional life. Service based business model which is widely known as product service systems (PSS), defined as a “*business approach to shift the focus of traditional businesses based on the design and sale of physical products to a new business orientation that considers functionalities and benefits delivered through products and services*” (Manzini and Vezzoli, 2003) is an approach that can ensure smooth return of products at the end-of-life/use.

Nevertheless, if service based business model is not seen as an enabler to resource conservation but as an independent entity, there are also business and environmental values. In a recent survey report jointly published by Fishburn and the Crowd indicates that there is a clear shift from ownership to service based business models in which both manufacturers and the consumers are mostly interested about the functions provided by the products rather than conventional buy-sell approach. Consumers appreciate the model due to financial savings, user convenience, social experience and environmental consideration. Manufacturers appraise the model as this can be a strategic tool to change the market (Fishburn and Crowd, 2014). Besides, highly competitive markets, price press tendencies and standardized solutions/technologies are forcing companies to extend their business with new value propositions. This also opens up possibilities to generate more revenues by selling services throughout the lifecycle of the product and ensure repeated sales to the same customers due to extended relationships with the customers. (Meier *et al.*, 2011; Kindström, 2010; Laperche and Fabienne, 2013; Mont, 2004).

To successfully implement service based business model, information technology infrastructure, more specifically, infrastructure that allows efficient collection, management and communication of information is essential (Baines, 2007; Erkoyuncu *et al.*, 2013). The purpose of this work is to lay a research foundation regarding information requirements and management for service based business models. The objectives of this paper are to provide an overview of research done in the area of service based business models in terms of information management and communication and outline the information requirements to implement service based business models.

2. METHOD

To meet the objectives mentioned in the previous section, a qualitative research approach was used. It was based on the case study methodology as an “empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used” (Yin, 2009).

Two case studies in two different manufacturing companies were conducted. One person from each company was interviewed in two occasions. The interview approach was semi-structured as it was more interesting to know their views about information requirements in general rather than asking specific questions. The information was analysed and processed as per need to meet the objectives. The results of the analysis were shared with the interviewees to validate the credibility of the processed information.

In addition to the empirical study, a literature review was conducted mainly to identify problem areas, gather knowledge in the area of service based business models in general and specific to information requirements and management.

3. STATE OF ART

Xerox is one of the first companies that adopted the concept of service based business model back in 1980s. By integrating consumable supply with its products, Xerox maximized machine uptime and availability, as a result, Xerox acquired knowledge in its product development and received higher profits (Henry and Richard, 2002; Henry, 2010). Transformed from a company producing copier, printers and paper into a services led technology company, such as document management and fleet management, Xerox has differentiated itself as solution provider. Today, 70% of Xerox’s revenues are created after the product sale. This transition has not been a coincidence but designed to put focus on customer values and constant service innovations (Nick, 2010). Since then the concept of service based business model has been researched in many terms, such as service innovation, service-oriented business, and product service system. Numerous number of studies suggested that the adoption of service business model has positive effect in the aspects of economic growth, customer relationship management, consumption of resources and improving environment (Baines *et al.*, 2007; Ivanka and Bart, 2013; Windahl and Lakemond, 2006; UNEP – United Nations Environment Programme, 2002; Yang *et al.*, 2009). Baines (Baines *et al.*, 2007) has summarised studies done in the area of service business model from three perspectives – theoretical, system and system engineering perspective. The theoretical studies cover methods including analytical conceptual research, empirical experimental research and empirical case study. The theoretical studies also include case studies that have provided some guidelines for the system and process design (Pezzotta *et al.*, 2009; Pezzotta and Cavalleri, 2010). Further, from the perspective of system engineering,

many methods have been proposed to design processes and track activities, such as service blueprinting and spiral model. To deploy these methods in real context, IT tools are required to collect and manage the data and information (Baines *et al.*, 2007).

