

# Defining service-based business models in manufacturing: A property rights perspective

*Daniela Buschak (daniela.buschak@isi.fraunhofer.de))*

*Competence Center for Industry and Service Innovation, Fraunhofer ISI, Germany*

*Martin Spring*

*Department of Management Science, Lancaster University Management School,*

*United Kingdom*

## Abstract

The trend of selling use instead of products is challenging traditional business logic in manufacturing. Instead of transferring the 'burden' of ownership, manufacturers stay responsible for the performance of their product. This dissolution of ownership between provider and customer affects the traditional operational design principles assuming a unitary nature of the firm and its assets. Reconsidering ownership as a bundle of property rights, this paper examines different service-based business models and their implications for operations management (OM), reasoned under a property rights perspective. The empirical foundation for the analysis is built on three case studies conducted in the machine tool building sector.

**Keywords:** Industrial services, business models, property rights theory

## Introduction

The expansion of service business in manufacturing industries is a trend of growing concern to both practitioners and researchers. Previous research argued that the shift from a product-oriented towards a service-oriented business logic can lead to high margins, advantages in the strategic positioning against competitors and higher customer satisfaction (Mathieu, 2001). However, more recent research shows that many companies fail to exploit the benefits of their investments in service expansion (Neely, 2008; Gebauer et al., 2005). Shifting from being a manufacturer of products towards being a provider of solutions requires fundamental changes of the product-oriented business model logic (Neu and Brown, 2005).

Recent conceptualizations of service have turned away from the so-called IHIP characteristics (Nie and Kellogg, 1999), instead adopting an institutional approach (Sampson and Froehle, 2006; Spring and Araujo, 2009). This has been termed the 'rental/access paradigm' (Lovelock and Gummesson, 2004) and draws on early conceptualizations (Judd, 1964) that suggested 'non-ownership' (of physical assets) as the defining characteristic of services. Empirically, we know that many instances of 'servitization' entail a shift from outright sale of products to various forms of rental, access and

payment for performance (Baines et al., 2009). This certainly involves many changes in the culture and activities of both buyer and supplier (Baines et al., 2009) and expanding the service business requires a reengineering of internal processes (Galbraith, 2002; Windahl et al., 2004). However, in this paper, we focus specifically on the implications of the change of ownership of assets in service-based business models, using property rights theory (Hart, 1995).

The paper is organized as follows. After contrasting operations strategy principles with service-based business model characteristics, a short overview on the foundations of property rights theory (PRT) is given. Then the applicability of PRT to the new service-based models is pointed out. The research method is then outlined before case studies from the manufacturing sector are presented. The paper concludes with a description of the findings and results in a conclusion.

### **Operations strategy and service-based business models**

The standard treatment of operations strategy in manufacturing businesses, growing out of Skinner (1969) and Hayes and Wheelwright (1984), defines the ‘decision categories’ that comprise manufacturing strategy. These include process technology, layout, job design, capacity and location. In doing so, this approach assumes implicitly that the assets about which these decisions are made belong to the firm – in other words, that managers have complete discretion to make decisions about their acquisition and use. Discussion of external resources is typically in terms of purchasing inputs such as materials and components, and is shaped around concepts such as the ‘make-or-buy’ decision and supply-chain management. The question of ownership of these inputs is barely mentioned – it is assumed that firms buy materials and components, then sell products. Hayes and Wheelwright (1984) do briefly discuss ‘investment integration’ as an alternative to operating integration. Two forms of this that they identify are the purchasing of tooling or machines that are used by suppliers – presumably in the suppliers’ premises – and the use of consignment inventories in the distribution channel. But this is indeed a very brief and marginal departure from the conventional model of a unified facility owning and controlling its own equipment.

Current practice in many sectors does not conform to this conceptualization. In capital goods industries, such as the one we study here and the servitization *cause célèbre* of Rolls-Royce’s ‘Power-by-the-Hour’, capital goods manufacturers retain ownership of assets that are deployed in the operations of their customers. They may also provide staff to run or maintain the capital equipment on a long-term basis. Their customers, meanwhile, have assets in their facilities or field operations that they don’t own, and over which they have restricted discretion. They may also be ‘managing’ – or at least co-ordinating – staff who are not employed by them, probably alongside their own staff, over whom they have more, or at least different, direct control. The boundaries of the firm and the boundaries of the operation are, in other words, increasingly blurred.

