Challenges of Measuring Service Productivity in Innovative, Knowledge-Intensive Business Services

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As the productivity of services has just become an intensely researched topic, measurement concepts that have been developed up to now are on a very abstract level and aimed at services in general. In the paper, a requirements framework for measuring and controlling productivity of innovative knowledge-intensive business services will be developed. On the basis of these requirements, the existing concepts of measuring productivity in services will be assessed. Strengths and weaknesses of the concepts will be identified and will serve as a basis for the development of a productivity measurement concept for innovative and knowledge-intensive business services in further research.

1. Introduction

Measuring the productivity of services has just recently become a much discussed topic. Whilst concepts of productivity measurement in manufacturing have been introduced decades ago and are based on contrasting input and output, productivity of services is a topic which is currently under intensive research. Productivity measurement concepts established in manufacturing cannot simply be transferred to service due to its peculiarities. The customer is always a part of the service and hence the customer actions need to be considered on the input side and consequently quantifying customer co-operation is necessary. Furthermore, service readiness, which is the major prerequisite of service delivery, also needs to be incorporated into measuring productivity.

Whilst measuring the productivity of services generally raises new challenges compared to a productivity measurement of manufacturing goods, there are even more challenges if we intend to incorporate innovativeness and knowledge intensity of services into an adequate productivity measurement. Traditional productivity measurement concepts as well as service-oriented concepts will privilege less innovative products and services due to their steady state of production and delivery. Hence a controlling merely by operating figures derived from existing productivity measurement concepts will mislead entrepreneurial decisions. The same statement can be made for knowledge-intensity, as one of the major input factors of productivity is employee, customer and third party knowledge which is hard to quantify in existing productivity measurement concepts.

On that background it is the objective of the paper to identify the specific requirements of measuring productivity of services which are innovative and knowledge-

intensive at the same time. Existing productivity measurement concepts are assessed as to what extent they already fulfil these requirements. On this basis, need for further research and enhancements of productivity measurement concepts are given so that an evaluation of innovative and knowledge-intensive services will be possible.

The basis for reaching the objective of this paper – to identify the challenges of measuring the productivity of innovative and knowledge-intensive services and to assess if existing measuring concepts meet the demands of these services – will be a systematic literature review. Starting from the peculiarities of services (intangibility, heterogeneity, inseparability and perishability), the characteristics of innovative services and of knowledge-intensive services will be compiled in section 2 of this paper. Following these characteristics, a set of requirements for measuring the productivity of these services will be derived. Subsequently, the most important existing concepts of measuring service productivity will be revisited in the third section of the paper.

By a comparison of requirements and existing concepts their applicability in measuring the productivity of innovative and knowledge-intensive services will become more transparent and can be used as a starting point for identifying and developing additional features to enrich existing concepts or for developing completely new approaches for measuring productivity in the frame conditions described above.

2. State of the art of productivity measurement concepts and new challenges from integrating innovativeness and knowledge intensity into the measurement of service productivity

2.1. State of the art of productivity measurement concepts

Productivity is commonly defined as a ratio of a volume measure of output to a volume measure of input use (OECD, 2001). In other words: “Productivity [...] is a gauge of the relationship between [...] production of goods and services and the factors of production used (labour, machinery, raw materials and so on) (Djellal/Gallouj, 2008, p. xi)”.

Traditionally productivity measurement concepts have been established in manufacturing industries and have been adapted to the needs of this sector. Generally productivity measures there can be classified as single factor productivity measures or multifactor productivity measures. Single factor productivity measures relate a measure of output to a single measure of input such as labour or capital. Multifactor productivity measures are linking a measure of output to a bundle of inputs like capital and labour or all production factors (Total Factor Productivity).

Measuring productivity must not be an end in itself, especially against the background of the effort needed to capture all relevant input and output parameters. Productivity measurement is an element of productivity management. Such a management serves two basic purposes: planning and monitoring resource allocation and outcome. “The basic objective of productivity measurement is to establish the

potential for improvement and make people accountable for the state of productivity" (Sahay, 2005, p. 19 f.)

In planning activities, productivity figures should be used to clearly state which objectives a company intends to achieve by defining target productivities and the resources needed to achieve the productivity goal respectively. By doing so, potential bottlenecks should become evident in target-actual comparisons. The overall aim of such planning activities is to outperform competitor companies. The guiding principle in these planning activities should be to determine either how the targeted outcome can be achieved by deploying the least possible amount of resources. Alternatively, it is possible to specify how the greatest outcome possible is to be achieved by deploying a predefined amount of resources.

Monitoring activities aim at comparing current figures with historical data, with information from other companies or departments of the same company. By comparing predefined target productivities and actual productivities, the deviations are being identified. The overall aim is to assure the competitiveness of the company. The guiding principle of the monitoring activities should be to assess how effective resources were combined and deployed in production of the outcome.

For a long time services have been regarded as being of inferior productivity. The application of productivity measurement concepts mentioned above on service activities resulted in productivity ratios far beyond manufacturing (Reckenfelderbäumer, 2008). This productivity gap has been regarded as service immanent (Meyer, 1987). The characteristic features of services were detected as reasons for that gap in measuring results. The so called IHIP-criteria summarize these characteristics; the term is an acronym for intangibility (I), heterogeneity (H), inseparability (I) and perishability (P).

In the following time these IHIP-criteria have been frequently used to distinguish services from products (see Fisk et al., 1993, p. 68):

- The term "intangibility" stands for both the physical intangibility of services as well as for the missing mental tangibility of services because the buyer does not know what the result will look like before a transaction.

