

Systemising Service Classifications

Michael Becker, Martin Böttcher, Stephan Klingner

University of Leipzig

Services today are of great economic relevance and are established as one of the main source of income for organisations. Therefore, it is necessary to understand services and implications of their specific characteristics. A variety of classifications to structure the heterogeneous service landscape was proposed in academic literature. In this article we compile existing classifications and extract used service characteristics. These characteristics are used as a foundation for a theoretical framework to gain deeper insights about services.

1. Introduction

Not only in recent times, it is known that services gain in importance and are one of the main drivers for economic growth in developed countries (Maglio, et al., 2006; OECD, 2010). Therefore, an efficient provision and optimisation of services is necessary. However, due to the heterogeneity of the service sector, it is not possible to follow one universal approach appropriate for all service types. For this purpose, several classifications for services have been established in academic literature. The aim of this work is to summarise these classifications and to extract and unify used concepts.

As in other research fields dealing with a variety of complex subjects, classification is one approach to structure the area. Classification schemes are developed to establish an order in the research area, manage its complexity by specifying common characteristics, and support the development of specific activities (Cook, et al., 1999; Baida, et al., 2005). However, in the academic literature about services a plethora of classification approaches exist. This situation can be explained by the heterogeneity of the area and the lack of a common, scientifically justified definition about services (Spohrer, et al., 2007).

In practice, a pragmatic answer to the question what services are does exist. Accordingly, services are everything that can be sold but that cannot fall on your feet (Lotter, 2002). Different and more elaborate approaches for defining services have been given in academic literature. Classical definitions can be separated in four distinct groups, described in the following paragraphs. Enumerative definitions list several service examples (like forestry, research, health etc.). An advantage of this approach is its clear separation of services from non-services. However, enumerative definitions cannot be holistic and complete because it is not possible to list all service types. A special kind of enumerative definitions is official statistics. Usually, services are ordered in groups, e.g. trade or transportation. Though statistics are official definitions, the same disadvantages arise.

Due to the lack of a real definition, the distinction of services from material goods is based on the definition of differences between material goods and services. Howev-

er, this approach has two disadvantages. First, it is necessary to specify material goods in every detail to be able to separate them from services. Second, and even worse, material goods and services are totally separated from each other. Due to the increasing convergence between products and services in today's economy (Becker, et al., 2008), this flaw cannot be ignored.

Finally, constitutive definitions establish specific characteristics of services. Based on these characteristics offers are divided into material goods and services. A well-known approach is the IHIP-method (Edvardsson, et al., 2005). According to this, services are intangible, heterogeneous, inseparable, and perishable. Though constitutive definitions try to establish service characteristics, they still lack from the fact of strictly separating services from material goods.

As can be seen from the discussion above, defining services is complex and maybe not even possible to a full extent. Therefore, we consider service classifications as a valid approach to handle the heterogeneity of services by limiting the scope on more specific subareas. To analyse the vast amount of existing classification, this work presents existing approaches and systemises classifications. Therefore, the remainder of this paper is structured as follows. In the following section, we present the outline of a conducted literature review and present classifications according to their goals and methodologies. Based on this review, we extracted characteristics that are used in classifications and structured these characteristics. The resulting taxonomy is presented in section 3. Using the characteristics, it is possible to develop new service classifications for specific objectives. In section 4, we show a new classification for modularising services. Finally, section 5 gives a conclusion and an outlook in future research activities using our characteristics ontology.

2. Literature review

Economic literature has a long history in establishing classification schemes for services. Based on a particular service type, specific guidelines are given to allow for the efficient treatment of services, e.g. guidelines for developing services of a specific type or for increasing service productivity. To analyse existing classifications we have conducted an extensive literature review and developed a systematisation of classifications. The starting points of the review were the works of (Cook, et al., 1999; Evanschitzky, 2003; Hagenhoff, 2003; Mersha, 1990). Due to their different goals, these works reference a wide variety of classification approaches. However, the referenced classifications were analysed for a specific application domain. Therefore, we had to deal with the original work to gain a deeper understanding, too. In addition to referenced works we were also able to identify further approaches by using common directories of academic work resulting in a total amount of 81 analysed classifications spanning the time from as early as 1923 to 2011.

A great amount of analysed approaches focuses marketing, especially the impact of customers on service development and provision. Furthermore, classifications focusing operations management (i.e. analysing process characteristics) were identified. To systemise classifications, in the following we will categorise them according to their underlying structure and goals.