Such extension of the equipment-makers’ service business is advocated for firms in developed countries as a means to succeed in a market where companies from emerging countries have grown out of their role in as cost-saving suppliers to competitors offering high technology solutions (High Level Expert Group, 2011; Velamuri et al., 2011). But it gives rise to new questions of how to manage operations, for both the capital equipment supplier and their customer. Some OM research has addressed aspects of these

kinds of issues, using agency theory (Kim et al., 2007) and game theory (Snir, 2001) to model incentive alignment and risk in stylized settings of chemical management services and performance-based logistics, respectively. We aim to complement these earlier studies through empirical studies of the structure and process of the development of service-based models. We use property rights theory, since it is highly consistent with a definition of services that hinges on the institutions of ownership, as in the ‘rental/access paradigm’ (Lovelock and Gummesson, 2004).

### Property rights

What does it mean to own a productive resource? According to Alchian and Demsetz (1973, p.17) “What is owned are rights to use resources [...]”. Alchian (1965) defines a system of property rights as ‘a method of assigning to particular individuals the “authority” to select, for specific goods, any use from a nonprohibited class of uses’ (Alchian, 1965, p. 130). As interpreted by Langlois (2002, p. 27):

‘The economic benefits of carving out a protected sphere of authority fall into two broad categories, the “concentration of rewards and costs *more* directly on each person responsible for them,” and “comparative advantage effects of specialized applications of . . . knowledge in control” (Alchian, 1965, p. 140, emphasis original)’

Langlois goes on to argue, drawing on Jensen and Meckling (1992), that:

‘Efficiency demands that the appropriate knowledge find its way into the hands of those making decisions. There are basically two ways to ensure such a “collocation” of knowledge and decision-making: “One is by moving the knowledge to those with the decision rights; the other is by moving the decision rights to those with the knowledge” (p. 253).’

The project of property rights theorizing is to work out which distribution of property rights leads to the greatest economic benefit. The more concentrated the property rights are at one individual, the higher are the incentives for this actor to use them efficiently, since the consequences of any misuse are borne by this individual. The fragmentation of ownership by transferring single rights to others, however, can be in some cases superior. Resources are not homogenous units, but bundles of property rights to attributes (Barzel, 1997; Foss and Foss, 2005). Different actors can thus hold property rights over this multitude of resource attributes and exploit the economic opportunities in their interest (Ullrich, 2004; Foss and Foss, 2005). The property rights of a resource are thus fragmented but the rights over a certain resource attribute is concentrated.

Two other issues are important here (again, this discussion follows Langlois (2002)). First, the definition, monitoring and enforcement of property rights generates costs, and so systems of property rights are only developed and used where economically worthwhile. This may change as technologies and institutions develop (cf Zipkin, 2006), and as the value of the resource attributes changes. Second, property rights interact in important ways with contracts. According to Hart’s approach (Hart, 1995), because contracts can never provide for all future contingencies (i.e. they are always incomplete), there is advantage in having a residual right to make decisions under circumstances not catered for by the contract. These residual rights are conferred by ownership. Although most definitions of property rights stem from Roman law, different interpretations lead to differing fragmentations (Furubotn and Richter, 2005; Hockerts, 2008; Ullrich, 2004). Adopting the classification by Ullrich (2004) property rights consist of four indi-

vidual rights: *Right to use a resource (ius usus)*, *Right to change its form, substance or location (ius abusus)*, *Right to retain profits (obligation to cover losses) (ius usus fructus)*, *Right to transfer all or some rights (ius successionis)*

Full ownership is defined when these four rights are assigned to one individual. However, property rights are only theoretically to be completely defined. Property rights that are defined are those stated in a contract, so-called specified rights. However, the specification of rights as well as assigning and enforcing is always subject to transaction costs, thus it might be too expensive to define all rights in the contract. Unspecified rights and thus not tradeable are so-called residual rights (Furubotn and Richter, 2005). Property rights theory basically advocates an efficient structure when all property rights are concentrated in the sense that they are assigned to one individual. The fragmentation of property rights, however, lead to so-called external effects, as the consequences of the usage cannot be fully allocated to one individual.

