

# Increasing service productivity by characteristics-driven recommendations for action

Michael Becker<sup>1</sup>, Stephan Klingner<sup>1</sup>, Martin Böttcher<sup>1</sup>

<sup>1</sup>University of Leipzig

*Service productivity is becoming increasingly important, since organisations face a growing competitive environment. With this article we propose an ontology linking several service characteristics with strategies to increase productivity. These strategies were identified in the course of an extensive review of academic literature. The ontology can be applied as a practical guide for decision makers.*

## 1. Introduction

The modern service sector is characterised by a growing macroeconomic significance and rising competitive environment (Maglio, et al., 2006). New business-to-business (B2B) services offered in addition to goods are of increasing importance (Johansson & Olhager, 2004). Therefore, companies are shifting from solely goods-production towards service-offering organisations. This change comes along with the necessity for increasing service productivity due to competitive markets and small profit margins (Sundbo, 1994).

However, due to growing complexity, measuring and optimising service productivity is a difficult task. In (Böttcher & Klingner, 2011), we presented modularisation as an approach to handle service productivity. As services are separated in distinct components, analysing productivity can be limited to specific components resulting in a better understanding of necessary service activities. Nevertheless, it is necessary to optimise existing components using strategies matching service characteristics.

In academic literature, a variety of strategies regarding productivity were proposed. Usually, a strategy is based on several service characteristics that should be changed to increase productivity. We have conducted an extensive literature review to comprehend existing approaches in (Becker, et al., 2011). Based on this review, in this article we present an excerpt of existing service characteristics and show their influence potentials on productivity in section 2. Following this, in section 3 we elaborate difficulties for measuring and optimising productivity in the service sector. The theoretical framework is used as a foundation for building an ontology containing relevant characteristics for productivity presented in section 4. Finally, section 5 concluded the paper and identifies additional future research directions.

## **2. Characteristics and their implications**

In this section we will present identified characteristics together with their possible values and the implications of specific values for productivity. For the reason of comparability, every presentation will follow a generic pattern. First, we give a short description and literature reference the respective characteristic is mentioned in. Second, possible values of the characteristic are shown and the productivity impacts of the values are presented. For the sake of brevity, we will not introduce all identified characteristics in detail but rather focus the most important ones (where importance is assessed by the occurrence frequency of a characteristic in academic literature). However, the ontology presented in section 4 contains the entire set of characteristics used in the literature we reviewed. The characteristics presented in this section can be used as a determiner for possible application areas of the ontology, since we outline each characteristic and give a brief explanation of strategies resulting in a changed characteristic value.

To furthermore structure our analysis, we have separated characteristics into three distinct groups. Characteristics of the customer interface describe the interaction between service providers and consumers. Using these characteristics, it is possible to define services according to the external factor. On the other hand, process characteristics describe services from the provider's viewpoint. With the exception of collaborative provision processes, customers usually do not realise these characteristics. Finally, the third group of characteristics describes the service result.

### **2.1. Customer interface characteristics**

Characteristics of the customer interface are a common representative in marketing-oriented service classifications. They describe the interaction between service providers and consumers during service provision. In doing so, they allow for analysing effects of activities conducted and decisions made by customers.

#### **2.1.1. Customer contact intensity**

The degree of customer contact has a long history in describing services. This characteristic was first mentioned in (Chase, 1978). It is defined as the physical presence of customers during service provision. A higher degree of customer contact leads to more interactions between providers and consumers. This results in a higher difficulty to control the service process, since customers' behaviour has great influence on service quality and provision. Furthermore, employees providing services with a high degree of customer contact need to be trained in dealing with customers.

According to (Chase, 1978), six steps are necessary to develop a strategy dealing with the customer contact of a service. First, an organisation has to position its service system in the spectrum from pure services (very high customer contact degree), mixed services, to quasi-production services (very low customer contact degree). Based on this, the second step is to identify, whether actual processes comply with the positioning. Thereafter, existing processes have to be analysed with regard to the possibility of reducing unnecessary customer contact. This can be achieved by moving activities from the front-office to back-office. Furthermore, employees can be separated in two groups – employees specialised in dealing with customers and em-

employees with rather technical skills. In the fourth step, strategies to increase the efficiency of activities without customer contact have to be analysed and implemented and, as a fifth step, existing customer contact has to be enriched. Finally, activities without customer contact should be relocated in different facilities that do not need the customer centred ambience of front-office locations.