- "Heterogeneity" stands for the variability of the results of providing services: The result of providing a service can always vary since, on the one hand, the needs as well as the demands of the customer vary; on the other hand, the strong involvement of this external factor in the process of service provision and the high labor intensity mean the result can have marked variations as a consequence.

- "Inseparability" describes the indivisibility of providing and consuming services. When offering services, the external factor, i.e. the customer or the customer's product, has to be included in the process of service provision and consumption; production and consumption of the service take place simultaneously and require interaction with the customer.

- "Perishability" stands for the transitory nature of services since these cannot be kept, stored for later utilization, resold or returned. From the viewpoint of service providers, this means that they are not able to produce services in advance, but have to be ready at all times to render the service.

The IHIP-characteristics of service production have several impacts on productivity figures created with traditional productivity measuring concepts:

- On the output side of the productivity formula, the capacities needed to perform services whenever the customer demands them (perishability) are neglected in traditional measuring concepts. Furthermore, the service quality (intangibility, heterogeneity) is not embodied.
- On the input side of the productivity formula the efforts for co-creation of services by customers (inseparability) are not part of the calculations.

These impacts of the peculiarities of services induce the incomparability of productivity figures from manufacturing and service mentioned above and disadvantage services.

Due to these peculiarities of service production in recent times there have been efforts to overcome the weaknesses of existing productivity measurement for services. In German (see e.g. Corsten, 1994; Höck, 2007; Reckenfelderbäumer, 2008) as well as in international publications (see e.g. Filiatrault et al., 1996; Grönroos/Ojasalo, 2004; Gummesson, 1998; Johnston/Jones, 2004) first attempts have been published to characterize productivity measurement concepts which are adequate for measuring service productivity. In section 3 of this paper, a selection of these concepts will be introduced in detail.

2.2. Peculiarities of innovative and knowledge intensive services

In the following section, we will analyse

- if the peculiarities services, i. e. the IHIP-criteria have effects in innovative and knowledge intensive services and hence need special consideration when measuring their productivity (section 2.2.1) and
- if additional aspects have to be taken into consideration for productivity measurement of these specific services (section 2.2.2).

2.2.1. Relevance of IHIP-criteria for innovative and knowledge intensive services

In the current literature doubts are expressed if the IHIP-criteria are appropriate to describe the peculiarities of services in general. Consequently, they come under scrutiny when measuring performance and productivity of innovative and knowledge intensive services. Several aspects should be highlighted.

Concerning the physical ***intangibility*** of services Lovelock and Gummesson (see Lovelock/Gummesson, 2004, pp. 25-30) argue that a product always represents a bundle of tangible and intangible elements and that especially the tangible elements of the service result are used in order to market services. The missing tangibility of the service result before the transaction takes place is not a characteristic which only applies to services, since, for example, consumer goods are sold already packaged and therefore cannot be felt before purchase, nor can the result of customized production be viewed beforehand. For services, this mental intangibility is mainly a problem for the first users of a service; the result is known with repeated use of the ser-

vice (see Lovelock/Gummesson, 2004, p. 26 f.). Hence, the criterion of intangibility does apply for innovative services.

Furthermore, in knowledge-intensive business services, the outcome of service delivery is mostly not tangible and the quality of the service in uncertain. Furthermore, due to the intangible character of knowledge-intensive services, measuring the quality of services is not a trivial task, since physical ways of measuring cannot be applied (Gnatzy, 2010, p. 66). Hence, a close interaction with the customer is needed to make sure the outcome of service production meets the client's expectation. All the more, these statements can be made for innovative services, for which the outcome is uncertain as well as the customer's expectations.

The ***heterogeneity*** or the variability of the result of a service provision process does also not only occur in the production of services. Whereas the trend towards automation, quality assurance and quality control as well as standardization is generally prevalent when providing services in order to make results more consistent, there is also the tendency towards customization in many areas of the capital goods industry but also the consumer industry, i.e. adapting products to customer specifications with the associated difficulties of producing consistent quality (see Lovelock/Gummesson, 2004, p. 27 f.). In knowledge-intensive services, however, the personal component plays a major role, since they are personnel-intensive on both sides, the customer side and the provider side. The more the human factor is involved, the more heterogeneous is the outcome of a service production process and, at the same time, the less standardized. For measuring the performance and the productivity of this type of service, the personal component, i. e. the knowledge and information of service workers and of their counterpart on the customer side need to be considered on the input side (Gnatzy, 2010, p. 67).

On the issue of ***inseparability***, Lovelock and Gummesson add that "separable" services do exist, where the customer does not have to be present as the co-producer of the service and where the result of the service provision process is only consumed after the point in time at which it is produced. This definition criterion is therefore not valid for all services (see Lovelock/Gummesson, 2004, p. 28 f.). However, it is valid for innovative, knowledge intensive business services. In these services competitive advantage depends on a company's ability to transfer the knowledge of individuals into corporate knowledge. Furthermore, companies need to be able to identify relevant new external information and make use of it by integrating it with their own knowledge during the service production process (Ojanen et al., 2009, p. 166).

Concerning the ***perishability*** of services from the customer's perspective, the result of a service may be of a non-perishable nature and is therefore able to be kept, stored, used later, sold or returned. From the producer's perspective, the situation of a service provider who always has to be ready to render a service is comparable to that of a manufacturer of products whose production capacities remain unused and who incurs corresponding idling costs. Although this criterion might not be of superior use when distinguishing between products and services, it needs to be taken into consideration when assessing the productivity of services. The effort of this service readiness needs to be incorporated into a measurement concept. In innovative services, no previous experience with the level of service readiness needed has been made, whilst in knowledge-intensive services, which heavily rely on the knowledge of experts, these experts need to be available for a service process if a customer demands it.