Whereas ownership substitutes imperfect contracts and reduces the threat of opportunistic behavior, the fragmentation of ownership, by transferring rights to other individuals, is linked to the costs of trading them and consequences of the opportunistic behavior of partners. According to property rights theory the actor that maximizes the value of a resource attribute by minimizing the incentives for opportunistic behavior should be the owner. To identify who is the best owner over resource attributes amongst other factors the specificity of the resource by the means as complementarity of resources between actors, the specific investments made by each individual and the human resources are key factors to maximize the value of a resource attribute by reducing the uncertainty from attenuating ownership (Ullrich, 2004).

### **Property rights and service-based business models**

Service-based business models respond to the notion that customers do not necessarily wish to own a product, but rather to avail themselves of its functionality (Levitt, 1960; Vargo and Lusch, 2004). In such models, the provider of goods takes over more and more responsibility formerly borne by the customer and the corresponding execution of activities. This type of arrangement is consistent with the institutionally-based definition of services developed by Gadrey:

“Any purchase of services by economic agent B (individual or organisation) would therefore be the purchase from organisation A of the right to use, generally for specified period, a technical and/or human capacity owned or controlled by A in order to produce useful effects on agent B or on goods C owned by agent B or for which (s)he is responsible.” (Gadrey 2000, pp. 382-383)

Note that this definition is couched in terms of the purchase of selected and more or less precisely delimited property rights. As argued by Araujo and Spring (2006), using such definitions to arrive at a binary distinction between products and services is rather beside the point, but does draw attention to the effort involved in specifying the rights that are being purchased. Furthermore, a shift in the balance of risk can be regarded as common ideas comprising a service-based business models (Johnstone et al., 2009).

Property rights have already been used to examine aspects such as product design, environmental impact and quality management of service models within manufacturing (Biege 2011; Hockerts, 2008; Ullrich 2004). Ullrich defines services as contractual pre-

agreed transactions in which the value creating activities as temporal assignment of property rights (*abusus, usus, fructus*) are performed on an assets which are third-party property (Ullrich, 2004; Judd, 1964). The traditional business model of the sale of a product and additional product-related services securing the performance level fit this description. In product-related services the customer gives the right to change a product and responsibility – maintain, replace spare parts – to the service provider. The specific investment in the machine, the routinely contractual agreement of the basic product-related services and their low specificity opts for the customer as owner of the machine and buyer of services.

The actual design opportunities of service-based business models are manifold (Lay et al., 2009) whereas the economic distribution of property rights is comparably limited. Thus, the central point of interest is what consequences arise for the operational management service-based business models with new distribution of property rights. The question driving this research is if the changes in the property rights structure of so-called service-based business models is a superior construct to create efficiency gains or lower transaction costs for the participating actors and what are critical factors.

### Research design

Our empirical work is guided by Tukker's (2004) typology: product-oriented, use-oriented and result-oriented services (see Table 1). In product-related services, the customer retains basically the ownership rights and only temporarily gives away to external parties the right to change the product for adjustment and maintenance. In use-oriented service concepts, the provider guarantees the availability of the product either through renting or by giving availability guarantees with different property right structures. Finally, in the result-oriented business model, all property rights stay basically with the provider.

*Table 1 – Property rights structures for product-service systems (adapted from Biege, 2011)*

	<b>Product-oriented</b>	<b>Use-oriented</b>	<b>Result-oriented</b>
Right to use a resource ( <i>ius usus</i> )	Customer	Customer	Provider
Right to change its form and substance ( <i>ius abusus</i> )	Customer and Provider	Provider	Provider
Right to transfer all or some rights ( <i>ius successionis</i> )	Customer	Provider	Provider
Right to retain profits ( <i>ius usus fructus</i> )	Customer	Provider and Customer	Provider
Residual rights	Customer	Provider	Provider

Three case studies from an existing intensive study of service-based approaches in the German machine tool manufacturing sector were selected so as to cover all three of Tukker's basic service-based business concepts. The cases were based on interviews with management representatives as well as customers, and the companies had between three and six years' experience with advanced industrial services. Then, a property rights perspective is applied in order to reason out differences in the transaction logic between service-oriented and traditional product-oriented business models. The implications on the business model for each service type arising from the different property rights structure then allow us to develop implications concerning OM issues.