Marko (Marko *et al.*, 2013) argued that service based business model requires higher network capabilities, such as network coordination, partner knowledge and internal communication, where partner knowledge and internal communication plays an important role in facilitating knowledge management through the product use and ensuring the corresponding of customer needs (Marko *et al.*, 2013; Windahl and Lakemond, 2010). In other words, leveraging information communication and product-service integration is identified and researched as avenues for improving the life of products (Schweitzer and Aurich, 2010; Durugbo, 2011), and enable manufacturers to retain a balance between their core product, manufacturing operations and growing service intensity (Windahl and Lakemond, 2006). The realization of information retrieval processes represents the basis for a continuous improvement of both product and service offerings as well as corresponding processes and resources by complementing the already existing knowledge of the manufacturer (Brissaud and Tichkiewitch, 2001). Recent studies show that information communication technology (ICT) has positive impacts from various aspects in service based business model, such as product development, process standardisation and process responsiveness (Valeria *et al.*, 2013). Such information communication enablers, for instance automated call centre, web-based supply chains, wireless communications for scheduling and trouble-shooting, can lead to significant improvement in offering on-site and off-site service, reducing downtime and increasing responsiveness. Today, the tools for realizing information system are for example product life-cycle management (PLM) and customer relationship management (CRM). Each system has their own focus, but not much information is obtained from the activities where the product is in use and service is delivered (Tan *et al.*, 2010).

The information, from a system point of view, involves customer activities, products and services, processes and activities possessed by service providers and partnerships. According to Schweitzer and Aurich (Schweitzer and Aurich, 2010), all partners in the information network have to support the processes of information gathering and analysis with the objective of forwarding the information immediately to the appropriate organizational units. The process of information gathering and analysis starts with identification of information from internal communication with organizational units and external communication with customers. The process is followed by gathering information from service technicians and service units in terms of how products are used and how the service is delivered. This information is then analysed and examined whether it can be used for further purposes or if the information only has statistical characteristics. Finally, the information is allocated for further processing within the organization units and for feedback to the customers (Schweitzer and Aurich, 2010).

4. CASE STUDY

As mentioned earlier, one of the main purposes of this research is to gather knowledge about information requirements for adopting service based business model. To fulfil the purpose two manufacturing companies were chosen to carry out the case studies. One of the companies (referred as company A hereafter) is pioneer in implementing service based business models and the other company (referred as company B hereafter) use conventional business approaches but expressed its interest to shift toward service based business models. As company A is already into service based business models for about a decade, they have developed their own information management systems to run the business smoothly. On the other hand company B has minimum information management systems required to provide only the maintenance and repair supports. This diversity has made it possible to understand practical problems to start up and hurdles to run service based business model in terms of information management. Figure 1 outlines the organizational structures and information flow in case companies A and B.

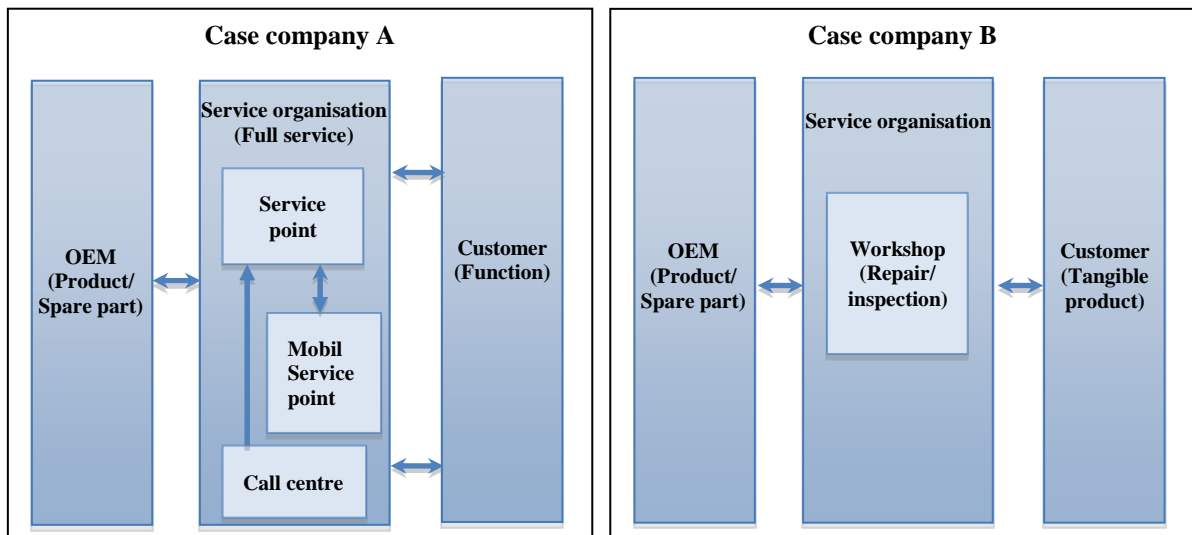


Fig. 1. Organizational structures and information flow in case companies (arrows indicate direction of information flow between stakeholders and organizations)