### **2.1.2. Customer influence potentials**

Extending the pure degree of customer contact, the potentials for customers to influence the service provision have a great impact on productivity, too. These two characteristics are somewhat related. Nevertheless it is important to distinguish between them as there are services with a very high degree of customer contact (generally speaking, all services affecting people). However, most of these services do not allow customers to influence the service provision because customers are not involved in making key decisions (e.g. a surgery). Contrary, services that can be influenced by customers to a great extent may have a low customer contact degree, since key decisions are met on short appointments.

In (Verma, 2000), the influence potentials of customers have been related to customisability of services (see also section 2.3.2). The more influence customers have on service provision, the more a service can be customised. This results in challenges regarding decisions about capital investment, used technology, and scheduling. This observation is also made in (Bell, 1986). Based on business goals, different strategies can be pursued. For example, to reduce influence potentials, organisations might standardise different service instances.

In addition to customer contact induced influence potentials, (Silpakit & Fisk, 1985) also mention influence potentials without any customer contact, e.g. in self services. A higher influence potential is associated with higher customer satisfaction, since customers feel taken seriously and needed. To increase the influence potentials, the authors suggest different strategies: changing external service factors, changing the service characteristics itself, and classifying customers according to their willingness to influence services.

### **2.1.3. Customer-provider-relationship**

Another important characteristic of the customer interface concerning productivity is the type of relationship between customers and providers. According to (Lovelock, 1983), several possibilities for providers and consumers to tie to each other exist. On the one hand, both can establish a cooperation regulated by an agreement. On the other hand, services may be provided by informal agreements, too (e.g. honorary activities). The former case usually results in agreements on quality and productivity, while the latter is based on commitment without possible forfeits. Furthermore, (Cunningham, et al., 2004) present a distinction between one-time-only service provision (together with a separate pay-per-use concept) and provision on a continuous basis (with subscription-based payment).

Based on the customer-provider-relationship, different implications occur. For providers it is often desirable to form long-term commitments. Thus, they know their customers and can listen and respond to them. Furthermore, continuous service provision ensures regular income. On the other hand, customers are in a better position to estimate providers' capabilities, if the provision is based on fixed contracts. However, the length and rigor of a commitment usually adds to the difficulty in switching pro-

viders. This is also mentioned by (Cunningham, et al., 2004) as the risk in selecting service providers and the difficulty in switching providers.

In (Goodwin, 1986), the relationship between customers and providers is analysed based on the division of authority to decide. This allows for describing providers' authority over customers and vice versa. This can be different even for services of the same type depending on environmental circumstances. For example, in school education teachers have full authority, while in adult education centres authority is rather evenly distributed.

The division of authority has, of course, a great impact on productivity. If providers have full control over the provision process they can decide independently, even when their decisions have profound influence on the services. For example, it is possible to modify the process regarding productivity aspects. Contrary, if customers are involved their opinion needs to be considered, too. However, due to subjective reasons, customers may refuse service changes even when they increase productivity.

A final characteristic considering the relationship between customers and providers is introduced by (Kellogg & Chase, 1995). They describe the relationship based on trust between both parties. A higher degree of trust usually results in a more successful collaboration. In addition, customers trusting the providers are more willing to participate in productivity-increasing service changes. For example, patients in a hospital won't refuse an ECG recording performed by a nurse instead of a doctor when they trust both the doctor as well as the nurse. It is easy to understand that trust is especially important for services affecting people. The higher the trust, the easier providers can modify the service encounter.

## **2.2. Process characteristics**

The second presented group consists of characteristics describing the development and delivery process of services. These characteristics are rather focused on the service provider's viewpoint and are mostly not transparent for customers. However, they have a great influence on local and temporal constraints of services.

### **2.2.1. Complexity**

The complexity of a service delivery process has been defined in literature as the number of necessary steps to fulfil a service (Copeland, 1923) and their complicacy (Shostack, 1987). Additionally, (Benkenstein & Güthoff, 1996) have separated complexity into more fine-grained measures such as number of participants, heterogeneity of activities, length of service provision, and individuality of the service.

