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Research Report

Servitization as a Productive Strategy of a Firm – Evidence from the Forest-Based Industries

ETLA Report, No. 14

Provided in Cooperation with:
The Research Institute of the Finnish Economy (ETLA), Helsinki

Suggested Citation: Viitamo, Esa (2013) : Servitization as a Productive Strategy of a Firm – Evidence from the Forest-Based Industries, ETLA Report, No. 14, The Research Institute of the Finnish Economy (ETLA), Helsinki

This Version is available at:
https://hdl.handle.net/10419/201296

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THE RESEARCH INSTITUTE OF THE FINNISH ECONOMY

ETLA Raportit
ETLA Reports

7 August 2013

No 14

Servitization as a Productive Strategy of a Firm

Evidence from the Forest-Based Industries

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Suggested citation: Viitamo, Esa (7.8.2013). "Servitization as a Productive Strategy of a Firm: Evidence from the Forest-Based Industries". ETLA Reports No 14. http://pub.etla.fi/ETLA-Raportit-Reports-14.pdf

This report summarizes the main findings of FP-Serve project.
TEKES is gratefully acknowledged for the funding received.

ISSN-L 2323-2447
ISSN 2323-2447 (print)
ISSN 2323-2455 (online)

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Abstract

A central aspect of the industrial evolution in the advanced economies is the phenomenon called servitization. In general, the term servitization or product-service transition is used to highlight the change, where the tangible offering of a manufacturing firm is augmented with intangible services. In this paper, servitization is addressed broadly as a strategic reorientation by a manufacturing firm which entails adjustments in the firm business model as well. A useful framework to address the product-service transition is the socio-economic view of service productivity. On that basis, the paper shows how the productive strategy of the servitizing firm is linked with the business model that builds on service-dominant (S-D) logic. The resources and capabilities of the firm are central drivers in servitization. Via the empirical case study of the servitization strategies in the Finnish forest cluster, the paper extends the scope of analysis in the servitization research from the installed base -industries to the process industries. In a wider context, this paper contributes to the research collaboration between Aalto University (BIT) and Research Institute of the Finnish Economy, ETLA in the field of service research.

Key words: Servitization, strategy, productivity, service-dominant logic, forest-based industries

JEL: D24, L14, M11, M21

Palvelullistuminen yrityksen tuottavuusstrategiana

Evidenssiä metsäperustaisesta teollisuudesta

Tiivistelmä

Palvelullistuminen (servitization) on keskeinen teollisen evoluution piirre kehittyneissä talouksissa. Palvelullistumisella, ts. tuote-palvelu -muutoksella tarkoitetaan tilannetta, jossa yrityksen tuottamaa ja tarjoamaa aineellista tuotetta täydennetään aineettomilla palveluilla. Tässä raportissa palvelullistumista tarkastellaan yrityksen strategisena uudelleen orientoitumisena, joka samalla edellyttää muutoksia yritysten liiketoimintamallissa. Uusi ja hyödyllinen tapa tuote-palvelu muutoksen tarkastelemiseksi on sosioekonominen viitekehys palvelun tuottavuudesta. Tähän viitekehykseen perustuen raportissa havainnollistetaan, miten palvelullistuvan yritysten tuottavuusstrategia on yhteydessä liiketoimintamalliin, jonka lähtökohtana on palveluperustainen logiikka (service-dominant logic). Yrityksen resurssit ja kyvykkyydet ovat keskeisiä tuote-palvelu -muutoksen ajureita. Suomen metsäteollisuuden palvelustrategioita tarkastelevan tapaustutkimuksen valossa raportti laajentaa palvelullistumisen tutkimuksen näkökulmaa ns. installed base -teollisuudesta prosessiteollisuuteen. Raportti on osa Aalto yliopiston (BIT) ja Elinkeinoelämän tutkimuslaitoksen (ETLA) välistä yhteistyötä palvelututkimuksen alueella.

Asiasanat: Palvelullistuminen, strategia, tuottavuus, palvelukeskeinen logiikka, metsäklusteri

JEL: D24, L14, M11, M21

1 Introduction

The growth of services in the manufacturing sector is a distinct driver of the modern service economy. In operations and business management such business evolution is called servitization (Vandermere and Rada, 1988) or product-service transition (Oliva and Kallenberg, 2003). While servitization brings along a number of changes in the business operations, its outcome becomes most concretely manifested in the firm's offering. In servitization, a manufacturing firm extends its offering by adding intangible services to the physical products. In many cases, services and goods are complementary and often inseparable parts of the product-service systems (Baines et al., 2007). In the high-tech sectors, such as ICT the development of product-service systems is often guided by the dynamics of the industry rivalry in search of dominant design (McGahan, 2004). In more traditional sectors like metal working or pulp and paper, servitization is more induced by the maturity of the products markets. In both cases, competitive edge based on the product-service systems is regarded distinctive, long-lived and easier to defend than low-cost advantages (Baines et al., 2009). Servitization thus enables differentiation (Porter, 1985).

In this paper, servitization is considered as a strategic decision and move by the manufacturing firm to enhance competitive edge by repositioning (differentiating) in the product-service markets[1] (Slack, 2005). The reposition may take place rapidly or gradually. In both cases, however, successful servitization involves complementary changes in the business logic, employment of the firm's resources, and in the organizational design of the firm's activities. In particular, the paper puts forward the view that servitization is a means to enhance firm's profitability through higher levels of productivity and through the reconfiguration of the firm's strategy in productivity. These considerations of corporate strategy go beyond the conventional duality between the cost-leadership and differentiation (cf. Rumelt et al., 1991; Porter, 1985) and the high importance assigned to firm's resources (Hoopes et al., 2003). The strategic approach considers servitization as a *trend* that characterizes the evolutionary trajectory of most manufacturing industries (McGahan, 2004). Within the manufacturing firm, servitization is a process based on learning and acquisition of required knowledge and capabilities.

The paper addresses servitization within an interdisciplinary framework that inter-connects the main approaches of strategic management with service management and productivity. In that framework, *strategizing* firms seek for a market position where they can defend themselves against competitive forces and can influence them in their favour (Porter, 1985; McGahan, 2004). At the same time, the observable forms of rivalry and market structure may also manifest *economizing* strategy by differentiated firms. Competition and innovative use of the firm's resources fosters growth in productivity, decrease in the transaction costs, and the competitive dynamics of the industry (Chandler, 1990; Hoopes et al., 2003; Barney, 1991; Grant, 1991). These two approaches lay the basis for the productive strategy of a servitizing firm. The analysis of productivity is based on the *socioeconomic* approach of service management (Viitamo, 2009; Djellal and Gallouj, 2008; Johnston and Jones, 2004). It posits that the un-

[1] The paper draws on the complementary research traditions in services and productivity by Aalto University Business Information Technology (BIT) and Research Institute of Finnish Economy (ETLA). The role of services in the economic growth and the aggregate productivity is one the central themes in ETLA's research agenda (e.g. Pajarinen et al., 2012). This involves e.g. the impacts of ICT on the productivity of service industries as well as digital transformation of services (Zysman et al., 2011). Related topics have been the competitive impacts of services in the industrial clusters (Viitamo, 2002; Lindström et al., 2004). In BIT, central fields of service research are service innovation (Toivonen and Sundbo, 2011), managerial approaches to productivity and strategy by service firms (Viitamo and Toivonen, 2013; Viitamo, 2012) as well as the evolutionary aspects of servitization in the manufacturing firms (Turunen, 2013).

derlying objective of the firm is to enhance long term profitability and the value of the firm, where balancing between *effectiveness* and *scale-efficiency* is the primary managerial task. The paper puts forward that the conceptualization of productivity is analogical with the duality between service-dominant and goods-dominant logic (Vargo and Lusch, 2008). Productivity links service-dominant logic with the inductive research of servitization.

Based on the synthesized framework of servitization, the empirical part of the paper illustrates how the strategic considerations of servitization and productivity are manifested in the process industries that are involved in multi-stage supply chains. The analysis here draws on the case study of the Finnish forest-based industries with a specific focus on fiber-based packaging. The process industries' perspective is used here to extend the focus in the mainstream servitization research. Most of the empirical studies of servitization is concerned with 'the installed base' industries that provide capital goods with various customer industries. The installed base of a firm can be used as an external asset to leverage growth in services (Kaario, 2009). While the process industries lack a comparable installed base, they also face competitive pressure to develop their services. The paper argues that servitization within the forest-based industries goes hand in hand with the pro-active supply chain management (Guan and Rehme, 2012). Hence, issues of vertical control would contribute to a more coherent framework of servitization.

The rest of the paper is constructed as follows. Section 2 discusses the firm level drivers of servitization and the consequent changes in the strategic focus of a servitizing firm. The main aspects of the service productivity framework and its linkage to service dominant logic are outlined in section 3. In the light of the integrative framework, section 4 addresses the servitization strategies within the Finnish fiber-based packaging industry. The main findings and contributions of the paper are discussed in section 5.

2 Managerial aspects in servitization

The initial conceptualization of servitization by Vandermere and Rada (1988) remained quite general. The extensive literature in the 1990s and thereafter has provided a number of more focused interpretations and new approaches in the empirical research (Baines et al., 2009). Some authors consider servitization as an evolutionary trend that in the manufacturing sector (Neely, 2008; Desmet et al., 2003). Other approaches suggest that servitization is a step-wise *process* (e.g. Oliva and Kallenberg, 2003), where the upgrade of the firm's offering is subject to industry-specific drivers. Moreover, servitization can be seen as deliberate *strategy* (Slack, 2005; Windahl et al., 2004), where the manufacturing firm employs its resources and capabilities in a new related field of business to enhance the long-term goals. Hence, a strategic reorientation with real changes in the firm's offering and business involves more than service-oriented marketing tactics. In the latter case, the aim is mainly to enhance brand loyalty through servitized image (cf. Mathieu, 2001).

