CIRP Annals - Manufacturing Technology xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

CIRP Annals - Manufacturing Technology

journal homepage: http://ees.elsevier.com/cirp/default.asp

Modeling the transition to a provider–customer relationship in servitization for expansion of customer activity cycles

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ARTICLE INFO

Keywords:
Design
Knowledge management
Servitization

ABSTRACT

Servitization requires that manufacturers shift their organizational capabilities and processes from sales to product-service systems and recognize the broader business activities of customer service companies. This study models the knowledge-based transition to the provider–customer relationship, using an actor network model for an auto-parts manufacturer as an example. We propose a model chain that explains the servitization process for construction equipment. A technical tool for design-in-use activities of customers is crucial to transform servitization into the next phase. Interconnections among activity cycles of providers and customers result in the transformation of the functional structure through service provision and knowledge transfer.

1. Introduction

Servitization is defined as 'the innovation in an organization's capabilities and processes to better create mutual value through a shift from selling products to selling Product-Service Systems (PSS)' [1]. Since the PSS is 'an integrated product and service offering that delivers value in use [2],' a servitized organization designs, builds, and delivers an integrated product and service offering that delivers value in use.

Servitization requires manufacturers to understand customer activity cycles in use phases and design a PSS that facilitates use processes. Manufacturers must delve further into a holistic daily user experience for B2C models and the broader business activities of customers for B2B models [3]. This use-centered viewpoint contrasts with the traditional engineering viewpoint of a product lifecycle consisting of sequential phases, such as design, development, manufacturing, sales, use, maintenance, and disposal.

Vandermerwe elaborates on how companies may focus on customer relationships through a methodology called 'customer activity cycles (CAC) [4].' It focuses on activities that customers do to benefit from the products and services offered. A customer activity cycle consists of three stages: what goes on before the customer achieves the result, while the customer derives the core benefit, and after the experience. Customer activity cycles represent various customer activities related to using products and receiving services.

This study aims to develop a method to expand servitization in manufacturing into deeper customer activity cycles. The remainder of this study is organized as follows. In Section 2, we describe an actual auto-parts supplier setting to analyze customer activity cycles, using an actor network. Then, we obtain the issues required for servitization. Section 3 proposes a model of servitization processes in the context of construction equipment manufacturers. The provider–customer relationship in terms of knowledge transfer is a key to capture the servitization process. A technical tool for design-in-use activities of customers is crucial to transform servitization into the next phase. Section 4 concludes the study.

2. Analysis of customer activity cycles

2.1. Trends of AUTOSAR in the automotive industry

The ratio of software to electronic control unit (ECU) development has been increasing due to the advancement of electronic control in automobiles. In 2003, a new standard called AUTomotive Open System ARchitecture (AUTOSAR) was established by integrating old standard specifications. AUTOSAR provides a set of specifications that describe basic software (BSW) modules, define application interfaces, and build a common development methodology based on the standardized exchange format. The slogan of AUTOSAR is 'cooperate on standard, compete on implementation.' BSW modules made available by the AUTOSAR layered software architecture can be used in vehicles and electronic components of different manufacturers and suppliers, thereby reducing expenditure on research and development and gaining expertise in the growing complexity of automotive software [5].

Further, AUTOSAR is expected to drive open innovation and development of new ecosystems in the automotive industry, involving multiple car manufacturers and ancillary suppliers.

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http://dx.doi.org/10.1016/j.cirp.2016.04.094
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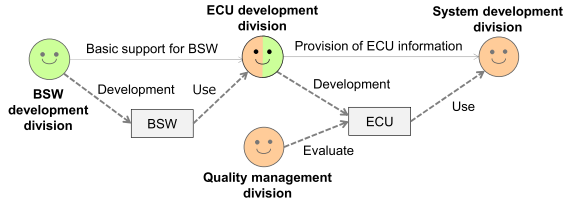
Although AUTOSAR-compliant development has happened only in Europe so far, auto-parts suppliers in Japan, such as DENSO CORPORATION have recently begun work on developing BSW compliance with AUTOSAR. AUTOSAR diffusion requires BSW vendors to seek various services that enhance productivity and reduce risks in user development. Therefore, many clues toward servitization are obtained from this case.