To reduce complexity, (Shostack, 1987) recommends removing activities from the service provision. Therefore, resources can be used in a more specialised environment (e.g. an X-ray in radiology rather than in general medicine). Reducing complexity simplifies control and service provision. It is profitable, if customers regard the provider as an expert in the field. However, too specialised services can lead to customer dissatisfaction because they expect a broader offer. This is especially the case, if business rivals provide full service offers.

Similarly, increasing complexity can be achieved by adding new services or enriching existing services (Shostack, 1987). This results in higher efficiency, since income per

customer is increased. However, too complex services may confuse customers and lead to a lower overall service quality.

### **2.2.2. Flexibility**

The freedom of employees providing a service to make own decisions (not necessarily with the permission of supervisors) is defined as process flexibility (Ng, et al., 2007; Silvestro, et al., 1992). A greater degree of flexibility is usually identified in professional services like management consultancy or in field services.

According to (Shostack, 1987), reducing flexibility leads to a more uniform service provision. This results in lower costs, higher productivity, and simplified service distribution. Furthermore, service reliability is increased, since quality is normalised and availability is enhanced. However, customers may respond negative on rigid processes because employees are not able to react to their specific requirements. Highly standardised services may be declined, even if they are cheaper.

On the other hand, increasing process flexibility allows for better reaction to customer requirements occurring during service provision. Flexible processes often occur in organisations focusing on a specific market segment. However, flexible processes are more difficult to manage and control resulting in higher prices. Customers emphasising price over value are not willing to obtain more expensive services (Shostack, 1987).

### **2.2.3. Technology usage**

Technology usage in service provision processes can be assessed according to different measures. In (Haynes, 1990), the author distinguishes between simple and complex technology. By using complex technology, fix and variable costs are increased, whereas transaction costs are decreased. Furthermore, with complex technology, availability is increased, transaction time is decreased, and flexibility is increased because more alternatives are available. Notwithstanding, a very complex technology may counteract those benefits. Services based on complex technology must, however, focus on the customer interaction design. Otherwise, customers may be overtaxed.

In addition to the continuum perspective, (Glückler, 2007) identifies non-technical, technology using, and technology based services. Furthermore, using technology has a significant impact on service productivity because it is only rarely possible to improve actual provision performance. This is tackled by automation where (Meffert, 1994) argues more complex technology leads to greater degree of automation.

## **2.3. Outcome characteristics**

The third group of characteristics describes the result of a service provision. The contained characteristics can be used to describe services from a customer's point of view.

### **2.3.1. Tangibility**

The degree of tangibility describes the ratio of tangible (e.g. a forged golden ring) to intangible (e.g. education) outcomes of a service provision. Based on the degree of

tangibility, employees need different abilities. For example, producing a golden ring needs craft skills, while education needs teaching abilities.

According to (Shostack, 1977), the more intangible components a service has, the more the provider needs to control the service input and view the process from a customer's point of view. Furthermore, (Zemguliene, 2009) argues that the degree of intangibility adds to the difficulty of evaluating the service outcome by the customer. Contrary, tangible outcomes can be objectively evaluated, even in advance to service provision.

To move from tangible to intangible outcomes and vice versa, (Bell, 1986) proposes bundling (adding services to goods) and unbundling (separating combinations of goods and services). For example, a solely sold machine may be bundled with an additional maintenance service. If business rivals sell machines without added services at a smaller price an existing combination can be unbundled.

### **2.3.2. Variety and customisability**

In former times, service providers only offered uniform services for every customer. However, with the increasing demand for customer specific services, variety and customisability of the service outcome are important concepts. While variety is defined as the total number of determined manifestations of a service product (Ganz, 2005), customisability defines the degree to which an existing service product can be adapted to customer requirements (Bell, 1986).

In (Kellogg & Nie, 1995), different degrees of customisability were identified. *Unique services* can be fully customised, since they are only created for a specific customer and not intended to be repeated. In *selective services* customers can select from a great amount of possibilities where only parts of the services are standardised. *Restricted services* are to a largely part standardised and customers' selection possibilities are limited. Finally, *generic services* provide only very few or even no customisable parts and customers have no freedom of choice.