2.1 Higher profitability and productivity of resources

From the perspective of corporate strategy the *first* fundamental question is what are the underlying drivers of servitization? The answer suggested here derives from entrepreneurial incentives in the competitive markets. The principal objective of the corporate management is to

enhance the long term value – the *profitability* and the *productivity* – of the firm. This implies that servitization is considered a viable strategy by the management as long as it contributes to these long-term goals (Rumelt et al., 1991; Chandler, 1990). In some cases, the firm's survival may necessitate a radical service-reorientation. The pursuit of an improved market position through differentiation and the customer loyalty (the structuralist view of strategy) is one side of the coin (Porter, 1985; 1998). The search of improved market position through services involves the positioning with respect to productivity[2]. The other side of the coin is the stylized fact that most companies possesses firm-specific resources and capabilities (Teece, 1980; 1982) that enable diversification (servitization) into a new, related field of business. This conforms to the resource-based view of a firm's strategy (Grant, 1991; Penrose, 1959). The argument that servitization is a viable strategy as long as it is conducive to higher profitability, has the analogy in the firm's resources as well. Firms are usually not interested in the resources *per se*, but the services[3] and profits they are expected to yield.

In general, resources are only obtainable in discrete amounts, so they are characteristically *indivisible*. A bundle of resources have to be acquired to obtain an appropriate number and quality of services (Penrose, 1959). This is also the source of excess capacity. In the resource-based view of strategy, *resource idleness* is the main driver of the growth of the firm. This means that the expansion of a firm is largely based on the opportunities to use their existing resource base more productively than it is currently used. As experience and learning improve the managers' ability to utilize new objective information, there is also a constant 'flow' of entrepreneurial and managerial services available to the firm. These new services and the business opportunities thereof will remain unused if the firm fails to expand (Penrose 1959). Accordingly, in the resource-based view of a firm, servitization is induced by the profitable opportunities to utilize the excess capacity of the indivisible firm-specific resources in services. The characteristics of firm's resources influence the pursued mode of productivity in servitized business. Actual performance of servitized firm is contingent on the *dynamic capabilities* as defined in Teece and Pisano (1998) and Teece et al. (1997). Dynamic capabilities emphasize the key role of the firm's management in adapting, integrating, and reconfiguring internal and external organizational skills, resources, and functional competences toward a changing environment. Sections 3 and 4 show in more detail how productivity is associated with servitization and how the strategic focus in productivity will change in the transition to the product-service systems.

2.2 Upgrade of the operational model

The *second* fundamental question in servitization is how does it affect the business model and business logic of the manufacturing firm? This can be addressed through the synthesized definition of servitization in Baines et al. (2009, 547): "*servitization is an innovation of organizational capabilities and processes to shift from selling products to selling integrated products and services that deliver value in use*". The definition indicates how the firm's operational model changes in servitization. *Selling* in this context implies that the firm does not necessarily produce all the components in its offering. Parts of it can be procured from the markets as well. This implies respective changes in the *organizational design* to better coordinate the comple-

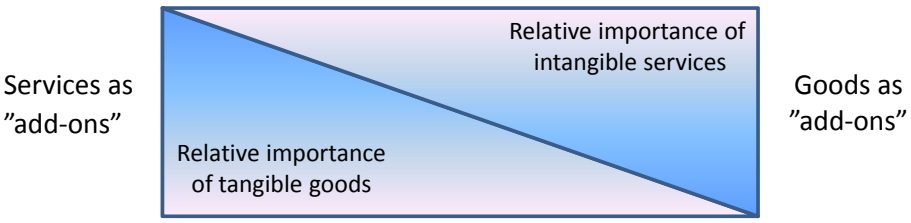
[2] See the more detailed discussion in Section 3.

[3] It is central to note that the services discussed in Penrose (1959) refer to the actual performance or accomplishment of (labour) inputs.

mentary activities which the product-service systems build on (cf. Coase, 1937; Williamson, 1985; Teece et al., 1997). In particular, successful commercialization of an innovation requires often that the know-how in question be utilized in conjunction with other capabilities and assets Teece, 1986). Sales of *integrated products and services* require new types of resources and capabilities in the coordination of the activities and in the management of customer relations. New assets and capabilities can be acquired from the markets, or they can be created internally through learning and experience (Baines et al., 2009). This enables reconfigure and the transform the firm's assets (Teece et al., 1997).

The upgrade of the firm's offering from a pure commodity to *integrated product-service systems* manifests the co-evolutionary aspects of commodities and services, more generally (Parrinello, 2004; Baines et al., 2007). For instance, service management and marketing posits that the prominent features of services are intangibility, heterogeneity, inseparability of production and consumption, and perishability (Zeithaml et al., 1985; Parasuraman, 2002). The co-evolutionary approach implies that the difference between services and manufactured goods – on the basis of the *typical* attributes of services – is however, a matter of degree. Hence, industries can be classified along the continuum between *pure* manufacturing and *pure* services[4] (cf. Metcalfe and Miles, 2006). Actually, a significant number of commodities cannot be classified as a *pure* good or a service. Commodities are increasingly sold as *packages* of goods and services where the mix as a whole has its own economic identity, distinct from the individual components (Parrinello, 2004). At a margin, it is a matter of definition whether such a package is a separate good of a bundle of separate goods and services (Gadrey, 2000)[5]. Intuitively this holds also for more complex product-service systems as well. They may evolve through the servitization of products or through the productization of services (Baines et al., 2007). The *continuum* of product-service offerings is illustrated in Figure 1.

Figure 1 The continuum of servitized offerings



Source: Neu and Brown, 2005.

[4] The term 'pure' in this context denotes the opposite ends in service characteristics: (in)tangibility, hetero(homo)geneity, (in)separability etc.

[5] The co-evolutionary aspect in services is manifested in mass-tailoring and service modularization. Mass-tailoring of a good or service is based on (scale-based) serial production of the components, the combination of which yield a high customer value through customer-specification. Service modularization is a strategy to transform intangibility into more tangible forms, and transform tacit information into more codified forms. This enables improved replication and standardization that are characteristic of manufacturing processes.

2.3 Upgrade of the business logic

The co-evolutionary view of product-service systems conforms to the premises of service-dominant S-D logic (Vargo and Lusch, 2008). Vargo and Lusch (2004) posit that goods and services are not mutually exclusive subsets of a common domain called commodities. Attempting to define service by contradiction from tangible goods both prohibits a full understanding of the richness of the role of service in exchange and limits a full understanding of the role of tangible goods. In S-D logic, services can be provided *directly* through an interactive process between the provider and the user, and *indirectly*, through the provision of tangible goods. In the former case, specialized competences (skills and knowledge) are applied through deeds, processes, and performances for the benefit of another entity. The latter case implies that tangible goods are distribution mechanisms for service provision. In S-D logic the value of services (direct and indirect) is based on their *value-in-use* which is determined by the customer[6]. In this setting, the role of the supplier (the firm) becomes a *collaborative resource integrator* and the co-creator of value with customers (Vargo, 2009; Kowalkowski, 2010) and other suppliers in the relevant networks. In regard to productive resources, the main argument of S-D logic is derivable from the resource-based view of a firm and the underlying theory of a firm by Penrose (1959, 24): "a theory of firm is essentially an examination of the changing productive opportunity of firms. It is never the resources themselves that are the inputs in the production processes, but only the services that the resources can render. The services yielded by resources are a function of the way in which they are used".

The opposite of S-D logic is goods-dominant (G-D) logic, which has been the traditional business logic in the manufacturing industries (Kowalkowski, 2010). G-D logic builds on the view that economic value is added through industrial processes. Value is embedded in the outputs, which is distributed and realized in a transactional manner through *the value-in-exchange* (Vargo, 2009). In the context services and service business, G-D logic implies the application of the manufacturing business logic; materializing, standardizing, specifying and packaging services and making them more visible (Lindberg and Nordin, 2008). On the other hand, the transition to S-D logic is more than an increased emphasis of the functionality of the product-service systems by the manufacturing firm. Kowalkowski (2010) puts forward that real transition implies *reframing* the purpose of the firm and its collaborative role in value-creation. This means reframing the firm's strategy and the vision.

With the above characterizations of S-D logic, it can be postulated that servitization involves two dimensions (Kowalkowski, 2010). *First*, the product-service transition reflects an objective (tangible) change, the repositioning of the firm in the product-service markets. This involves respective adjustments in the firm's operational model. *Second*, the subjective (intangible) transition from G-D logic to S-D logic implies a more strategic shift; the adoption of new principles in value creation and business logic. Consequently, the value and the profitability of the firm become contingent on the managerial capabilities to make value propositions that strive for high customer value. These two forms of servitization may occur *independently*. For instance, Kowalkowski (2010) identifies cases where manufacturing firms with advanced product-service systems are committed to G-D business logic. There is also evidence of the opposite cases where the goods producing companies follow S-D logic. While the independence -argument is generally plausible, it is pointed out in the following sections that the transition to service-product systems facilitates the transition from G-D logic to S-D logic. This follows from the enhanced options to manage productivity.

[6] Value-in-use is considered as a central aspect in the transition to integrated product-service systems as well (Baines et al., 2009).

3 Socioeconomic framework of productivity

The product-service system (offering) of a manufacturing firm is characteristically a composite good that often shows a modular structure. Following the co-evolutionary reasoning (Parrinello, 2004), servitization can be seen as a process where the offering becomes increasingly intangible and at the same time it takes the characteristics of pure services (Hill, 1977; Parasuraman, 2002). From the intangibility and flexibility follows that a product-service offering can be better adjusted (customized) to the customer specifications than the initial non-servitized physical goods. In that case, the production of product-service systems can utilize the economies of effectiveness and customization (high customer value and unit price) and the economies of scale and standardization (low unit costs) in various proportions. This can be further generalized to cases where vertically linked activities with standardized and tangible (back office) components are integrated with the customized and intangible (front office) components of the offering. This section puts forward the view that the general characteristics of technology, productivity and strategy of servitized firm can be analyzed within the socioeconomic (integrative) framework of service productivity (Viitamo, 2012, Viitamo and Toivonen, 2013)[7]. Moreover, the discussion points out how the service productivity framework is linked with the argumentation of service-dominant logic (Vargo and Lusch, 2008; Vargo, 2009).