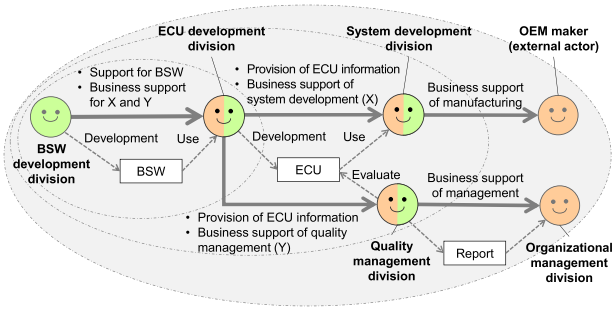
2.2. Building an actor network to consider support services

The authors collaborated with a business planning division and the BSW development division in DENSO CORPORATION to design new support services beyond BSW.

First, we understood the scope of BSW support services by constructing an actor network model as shown in Fig. 1(a). Suppose that a provider is green and receiver is orange. Services are delivered through complex multiple structures consisting of various go-betweens. An intermediate actor who receives a service and then provides a different service is bi-colored [6]. Fig. 1(a) represents the goods-dominant perspective of support services. Products such as BSW and ECU are network focused; however, the network has meager information on the activities of the ECU and system development divisions. Suppose that all customers at this stage are internal actors in the company. The system development division plays the role of integrating ECU components into the automobile electronic control systems.



(a) Good perspective (focus on products)



(b) Service perspective (focus on customer activity cycles)

* Basic Software
* ECU: Electronic Control Unit

Fig. 1. Actor network about support services on basic software (BSW) of AUTOSAR.

To focus on the customer activity cycles discussed in Section 1, we revised the actor network model as illustrated in Fig. 1(b). In addition, quality management and technology management divisions were recognized as important actors. The content of possible support services can be described on arcs among actors. For example, the ECU development division can provide not only ECU information but also business support to the quality management division. The BSW development division must coordinate business processes with the ECU development division to enable further investigation of support services between the two divisions.

After reviewing the revised actor network, we decided to focus on ECU development, quality management, and organizational management divisions in this study. Consequently, three types of customer activity cycles were specified: (1) product development activity cycle; (2) quality management activity cycle; and (3) organizational management activity cycle.

2.3. Review of support services in customer activity cycles

The business processes of target actors were elaborated according to customer activity cycles obtained. We also referred to domain knowledge of software development derived from software product line (SPL) methodology [7]. Then, as shown in Table 1, we collected and listed up possible support services, including those offered by competitive BSW vendors. Through the above-mentioned process, the following issues about servitization are raised in our study:

- How manufacturer evolves organization's capability of support services for different types of customer activity cycles in the servitization process.
- How manufacturer and customer interact in the servitization process.
- How customer's engagement and contribution are considered in the servitization process.

For the third issue, the relationship between the customer activity cycle and design is studied later in this section, while the other two issues are dealt with in the next section.

2.4. The design aspect in customer activity cycles

The customer activity cycle can be restructured as a use process. The relationship between design and use has become a core issue in user-centered design approaches. The two must overlap, intertwine, and simultaneously change [8]. This implies a holistic view of design, integrated with practical use, which continues during the in-use phase. A variety of use situations can display more design-like characteristics rather than just consuming functions arranged by providers. An earlier study by the authors [9] suggested that an ecosystem consisting of different types of designs could link design and use. Design-of-use and design-in-use

Table 1
Possible BSW support services associated with customer activity cycles (partial).

1. Product development level	2. Quality management level	3. Organizational management level
•Support the introduction of AUTOSAR	•Define development processes	•Marketing analysis
•Version up of BSW and its tool	•Technical planning	•Technology forecasting
•Introduction education	•Technical risk management	•Building a business case
•Consulting of functional safety compliance	•Make/buy/mine/commission analysis	•Customer interface management
•Definition and evaluation of architecture	•Measurement and tracking	•Organizational planning
•Requirement engineering	•Configuration management	•Organizational risk management
•Assurance for defects		
•Technical support		
•Migration service		
•Temporary staffing		
•Quality analysis of source code		
•Review usage of BSW		
•Test and report		
•User group		

Please cite this article in press as: Hara T, et al. Modeling the transition to a provider–customer relationship in servitization for expansion of customer activity cycles. CIRP Annals - Manufacturing Technology (2016), http://dx.doi.org/10.1016/j.cirp.2016.04.094