Based on the structure, it is possible to identify four distinct types. Enumerative classifications are established analogously to the enumerative service definition approaches. In addition to only listing services, they are also assigned to specific classes. Usually, enumerative classifications are established by standardisation bodies to enable automatic service trade. As with enumerative definitions these classifications are inherently never complete and must be adapted for new service types. The problems with enumerative classifications have led to the development of more versatile approaches. One-dimensional classifications use one service characteristic seen as most discriminative for a specific goal and position services in a continuum. Based on the observation that one-dimensional classifications are not powerful enough to differentiate service types, one more dimension was added resulting in two-dimensional classifications. Using this, services are positioned in a matrix. While two-dimensional classifications are seen as a good compromise between comprehensibility and expressiveness, a small number of multi-dimensional classifications exist, too.

The second distinction between classifications is established based on their specific goal. Classifications usually focus one (or more) specific application areas. We have identified several important goals. A significant part of classifications focuses on recommending competitive and marketing strategies. Based on used characteristics, different strategies can be applied. For example, (Bell, 1986) uses degree of customisation and tangibility as separators. Therefore, he gives insights how to move to a more differentiated offer and how to bundle and unbundle product-service-combinations.

Furthermore, analysis of customer behaviour plays an important role in classifications, too. One example is given in (Bowen & Jones, 1986) where the authors analyse the impact of customer participation on transaction costs based on performance ambiguity and goal incongruence (see the description in section 3.4 for details). They give insights about developing governance mechanisms based on the positioning of an organisation.

Besides the three goals presented above, additional goals are to give an explanation for the changes in the working environment, give strategies to improve quality and productivity and to separate services from products. For the sake of brevity, we do not elaborate all goals in full detail. The interested reader may refer to the analysed literature.

3. Service characteristics

Based on the above presented literature review, it is possible to establish a framework containing used characteristics and the implications of their specific values for service development, provision, and marketing. Due to the great amount of existing service classifications, there are many characteristics presented in literature, too. To allow for a systematic reflection, we have separated used characteristics into four 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. The third group of characteristics describes the service result. Finally, we have estab-

lished another group with miscellaneous characteristics that do not fit in other groups but may be an interesting point for analysing services. In the following sections, we detail the established characteristics groups and present important representatives for every group. All characteristics we identified in literature are summarised in **Fehler! Verweisquelle konnte nicht gefunden werden.** below together with their frequency of occurrence.

Customer interface	#	Process	#	Outcome	#	Miscellaneous	#
Customer contact	32	Complexity	3	Variety	2	Goal incongruence	1
Customer interface	3	Workload	5	Materiality	14	performance ambiguity	1
Demand variety	1	Degree of routine work	4	Customisability	12	competitions stage	1
Relation customer, provider	5	Flexibility	8	Demand fluctuation	1		
Information asymmetry	4	Technology usage	5	Durability	3		
Participation willingness	2	Decoupling	3	Reversibility	1		
Customer type	2	Reaction time on fluctuating demands	1	Recipient: people, things, information	11		
Intended importance	2	Ability to digitise	1	Recipient: time, location	1		
Time and work investment	1	Expenditure of time	1	Recipient: physical, mental	1		
Concurrent demands	2	Provision frequency	1	Service distinctness	1		
		Capital intensity	1				
		Knowledge intensity	1				
		Continuous vs. discrete provision	1				

Table 1: Service characteristics used in literature

3.1. Customer interface characteristics

Characteristics of the customer interface are a common representative in marketing-oriented 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 of decisions made by customers.

3.1.1. Customer contact

One of the most frequently used characteristics in service classifications is the degree of customer contact. Its analysis is especially important for defining marketing

strategies. The higher the customer contact degree, the more customers are involved in the service development and provision process (Chase, 2010). However, this does not necessarily imply active customer participation. For example, during medical examinations, patients are only required to be physically present.

Different interpretations of customer contact exist in service literature. Merely based on contact intensity (the frequency of contact between provider and consumer), (Barth, et al., 2000; Chase, 1978; Engelhardt, et al., 1995; Grove & Fisk, 1983; Kellogg & Chase, 1995; Meffert, 1994; Meyer, 1983; Scharitzer, 1993; Staffelbach, 1988; Wemmerlöv, 1990) present classification approaches. Using this interpretation, the ratio of customer presence to the overall duration of the service provision is measured. In addition, (Bell, 1986; Kellogg & Nie, 1995; Lovelock, 1980; Rushton & Carson, 1985; Schmenner, 1986; Silpakit & Fisk, 1985; Verma, 2000) analyse the possibility for customers to influence the service or the service provision. This influence cannot be directly mapped to the pure contact intensity because customers may be able to influence the service in a great way while the contact intensity itself is low. This usually is the case if customers can participate in strategic decisions about a service. Finally, (Corsten, 1985; Haywood-Farmer, 1988; Mersha, 1990) distinct between active and passive contact and, therefore, enable a refinement of the generic contact intensity. Active contact describes the time where customers directly participate in service provision while during passive contact time they only have to be on site for receiving a service.

