



Flexibility in industrial product-service systems and use-oriented business models

Alexander Richter^{a,*}, Tim Sadek^b, Marion Steven^a

^a Chair of Production Management, Ruhr-University Bochum, Universitätsstraße 150, 44801 Bochum, Germany

^b Chair of Engineering Design, Ruhr-University Bochum, Universitätsstraße 150, 44801 Bochum, Germany

ARTICLE INFO

Article history:

Available online 23 July 2010

Keywords:

Use-oriented business models
Industrial product-service systems
Incomplete contracts
Flexibility
Modularity in design

ABSTRACT

Today's corporate environment is characterized by growing dynamics and uncertainties. Here, flexibility gains importance as a critical success factor. This is especially true for those innovative business models, which have in common relational and long-term customer-supplier relationships. As a solution to the mentioned uncertainties connected with such a business relationship, one can think of flexibility designed Industrial Product-Service Systems. The contribution at hand focuses on contracts to control customer-supplier relationships, which remain incomplete due to their long-term horizon and the resulting uncertainties and therefore implicate incentive problems and, thus, inefficiencies. We can show that by re-allocating property rights in use-oriented business models it is possible to distribute incentives and risks more uniformly and to better balance the interests of customers and suppliers. Doing so, the leeway resulting from these incomplete contracts should not be interpreted as a risk anymore but more as an opportunity to exploit the accordant development of flexible Industrial Product-Service Systems. Our contribution points out the importance of flexibility and describes the opportunity to detect the optimal degree of flexibility of such a system.

© 2010 CIRP.

1. Introduction

The change from a mere product business to selling customized problem solutions has led to the establishment of terms such as business models, performance contracts, life-cycle costs and product-service systems. This conception, which focuses on securing sustained earnings through services besides the one-off sale of products, originates in the change of customers' requirements and is driven to a great extent by the reallocation of risks and incentives. In a business environment characterized by increased uncertainty, the aspects "availability" and "flexibility" of an Industrial Product-Service System are thus of special significance.

Here, the classical term "production system" is consciously replaced by the term "Industrial Product-Service System" (IPSS) which, according to its definition, is characterized by a life-cycle-oriented integration of the industrial supply of products and service parts [1]. This substitution of the term which is discussed both in academic and in industrial circles as well as a currently high publication density regarding the issue of use-oriented business models raises the following questions (Fig. 1):

- What is the relationship between uncertainty, use-oriented business models and IPSS?
- What is the significance of the aspect flexibility in use-oriented business models and how can flexibility be integrated into IPSS?
- How can IPSS be designed in an economically sensible way and how can you quantify the value of flexibility of IPSS?

The remainder of the article is organized as follows. In Section 2 we motivate for the dominance of use-oriented business models over traditional ones from the perspective of incentive theory. Section 3 gives a short review of the related literature. Afterwards Section 4 highlights the significance of flexibility for Industrial Product-Service Systems and shows how flexibility can be integrated into the system design. In Section 5 a superordinate reference value with the economic value is introduced by means of which the process of determining the ideal degree of flexibility can be supported. The real option concept to quantify flexibility is explained in Section 6 and applied to questions of modularization in design in Section 7. Finally, conclusions and implications for (managerial) practice and future research are offered in Section 8.

2. Uncertainty, use-oriented business models and IPSS

Contracts, which create an institutional framework within which rights, obligations and responsibilities are regulated, constitute the basis of a business relationship between the

* Corresponding author. Tel.: +49 234 32 24657.

E-mail addresses: alexander.richter@rub.de (A. Richter), sadek@lmk.rub.de (T. Sadek), marion.steven@rub.de (M. Steven).

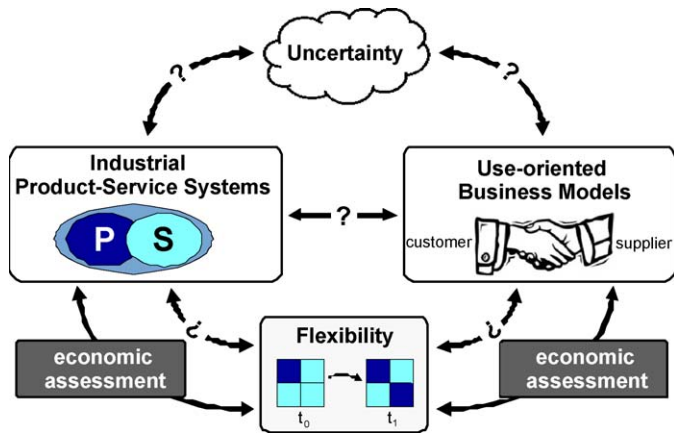


Fig. 1. Questions.