3.1 Conceptualization of service productivity

The integrative approaches to service productivity aim to the reconcile the traditional supplier-based view in assessing service performance (Inklaar et al., 2006) with the socioeconomic perspectives (Metcalfe and Miles, 2006) that stresses the importance of customer value and the perceived quality (Djellal et al., 2008; Grönroos and Ojasalo, 2004). The integrative framework that is outlined here takes a microeconomic stance and specifies the technological linkage between scale-efficiency and effectiveness. The firm level definition of productivity in Bernolak (1997) provides an appropriate template for the further characterization of productivity in services. According to Bernolak (1997) productivity means how much and how well is produced from the available resources. If more or better goods are produced from the same resources, productivity increases. Or, if the same goods are produced from fewer resources this also increases productivity. The same holds for services. If more services or better quality services are produced from the same resources, productivity increases. By resources Bernolak refers to all human and physical resources, people who produce the goods and provide the services, and the assets with which the people can produce the goods and provide the services. The resources include land and buildings, machines and equipment, tools and raw materials, inventories, and other current assets.

Applicable to goods and services equally well, the productivity definition of Bernolak conforms to the generic interpretation of service by Vargo and Lusch (2004) and Penrose (1959). If the resources are understood as consisting of all human and physical assets, productivity results from the overall delivery of services by the resources, which are used in the productive activities of the firm. As the definition of productivity is contingent on the use and the availability of (qualified) resources, the firm's productivity is reduced, if its resources are not properly used, or if there is a lack of them. The use of productive resources is manifested in the qual-

[7] Hence, the socioeconomic framework of service productivity can also be considered as a generic framework of productivity.

ity of the output and how it is perceived by the customer (markets). As quality assessment requires a benchmark, it is implicitly assumed that the relevant characteristics of the output can be prescribed objectively prior to the production or the relevant characteristics of the output is learnt and evaluated subjectively in the market. This results from replication and the routinization of activities (Nelson and Winter, 1982) in production and the transactions with the clients. With regard to the quality of the resources and the output the general implication of productivity is symmetric. A higher productivity of activities is attainable through a decrease of wasted and idle resources or through a higher volume and the quality of the output.

Having the customer's specifications of the product and the service, the producer's main objective is to attain the lowest possible unit cost of the production and delivery. To the extent that the input prices are also given, cost reduction implies the pursuit of *efficiency*. The user, on the other hand, is primarily interested in extracting high utility and (perceived) quality from the product or service, given its costs and price. This other component of productivity is generally called *effectiveness* (Neely et al., 1995). Efficiency growth of a service can be decomposed into three effects and sources (Varian, 1984) Improved *operational efficiency* or *cost-efficiency* implies cost reduction given the existing technology and the scale of production. Higher cost-efficiency reduces the waste of resources and moves the actual costs closer down to the firm's average cost curve. 2) Improved *scale-efficiency* implies a move along the producer's average cost curve towards the point, where the average costs reach the minimum level[8]. In the presence of *economies of scale* this implies an increased volume of production. 3) *Technological advance*, which reflects improved total factor productivity (TFP), shifts the firm's average cost curve downwards. The above efficiency concepts are also applicable to a multi-product firm, which utilize the *economies of scope*[9]. In this case the firm decides how to allocate resources across the production lines to achieve high cost-efficiency and scale-efficiency (Baumol et al., 1988).

While efficiency is characteristically *unambiguous,* bounded by the inputs, the output and the technology, this is not the case with the general conceptualization of effectiveness. It is a more diffuse term and in most cases very difficult to quantify. Such definitions lead to an interesting concept: there are usually no limits as to how effective an organization can be (Tangen, 2005). However, competitiveness of a service firm requires that productivity is assessed in relation to both components (cf. Jackson and Petersson, 1999; Vargo and Lusch, 2008). This in turn implies that the service provider (firm) – in making the production plan – has prior information (idea) how to attain effectiveness and how the goals in effectiveness are reconciled with the firm's goals concerning the production efficiency. To be economically feasible and predictable for the service firm, the level of effectiveness needs to be bounded from above[10]. In the context here, effectiveness is defined technically from the producer's perspective as the level of customization of the service to the needs of an individual customer. This conforms to the conceptualization of effectiveness in Neely et al. (1995).

With regard to the overall productivity, the focal issue in service management is whether the firm is capable to attain the desired level of effectiveness and the desired level of production

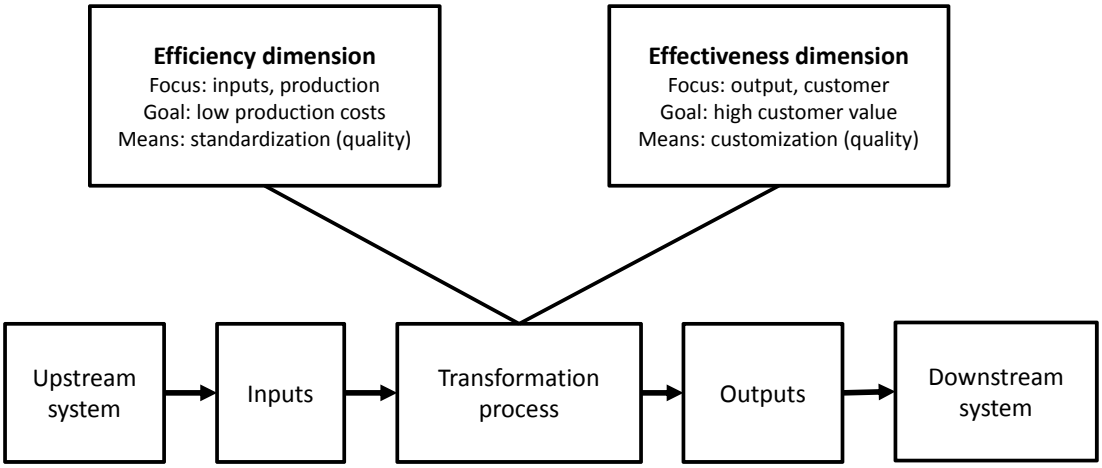
[8] In textbook microeconomics, this point shows the maximum productivity and it is allocatively efficient.

[9] In general, economies of scope over a given bundle of products and services prevail, when the average production costs in the integrated production are lower than the sum of the average costs in the separate production.

[10] The requirement that the desired effectiveness is technologically feasible means that it locates within the firm's production possibility set.

efficiency, given the production technology. Hence, the general formula the overall productivity of the service can be presented as a function of efficiency and effectiveness, where the marginal contributions of both components are locally positive[11]. The decomposition of service productivity into efficiency and effectiveness and their role in the production process (transformation) is illustrated in Figure 2. In this setting, *quality* is equally important for the scale-efficiency and the effectiveness of services. Based on the notion by Vargo and Lusch (2004)[12], it is assumed here that the customer's perceived quality is always the driving factor. The willingness to accept a trade-off between standardization quality and customization quality, usually for a commensurate trade-off in price (inclusive of other sacrifices) is eventually a form of customization. In the present context, the level of a customer's productivity is equalled to the level of perceived quality, which is a continuous combination of the customization quality and the standardization quality. For simplicity, customization quality is assumed to be a growing linear function of effectiveness while standardization quality is assumed to be a growing, linear function of scale-efficiency. Thus, given the variation (differentiation) in customers' preferences with respect to standardization and customization, customer satisfaction and productivity can attain compatibility[13].

Figure 2 Productivity in service transformation and value creation



3.2 Service technology and productivity strategy

Based on the above conceptualization, the characterization of service productivity in Figure 3 assumes that the production possibilities of a service firm can be approximated by a continuous and concave functional relationship between scale-efficiency and effectiveness. The curve with the symbol S indicates the firm's constant and maximum levels of productivity. The con-

[11] That is, given the level of efficiency, an incremental growth in effectiveness should lead to an incremental growth in productivity. The deduction is symmetric for scale-efficiency.

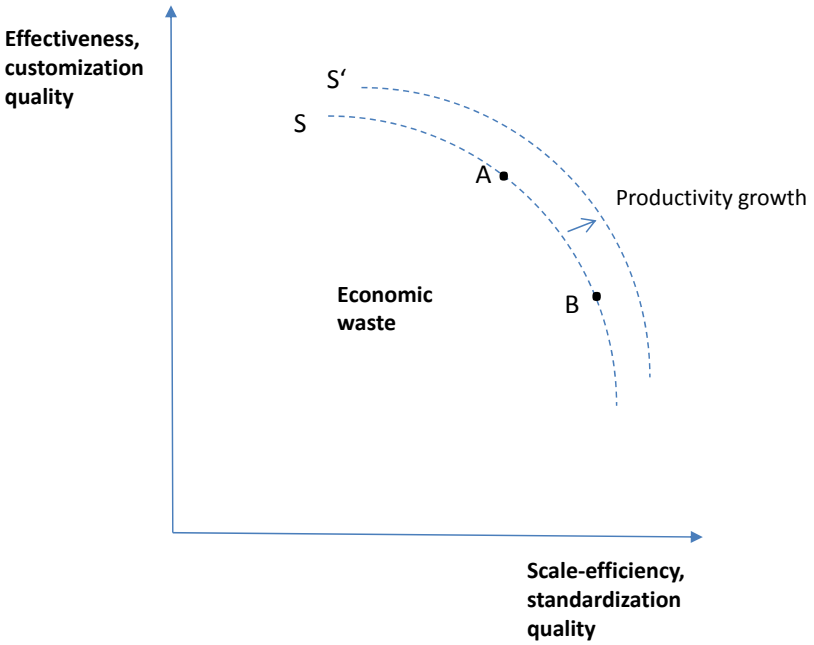
[12] Some customers prefer to engage in relatively high levels of co-production (tailoring), and some prefer to have the offering firms provide services more directly. When customers make trade-offs, they are not necessarily making value trade-offs. Goods and services are appliances, and the customer must add mental and physical effort to co-create value. This effort is part of the total cost of ownership and use of an appliance (Vargo and Lusch, 2004). However, because the firm does not pay for the consumer's effort, it does not usually enter into the firm's financial statement and determination of profit and productivity.