3.1.2. Relationship between customer and provider

According to (Lovelock, 1983), during service provision, there are several possibilities for providers and consumers to tie to each other. 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). Besides this differentiation, services can be provided one-time only or on a continuous basis with implications for payment (Cunningham, et al., 2004). In the latter case, customers subscribe for services; in the former case a separate pay-per-use concept is established.

In (Goodwin, 1986) the relationship between customer and provider 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.

Additionally, (Kellogg & Chase, 1995) describe customer-provider-relationship based on trust between both parties. A higher degree of trust usually results in a more successful collaboration. Finally, (Cunningham, et al., 2004) analyse the risk in selecting service providers and the difficulties in switching providers, too.

3.1.3. Customer interface

Using characteristics of the customer interface, it is possible to describe specific possibilities of interaction in more detail. First, services can be provided by humans or by machines (Haynes, 1990). For example, customers can withdraw money either using an automated teller machine or at the bank counter. Both cases have different implications on service provision. According to (Haynes, 1990) machine interfaces result

in hierarchic control and communication and require precise process definition. Opposing to this, human interfaces are based on interaction and allow for flexibility during service provision.

Furthermore, customer interface is defined by the amount of places where a service can be delivered. A service may either be locally restricted or independent. Depending on this, different interaction possibilities exist (Lovelock, 1983). For example, withdrawing money from an ATM is possible at several locations. Contrary, using the bank counter may be restricted to the bank's headquarter. As stated in (Lovelock, 1983), controlling quality is more easy for locally restricted services. However, this restriction lowers convenience for customers.

3.1.4. Variety of customer demands

Customers use services for specific purposes and to fulfil their requirements. Of course, not all customers have the same requirements and, therefore, a variety in demands exists and adds to the so-called input uncertainty (Larsson & Bowen, 1989). This uncertainty results from incomplete information about customer demands. It is possible to react on different requirements by customising services. However, this eventually requires additional expert knowledge to fulfil different service variations. For example, a repair shop might be confronted with different car types and their specific problems. The repair shop can either specialise to a particular car type or gain knowledge to handle different car types. Contrary, services with a restricted number of variations or firmly defined variations (e.g. fast food restaurants) do not need specialised knowledge.

3.1.5. Miscellaneous customer interface characteristics

Besides the above mentioned, further characteristics of the customer interface were identified in academic literature. For the sake of completeness, they are briefly presented in the following. The willingness of customers to participate in the service process was identified by (Larsson & Bowen, 1989) and affects service provision in two ways. First, a high willingness is highly correlated with input uncertainty, since providers cannot control customers' activities like activities of employees. Furthermore, it directly affects service quality. For example, evening classes profit from customers willingness to participate. Related to the willingness is the amount of time and work customers want to invest in service provision (Murphy & Enis, 1986). The more important a service is seen by customers the more time and work they are willing to invest.

The importance of services from customers' viewpoint is addressed by (Meier & Piller, 2001). Accordingly, services can either be primary activities concerning an organisation's core business or secondary activities representing additional offers. In the first case, customers are willing to invest far more time and work for searching and using services than in the latter one.

Correlating with the risk in selecting and the difficulties in switching service providers (see section 3.1.2), information asymmetry describes the difficulties for consumers to assess services beforehand (Krishnan & Hartline, 2001; Rushton & Carson, 1985; Zeithaml, 1981). Unlike products, it is not possible to assess service quality before its provision because services are consumed while provided (uno actu principle). Be-

sides these difficulties for consumers, it also results in difficulties for providers in reacting on quality shortcomings.

Finally, (Lovelock, 1980) distinguishes services based on their respective recipients. This may either be individuals or organisations. Depending on the customer type, services must be provided in different ways. In a rather simple example, invoices differ (e.g. individuals obtain invoices with accounted value-added tax, while organisations do not). However, usually more complex customisations are necessary to meet the specific differences.

3.2. Process characteristics

The second presented group consists of characteristics describing the service development and delivery process itself. 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.