Lovelock and Gummesson conclude that the IHIP criteria cannot be applied to all types of services in order to distinguish them from products; there are always exceptions which contradict the generalizability claim of the IHIP-criteria (see Lovelock/Gummesson, 2004, p. 31). But, as can be derived from the explanations above, for innovative and knowledge-intensive services, the IHIP-criteria can be applied and have their impact on measuring and managing service productivity. These impacts are shortly summarized in table 1.

Criterion	Innovativeness	Knowledge-Intensity
Intangibility	"mental intangibility of services": the outcome of innovative services is uncertain; close interaction with the client is needed	outcome of knowledge-intense services is intangible
Heterogeneity	no previous experience with the service within the providing company	project based structure of business: service delivery is regarded as a project – results hence vary outcome of service production strongly depends on the personal component on both sides, provider and customer
Inseparability	client participation in both, service production and service innovation	production and consumption cannot be separated: outcome of the service production does not only depend on the service worker, but also on its counterpart on the customer side
Perishability	no previous experience with the level of service-readiness needed within the providing company	experts and their knowledge are one of the most important factors of service readiness

Table 1: IHIP-criteria and service innovativeness and knowledge-intensity (following Grönroos/Ojasalo, 2004)

2.2.2. Peculiarities of innovative and knowledge intensive services beyond IHIP-criteria

By knowledge-intensive services we understand, on the one hand, services which, from a sectoral perspective, are performed by companies from the industrial groups WZ 72, 73 and 74 (and their sub-groups). They are divided into technology-based and non-technology-based services. Engel and Steil demarcated technology-based service branches according to their level of innovation activities. These include, among others, data processing and databases (72), architecture and engineering firms (74.2), technical, physical and chemical testing (74.3), as well as research and development in the fields of natural and engineering sciences, agronomy and medicine (73.1) (Engel/Steil, 1999). In contrast, non-technology-based knowledge-intensive service providers ("non-technical consultants") e. g. tax, legal, and man-

agement consultants or accountants and pollsters, apply technologies primarily only in the context of their service activities (e. g. ICT technologies).

On the other hand, knowledge-intensive services are also performed by manufacturing firms. No sectoral demarcation can be made here. It is important, however, that the type of service separates knowledge-intensive from non-knowledge-intensive services. While the product-related services performed specifically for the client, such as engineering, consulting, software development, or training represent knowledge-intensive services, internal services like cleaning, plant security, canteen, etc. do not belong in this category.

Knowledge-intensive services, or knowledge-intensive business services (KIBS) are mainly supplied to organizations, not to individuals (Miles et al., 1995, p. xi). Since knowledge is the major input factor, the complexity of the service itself and its production is high, i. e. there is a large variety of outcome variants. A further characteristic of knowledge-intensive services is their degree of interactiveness between provider and customer (Baumgärtner/Bienzeisler, 2006, p. 14 f.).

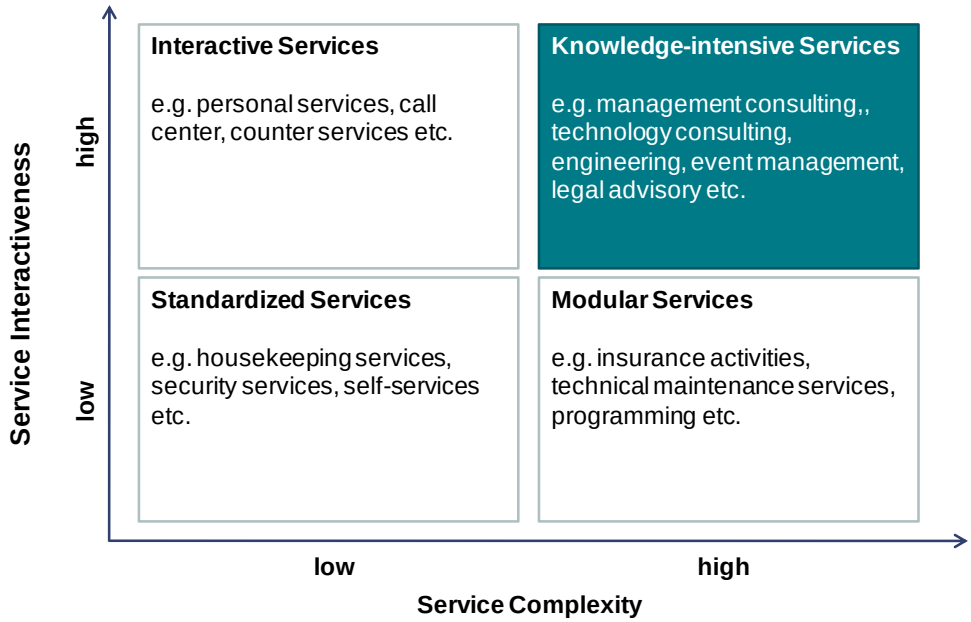

Fig. 1: Complexity and interactiveness of knowledge-intensive business services (Baumgärtner/Bienzeisler, 2006, p. 15)

Knowledge-intensive firms operate under four major conditions, according to a literature review of Ojanen et al., 2009 (see also Miles et al., 1995).

- The first condition is knowledge-intensity, which means that they heavily depend on the knowledge of experts.
- Furthermore, the customers are strongly involved in the production of the service. Clients are not only central in the service delivery process, but are also the major source of innovation. Knowledge and information from both, customers and providers, are needed to produce the service. However, information and knowledge do not stand alone but are being integrated in the process of service production.