[13] A more detailed discussion of service quality and customer's productivity is available in Viitamo and Toivonen (2013).

tinuity of the surface S reflects the intrinsic flexibility of service technology. The concavity reflects the impact of economic scarcity and the diminishing marginal rate of technical substitution (MRTS) between effectiveness and scale-efficiency (cf. Kreps, 1990; Varian, 1984). Accordingly, along the surface S there is a trade-off in using the firm's resources most productively at any point of time: part of effectiveness has to be given up to obtain higher scale-efficiency. This holds for the moves in the opposite direction as well: sacrificing scale-efficiency for higher effectiveness.

In this framework, the key issue is not only the level of productivity and quality, but also the optimal employment of the provider's resources with respect to customer preferences on service quality. Contingent on their *flexibility and redeployability*, a provider's resources can be used in the production of low number of customized services (point A in Figure 3), or high number of standardized services (point B in Figure 3). It is realistic to assume that the productivity surface S evolves through the provider's learning of and experience in how to attain customer satisfaction in different types of customer segments. Productivity outcomes are ultimately contingent on how the firm's activities and the *resources* available to it are employed and how the customer is involved and used as a productive asset. It is realistic to assume that *the customers' participation in service production increases with the higher degree of customization of the service*[14].

Figure 3 The graphical illustration of service productivity



The surface (frontier) S also describes the best practice service technology available to the firm. Its principal objective to stay on the productivity frontier S, where the maximum level of productivity and the *right* balance between effectiveness and scale-efficiency for different

[14] In reality, this increases the uncertainty *ex ante* on the service outcome. For simplicity reason the impacts of uncertainty is excluded from the analysis here.

customers and customer segments can be reached. To exemplify, if the preferences of a customer change so that a higher level of customization is required, the firm has to allocate more resources to serve this particular client. In Figure 3, a move of the symbol A to the left on the frontier S illustrates this situation and the customer type. The move implies a higher uncertainty in the service outcome and a diminished opportunity to utilize economies of scale (replicability and standardization) in the service provision. Since customer time and the amount of other resources are fixed and fully employed in the frontier S, scale-efficiency needs to be enhanced in the service of other clients. This implies that more standardized services will be offered to the customers of type B in Figure 3, i.e. the point B moves to the right on the surface S. On balance, when the shifts along the frontier S correspond to customers' preferences, the overall productivity of the services and the firm's resources will remain unchanged.

In Figure 3, the area below the surface S is, by definition, inefficient (unproductive) and thereby it reflects the waste of the firm's resources. Correspondingly, the move towards S indicates an improvement in the use of the resources and an increase in the *operative cost-efficiency* of the firm. Productivity growth, which is manifested in technological progress and innovation, may shift the firm's productivity frontier outward from S to S′. For the exogenous factors inducing such a shift Anderson et al. (1997) note that appropriate applications of *information technology* may improve both customer satisfaction and productivity simultaneously. It is realistic to assume that the outward shifts of the surface S are mostly asymmetric and demonstrate the impacts of learning, improved skills of the service professionals, improved quality of the complementary inputs, or the *re-organization* of the service processes. However, the provider's strategy to increase its own productivity *unilaterally* does not necessarily generate the first-best solutions for the customer. This is the case, for instance, if the improvements in cost efficiency lead to the point on the productivity frontier S that is not preferred by the customers A or B.

It is apparent that the extent to which the firm's technology is smooth and continuous as indicated by the frontier S, is an empirical matter and depends on the industry characteristics. It is plausible to assume that through learning and routinization of the processes firms become more specialized (differentiated) in the production of specific types of services for specific types of customer segments. In that case *A and B in Figure 3 represent two differentiated firms, whose technology is approximated with the common productivity frontier S of the service industry.* Accordingly, competing firms may adopt differentiated productive strategies in services markets (cf. Porter, 1985, 1998; Barney, 1991). The main implication of the above analysis is that the (re)creation of competitive advantage in service productivity requires focused balancing between the provider's and the customer's productivities. Moreover, as technical progress fosters productivity growth and knowledge-intensity in services, organizational adaptation and redesign is needed to appropriate the economic benefits of the technical progress.

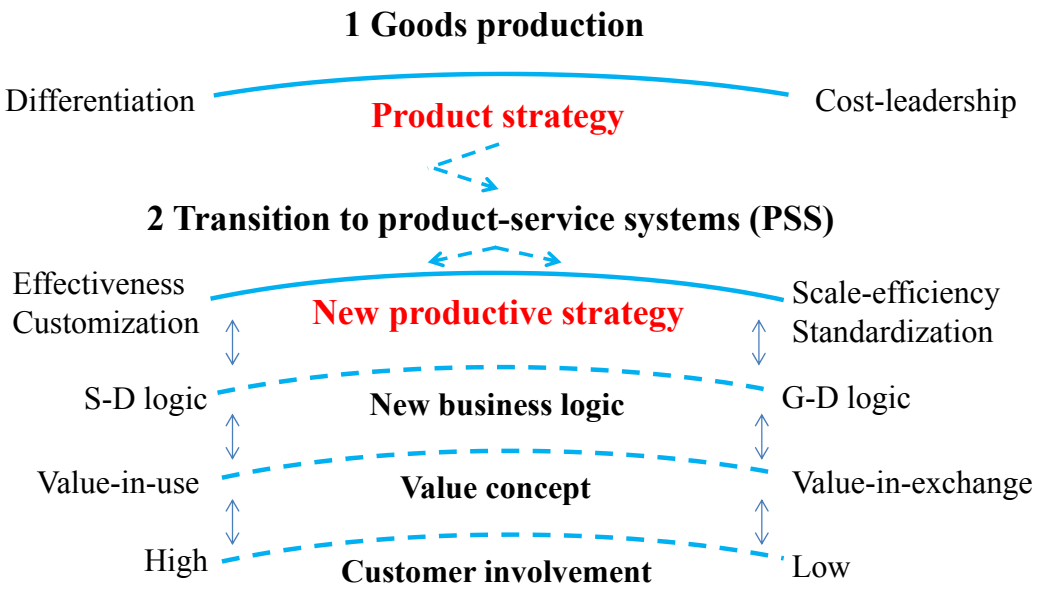
3.3 Linking productivity to S-D logic

In the context of servitization, the overall implication of the integrative approach to service productivity is that the *objective transition* to product-service systems extends the firm's opportunity set in productivity. The new opportunity set is manifested in the trade-off between scale-efficiency and effectiveness along the productivity frontiers in Figure 3. On the basis of the co-evolutionary view of products and services and the characteristic differences between

S-D logic and G-D logic (Vargo and Lusch, 2008), *it can also be concluded that the movement along the productivity frontier from scale-efficiency to effectiveness fosters a parallel shift from G-D logic to S-D logic.* This interdependence can be further highlighted by the notion by Lindberg and Nordin (2008, 294): "the service-dominant logic essentially sees service something that is intangible (low degree of objectification) that cannot specified in detail and should be exchanged in close buyer-supplier relationship (high degree of relational proximity)". Assuming that the opposite holds for G-D logic, we can conclude that 1) *the distinction between the two forms logic is a matter of degree,* and 2) the servitization strategy that is based on effectiveness of the product-service systems conforms to the characteristics of service-dominant business logic. In this regard, the objective (tangible) product-service transition facilitates the subjective (intangible) transition from G-D logic to S-D logic.

Figure 4 highlights the two arguments from a broader *process* perspective. For a goods producing firm, the product-service transition offers the way to differentiate from the competitors, *ex ante* (e.g. Wise and Baumgartner, 1999; Vandermere and Rada, 1988). This implies a move within the Porterian productivity domain from cost-leadership towards differentiation strategy (Porter, 1998). For the servitized firm and the evolving product-service offering the key issue is not only the differentiation *per se,* but also how to implement differentiation within the extended opportunity set in productivity, *ex post.* This is defined through the trade-off between scale-efficiency and effectiveness. To be operational, however, the chosen strategy in productivity has to be aligned with the respective business logic. These options can be characterized by the equivalent and continuous trade-off in S-D logic and G-D logic. The contingency condition in productive strategy and business logic (Scott and Davis, 2003) means that a successful strategy in servitization cannot just be a thought of construction (Mathieu, 2001); it must carefully balance between the two objectives of reality. As discussed in Vargo and Lusch (2008), the transition to S-D logic is reflected in various dimensions of economic thinking and business. Two of these dimensions are particularly important business management.

Figure 4 Productivity strategy within the framework of S-D logic



The inter-dependence between the productive strategy and business logic with respect to the *value concept* and the *customer's involvement in the production* (co-production) is highlighted in Figure 4. Whereas value-in-exchange (the market value) is more directly linked with the traditional analysis of productivity (efficiency), value-in-use is central in assessing customer value and effectiveness of services. In the light of the socioeconomic productivity approach it can be argued that the two value concepts are inter-linked. Information concerning value-in-use is central in the determination of a proper value-in-exchange, the market price of the service (product). It can be concluded that the relative importance of the information on the value-in-use and customer's context grows with the increase in the degree of customization and effectiveness of the offering. In highly customized services – or product-service systems – with less predictable outcome and thin markets, individual customers' value-in-use is central for the profitable pricing of the services. A high degree of customization implies that the determinants affecting the individual customer's context need to be taken into account in the design of the service, *ex ante*. In the case of standardized product and services with more predictable outcome, pricing is less affected by individual customers' value or context. Instead, pricing reflects more the actual production costs and the general supply and demand conditions of the markets. In that case, the value-in-use of product-service systems is reflected indirectly via the market demand.