3.2.1. Flexibility

Services can be distinguished by the degree to which employees are able to make decisions on their own during delivery. In case of a very rigid process employees have to execute completely predefined which is rather inflexible. On the other hand, employees may be able to customise necessary activities for provision. Flexible services express themselves by the possibility to individually combine activities resulting in a flexible order, customised execution, or even skipped activities (Dilworth, 1983; Kellogg & Nie, 1995; Lovelock, 1980; Shostack, 1987; Silpakit & Fisk, 1985; Silvestro, et al., 1992).

Flexible processes usually occur in complex and sophisticated services. For example, medical examination conducted by a doctor is pretty variable. On the one hand, doctors have to be able to respond to patients' requirements. On the other hand, external factors may influence the processes, too (e.g. availability of specific kinds of blood preserves). This example also illustrates ad hoc usage of flexibility by conducting alternative activities during service provision.

3.2.2. Workload

The amount of work is calculated by the ratio of work costs to technical costs. In a service consisting of a variety of combined activities, total expenditure is a result of the workload in individual activities. Therefore, services consisting of many distinct (eventually simple) activities as well as services consisting of only a few but complex activities have a high workload (Copeland, 1923; Haywood-Farmer, 1988; Schmenner, 1986; Shostack, 1987; Verma, 2000).

Services with low workload usually consist of simple activities. Therefore, it makes sense to automate, if possible. Rising workload results in a focus shift towards employee consideration because their motivation and abilities gain importance.

3.2.3. Degree of routine work and technology usage

As stated above, simple activities may be automated. The complexity of individual activities is also considered by (Davis, 1999). He distinguishes between routine activ-

ities (with a rather high potential for automation) and knowledge activities (where automation is not necessarily easy or even impossible). The degree of routine work is identified by (Wemmerlöv, 1990) based on technology usage and by (Wohlgemuth, 1989) based on standardisation of single activities.

The used technology is closely connected with the degree of routine work. Knowledge activities call for more complex technologies, e.g. knowledge management systems or collaboration platforms. Contrary, routine activities can be supported by simple technologies (Haynes, 1990; Kotler & Armstrong, 2009; Thomas, 1978). Based on the possibility to digitise, (Meier & Piller, 2001) describe technology usage. This allows for assessing the feasibility to automate activities using IT systems.

Not directly concerning technology usage, (Stiff & Pollack, 1983) classify services according to their capital intensity. However, technology usage can be deduced from this characteristic, since the more complex technology is used, the higher capital intensity is necessary because new machines or software require capital expenditure.

3.2.4. Complexity

Complex services consist of a variety of single activities assembled to an overall service. According to (Copeland, 1923; Shostack, 1987), a higher amount of necessary activities results in a higher service complexity. Therefore, it is necessary to structure complex services and coordinate activities between them. Besides the simple number of activities, complexity is also determined by other factors. For this purpose, (Benkenstein & Güthoff, 1996) split complexity into the amount of single activities, multipersonality (the cooperation of multiple people in a process), heterogeneity of activities, length of service provision, and service individuality.

3.2.5. Decoupling from delivery

The degree of decoupling services from delivery is associated with the amount of places a service can be delivered as presented in the customer interface characteristics in section 3.1.3. Being tied to a specific time or place is usually influenced by external factors, e.g. the availability of certain machines necessary for service provision (Davis, 1999; Lovelock, 1983). Davis also gives examples for different degrees of coupling. Closely tied to a certain place are services like fast food restaurants. Opposing to this, insurances are decoupled because the insurance itself is not restricted to specific times or places.

3.2.6. Miscellaneous process characteristics

Time expenditure is one more possibility to distinguish services from each other. It is self-evident that long-running processes need for different organisation than short-running ones. According to (Silvestro, et al., 1992), long-running processes are harder to manage. However, the runtime of a process must not be confused with complexity or workload. This results from the fact that even services consisting only of a few or of predominantly simple activities may have a long runtime before they are fulfilled.

In (Silvestro, et al., 1992) services are also classified according to their provision frequency. Often delivered services are accounted to the core offer of an organisation, contrary to rarely delivered services. The more often a service is delivered, the better

its performance can be assessed because with every provision providers gain more insights about the service.

Based on the provision frequency, (Lovelock, 1983) analyses fluctuations in demand for services. Classification is done according to the time necessary to react on fluctuations. The reaction time especially affects marketing and contracting of services. In rather technical services, e.g. gas or water supply, reacting to fluctuating demands is usually easier. In contrast, provision frequency of services conducted by humans is limited by their performance. For example, a hairdresser's shop cannot instantly react on an unexpected stampede of customers. A possibility is to hire new staff which, of course, needs a certain preparation time.