According to (Kellogg & Nie, 1995), a high customisation degree requires interaction with the customer during service provision because services cannot be adapted without any feedback. However, the interaction degree can be decreased by using technology (see section 2.2.3, too). The necessity for interaction is stated in (Haywood-Farmer, 1988), too. Thus, the service provider has to guide customers, decide upon best fitting service provision, and interact with customers to identify their needs.

The increased degree of customisation adds to the complexity of management decisions. Especially decisions about capital expenditure, technology modernisation, and service provision scheduling are affected by this (Verma, 2000).

### **2.3.3. Service recipient**

Services can be targeted at different recipients. In (Lovelock, 1983) a distinction has been made between services affecting people and services affecting goods. The class of services affecting information was added in (Wemmerlöv, 1990). Depending on the recipient, different provision strategies have to be kept in mind.

As shown in (Wemmerlöv, 1990), services affecting goods can be portioned further in goods possessed by the customers and brought to the provider (e.g. shoes delivered

to repair), goods possessed by customers but providers have to visit customers (e.g. carpet cleaning), and goods provided by the service system (e.g. fuel at a petrol station). Depending on the type, different implications on inventory management, quality control, product design, and activity scheduling come about. For example, goods provided by the service system can be produced in advance based on the assessment of the demand. This is not possible for goods possessed by customers.

Second, services affecting people are directly carried out on people (e.g. haircutting, surgery). Therefore, analysing interaction between customers and service employees is of great importance. This type of services does not only require technical skills but also empathy by service employees who have to listen and respond to customers (Wemmerlöv, 1990). Services affecting people are, therefore, also called high-touch services.

Finally, services affecting information receive, edit, and manipulate data. The main activity in these services is to plan and manage employees responsible for service provision. It is possible to identify two types of workers. First, routine workers execute highly routinized activities without any flexibility. Second, knowledge workers execute unstructured activities that provide a high degree of flexibility and need for careful consideration (Wemmerlöv, 1990). This type of services is sometimes referred to as high-tech services.

### **3. Service productivity**

Measuring productivity is less common for services than for manufacturing. The challenges in measuring service productivity emerge from their inherent characteristics. They are intangible, heterogeneous, inseparable, and perishable – constituting the so-called IHIP characteristics (Edvardsson, et al., 2005).

The consequences of service characteristics were identified in (Klassen, et al., 1998). Intangibility complicates quantifying factors, perishability results in the impossibility to produce services in advance, and heterogeneity is challenging when analysing services as similar units. Furthermore, (Klassen, et al., 1998) identify simultaneity of service production and provision as a challenge to separate marketing from operations activities.

Productivity is usually analysed based on two dimensions: effectiveness and efficiency. While the former represents the ability of a service organisation to fulfil its customers' demands, i.e. doing the right things, the latter one represents an organisation's ability to produce a specified output using as few input resources as possible, i.e. doing things right (Klassen, et al., 1998; Vuorinen, et al., 1998). However, one of the main challenges in measuring service productivity is to define inputs and outputs the right way. According to (McLaughlin & Coffey, 1990) a careful process analysis is necessary to define these factors.

When discussing service productivity, it is always necessary to study the special interrelation between productivity and quality. In services, quality is always defined as customer perceived quality. Contrary to production, increasing service productivity may lead to a decreased perceived quality. This fact was elaborated in (Uhl & Upah, 1979). They have identified four trade-offs between productivity and quality. First,

structuring services may result in a reduced attractiveness for customers. Second, standardisation reduces customisability resulting in reduced perceived quality. Furthermore, increasing customer participation can discourage customers who are not willing to put effort into service provision. Finally, replacing employees by machines alienates customers from the service.

As identified in (Grönroos & Ojasalo, 2004), there are several contributions to productivity of a service process. Customer-induced contributions are based on the assumption that customers are integrated into the service provision process and their activities influence the progress and outcome of the service delivery. On the other hand, provider-induced contribution manifests in resources available for a service. Furthermore, productivity is influenced by interaction-based contributions between customers and providers and by demand-induced contributions (minor demand leads to slightly less utilised resources resulting in lowered productivity). Especially the relations between perceived quality and productivity have to be taken into account when implementing strategic decisions.