The socioeconomic productivity analysis implies – technically – that the degree of customer involvement (co-production) in the design and production of standardized product-service systems is generally low. Since scale-efficiency with low unit costs is the dominant form of productivity, the competitive advantage of the firm is mainly contingent on the organization of its own activities and the supplying network. In the case of customized product-service systems, customer involvement is more intensive and versatile. Customers provide contextual information and participate in the design and the production activities as well (Vargo and Lusch, 2008; Windahl et al., 2004). This duality highlights, more generally, the distinctiveness of the open systems logic relative to closed systems logic in the value creation processes (Scott and Davis, 2003). In open systems based on customized production and quality the producer needs customer's input to reach the agreed level in effectiveness. Thus, the overall productivity of the firm is dependent on the external resources that are beyond its direct control. This stresses the dynamic capabilities of the firm and its role as a resource integrator. The deduction is symmetric in the opposite cases where the production of the product-service system is based on standardized service inputs of complementary assets. This kind of arrangement favors external sourcing (Teece, 1986; Teece et al., 1997).

4 Evidence from the forest-based industries

To date, empirical studies and models of servitization have primarily been focused on the manufacturing industries that provide capital goods with various segments of industrial users[15]. Typical examples of are metal working industries, machinery building and electrical equipment (Kaario, 2009). In these industries, client firms' investments in capital goods enhance provider's *installed base* (Kaario, 2009; Neely, 2008; Windahl et al., 2004). From the provider's perspective installed base represents external asset that enables develop service businesses. Moreover, installed base fosters the transition from the goods-related maintenance to

[15] This assumption is made explicitly or implicitly (Baines et al., 2009).

customer-oriented KIBS-type services that support clients' business (Oliva and Kallenberg, 2003). The opportunities for servitization are highly different in the *process industries*[16] which are typically focused on capital-intensive primary production that provide material inputs to the subsequent stages in the supply chain[17]. Whereas process industries lack an installed base, they also face a growing competitive pressure to develop services. Servitization, however, needs a more comprehensive approach to the supply chain management.

The discussion of servitization and related strategies in the process industries in this paper draws on the case study of the Finnish forest-based industries with the specific focus on fiber-based packaging. *Sustainable packaging* that utilizes renewable wood fiber as the raw material is the focused business area in two forest industry companies, Stora Enso[18] and Metsä Group[19]. Both companies are among the world's largest manufacturers of carton board, which is the primary material of the carton packages for various consumer goods. Stora Enso also produces corrugated boards and converted boxes used in transportation and in the storage of several types of goods. Corrugated products include also shelf-ready containers and displays in groceries. The industry case study – involving these two paperboard companies – was conducted by Aalto University, BIT research center in 2011-2013. The overall aim of the study was *to highlight how services can be developed to enhance the efficiency and effectiveness of the supply chain in fiber-based packaging*[20]. As major players in the packaging board industry, Stora Enso and Metsä Group hold strong market position in the supply chains they are involved in. Therefore, the operative goal in the company case studies became to foster productivity and profitability of the company value chains through services.

4.1 The role of supply chain management

Equivalent to the small-scale production systems like the service transformation depicted in Figure 2 there are larger-scale input-output systems called value chains and supply chains. The inter-industry *supply chains* encompass successive stages of production (value creation activities) starting from the raw materials and ending to the finished products (e.g. Möller et al., 2010). A counterpart to inter-industry supply chains - most often are operated by several independent firms at the successive stages - is the intra-firm *value chain* (Porter, 1985) that consists of the successive value adding activities from the procurement of inputs to the sales of finished products. In regard of the supply chain, process industries are typically involved in the scale-intensive production of the raw materials and the primary products. For instance,

[16] Typical examples of the process industries are basic chemicals, basic metals and the forest-based industries. The simplest and easiest way to grasp the definition of process manufacturing is to recognize that, once an output is produced by this process, it cannot be distilled back to its basic components.

[17] The term supply chain and value chain is used here interchangeably. A firm's value chains overlap with the inter-firm value networks or systems, which have a horizontal dimension as well.

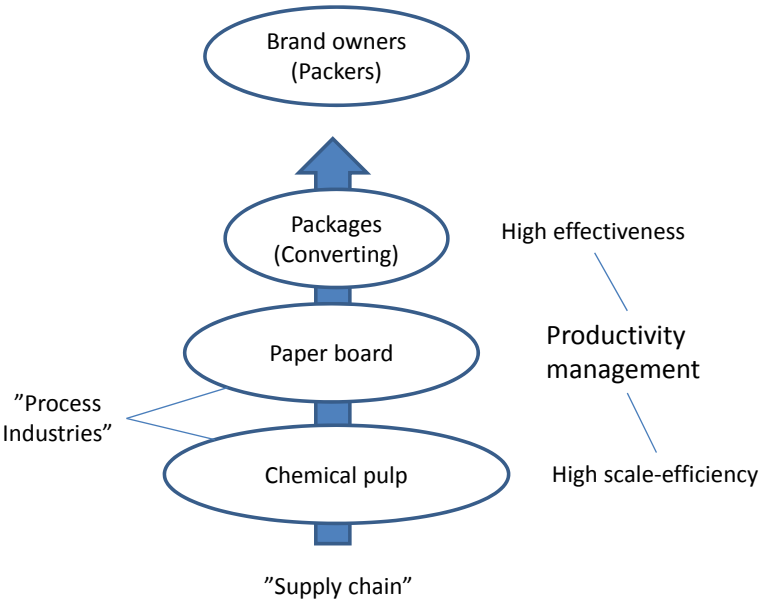
[18] http://www.storaenso.com/

[19] http://www.metsagroup.fi/

[20] Most of the data in the industry case study was collected through structured, in-depth interviews of the selected key employees in **Stora Enso** and **Metsä Group**. The interviewees represented managerial expertise in sales and marketing, production and the R&D functions. The analysis of the company data provided a detailed view of the operation of the packaging supply chains and the role of services in the different stages of the company value chains. Complementary data of the business potential in services was collected from the main customers of the case companies. Customers represented well-known 'brand owners' in various 'packing industries'. The collection of the data on customers' views and feedback was based on structured interviews that were conducted in three kinds of activities of the client firms: **procurement, package development and marketing**. While the company data was kept confidential, it enabled important generalization (modeling) of the key characteristics of servitization strategies in fiber-based packaging. These generalizations are presented in this paper.

the main operational focus of Stora Enso and Metsä Group is the production of pulp and the carton boards that used in the production of carton packages. In the supply chain of corrugated packaging products, Stora Enso's value chain also includes the converting stage; the production of finished boxes with customers' printing layouts. The generic supply chain in fiber-based packaging – involving the carton and the corrugated products – is illustrated in Figure 5.

Figure 5 The supply chain in the fiber-based packaging



In the supply chain management – particularly from the process industries' perspective – the main challenge is how the productivity objectives in the pulp and paperboard production can be reconciled with the productivity objectives in converting and related services (printing, design and consulting). The former relies principally on scale-efficiency and standardization quality whereas in the latter, effectiveness and customization quality is relatively more important to the overall productivity. As the companies in the primary production – like Stora Enso and Metsä Group – and the more numerous but still powerful companies in the converting stage operate under differing 'productivity regimes' with conflicting interests, the supply chain is exposed to hazards of sub-optimization. As a result, there is built-in *productivity deficit*. When the coordination between the primary processing and the converting is based on markets (see below the case a in Figure 7) the process industry firms have a clear rationale for more hierarchical governance of the supply chain activities[21]. This is a persistent dilemma in the carton board industry, in particular.

Companies in all stages of the packaging supply chain pursue servitization as it enables differentiation and the creation of long-standing customer relationships. In particular, product-service transition in the converting stage is boosted by the technical progress that enables customization, smaller batches and faster deliveries of finished packages (cf. Petrie, 2010). The

[21] The inefficiencies of market coordination is manifested in high transaction costs (haggling) and non-optimal capacity utilization and investments.

opportunities and the profitability of servitization are, however, contingent on the company's *position* in the supply chain. The implications are pointed out e.g. in Szasz and Demeter (2010, p. 3): "more upstream players [e.g the pulp and board producers] deliver raw materials and simple components to buyers who build these inputs into their own products. They probably have to serve fewer customers and their products and more *commoditized*. More downstream players [e.g. the packaging converters] provide more *complex parts* of subassemblies and serve end users. Due to complexity they might have to add more information and service to their products". Typically, the paperboard manufacturer provides the packaging material and the add-on services with the converter-printers. Services provided are mainly technical problem-solving, related to the converting process, and the fiber characteristics. Moreover, services are most often 'given away' for free to enhance customer loyalty (Oliva and Kallenberg, 2003). In contrast, the services provided by the converter-printer to its customers (the brand owners) are more versatile including KIBS-type services, such as consulting and design. Showing more the characteristics of integrated product-service systems, the offering of the converter-printer is aimed to enhance the customer's (the packer) brand and business. Hence, in the market co-ordination case the better prospects for more *profitable* servitization in the downstream activities provides an added rationale for the process industries firms to have control over the supply chain activities.