3.3. 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.

3.3.1. Materiality

Materiality is one of the most frequently used characteristics to describe services. It is possible to define materiality in a continuum. The two extremes are services with completely material results (e.g. goldsmith's work at a jeweller) and completely immaterial results (e.g. education). Alongside, most services contain both material and immaterial parts (Bell, 1986; Bowen & Bowers, 1986; Engelhardt, et al., 1995; Lovelock & Yip, 1996; Lovelock, 1983; Meffert, 1994; Meyer, 1983; Sasser, et al., 1978; Shostack, 1977; Staffelbach, 1988). With materiality of the service result in mind, it is possible to determine necessary employee qualifications. In the goldsmith example, craft skills are necessary, while education needs teaching abilities.

Materiality is an important criterion from customers' point of view, too. It is way easier to assess the quality of services with material results (e.g. the material value of a gold ring can be determined exactly even if subjective value may vary). By contrast, assessing the quality of immaterial results is not straightforward. For example, success of a lecture cannot be assessed directly because it only appears after a certain amount of time and does not entail visible changes. Therefore, the provision quality of services with immaterial results can be assessed, while this is often not possible for the result itself.

3.3.2. Variety and customisability

Complex services usually can have different outcomes (Barth, et al., 2000) resulting in the possibility for providers to create a service portfolio presenting their different offers to customers. For example, services may be offered in different quality levels with omitted or added activities depending on the selected level. The more variation points a service has, the more important are contact persons and tools for supporting customers in choosing the right variant. A hairdresser's shop with a catalogue of hair styles is an example for a provider of a service with many variants.

Based on the variety, it is possible to offer customisable services. In that case, customers can configure the service according to their specific requirements and not on-

ly select a predefined variant (Bell, 1986; Bowen & Bowers, 1986; Engelhardt, et al., 1995; Lovelock, 1983; Lovelock & Yip, 1996; Meffert, 1994; Meyer, 1983; Sasser, et al., 1978; Shostack, 1977; Staffelbach, 1988). Due to customisation it is also possible to meet customer requirements that are not part of a provider's standardised portfolio. To achieve this, communication between customers and providers (based on humans or tool supported) is necessary. During communication, service pricing and other properties are negotiated. Similar to the variety in a hairdresser's shop a shop offering styles according to customer requirements has a customisable service portfolio.

3.3.3. Service recipients

The recipient of services was a classification presented in the customer interface characteristics in section 3.1.5. However, besides simply determining the recipient, it is also possible to distinguish what (or who) is affected by a service provision. This can be separated into two discrete dimensions. First, services can affect things, people, or information (Fitzsimmons & Sullivan, 1982; Hill, 1977; Hsieh & Chu, 1992; Lovelock, 1980; Lovelock, 1983; Lovelock & Yip, 1996; Wemmerlöv, 1990). Second, services may either affect temporal or local factors (Hsieh & Chu, 1992).

Services affecting things cause a change in the state of these things as a result of activities (e.g. carriage of goods changes the location of goods). In contrast, services affecting people result in a change of the mental or physical state. For example, education changes the mental state of a person by imparting knowledge, while passenger transport results in changing the physical state by changing the location of a person. Due to the increasing spread of information technology, services affecting information are getting more and more important. Examples can be found especially in the Cloud Computing environment with its different Software as a Service offers (Armbrust, et al., 2009).

Services affecting temporal factors focus on the reduction of temporal dependencies. This could be for example a service to reduce car wear and tear to reduce its loss in value over time. The goal of a service affecting temporal factors is to reduce the effort necessary to create goods or to increase their expected useful life. Goals of services affecting local factors are twofold. First, they try to extend the amount of places a service can be provided. Second, service efficiency should be raised also in environments with unproductive circumstances. A good example is the food supply during flights, since this service must be tailored to the restrictions in an airplane.

3.3.4. Miscellaneous outcome characteristics

Related to the reaction time on fluctuating demands presented in section 3.2.6, (Lovelock, 1983) classifies services by means of the fluctuation itself. In the ideal case, fluctuations can be assessed during service development. Services with a high fluctuation need processes that allow for fast reaction. If it is not possible to change processes, service providers need to communicate possible challenges with fluctuating demands. Contracting can then be conducted with this in mind.