## 4. Ontology for service productivity

In section 2 we briefly described an excerpt of service characteristics having an effect on productivity. To support decision makers, we developed an ontology based on these characteristics and their productivity implications. In the following, the structure of the ontology (in the form of entities and relations) is presented. To the best of our knowledge, this is the first attempt to relate service characteristics and productivity implications in ontology-form. Up to now, these relations were only captured in self-contained classifications. The two biggest advantages of an ontological representation are its flexibility and extensibility. To define the ontology we have used the well-known and widely-used tool Protégé (Knublauch, 2004)<sup>1</sup>.

### 4.1. Entities

Ontologies are based on a set of entities and a set of relations between these entities. In our case, we want to represent service characteristics and relate them with strategic recommendations for action to increase service productivity. Therefore, we have established the set of entities as shown in **Fehler! Verweisquelle konnte nicht gefunden werden.** Every entity in our ontology is based on the root class *thing*, since we represent the ontology in OWL (W3C, 2009). Subclasses of the first level are *Characteristic*, *Characteristic Value*, *Literature*, and *Strategy*.

Subclasses of the class *Characteristic* describe a specific service characteristic. Further on, this class is divided into three distinct classes aligned with the dimensions of the characteristics presented in section 2: *customer interface*, *process*, and *outcome dimension*. The specific characteristics are subclasses of the respective dimension class (due to comprehensibility, they are not shown in **Fehler! Verweisquelle**

<sup>1</sup> The ontology itself is available in OWL format at <http://koproserv.uni-leipzig.de/publikationen>



konnte nicht gefunden werden.). Every characteristic has an aligned set of possible values represented by the class *Characteristic Value*. We have sketched the two values *high* and *low*. However, different values are conceivable, too. For example, the relation between customer and provider can be expressed using the values *loosely couples* and *long-term relationship*.

As our ontology focuses on giving strategic recommendations for action, the subclasses of the class *Strategy* play an important role. Each of these classes represents a strategic decision mentioned in academic literature. Furthermore, they have a description of how to implement the respective strategy and what characteristics are affected in doing so.

Finally, we have added the class *Literature* to include references to academic literature in the ontology so the interested reader may refer to the original source of characteristics and strategic implications. Including this class is more research-focused, since it is not really necessary to implement strategies.



Fig. 1: Entities of the ontology

## 4.2. Relations

To link the above defined entities with each other, several relations have been defined in the ontology.

- **hasSimilarStrategy:** In academic literature, different approaches for similar activities are available. This fact is taken into account by relating similar strategies with each other. For example, the strategies *Standardisation* and *Undifferentiation* are somehow related to each other but differ in detail. Both the domain and the range of this relation is the entity *Strategy*. Furthermore, it is its own reverse.
- **hasSource / isSourceOf:** The relation *hasSource* and its inverse *isSourceOf* link strategies and characteristics with their occurrence in academic literature. Therefore, the domain of this relation consists of the entities *Characteristic* and *Strategy*, while its range is *Literature*.
- **hasValue / isValueOf:** The relation *hasValue* has the domain *Characteristic* and the range *Characteristic Value*. It links characteristics with possible values and has the inverse *isValueOf*.
- **resultsIn:** The perhaps most important relation links entities from type *Strategy* (the domain) with their implications on *Characteristic* and *Characteristic Value* (the range). For example, the strategy *Differentiation* presented in (Bell, 1986) results in a higher customisability of the service outcome.

**Fehler! Verweisquelle konnte nicht gefunden werden.** sketches an excerpt of the relations contained in the ontology. It shows the class *Strategy* as subclass from the class *Thing* together with its own subclasses (e.g. *Standardisation*, *Bundling* etc.). As can be seen, *Strategy* is related to *Literature*, *Characteristic*, and *Characteristic Value*. Furthermore, *Unbundling* is a strategy introduced in the literature entity *Bell1986*.