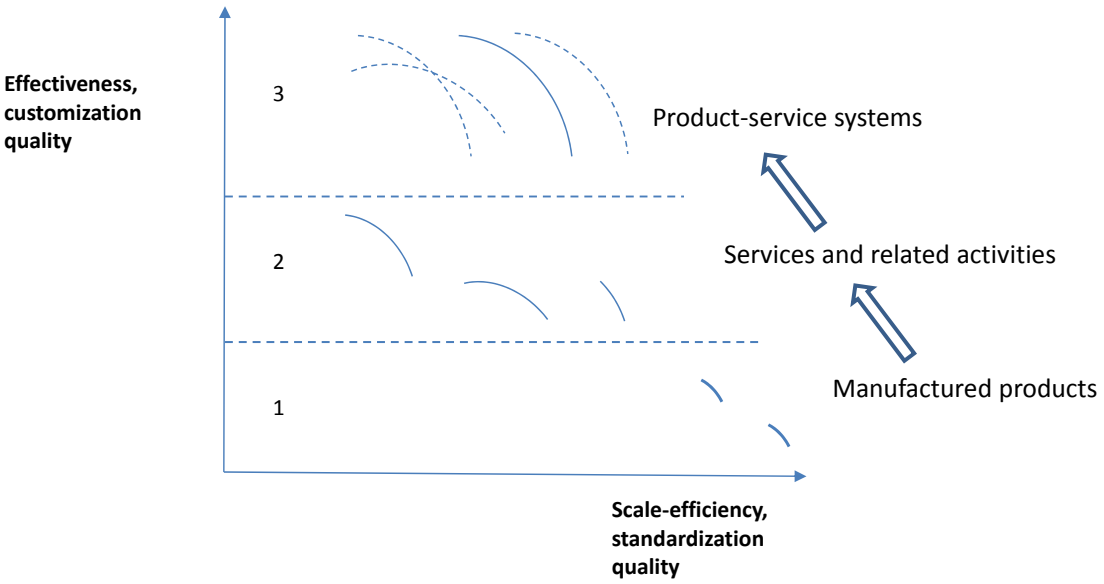
4.2 Shift in the productivity strategy

Assuming that hierarchical control over the supply chain activities is possible, the socioeconomic productivity framework can be used to illustrate how *servitization* – the transition to product-service systems – changes the focus in the productivity management by a process industry firm. The traditional approach to depict strategic choices of a goods producing firm is the Porterian productivity model which assumes a (continuous) trade-off between the strategy of cost-leadership (cost-efficiency) and the strategy of product differentiation in the industry (Porter,1998)[22]. As pointed out in Section 3.3, objective servitization expands the firm's opportunity set in productivity management. This is illustrated in Figure 6, which summarizes the productivity strategies of the two case companies more generally. The focal issue here is how the available options in productivity can enhance the competitiveness of the firm's product-service systems. In goods production, particularly in the scale-intensive process industries, productivity is intrinsically addressed in terms of producer's efficiency. This follows from the stylized fact that customization in scale-intensive production is technologically and economically highly limited (infeasible). Even when the manufacturing company (the paperboard producer) adopts the differentiation strategy in the product development the level of effectiveness is to a high extent predetermined. The principal means to appropriate profits from differentiation is to minimize the unit costs through replication and standardization of processes.

The region 1 in Figure 6 illustrates a case where a paperboard company produces two variants of non-servitized products that show high scale-efficiency and standardization quality. The technological options in the productivity of the service components in the product-service systems are illustrated in the region 2 of Figure 6. In fiber-based packaging, these services include various activities in converting, printing, design and consulting. In the corrugated packaging, the supplementary activities in the overall offering may also include automation

[22] This is analogous to the socioeconomic framework of scale-efficiency and effectiveness.

Figure 6 Productivity implications of servitization illustrated in the paperboard production[23]



systems that operate the brand owners' (customers') packaging lines. In the service components, relatively higher emphasis is put on effectiveness and customization quality. Technically, there are better opportunities – and also higher customer needs – to balance between the standardization quality and customization quality than in the manufacture of paperboard in the region 1. On aggregate, this implies higher flexibility in moving along the productivity frontiers in the region 2. The region 3 in Figure 6 illustrates the productivity options in the delivery of integrated product-service systems, i.e. the packaging solutions. For instance, both case companies can vary the characteristics of productivity in specific types of solutions but the shifts also involve discontinuities. This is indicated by the dotted productivity frontiers in the region 3. The productivity frontiers in Figure 6 also highlights the stylized fact that servitization enables new kinds of service-product combinations. That is, product-service transition is usually associated with horizontal diversification and variation in the types of solutions offered to different customer segments[24]. While modular structure is the intrinsic characteristic of servitized packaging solutions, the data shows that modularization is not yet 'systematically' applied in the operational models of the examined case companies.

4.3 Organizational ramifications of servitization

The transition to product-service systems manifests the expansion of the manufacturing firm beyond its traditional fields of business. This is inevitably associated with organizational changes in the industry supply chain (Guan and Rehme, 2012). Enhanced knowledge of the customer's value creation models and the conversion of wood fiber in the packaging process

[23] The figure is based on the industry data collected in the case study. The dotted horizontal lines indicate that the three regions are not comparable in the variables of the two axes.

[24] The dotted lines in the productivity surfaces indicate the stylized fact that the trade-off in vertical differentiation (moving along the productivity frontier) is more discontinuous in the product-service systems than in pure services.

are the principal sources of excess resources (Penrose, 1959; Grant, 1991) that encourage the paperboard producer to expand to converting and related service activities (Wise and Baumgartner, 1999). *Coordination through integration* (the case b in Figure 7), where the manufacture of paperboard and converting to packages is based on joint ownership, can be considered as a servitization strategy that enables a direct access to the brand owner (cf. Möller et al., 2010)[25]. There are two kinds of managerial incentives. *First*, integration implies a shift from the delivery of paperboard products with unpriced add-on services (market coordination in Figure 7) to more comprehensive and profitable product-service systems, or packaging solutions (cf. Oliva and Kallenberg, 2003). *Second,* integration enables higher productivity of the value chain as the market coordination, which is subject to misaligned incentives and related transaction costs, is replaced by more hierarchical governance in the value creation processes. Through the reduced uncertainty and transaction costs[26] (Williamson, 1985; Masten, 1982) – and improved transparency of information in the supply chain, integrated coordination can benefit the consumers, the customers (the brand owners) and the paperboard producer at the same time (Teece and Pisano, 1998)[27]. Within the productivity framework illustrated in Figures 3 and 6, improved coordination in the delivery of integrated product-service systems shifts the productivity frontier S outward. Thus, higher levels of scale-efficiency and (or) effectiveness can be extracted from the servitization that is facilitated by forward integration with unified ownership.

Coordination through vertical integration is a viable strategy in the *corrugated box boards* and the finished transport packages; the main products of *Stora Enso packaging*. These products show on average, relatively low value added and therefore the converting and printing activities must be located close to the packaging markets. The excess resource that the paperboard company utilizes in servitization is predominantly the technical knowhow in the wood fiber conversion and logistics. The up-grade of resource base in the service transition is facilitated by learning and collaboration with the customers and the suppliers in the network.

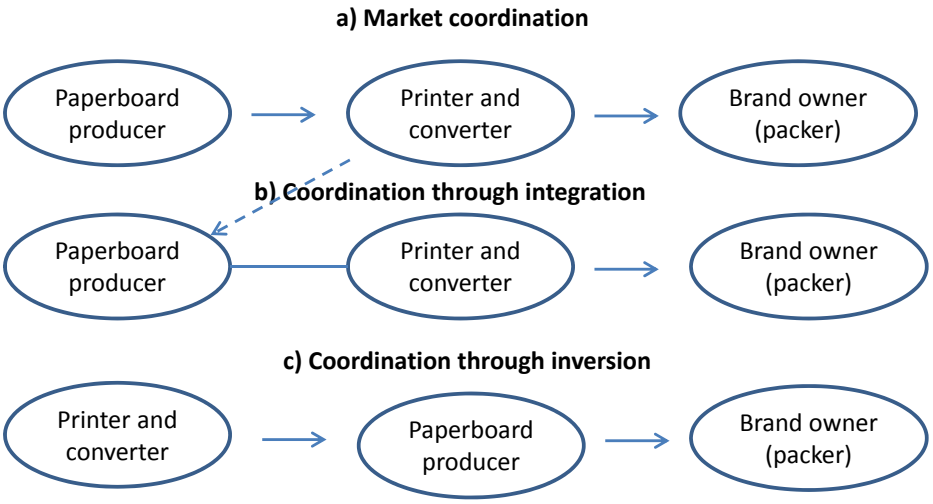
The situation is highly different in the *carton boards* and packages, which show higher value added and R&D investments. Carton board is used in packaging of consumer goods whose markets are global. The standard mode in the coordination of the supply chain is the market coordination (case a), where the global printing and converting companies usually possesses a distinct market power with respect to the paperboard producers. In specific locations and product markets however, it has been possible for the carton board producer to *invert* or reorganize the supply chain. This is illustrated by the case c in Figure 7. Here, the carton board producer establishes a direct customership with the brand owner and offers them integrated product-service systems – the packaging solutions. In this setting, manifested e.g. in Metsä Board's *Integrated Brand Packaging* (IBP) business concept, the carton board producer purchases the printing and converting services as well as the design and related services contractually from independent usually local suppliers. Coordination in this case is facilitated by a web-based communication system that links the board producer with a number of selected

[25] Within the integrated coordination mode, the manufacturing firm performs the adjacent stages in the manufacturing supply chain internally. In that case the firm may produce the supplementary services internally or it may purchase them from its external value network.

[26] In the hierarchical control (integrated firm), the incentives of the transacting parties are aligned, which saves transaction costs.

[27] This assumes that the reduced competition within the supply chain and the more limited choice by the clients do not off-set the productivity gains of coordination. In that setting **coordination can be interpreted as a specific service** that is associated with intrinsic costs and benefits.

Figure 7 Alternative modes of coordination in the packaging supply chain[28]



service providers and brand owners. The principal sources of excess resources and capabilities that are utilized in this mode of servitization are the product-based knowledge created through in-house R&D, the accumulated knowledge in fiber conversion and logistics as well as the management of global customer relations[29]. The up-grade of the resource base in servitization utilizes learning and the acquisitions of new capabilities in the local labor markets.