## Data

The data for were gathered in the year 2006 in the course of a research project on advanced service concepts in the German machine tool building sector. Table 2 lists the information on the data gathered on each case company.

*Table 2 – Details of Case Studies*

Company	Interviewees	Year	Machinery	Customer Industry	Size	Business model
A	General Manager, Technology Manager, Accounting Department, Customer	2006	Specialized machine systems	Automotive	small	Result-oriented
B	Service Manager	2006	Specialized machines	Automotive, Medical Engineering	small	Result-oriented
C	Service Manager, Division Manger Service	2006	(specialized) Machining centers	Automotive	large	Use- & Result-oriented

A qualitative approach was chosen to understand the complex phenomenon of different property rights structures underlying a so-called service-based business model and its implications on the behavior of the customer as well as provider company (Yin, 2003; Meredith, 1998). Case studies allowed us to observe not only different property rights structures of business transactions and their result but also retrace cause and relationship with an open mind. The case studies applied here consisted of several interviews and that were fully documented. The documentation of the interviews was revisited with the current focus on property rights and operations management in mind.

## Description of Business Models

Each study reported here consists of the focal firm, i.e. the machine-tool builder, and one of its customers. The firms may operate different models with other customers, but we use the dyad as the unit of analysis. For clarity's sake, we refer to Company A's customer as 'Customer A', Company B's as 'Customer B', and so on.

**Business model A** Customer A had already agreed an order for a machine system from Company A. But, due to a shortage of available capital, it was looking for an alternative to outright purchase. So it asked Company A for an operational service agreement, which meant the outsourcing of a certain process step of the part production. By doing this, Customer A's expenditure was distributed over several years as payment for bought-in parts. For Company A, this was the first time it had to operate its own machines and receive payment according to the amount of produced units. To respond to this customer demand service, a legally independent company was established, which bought the machine system from Company A and rented shop capacity from Company A. In the context of the operational service, Company A was included in the logistics by taking the raw material, manufacturing the parts, controlling the quality and delivering products to Customer A for the next steps in the production process.

**Business model B** Company B's service-based business model was intended to make up its customers' capacity shortfalls, initially during machine overhauls and then also during spikes in demand. The production is done within Company B's production facilities by an independent service team. The initiative originated from the service department. Due to the intimate knowledge of the machine tools and internally developed process know-how, existing machines are adjusted to the individual customer needs.

**Business Model C** Company C offers two different kinds of business models. In both cases the customers ordered specialized machines and bought it from Company C. Characteristic for model 1 is a performance contract with the payment according to pre-agreed operating hours of the machine. This guarantee of availability is only achievable when a service employee is permanently at the customer side. Model 2 resembles with some but significant exceptions Model 1. The agreement is based in contrary to model 1 on a pre-agreed number of produced parts. However to guarantee the quality of the service the service outpost is in both cases supported by the service headquarter in terms of spare parts, advice and also in case of illness or holidays.

### **Discussion**

The starting-point in each company was the traditional product-oriented business model of selling the product and offering in addition a portfolio of product-related services such as maintenance, repair, engineering services as well as remote services.