- Business activities are either organized as projects or are carried out using a project-based way of thinking to be able to react flexibly to changing customer requirements. This is owing to the fact that each customer is different and each situation is different, i. e. even if one customer is served twice, the conditions of service delivery and hence the outcome of the business activity might not be the same.
- Last not least, innovation in firms delivering knowledge-intensive services in most cases happens without a dedicated R&D team or innovation department, but is carried out by a rotating team or as day-to-day R&D.

Summarizing knowledge intensive services require more interaction between service provider and customer compared to other services. Furthermore the production of knowledge intensive services requires creativity superior to the delivery of non-knowledge-intensive services. Both aspects seem to have major implications for productivity measurement beyond the impact of IHIP criteria.

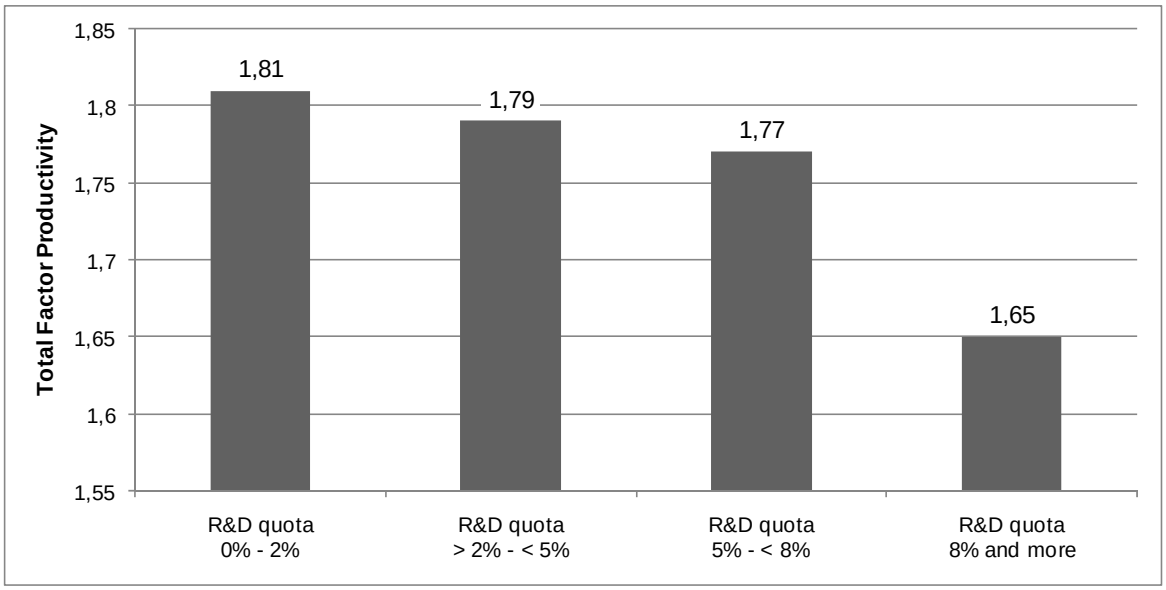

Fig. 2: R&D quota and productivity measured by the total factor productivity (Source: *German Manufacturing Survey* 2006, Fraunhofer ISI)

Innovative services apparently induce some additional requirements for productivity measurement as well. In order not to pursue the productivity and innovativeness of services with contradictory measures, it is necessary to express the innovative content of the services in productivity measurement concepts. As experience has showed, innovative services cannot yet be performed with rationalized factor inputs, as additive development efforts are required to generate these new services and introduce them to the market, hence productivity measurement concepts which disregard the innovativeness of the service generally risk being hostile to innovation. Ultimately, it is important to note that investments in innovations do not have a direct, positive impact on the output, on the one hand, but are necessary to maintain competitiveness, on the other hand. They can be regarded as investments with a medium-term perspective, similar to how the production of knowledge is modeled in the

concepts of new growth theory (see e.g. Romer, 1990 or Lay et al., 2000, where it was demonstrated that firms achieved superior returns by offering innovative services). In figure 2 is shown, as evidence of this problem, that innovativeness - measured according to R&D expenditure - and productivity in the established form of total factor productivity in the firm are negatively correlated.

Innovations are finally also to be seen in the context of increasing productivity. Thus, in Schumpeter's classical approach, innovations in organization and in opening up new markets are found, besides product and process innovations. In this perspective, innovations should bring about changes in the framework conditions of production and thus changes in the production function, which ultimately leads to increased productivity. If it is not just a question of adequately recording productivity, but also of finding starting points to increase it, then considering the role of innovations is essential.

Only in very rare cases service innovations are radical innovations; in most cases, service innovations can be considered to be incremental, since employees of the providing company create solutions to individual customer problems. Following this argumentation of the service management theory, Sundbo draws a parallel between organisational learning and service innovation, due to the fact that “the development of service business could generally be considered as a process with a series of small changes in individual situations with single customers involved” (Sundbo, 1997, p. 437). However, such a specific solution might not be repeatable. Sundbo further arguments that customer involvement in these incremental service innovations is high compared to “real innovation” which requires more standardisation and technology. Yet, findings of Ojanen et al. indicate that customers prefer reliable solutions instead of “big innovations” (Ojanen et al., 2009, p. 170).

Sundbo consequently differentiates two different kinds of innovations in services: innovation processes, which lead to radical innovation that can be reproduced, and organisational learning processes, whose outcome are incremental service innovations. (Sundbo, 1997, pp. 437-440). The differences between “real” innovations and innovative customer adoptions, i. e. incremental innovations, in services cannot be easily quantified (Hipp/Grupp, 2005, p. 525).