In comparison to the adaptive governance based on markets the *pro-active* modes of integrated coordination (ownership) and inverted coordination (contractual control) enable deeper-going service transition. While the requirements for managerial capabilities and customer-relationship management are principally same in both cases, their employment as the 'first-best organizational responses' is contingent on the differing features of the product-service systems and the business environment (Williamson, 1985; Coase, 1937). These differences can be addressed systematically in the *profiting from innovation* (PFI) -framework of David Teece (1986). That is, if complementary assets and services are required in the profitable commercialization of innovations by a firm, the focal question is when the hierarchy (ownership) is more profitable than markets in the coordination and the procurement of these services. According to PFI hierarchy is the prioritized mode of governance when a) the complementary assets and activities are *specialized* to the innovation, and additionally b) when the prevailing property right regime is *weak*. When the first condition holds the market transfer of complementary services in the case of high relational dependency, becomes excessively costly (Williamson, 1985; Masten, 1982). The *second* condition implies that the innovation in question cannot be protected by patents or trade secrets. In the contractual (market) sourcing of complementary services, the innovation would be exposed to information externalities with costly side effects (Teece, 1982; 1986).

[28] The figure is based on the industry data collected in the case study.

[29] The conclusion that customer relationship management is a source of innovation and is associated with excess capabilities, is particularly relevant in the situations where the paperboard company, starting from the market coordination case in Figure 7 has been able to pass the converter and to create direct business relations with the global brand owners. This is the case with Metsä Board (IBP).

Most of the innovations in the paperboard industry are incremental, technical improvements in the process and material, or in the packaging solutions and their components. In case of corrugated boards and boxes, vertical integration follows from the logistical imperative to locate the converting units close to the local packaging markets. Since the local markets can support only few providers of the complementary services – implying high geographic specialization of the assets – market procurement would entail in high transaction costs (Williamson, 1985). Integrated has *induced* (enabled) paperboard producers like Stora Enso Packaging to innovate sophisticated packaging solutions and extend the product-service systems with more complex components in the packaging automation and related services[30]. However, the property right regime in the corrugated supply chain is relatively weak, which further favors integration. Inverted coordination in the carton boards follows from the PFI argumentation as well, but in an opposite way. Technical R&D and the evolving customer relations with the brand owners are the main sources of innovations that show a relatively strong property right regime. Packaging products markets are more global and hence less subject to local production than corrugated packaging products. From the perspective of the carton producer such as Metsä Board (IBP), the complementary services of printing, converting, design and consulting are *generic* with respect to the innovations and they are available in competitive supply. In these circumstances, a contractual relation may well suffice (Teece, 1986). If necessary, service providers can be easily switched in the value network and the product-service systems can be expanded with new services and suppliers.

4.4 Service-dominant logic in action

On the basis of the inter-dependence between service-dominant logic (S-D) logic and service productivity discussed in Section 3.3, this section addresses how the objective forms of servitization with product-service systems are associated with the more subjective arguments of (S-D) logic in the paperboard industry and the examined case companies. In general, the notion in (S-D) logic that all economic actors are *resource integrators* (Vargo and Lusch, 2008) conforms to the observation of the case study that integrated and inverted coordination are alternative but equivalent approaches to manage the paperboard supply chain in different circumstances (cf. Williamson, 1985; Teece, 2009). Coordination, which manifests a distinct service function, is about integrating resources in a pro-active way. In both organizational contexts, dynamic capabilities (*transformation* and *reconfiguration)* are needed to integrate the services of the internal and external assets for the productive operations of a firm (Teece et al., 1997). As with Sections 4.2 and 4.3 the discussion here draws on the findings of the Finnish case study.

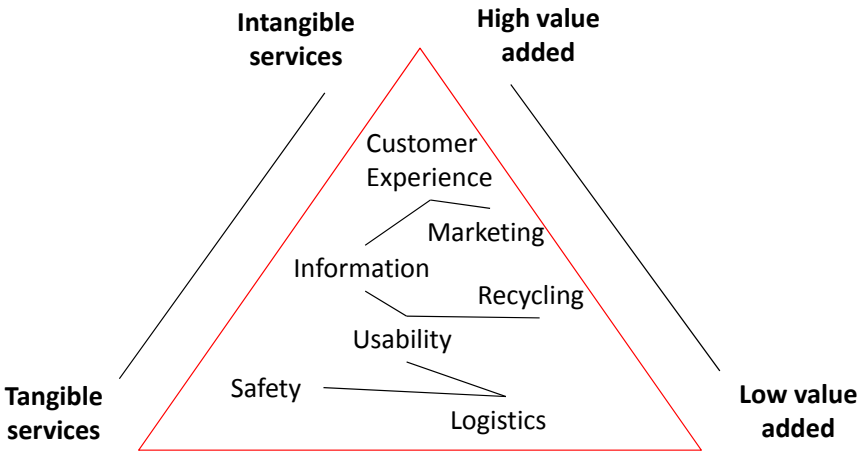
Traditionally, the business logic in the paperboard production – as well as the other product lines of the forest-based industries – has been based on G-D logic. The evidence from the paperboard industry points out that the managerial approaches to the S-D logic in case of productivity and servitization is principally neutral. At the margin, S-D logic and G-D logic with the underlying productive strategies are considered equally viable options. The choice is influenced contextually by the firm's resources, technologies as well as the specific goals in productivity, the market position, and the overall prospects in profitability. S-D logic and G-D logic are usually co-employed in different customer segments and markets with differing weights.

[30] Actually, this also reflects a shift from the traditional process industry business logic closer to the installed base business logic.

For instance, big customers and 'strategic partners' are attended through the principles of S-D logic, whereas smaller clients with shared needs are attended through G-D logic and replicated solutions. On aggregate, enhanced rivalry on global customers, higher intelligence and flexibility of the packaging technologies, and the product-service transition *per se,* have been supportive in developing customized packaging solutions. There are some indicators of more systematic transition towards S-D business logic in the paperboard industry as well.

The application of S-D logic in the paperboard and the packaging industries is facilitated by the stylized fact that the physical package provides several kinds of services to the packaged products and their users. According to the often cited slogan 'packaging has important service functions to *protect, distribute, inform, attract and sell*' (cf. Petrie, 2010). The service functions of packaging are illustrated systematically in value pyramid of Figure 8. On the bottom of the value pyramid are tangible, goods-related services like logistics, safety and usability of the product. These services derive mainly from the physical properties (e.g. strength, stiffness) of the package and the paperboard. In these categories of services, the dominant form of productivity is scale-efficiency the provider's and the brand owner's processes. On the top of the value pyramid, the services are characteristically more intangible, provided mainly with the users of the package (individuals). In these categories of services, a higher emphasis is put on the information (printability) and the outlook (brightness) of the package (paperboard) to enhance brand owner's business and the customers' value. Intangible services enable higher customization and effectiveness and – depending on the market conditions, higher unit prices of the packages as well.

Figure 8 The value pyramid of the packaging services[31]



In the spirit of S-D logic, the multi-functionality of packaging services is stressed in the marketing and branding strategies by the leading paperboard companies. For instance, SCA the major Swedish competitor of the Finnish case companies holds that *packaging is the communication medium that connects your (the brand owner's) product with the consumer...our objective is to compete not just on functionality but also on qualities such as emotions, meaning and*

[31] The figure is based on the industry data collected in the case study.

look-and-feel…we are constantly strengthening our design capabilities to translate effectively consumer insights into innovative packaging concepts[32]. Some reflections of S-D logic are also identifiable in external marketing by Stora Enso and Metsä Board[33]. In response to the equivalent business practice in SCA, sales promotion in Stora Enso Packaging is increasingly fostered by a focused co-creation facility called *design studio*. Based on the interactive sessions by individual experts of the corrugated packaging value (business) network, design studio is aimed to develop new packaging concepts and tailored solutions to the key customers of Stora Enso Packaging[34]. Within the framework of S-D logic, design studio facilitates an extended value co-creation network and supplier's integration of the internal and external resources (cf. Vargo, 2009). With the user and producer of the packages, design studio integrates other important stakeholders of the packaging network; design, packaging automation, retail and trade and marketing.

The case study indicates that the paperboard companies apply the principles of S-D logic in various ways in their sales promotion activities. Another practical example is the sales tactics called *performance selling*. It means selling packaging solutions and materials by the guaranteed performance criteria instead of guaranteed contents of board and board composition[35]. In performance selling, the objective of the paperboard company is to price their packaging products on the basis of the value-in-use with respect to the functional services depicted in Figure 8. More generally, performance selling represents a managerial effort to move from the traditional G-D logic – where the prices of packaging and materials are mainly determined by *grammage* and the value-in-exchange – to S-D logic in sales and customer relations management. In a longer perspective, the pursuit of performance selling reflects the persistent dilemma in the Finnish paperboard industry. While the packaging materials are generally ranked high in quality and service value and the packaging solutions are usually tailored to global the brand owners, product prices tend to be determined by the bulk products markets and standard solutions. The case data indicates that performance selling can be viable tactics when a) the firms operate in emerging and growing markets (e.g. Asia and Eastern Europe) and b) when the packaging supply chain is proactively coordinated. For instance, integrated coordination and product development in Stora Enso Packaging enables reach the performance targets in usability and logistics with reduced material costs. Inverted coordination in Metsä Board (IBP) is moreover aimed to generate higher premium (price) for the intangible services of packaging (e.g. printability and customer experience) in the emerging Asian markets[36].

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[32] http://www.sca.com/

[33] In a similar spirit, Stora Enso notes that "our (packaging) vision is to sustainably create value for customers and shareholder by being the most innovative and efficient fibre-based packaging material and solutions company in the world" (http://www.storaensopack.com). Similarly, Metsä Board stresses that "IBP Packaging Services is dedicated to enhancing global brand owners' brand value and success. We are a global packaging services provider offering value-added services and solutions" (metsaboard.com/products/ibpservices).