*Company A* founded for the realization of the business model a subsidiary company that became the owner of the machine system and rented job shop capacity from company A. The knowledge of operating the product was from company A's point of view seen at the customer which contradicts PRT suggestions in terms of the question of ownership. Although, being the owner, company A gave up the role of the decision maker to the customer and accepted its lack of ideas on how to organize the business model. The reluctance on provider side against this model is further more highlighted in employing temps to operate the machine. Residual gains through acquiring information in the usage phase and feeding them back into the design and R&D department was thus not stimulated. The customer, however, shifted through buying the outcome the responsibility of the investment, the personnel management and also the need for space for the machine system to the manufacturer. Although not on purpose, the customer A still governed the decision making process because of the inexperience of company A. However, as the owner it could be presumed that company A (on behalf of its subsidiary) has the incentive to optimize the operation. Indeed customer A hoped for a better training of the employees with the result of lower failure rates in the production. But the aim of company A was to guarantee basic capacity utilization through this business model. The idea was that the maintenance personnel of company A could do also quality control and management in times with less work at the subsidiary in order to balance the heavily-varying traditional manufacturing business. Thus the agenda of both manufacturer and customer was conflicting and final decision rested upon company A as the owner of the machine system. In addition, absorbing positive externalities, by taken advantage of the information on the operating behavior of the machine system was not intended by company A. It can be concluded that company A was not the maximizing party of the resource and should not be the owner. Company A neither had the superior knowledge,

nor incentives to maximize the value of this cooperation. Also the transactional cost savings hoped to result from the newly arranged property rights structures could not be met as to the drawbacks in the operational planning, e.g. the reluctance to gain, improve and exploit operating knowledge, which led finally to problems in the quality attainment. After a fourth of the originally agreed contract duration the agreement was jointly dissolved.

*Company B* acts as a temporary contractor and sells the result – parts produced - of operating the machine. As special treatment is necessary an advantage in technical know-how is seen in most cases at company B. The competence of company B allows reconfiguring machines to process several customer specific parts on the same machine. Company B uses the machines standing in its facilities. With own operating and service personnel, company B bundles several small projects of its customers, which every project by itself would not reach the critical mass to legitimize the investment in an machine, whereas company B can operate at full capacity. Characteristic in this case is through keeping ownership, company B keeps the complete freedom to solve the problem, the processing of the parts, without any technical specifications from the customer. That allows company B to consistently reconfigure existing machines for the individual project. In addition the deepened knowledge of company B in the processing technology allows the company to optimize the processes probably in a better way than any customer. Although by applying the result-oriented service, the so-called core competencies of the customers are affected, together with the outlined argumentation of the special capability of the provider, this business model also converts fixed costs through ownership (such as the purchase of a new machine) into variable costs (pay per part), makes additional space for machinery and capacity utilization obsolete and thus are reasons why customers use this service. However, this purchase of flexibility due to the often short term nature of capacity shortage makes the customer dependent on the schedule and price demanded by Company B (hold-up). Company B as owner claims the right to retain profits not specified in the contract as the experience they draw from adapting to individual customer needs are fed back into the design process for new machine tools.

*Company C* in its model 1 the customer is the owner but via contracting outsources the responsibility for the availability of the machine to the provider. Due to the intimate knowledge of the company C it has the ability to generate over a longer time span the optimal availability and output quantity better than their customers. This allows its customer to squeeze out in time of capacity shortage the optimum of their machines. Company C bears the responsibility and by having a co-worker permanently on site makes monitoring costs obsolete. Enough skilled workers, willing to change location temporarily and well working interfaces with headquarter for e.g. holiday leave or sending spare parts existed. However, the high availability level achieved led to high bonuses for the provider and was finally in addition to internal changes of the customer company a point why in this case the contract was ended earlier. In model 2 the payment was tied to the parts produced, also with an agreed variance. In both models Company C bears only the risk of its performance on the machine, market risks of the customers stays with the customer. This is in line with PRT as Company C is the optimal owner of the attribute of machine availability with the potential to maximize its value. Company C



retains profits not specified in the contract as the experience they draw from this on-site preventive maintenance and wants to use this knowledge to improve their existing offer of (full) services. By outsourcing the maintenance function of the machine system the customer is released from the responsibility. However, whereas model 1 was quite successful in maximizing the resource value, model 2 was not as successful. Though similar design the basic conditions were different. Whereas in model 1 the customer was long time known and a good data basis for doing the calculation could be accessed, in model 2 a complete new element had to be produced prolonging the ramp-up and the data quality for doing the calculation was quite poor.