Martin and Horne (1994) identified a set of features of the development process of new services, which are closely linked to their incremental character. The development of new services is an unsophisticated process and often happens informal and ad-hoc. The development time is shorter than the development time needed for new products. The life-cycle of services, however, is also shorter than that of products. Investments in new service offers are in most cases minimal, due to the labour-intensiveness, and hence the risk perceived with such a new offering “is either low or non-existent” (Martin/Horne, 1992, p. 31).

It is furthermore not a simple task to measure the output of innovative services, due to their intangibility and the “close connection between products and processes” (Hipp/Grupp, 2005, p. 525).

2.3. Requirements for productivity measurements in innovative, knowledge-intensive service providing companies

Following the argumentation above, from the characteristics of innovativeness and knowledge-intensity several requirements for a productivity measurement of such services can be derived, which are presented below.

1. Besides output quantity (traditional productivity measuring) and output quality (IHIP), the innovativeness of the output has to be included into a concept for adequately measuring the productivity of knowledge-intensive services if innovative and non-innovative services shall be covered and compared. Innovativeness should be measured by differentiating “services new to the company” and “services new to the market” (see e. g. Gnatzy, 2010). Thus a measurement and management instrument can be realized serving at the same time as a productivity measurement and management tool and as a tool for innovation management, auditing the chance of success, feasibility and profitability of future services in the process of development.

2. Additionally to output figures, which measure the output delivered to the customer in terms of quantity, quality and innovativeness, the “internal output” of a service process has to be included into an adequate productivity formula. As an innovative output from service operations may affect future internal process efficiency such externalities of processes are crucial for a comprehensive assessment of service process productivity.

3. Input figures into productivity measurement concepts fit for innovative and knowledge intensive services have to additionally include–besides the service provider’s inputs (traditional productivity measuring) and the customer’s inputs (IHIP)–interactive inputs which are not already expressed by provider’s and customer’s inputs. Especially time and costs induced by interactive loops in service processes developing knowledge intensive services can be incorporated with such an extension of productivity measurement.

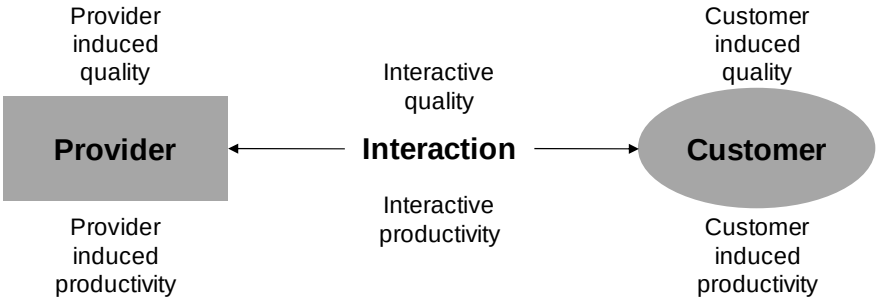

Fig. 3: Service productivity and service quality induced by provider and customer and the interaction between the two (Gummesson, 1998, p. 9)

4. As knowledge is the central resource used in knowledge-intensive business services, knowledge needs to be included in a productivity measurement concept. However, knowledge is not only an input factor but also an output factor due to the fact that in services each delivery differs from the one before and hence new

information is retrieved in every service activity, which can be seen as a kind of a learning process (Sundbo, 1997).

3. Review of existing concepts of measuring service productivity

In 2006, Baumgärtner and Bienzeisler stated that in service research neither a common understanding of the term “service productivity” nor an agreed formula to measure service productivity existed (Baumgärtner/Bienzeisler, 2006, p. 8). Today, five years later, this statement is still true (Bartsch et al., 2011, p. 38 f.), although–or maybe because–over the past 20 years an increase in papers published could be detected (Lehmann/Kölling, 2010).

In their literature review on state-of-the-art of service productivity, Bartsch et al. identify four streams of literature dealing with this topic:

- industrial productivity (e. g. Levitt, 1972)
- service production (e. g. Corsten, 1994)
- customer integration (e. g. Johnston/Jones, 2004)
- service marketing (e. g. Grönroos/Ojasalo, 2004)

The first attempts of exploring service productivity merely transferred the concepts of measuring industrial manufacturing productivity into the service area (Bartsch et al., 2011). Especially against the background of above findings that in innovative and knowledge-intensive services the IHIP-criteria do apply and cannot be disregarded, the concepts simply transferred from industrial productivity measurements to services will not be assessed in this paper, since they neglect that services need special attention when measuring their productivity. As Grönroos and Ojasalo (2004) state: “in service processes, the underlying assumptions of these concepts and models do not hold” (p. 414).

In the following section, of each of the remaining three streams of literature dealing with service productivity one measurement concept for service productivity will be presented and reviewed against the background of the requirements derived above.

3.1. Service production: Corsten, 1994

Corsten is among the few researchers who studies production management and service management in an interdisciplinary way (Baumgärtner/Bienzeisler, 2006, p. 22f.). Consequently, Corsten’s concept of measuring service productivity is based on an approach from production theory, using a service provider’s point of view: Factor combinations between inputs and corresponding outputs represent the flow of a service transformation.

With a special focus on bilateral, personal services, in Corsten’s measurement concept service productivity is therefore related to multiple stages of a service delivery process and accordingly divided into two individual productivity ratios (see figure 4).