[34] The company interviews indicate that design studio concept enables a (transaction) cost-efficient involvement of the customers in the design process and hence to reconcile the requirements on scale-efficiency and effectiveness.

[35] Source: unpublished case material, 2013.

[36] In comparison to the integrated coordination mode, inverted coordination enables (also technically) higher vertical and horizontal differentiation. This follows from the opportunity to use a number of differentiated converters and designers in the value network.

5 Conclusion and discussion

Building on the socioeconomic approach to service productivity and the business management, this paper aims to contribute to an integrative analysis of servitization by a manufacturing firm. The conceptualization of productivity draws on the mainstream of service management literature, the established theories of firm in the context of business management. The observations from the forest-based industries confirm that the perspectives of strategic management are useful to shed light on the actual drivers and the consequences of product-service transition. With the inter-disciplinary focus, the integrative approach in this paper is manifested in 3 important dimensions.

First, the conceptualization of productivity on the basis of scale-efficiency and effectiveness aims to reconcile the producer's and the customer's perspectives in assessing the performance of the product-service systems. Independent of the firm's productive regime balancing between these two components of productivity in dyadic business relations is a key managerial task. This balancing becomes even more critical when the product-service systems are complex and based on networked coordination of external resources. *Second*, servitization is considered here as a business transition with two dimensions. A shift from the production of goods to the production and delivery of product-service systems highlights the tangible (objective) mode of transition. It may or may not be associated with the move from G-D logic to S-D logic, which represents the intangible (subjective) mode of servitization. It reflects a mental reorientation in the value creation principles and business logic of the firm. The paper asserts that this duality – discussed e.g. in Kowalkowski (2010) – is linked with the firm's strategy on productivity. On the basis of the socioeconomic framework it is further contended that objective transition to the product-service systems enables mode flexible utilization of scale-efficiency and effectiveness. Hence, it also facilitates subjective transition to S-D logic. On aggregate, the adoption of S-D business logic is contingent on the techno-economic characteristics of the industry, the productive strategy of eth firm as well as the dynamic capabilities of the management.

The *third* aspect in the integrative approach is the *industry focus*. To date, empirical studies of servitization have been centered on the manufacturing industries that provide capital goods with their industrial clients. The installed base -argument provides practical and credible arguments on how the offering and the business logic of a manufacturing firm can be stepwise enhanced to more knowledge-intensive solutions. The paper posits that extending the sectoral focus to the process industries would contribute to a more holistic framework, where the characteristics of supply chains and networks including information flows and other inter-firm linkages become important determinants of servitization[37]. Ultimately most companies are involved in one or several industrial value chains, which influence the firms' opportunities to develop services. The evidence from the Finnish paperboard industry suggests that productivity is central driver in servitization and supply chain management. In safeguard of the smooth running of vertically linked activities, servitization is associated with a pro-active control of the subsequent value adding stages. This stresses the importance of *coordination services* and the role of the servitized manufacturing firm as a resource integrator.

[37] With their marked investments in the scale-intensive production lines, process industries are important customers of the installed base industries as well.

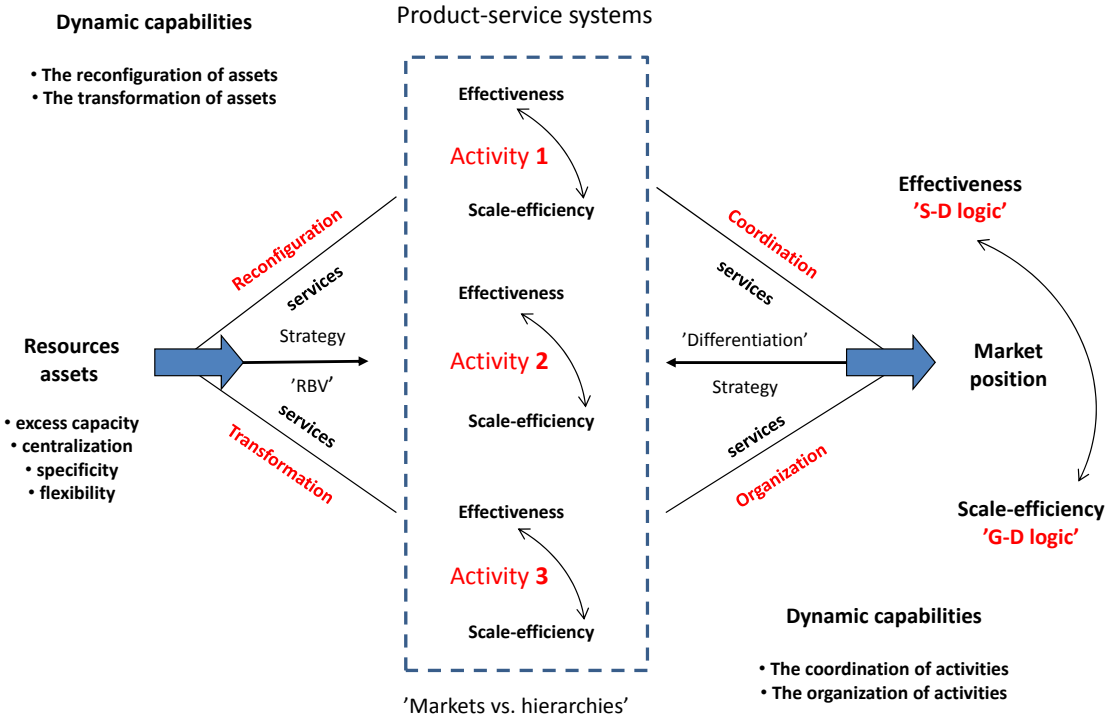
The case study of the packaging industry suggests that integrated and inverted coordination of the supply chain are considered alternative organizational approaches to enhance productivity and implement servitization strategies. In particular, the coordination of complementary activities within the inter-firm networks holds a substantial potential for innovation and enhanced productivity in the production and delivery of the product-service systems. Such a conclusion can be juxtaposed with the parallel argumentation on the *systems integration business* that evolves in the metal working and the electrical engineering industries (Prencipe et al., 2011). Systems integrator companies that design and sell large, complex systems have *outsourced* a number of their components. At the same time they have kept certain key functions in house. Through that change the systems integrators become increasingly customer- and service-oriented on the delivery side. On the basis of their activities and business logic, systems (resource) integrators manifest the third mode of servitization, which may be called *stuctural* mode of transition[38]. While there is an apparent consistency between S-D logic and systems integration modes, the question of how they are co-implemented is empirical and needs further research. On tha basis of the preliminary observations in the paperboard industry it can be conclued that these three aspects of servitization can co-exist whereas their utilization is a matter of degree.

In summary, the earlier academic literature and the findings of the case study suggest that there is need to more integrative approaches in servitization research (Baines et al., 2009). The strategic approach suggested here links strategic management with S-D logic and the socioeconomic view of service productivity. This framework, which is illustrated in Figure 9, also involves organizational (markets vs. hierarchy) design in the management of the complementary activities and assets. The foundation of the integrative approach is the combination of the structuralist view and the resource-based view of the firm's competitive advantage. These two 'schools' are highly complementary as they explain the origins of competitive advantage and the productive strategy from the opposite angles. The bridging elements in the framework are the dynamic capabilities theory (Teece, 2009) and the underlying 'service-based theory of a firm' by Penrose (1959). The performance of the services of the resources, which materializes through their employment in a productive *action,* is contingent on the technology and the managerial and organizational capabilities of the firm. Managers coordinate and integrate firms' *activities.* How *effectively* and *efficiently* this is conducted is vital for the overall performance of each activity and the firm's value chain as a whole.

Proactive coordination of inter-firm activities – that is also manifested in the evolving systems integration business – is a central part of servitization strategies in the manufacturing supply chains. In rapidly changing environments, there is high value in the ability to sense the need to reconfigure the firm's asset structure, and to accomplish the necessary and transformation of the internal and external resources. Equivalent to the trade-off between scale-efficiency and effectiveness in the delivery of product-service systems, there is a trade-off between efficiency and flexibility in the organizational routines, which is subject to the transferability of the firm's resources between their alternative uses. In the socioeconomic service productivity framework, flexibility (transferability) of firm's resources and capabilities is central for the utilization of the trade-off between scale-efficiency and effectiveness in different business cases. *Horizontal flexibility* implies that the product-service systems can be adjusted to the customers' specifications that require horizontal differentiation. *Vertical flexibility* implies that

[38] This adds to the objective and subjective aspects in the product-service transition.

Figure 9 The integrative framework of strategy, productivity and servitization



product-service systems can be adjusted to the customers' specifications that are differentiated with respect to customization quality and standardization quality. This can be highlighted by the moves along the productivity frontier in Figure 3. For the firms' productive regime that is based on high effectiveness and customization quality a consistent business logic is service-dominant logic as defined in Vargo and Lusch (2008) and Lusch (2009).

In conclusion, the data of the coordination models in the paperboard industry suggests that productivity and competitiveness of product-service systems draws on the firm's capabilities to utilize markets and the hierarchies in managing the complementary assets and activities within the industrial supply chains. This requires effective balancing between *organizational routines* and *individual skills* that are the basic productivity drivers of the firm's activities (Nelson and Winter, 1982). In general, when the firm's capabilities in the activities are embodied in a number of small teams and individual skills, their productive employment requires a *decentralized* organization (Viitamo and Toivonen, 2013). This is usually the case with the KIBS-type activities (e.g. consulting and design) that show high the customer involvement in the value creation and build on flexibility and effectiveness. When the firm's capabilities in the complementary activities are embodied in the organizational routines a more *centralized* organization is required for the productive employment of a firm's resources (Viitamo, 2013). In view of the future research, the inter-play between the firm's capabilities and organization is a central issue to address within the integrative framework of servitization.

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ISSN-L 2323-2447, ISSN 2323-2447, ISSN 2323-2455 (Pdf)