Service results can be very different in their durability. This fact is considered by the classifications in (Bowen, 1990; Engelhardt, et al., 1995; Hill, 1977). Durability covers a wide spectrum and ranges from rather short effects (e.g. supplying water) to lifetime effects (e.g. painting a wall). Besides durability, reversibility plays an important

role to describe the outcome of a service, too. For example, the outcome of the service painting a wall is reversible by repainting it. On the other hand, heart surgery is irreversible. The reversibility aspect needs careful consideration during service provision.

3.4. Miscellaneous characteristics

In addition to the aforementioned several other characteristics were presented in academic literature. In (Bowen & Jones, 1986) services are classified based on the so-called goal incongruence and performance ambiguity. The former is a phenomena occurring, if customer and provider pursue different objectives or if one of the parties tries to achieve its goals at the expense of the other. The reason for this is that one side expects a higher return by competitive instead of cooperative behaviour. The latter one, performance ambiguity, occurs in cases in which it is difficult to assess the value of a service. This can be related to information asymmetry presented in section 3.1.5.

The organisation type is addressed by (Chase & Hayes, 1991) using an organisation's competitive stage. Four stages exist: organisations available for services are at the infancy of service delivery. Journeymen have some experience resulting in a little higher quality. The two remaining stages are organisations that have achieved a distinctive competence where service quality excels customer expectations and, finally, organisations with world class service delivery seen as innovative and cutting-edge.

4. Structuring the service sector using characteristics

In the previous section, we presented characteristics used in service classifications. These can be used as a foundation for structuring the service sector from different research perspectives. In one of our research projects we analyse capabilities for modularising services. The objective of modularising services is to handle their complexity and increase their productivity (Böttcher & Klingner, 2011). Based on the above presented characteristics of services, we developed a new classification focusing modularisation abilities of services.

The methodology to establish a new classification consists of several steps. First, it is necessary to identify relevant characteristics. Depending on the specific classification domain, different characteristics are relevant. Second, different values of the characteristics have to be analysed for their usage for classifying services. Finally, the classes have to be established together with respective recommendations for action depending on the aim of the classification.

For our modularisation example, we have identified six relevant characteristics presented in **Fehler! Verweisquelle konnte nicht gefunden werden.** together with their possible values. Suitability of services for modularisation can be analysed by two different perspectives: technical and organisational. The technical perspective only considers characteristics values without analysing side effects. Contrary, organisational perspective also focuses the cost-benefit-ratio of modularising services with specific characteristics. Based on these two dimensions, we have established four distinct groups with different modularisation potential. Organisational unsuited and

technical unsuited (usually customer-to-customer services), organisational suited but not technical (atomic and ad-hoc services that are rarely performed), technical suited but not organisational (organically grown, complex, and unstructured services), and technical and organisation suited services (complex services that are well-structured). Depending on the positioning of a service in the matrix, different strategies can be applied to move to a position better suited for composition. For a detailed description about identified characteristics and the impact of their specific values, the interested reader is referred to (Becker, 2010).

Characteristic	Values	
	Technical	Organisational
Variety / Customisability	Low ... high	Monolithically vs. well-defined customisation points
Variety of customer demands	Constant vs. diversified	
Provision frequency	Rarely ... often	Simple vs. complex, primary vs. secondary service
Complexity	Low ... high	Unclear responsibilities vs. well-defined interfaces and definable partial performances
Flexibility	Rigid processes vs. free choice	Unclear responsibilities vs. well-defined interfaces and definable partial performances
Standardisation	Not standardised vs. standardised	Standardisation vs. customisation

Table 2: Relevant characteristics for modularisation

5. Conclusion and future research

In the course of this article we presented characteristics used in academic literature for classifying services. Based on existing classifications, several recommendations for action are given that focus on different goals, e.g. marketing strategies, productivity improvement, or quality improvement. Our work improves the understanding of services by summing up existing classifications. However, the conducted work can only be seen as an initial point for further research.

Currently, we have manually identified and gathered the characteristics but their implications still remain hidden in scattered academic literature. To really improve service development and provision, it is necessary to automate this process. One approach for doing so is to develop an ontology – a formal, explicit description of concepts in a domain (Noy & McGuinness, 2001). An ontology helps to relate similar concepts (in our case: characteristics) with each other. Furthermore, integrating the recommendations for action in the ontology allows for an automated deduction based on specific service types. This helps persons responsible for service management to gain further insights about their services.

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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

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

Stephan Klingner
University of Leipzig
Department of Business Information Systems
Johannisgasse 26
04103 / Leipzig, Germany
klingner@informatik.uni-leipzig.de