These services, which are in the focus of research, are labour-intensive and of interactive nature. Service readiness in this context is the main starting point of a company's ability to provide services. Comparing the ratio of this initial output, service readiness itself (SR), to the related inputs needed (I_{SR}), leads to the definition of productivity of internal service readiness. Service readiness efficiency in this context is representing the ratio of actually used service readiness to total provided service readiness. Stochastical demand leading to low and excess service readiness capacity is incorporated in the concept through a spread in service readiness-productivity.

In the second stage, the end combination, customer-induced inputs (external factor (EX)) are a requirement of the production of services and are causing provider-independent uncertainties. This qualitative and timely variability in the service delivery process needs to be taken into consideration. The productivity of the final combination is defined as the ratio of the output of the final combination (O_{FC}) and the sum of service readiness, further internal factors (I_{IN}) and the external factor (I_{EX}).

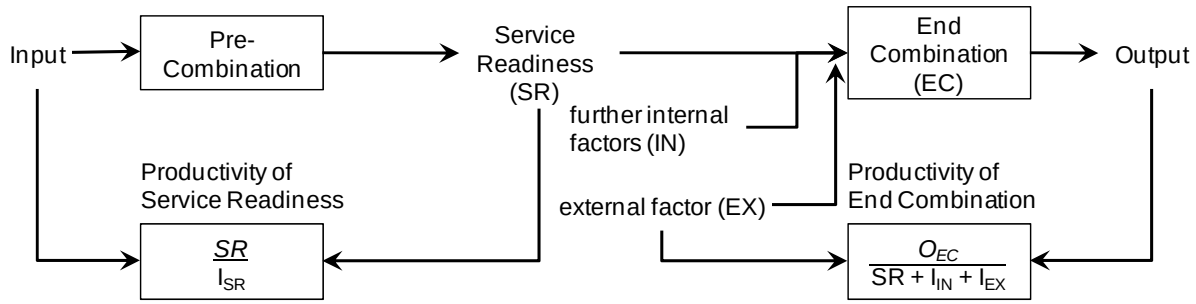

Fig. 4: Corsten's structure for measuring service productivity (Corsten, 1994, p. 61)

At least partly substitutive relations between internal and external inputs lead to different input combinations with identical service outputs. Therefore externalization of activities from a service provider to a customer are a possibility to reduce provider activities (Corsten, 1994, p. 66).

The achievement of this very early work dealing with service productivity is the division of productivity into two types of productivities. The pre-combination highlights the resources a service provider needs to hold available to be ready to provide a service; capacity is needed to be able to deliver a service (perishability) (Bartsch et al., 2011. The end combination consists of three elements: service readiness, further internal factors needed and the input of the external factor, i. e. the customer (inseparability) (see Baumgärtner/Bienzeisler, 2006, p. 24).

Although multiple stages of the service process and framework requirements, such as demand and capacity difficulties, are already included in the concept, for the conceptualization of interactive services further aspects need to be added and taken into consideration:

- higher degrees of subdivisions of the service process, e. g. via concepts such as service blueprinting,
- including further requirements, such as service quality and customer-satisfaction and

- a detailed view on the service encounter and its influence on productivity (Corsten, 1994, p. 71; Baumgärtner/Bienzeisler, 2006, p. 24)

3.2. Customer integration: Johnston/Jones, 2004

Based on the concept of "client productivity" (Martin et al., 2001), Johnston and Jones propose two perspectives for measuring the service productivity:

- operational productivity, which is a "function of the ratio of operational outputs to inputs over a period of time" (Johnston/Jones, 2004, p. 205). Inputs are materials, equipment, customers, staff etc., whilst outputs are revenues, customers, used resources etc., and
- customer productivity, which is defined as a function of the ratio of customer outputs such as experience, outcome and value to customer inputs, such as time, effort and costs.

This distinction between two types of productivity is owed to the fact that the principles of manufacturing productivity cannot be transferred to services. In industrial processes, the lower the ratio between output and input, the lower are the costs of production and the lower are the prices. Hence both, provider and customer, profit from a good productivity. However, in service processes, this argumentation cannot be applied. Whilst the provider benefits from a better ratio of outputs and inputs, this is not necessarily true for the customer, whose service experience and satisfaction with the service delivered might be negatively correlated to a better productivity from a provider point of view. Due to the customer's role as co-producer of a service, the process of service delivery and the customer's experience overlap (see figure 5).

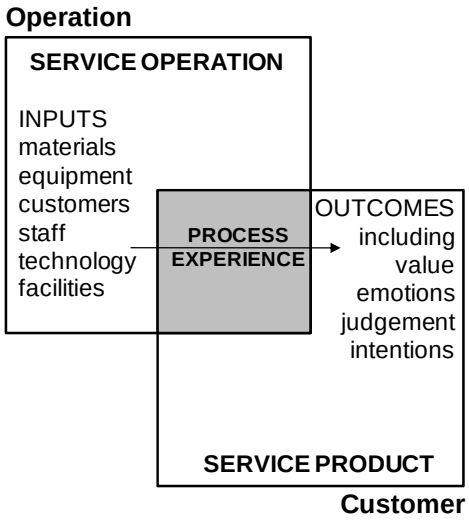

Fig. 5: The overlap between process and experience (Johnston/Jones, 2004, p. 206, adapted from Johnston/Clark 2001)

To illustrate their reasoning, Johnston and Jones present "paradoxes" (Baumgärtner/Bienzeisler, 2006, p. 28) of service productivity. They are presented below.

- Faster flow and bottlenecks: By speeding up an operation, the operational productivity is increased, which is depicted as up-arrow in figure 6. However,

the customer's perception of the service process can deteriorate, since he or she might feel "pushed" through a delivery process, flagged as down-arrows in figure 6 below. The other way around, customers might perceive bottlenecks, such as waiting time, in some cases as valuable time, e. g. to make a decision on the next step of the process (Johnston/Jones, 2004, p. 207 f.)