## Conclusion

The research showed operational implications resulting from the changes in the property right structure going along with service based business models. Secondary case studies were taken to show the different distribution of property rights following the typology of Tukker for service-based business models. The missing transfer of total ownership in use and result-oriented services affects the traditional business model. It requires changes towards a new value proposition that focuses on the sale of use or result. Also an adaptation of the value chain is necessary to be capable of delivering the activities formerly borne by customers. The dissolution of ownership by giving individual rights away to the maximizing party clearly can lead to efficiency gains for both parties. However the breakup of the concentrated authority cuts back the freedom of the customers. This paper shed light on the manufacturers of capital goods other industries with different characteristics of the product, technologies or transaction culture might be another interesting field to study with property rights glasses on.

## References

- Alchian, A. A. and Demsetz, H. (1973), "The Property Right Paradigm", *The Journal of Economic History*, Vol. 33, No. 1, pp. 16-27.
- Araujo, L. and M. Spring (2006), "Products, Services and the Institutional Structure of Production", *Industrial Marketing Management*, Vol. 35, No. 7, pp. 797-805.
- Baines, T. S., Lightfoot, H. W., Peppard, J., Johnson, M., Tiwari, A. and Shehab, E. (2009), "Towards an operations strategy for product-centric servitization", *International Journal of Operations & Production Management*, Vol. 29, No. 5, pp. 494-519.
- Barzel, Y. (1997), *Economic Analysis of Property Rights*, Cambridge University Press, New York.
- Biege, S. (2011), *Servicegerechtes Design. Rückwirkungen der Ausgestaltung dienstleistungsbasierter Geschäftsmodelle auf die Auslegung von Investitionsgütern*, Fraunhofer Verlag, Stuttgart.
- Foss, K. and Foss, N. J. (2005), "Resources and Transaction Costs: How Property Rights Economics Furthers The Resource-based View", *Strategic Management Journal*, Vol. 26, No. 6, pp. 541-553.
- Furubotn, E. and Richter, R. (2005), *Institutions & Economic Theory: The Contribution of New Institutional Economics*, The University of Michigan Press, Ann Arbor.
- Gadrey, J. (2000), "The Characterisation of Goods and Services: An Alternative Approach", *Review of Income and Wealth*, Vol. 46, No. 3, pp. 369-387.
- Galbraith, J. R. (2002), "Organizing to Deliver Solutions", *Organizational Dynamics*, Vol. 31, No. 2, pp. 194-207.
- Gebauer, H., Fleisch, E. and Friedli, T. (2005), "Overcoming the Service Paradox in Manufacturing Companies", *European Management Journal*, Vol. 23, No. 1, pp. 14-26.
- Grossmann, S. J. and Hart, O. D. (1986), "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration", *Journal of Political Economy*, Vol. 94, No. 4, pp. 691-719.
- Hart, O. (1995), *Firms, contracts and financial structure*, Oxford University Press, Oxford.
- Hayes, R. H. and Wheelwright, S. C. (1984), *Restoring our competitive edge: competing through manufacturing*, Oxford University Press, Oxford.