As it is apparent, in case of company A the organizational structure and the information flow is complex compared to company B. In this structure the ownership of the products remains with the OEMs and customers buy function instead of product for a certain period. To meet the functional needs of customers the OEM established a sophisticated service organization and the only purpose of it is to make sure that the functional needs of the customers are met all the time. If the functional needs are not met as agreed, the OEM is penalized with financial compensation system to customers. Such an arrangement demands that there is proper and efficient information management system in place and all parties share the information when necessary.

In case of company B the organization structure is a classic one where product is the main focus and the ownership of the products stays with the customers. In addition to the product, the customers buy full services for the products from the OEM affiliated service organizations. The service organization is responsible for maintenance and repair of the products when a failure occurs. The service organization is paid per man hour spent on fixing the problem. However, the company B wishes to have similar information management systems as company A to improve the efficiency of their maintenance and repair services.

Even though both companies are trying to meet needs of the customers differently the main objective of both the companies are the same, i.e., to maximize the uptime of the product and improve the efficiency of the services. It means the challenges they are facing in terms of information gathering, sharing and managing are the same. By combining learnings and getting the insights of the two case study companies, it was possible to understand the information requirements for service based business models, which is presented in following section.

5. RESULTS

The results of this research can be divided in two categories. Results extracted from the review of the state-of-the-art research and the results of the case studies.

The literature reviews revealed that service based business model is an emerging business approach in which OEMs, customers and society can win. Much of the work done in this area is related to outline the importance of adopting service based business models and their strategic, economic and environmental benefits. It has also become evident that there is a knowledge gap when it comes to information management systems in service based business model.

The results of case studies are set of requirements that are essential to establish and run a service based business model. These requirements are categorized based on users and providers of the information and for which purposes the information is used. Table 1 in the next page is a summarized list of the information requirements for service based business models and their categories.

Table 1 Information requirements for service based business model for the case companies

		OEM	Service Provider	Customers
Information category	Contract	capacity needs location of operation market/commercial conditions customization	types of service contract how often is maintenance tax/legislation environment regulations	cost responsibilities warranty insurance
	Operations		operating hours/distance how machine is operated operating environment failure symptoms cause of failure failure types/codes possible solution on-site Location and local language	operating manual operating conditions failure symptoms trouble-shooting tools (phone/email) order consumables spare parts book Location and local language
	Maintenance & repair		workshop opening hours maintenance schedule parts availability machine conditions parts usage/wear installed program data failure risk evaluation workshop history warranty declare history level of work(overtime/idle time) personal training Location and local language what information can be shared	upgrade maintenance schedule exchange of parts maintenance/repair time alternative machine Location and local language

6. DISCUSSION AND CONCLUSION

The work presented in this paper is an ongoing research which at this point involves three Swedish companies. As this is an emerging area, any knowledge created in this area is highly valuable but at the same time becomes confidential in nature. The companies involved in this research have their strategic interests in this work which prevents us to share all the findings. We are also obliged to keep the name of the case study companies anonymous which may have made this work vulnerable as a scientific research.

Despite the limitations of this work in terms of disclosure of all research findings, the following important conclusions can be drawn,

- Service based business model is an emerging business approach which retains high value for OEMs, customers and the society.
- There is knowledge gap when it comes to information requirements and management in service based business model.
- To run service based business model, it is important to know information requirements and how information can be collected, stored and communicated. It is also important to know how the information will be shared and who is responsible to generate and provide the information.

- Large company may have own resources and know-how to develop sophisticated information management systems for service based business model but SMEs need external support that can provide them required information management and communication infrastructure.
- More work needs to be done to identify complete set of information requirements which is applicable in a specific industrial sectors.

Up to this point in research, a small fraction of information requirements have been identified. Moreover, the empirical studies were done only in two specific manufacturing companies. There are more information requirements to identify within this sector and beyond this sector. The future work will be to continue identifying information requirements to adopt service based business model.

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