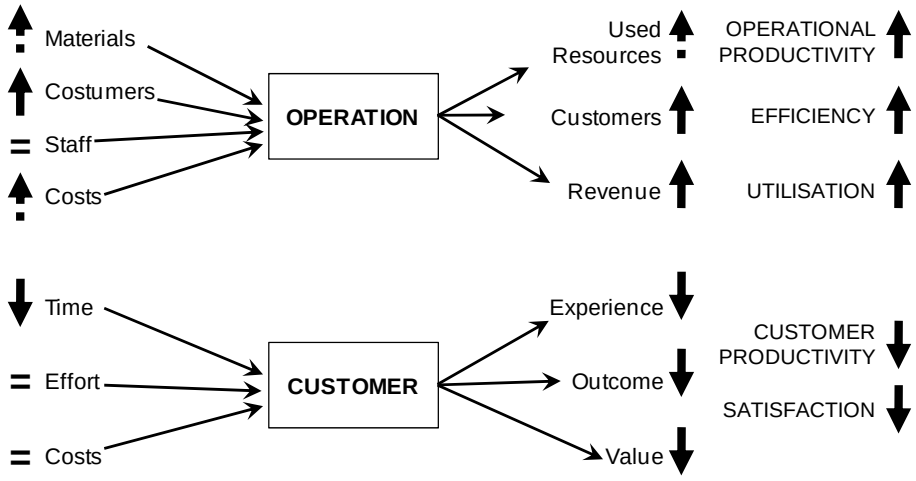

Fig. 6: The impact of faster flow on operational and customer productivity (Johnston/Jones, 2004, p. 207)

- Greater variety: Whilst in manufacturing offering a broad spectrum of product variants has a negative impact on productivity, this is not necessarily the case in service processes. Since the customer is a co-creator of value, he or she is responsible for delivering the variety by fulfilling a part of the tasks necessary for the service operation. The provider that way saves resources, e. g. staff, and the operational productivity is increased. Being a part of the delivery system can contribute to the customer's satisfaction with the service process and also increases the customer productivity (Johnston/Jones, 2004, p. 209).

- Broad array of tasks: Whilst task simplification raises the productivity in manufacturing operations due to economies of scale, this is not the case in service operations. Standardized or automated processes might even lead to customer dissatisfaction, as they might feel that their multiple needs are not addressed adequately (Johnston/Jones, 2004, p. 210; Baumgärtner/Bienzeisler, 2006, p. 29). The other way around, assigning a broad array of tasks to service workers can contribute to increasing operational and customer productivity. From a providers' perspective, members of staff who are able to fulfil a multitude of tasks can be employed flexibly in times of peak demand, while the customer's perception of a process running smoothly even in times of high demand contributes to their satisfaction and productivity (Johnston/Jones, 2004, p. 211).

Revisiting the four requirements of measuring service productivity derived above, we come to the conclusion that Johnston and Jones have significantly contributed to a better understanding of how customers perceive the production of services and how their personal productivity correlates to productivity from a provider's point of view and vice versa.

Yet, for measuring the productivity of innovative and knowledge-intensive services, their concept is too rough and can only be seen as a starting point for further investigations.

3.3. Service marketing: Grönroos/Ojasalo, 2004

Based on the assumption that service quality and service productivity cannot be managed separately, Grönroos and Ojasalo present a critical appraisal of manufacturing-oriented productivity concepts which have their foundation in the “constant quality assumption”. In manufacturing processes this assumption can be taken for granted, because the input resources and the production processes can be standardized. Furthermore, production and consumption of goods are two separate processes. In service processes, however, the customer actively participates in service production (“inseparability”) as an input factor, hence the resources used cannot be standardized and are difficult to calculate (p. 416). Also it is not a simple task to measure the outputs, since the quality perceived by the customer is also an important output.