- High Level Expert Group (2011), "Key Enabling Technologies", in: [http://ec.europa.eu/enterprise/sectors/ict/key\\_technologies/kets\\_high\\_level\\_group\\_en.htm](http://ec.europa.eu/enterprise/sectors/ict/key_technologies/kets_high_level_group_en.htm), last access 19.05.2012.
- Hockerts, K. (2008), "Property Rights as a Predictor for the Eco-Efficiency of Product-Service Systems", CBS Working Papers Series No 02-2008, Copenhagen.
- Johnstone, S., Dainty, A. and Wilkinson, A. (2009), "Integrating products and services through life: an aerospace experience", *International Journal of Operations & Production Management*, Vol. 29, No. 5, pp. 520-538.
- Jensen, M. C. and Meckling, W. H. (1976), "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure", *Journal of Financial Economics*, Vol. 3, No. 4, pp. 305-360.
- Judd, R. C. (1964), "The Case for Redefining Services", *Journal of Marketing*, Vol. 28, No. 1, pp. 58-59.
- Kim, S.-H., Cohen, M. A. and Netessine, S. (2007), "Performance Contracting in After-Sales Service Supply Chains", *Management Science*, Vol. 53, No. 12, pp. 1843-1858.
- Langlois, R. N. (2002), "Modularity in technology and organization", *Journal of Economic Behavior & Organisation*, Vol. 49, No. 1, pp. 19-17.
- Lay, G., Schroeter, M. and Biege, S. (2009), "Service-based Business Concepts: A Typology for Business-to-Business Markets", *European Management Journal*, Vol. 27, No. 6, pp. 442-455.
- Levitt, T. (1960), "Marketing Myopia", *Harvard Business Review*, Vol. 38, No. 4, pp. 45-56.
- Lovelock, C. and Gummesson, E. (2004), "Whither services marketing: in search of a new paradigm and fresh perspectives", *Journal of Service Research*, Vol. 7, No. 1, pp. 20-41.
- Mathieu, V. (2001), "Product-services: from a service supporting the product to a service supporting the client", *Journal of Business and Industrial Marketing*, Vol. 16, No. 1, pp. 39-58.
- Meredith, J. (1998), "Building operations management theory through case and field research", *Journal of Operations Management*, Vol. 16, No. 4, pp. 441-454.
- Neely, A. (2008), "Exploring the financial consequences of the servitization of manufacturing", *Operations Management Research*, Vol. 1, No. 2, pp. 103-118.
- Neu, W. A. and Brown, S. W. (2005), "Forming Successful Business-to-Business Services in Goods-Dominant Firms", *Journal of Service Research*, Vol. 8, No. 3, pp. 3-17.
- Nie, W. and Kellogg, D. L. (1999), "How professors of operations management view service operations", *Production and Operations Management*, Vol. 8, No. 3, pp. 339-353.
- Rück, H. R. G. (2000), *Dienstleistungen in der ökonomischen Theorie*, Deutscher Universitäts-Verlag, Wiesbaden.
- Sampson, S. E. and Froehle, C. M. (2006), "Foundations and Implications of a Proposed Unified Services Theory", *Production and Operations Management*, Vol. 15, No. 2, pp. 329-343.
- Skinner, W. (1969), "Manufacturing - Missing Link in Corporate Strategy", *Harvard Business Review*, May-Jun, pp. 136-145.
- Snir, E. (2001), "Liability as a catalyst for product stewardship", *Production and Operations Management*, Vol. 10, No. 2, pp. 190-206.
- Spring, M. and Araujo, L. (2009), "Service, services and products: rethinking operations strategy", *International Journal of Operations & Production Management*, Vol. 29, No. 5, pp. 444-467.
- Tukker, A. (2004), "Eight Types of Product-Service Systems: Eight Ways to Sustainability? Experiences from SusProNet", *Business Strategy and the Environment*, Vol. 13, No. 4, pp. 246-260.
- Ullrich, F. (2004), *Verdünnte Verfügungsrechte*, Deutscher Universitäts-Verlag, Wiesbaden.
- Vargo, S. L. and R. F. Lusch (2004), "Evolving to a New Dominant Logic for Marketing", *Journal of Marketing*, Vol. 68, No. 1, pp. 1-17.
- Velamuri, V. K., Neyer, A.-K. and Möslin, K. M. (2011), "Hybrid value creation: a systematic review of an evolving research area", *Journal für Betriebswirtschaft*, Vol. 61, No. 1, pp. 3-35.
- Windahl, C., Andersson, P., Berggren, C. and Nehler, C. (2004), "Manufacturing firms and integrated solutions: characteristics and implications", *European Journal of Innovation Management*, Vol. 7, No. 3, pp. 218-228.
- Windahl, C. and Lakemond, N. (2010), "Integrated solutions from a service-centered perspective: Applicability and limitations in the capital goods industry", *Industrial Marketing Management*, Vol. 39, No. 8, pp. 1278-1290.
- Yin, R. K. (2003), *Case Study Research. Design and Methods*, SAGE Publications, Thousand Oaks et al.
- Zipkin, P. (2006), "The best things in life were free: on the technology of transactions", *Manufacturing & Service Operations Management*, Vol. 8, No. 4, pp. 321-329.