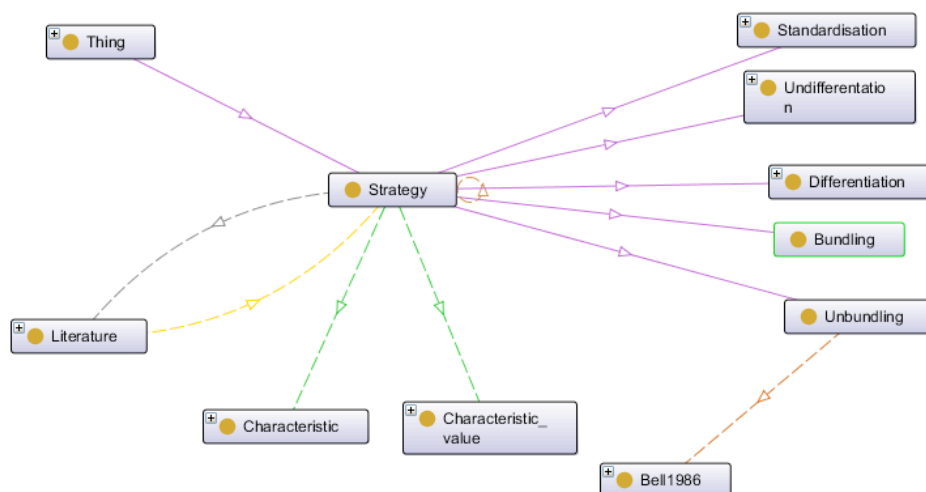


Fig. 2: Relations between entities

### **4.3. Applications**

The ontology allows for manifold applications. First, it is possible to analyse one's own business and identify values of service characteristics. Based on these characteristics, different strategies concerning productivity can be shown. According to the overall organisation strategy, decision makers can select appropriate strategies. The ontology gives information about implementing strategies and its influence of different service characteristics.

Furthermore, business analysts may select appropriate strategies according to a predefined plan. For example, many businesses today are developing product service systems – a trend to increase customer perceived value of formerly purely product offers (Baines, et al., 2007). The transformation of a product oriented to a service oriented organisation requires a variety of activities. Using the ontology, decision makers can identify existing strategies and derive effects resulting from the implementation of a specific strategy.

From a broader perspective, the ontology helps structuring the topic of service productivity in general. It can be used as a foundation to analyse different impact factors on productivity and to identify the influence of various strategic approaches. This is not only applicable in economic contexts, since the ontology can be used as a kind of knowledge map in service science education.

## **5. Conclusion and future research**

This paper presented a brief outline of characteristics influencing service productivity and determined by surveying academic literature. Based on these characteristics, we proposed an ontology including related strategic decisions to increase productivity with specific characteristic values. Using the ontology, various management tasks can be supported. However, it is still necessary for decision makers to identify several trade-offs between productivity and quality as stated in section 3. In future extensions of the ontology, this fact has to be taken into account. Therefore, the ontology can be enriched with results from empirical research gained by the realisation of strategic recommendations for action.

As services today are of great complexity and usually a bundle of different individual parts, it is sometimes hard to identify characteristics for the overall service encounter. Furthermore, characteristics effective for one subset of activities may not be effective for another subset of a complex service. Based on this observation, it is helpful to decompose complex services into smaller parts and analyse the productivity of the parts. In past, we have developed a formal model for service modularisation based on components (Böttcher & Klingner, 2011). This idea allows for a separate analysis of service components.

Apart from being used to increase service productivity, the developed ontology also helps in structuring the service sector itself. Therefore, it is possible to use the ontology as a foundation for different applications and address other questions within the services field, too. For example, in (Becker, 2010) we have related service characteristics with the suitability of services for modularisation. In addition, it is imaginable to bundle a set of strategies that are often conducted together. In section 4.3 we ad-

dressed the current trend in product service systems. For many organisations it would be very helpful to receive an overview about different activities required for switching to a more service-oriented portfolio of offers.

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## Authors

Michael Becker  
University of Leipzig  
Department of Business Information Systems  
Johannisgasse 26  
04103 / Leipzig, Germany  
[michael.becker@uni-leipzig.de](mailto:michael.becker@uni-leipzig.de)

Stephan Klingner  
University of Leipzig  
Department of Business Information Systems  
Johannisgasse 26  
04103 / Leipzig, Germany  
[klingner@informatik.uni-leipzig.de](mailto:klingner@informatik.uni-leipzig.de)

Martin Böttcher, PhD  
University of Leipzig  
Department of Business Information Systems  
Johannisgasse 26  
04103 / Leipzig, Germany  
[boettcher@informatik.uni-leipzig.de](mailto:boettcher@informatik.uni-leipzig.de)