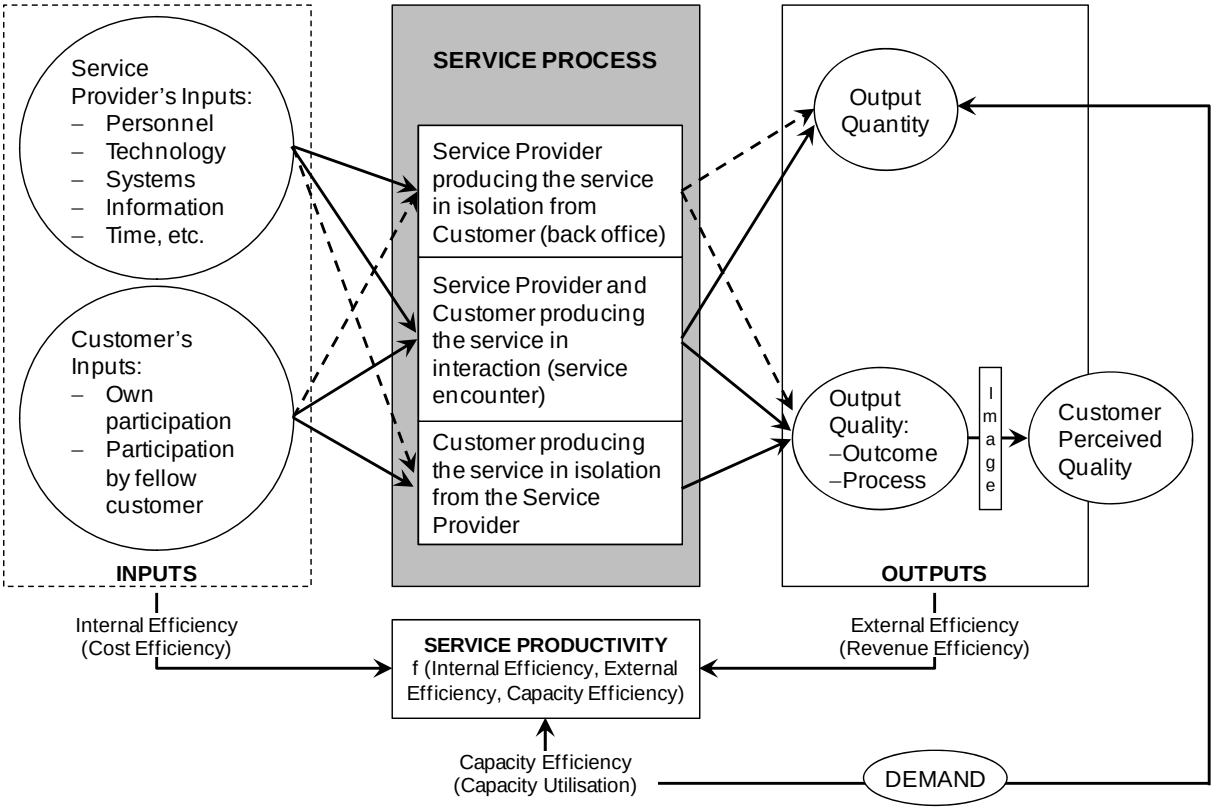

Fig. 7: Service productivity model (Grönroos/Ojasalo, 2004, p. 418)

Due to the role of the customer, for measuring the productivity of service processes it is not sufficient to assess the internal efficiency of the provider company only. Rather as a further factor of service productivity the way service quality is perceived by the customer needs to be included in a service productivity measurement concept. Grönroos and Ojasalo term it “external efficiency”. Last not least, owing to the perishability of services, a third component of the productivity model is capacity effectiveness.

Grönroos and Ojasalo hence propose to define service productivity as a function of internal efficiency, external efficiency and capacity efficiency. These three elements can be found in figure 5.

Due to the role that customers play in the service production process, the authors identified three sub-processes which together form the process of service production:

- back office process: service produced by the provider in isolation
- service encounter: service produced by provider and customer interactively and
- self service: service produced by the customer in isolation from the service provider using the infrastructure provided (see Grönroos/Ojasalo, 2004).

When comparing the conceptualization of Grönroos and Ojasalo with the requirements derived above, it can be stated that the measurement concept proposed by the authors is a promising approach also for measuring the productivity of innovative and knowledge-intensive services. The model presented by the authors currently is the most comprehensive concept for measuring the productivity of services, as it includes the relevant findings of service research (Bartsch et al., 2011, p. 44)

However, concerning the requirement to measure the productivity of innovative and knowledge-intensive services, Grönroos and Ojasalo have made a great contribution to service productivity measurement valid for all types of services; yet the needs of the services under consideration in this paper needs to be addressed more specifically.

Innovativeness is not an explicit output in the proposed measurement model, neither are the “internal outputs” on a process level, the learning effects. Concerning the requirement to consider interaction between customer and provider as an input factor, the authors state that “the interactions which are created by the service provider and its customers influence the efficiency of the service process” (p. 417). Yet, in the measurement concept, the interaction between these two parties is not seen as an input factor, although its relevance for the service process is highlighted. In figure 5, the dotted lines from provider and from customer input to the three elements of the service process indicate the relevance of interaction.

Knowledge, or information, is regarded as an input factor on the supplier side in the proposed measurement model. It is, however, not an output factors. The requirements derived for innovative and knowledge-intensive services are only partially fulfilled by the productivity measurement concept of Grönroos and Ojasalo. Yet, it seems to be promising approach to base further considerations on measuring the productivity of innovative and knowledge-intensive services on this model.

4. Conclusions and need for further research

In the paper it could be shown that neither innovativeness nor knowledge-intensity up to now have been covered adequately in service productivity measurement concepts. A review of three measurement concepts revealed that existing proposals up to now are on a very rough level. The authors of these concepts were the first to put down

general considerations on services and productivity in measurement concepts and their publications contributed to a better understanding of the interrelationship between the peculiarities of services and productivity.

In table 2, a breakdown of the measurement concepts and the requirements is given. Only the concept proposed by Grönroos and Ojasalo covers two of the requirements partially. Yet, as stated above, the measurement concepts can be taken as a starting point, serving as basis for further research in this field.

Concept / Requirement	Corsten, 1994	Johnston/ Jones, 2004	Grönroos/ Ojasalo, 2004
1) innovativeness as output	○	○	○
2) internal output on process level	○	○	○
3) interactive inputs	○	○	◐
4) knowledge as input and output	○	○	◐

○ - Requirement not fulfilled ◐ - Requirement partly fulfilled ● - Requirement completely fulfilled

Table 2: Productivity measurement concepts and the requirements of innovative and knowledge-intensive services

The next steps of research will be to further detail the requirements derived and to transfer them into input and output measures to generate a concept of measuring service productivity. Furthermore, the “classic” controlling literature will be revisited as well as productivity measurement concepts that can be found in manufacturing and manufacturing-related services respectively. Combining these findings with the results obtained in this paper will contribute to the generation of a productivity measurement concept for innovative and knowledge-intensive services. By doing so, a promising approach will be to follow Corsten’s proposal of breaking the processes down by using process modelling techniques (Corsten, 1994, p. 71).

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