supplier and the customer. Thus, contracts determine business models and, depending on these, they can be of formal and/or informal nature, i.e. explicitly stipulate terms and/or include implicit agreements. The design of contracts and, thus, of business models is, in particular, characterized by the factor “uncertainty”. On account of “uncertainty”, long-term contracts have to remain “incomplete” so that they provide room for opportunistic behavior and therefore influence the players’ incentive to behave in the sense of the business relationship. Besides the negative consequences related to this uncertainty regarding conduct, the contracts’ incompleteness offers the possibility to flexibility react to future environmental situations. Thus, uncertainty does not only generate risks, but also, most importantly, chances. The elements of particular importance for contractual design are (i) the revenue model which determines the suppliers’ pricing scheme, (ii) the distribution of decision rights and ownership rights and (iii) the allocation of risk. Thereby the allocation of risks and consequently incentives result out of the interaction of the two first mentioned elements, i.e. the distribution of both the generated value and the decision rights in the business relation. Traditional business models with a focus on the sale of a product fix separate prices for products and services. Besides the initial costs for the equipment, the revenue model provides either a cost-plus or a fixed-price compensation for industrial services. It is the aim of innovative business models to evenly allocate risks, chances and incentives between the supplier and the customer [2].

In Fig. 2, the evolution of business models is depicted. The expansion of the spectrum of business models from the cost-plus to the use-oriented business model is rendered possible through

innovative technologies, the rearrangement of the ownership of capital goods (customer ownership versus supplier ownership) and, in particular, through the expansion of industrial services. This directly affects the flows of accumulated costs (LCC_i), revenues (LCR_i) and profits (P_i).

Cost-plus contracts are characterized by the fact that the supplier is fully compensated for his costs and gets an additional mark-up. Thus, in cost-plus offers, industrial services are mainly only intended as add-on and are limited to the maintenance and servicing of certain components of the production system. Further services are merely optional, as the customer is the owner of the machine and is responsible for the availability of the machine. In this business model, the financial risk caused by a system failure is the responsibility of the customer and results in fluctuating life-cycle costs (LCC_1) (Fig. 2). As the supplier does not assume any risk in this business model, he has no incentive to carry out sustained changes to the machine and to thus reduce the life-cycle costs associated with servicing the machine.

Fixed-price models for industrial services, however, include the customer’s requirement that the product’s life-cycle costs are guaranteed, depicted in the linear course of the LCC_2 curve in Fig. 2. For example, especially in the automotive industry life-cycle costs are an important factor for the buying decision. This leads to the transition from a transaction-oriented, short-term business relationship to a relational, long-term business relationship in which a substantial proportion of the risk of a failure is transferred to the supplier [3]. In order to determine and/or reduce the risk of a failure and the costs related herewith, the supplier expands his industrial service offer and provides condition-oriented maintenance and servicing especially aligned to the machine. In the contrary to the cost-plus business model, it is necessary to integrate the development of products and services in this case. Through bundling product and industrial services, incentives have now, however, been created for the supplier to reduce the product-service system’s life-cycle costs, but not to increase the productivity of this system. Likewise, the customer has no incentive to operate the technical system in “manner which protects the material”.

The comparison of cost-plus and fixed-price business models leads to the conclusion that a one-sided distribution of risks and incentives is no basis for solving the problem in a way which is ideal for both parties. In contrast to traditional business models in innovative business models products and services are not priced separately, but rather underline the value proposition created by an integrated solution for the customer. By emphasizing the value proposition for the customer respectively for his production process, it is possible to orientate more to satisfy customers’ needs

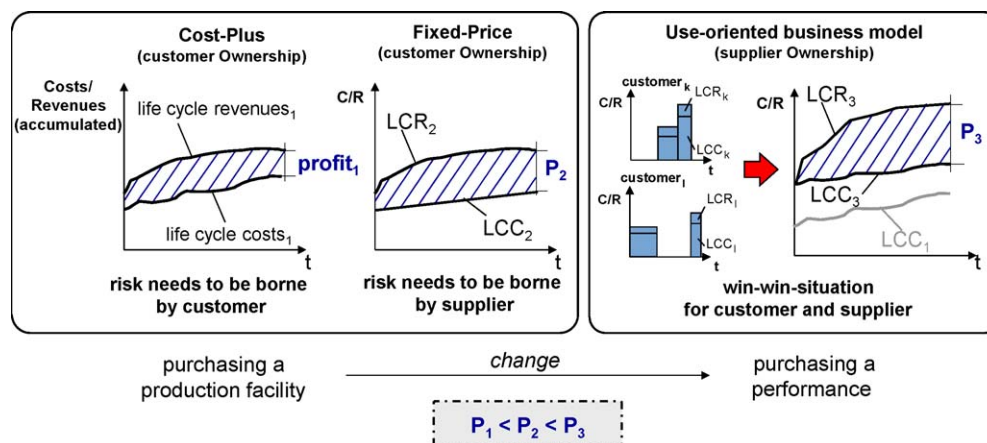


Fig. 2. Costs, revenues and profits of selected business models.

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات