Please quote as: Menschner, P.; Hartmann, M. & Leimeister, J. M. (2010): The nature of knowledge-intensive person-oriented services - challenges for leveraging service engineering potentials. In: 2. International Symposium of Service Sciences (ISSS) 2010, Leipzig, Germany.

The nature of knowledge-intensive person-oriented services – challenges for leveraging service engineering potentials

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Abstract: Knowledge-intensive person-oriented services (KIPOS) are predominately existent in sectors such as health care, home care or education. They are of high economic relevance in terms of market size and growth. Yet they are laggards in terms of leveraging typical service engineering potentials as applying (partial) automation, process standardization or customer integration techniques, since the most value creating activities in service provision are bound to persons or personal knowledge. In this paper, we first analyze existing typologies from literature and derive a characteristic profile of KIPOS. Next to this, we present specific challenges for KIPOS engineering derived from qualitative interviews with service providers and observations. Our results can serve as an input for developing service engineering methods for KIPOS.

1 Introduction and Background

The service sector was long thought to be a laggard with regard to innovation, as it was assumed to be an uninteresting adopter of existing technologies rather than a producer of new technology. This perception still exists, and is a major reason why innovations in services remain under-researched [Ma06][ST06].

Services dominate western economies, accounting for about 70% of employment and gross value added. Moreover, services are the only part of western economies to have expanded in terms of employment in recent years, as manufacturing, mining and agriculture continue to contract [MS08]. Especially knowledge-intensive person-oriented services (KIPOS) bear great economic potential, although little statistical data is available for this kind of services (see e.g. [RWI08] for Germany). Just the market for private consumption of health care services, for example, will grow by 27 billion Euros until 2020 [Ka05]. This is partly due to the demographic shift which leads to increased health care spending as well as to a higher private demand for home services [Oe05].

The potentials of the IT-usage in business are well-known. Amongst others, IT allows standardization and support of processes, automation or integration [Da93]. The use of IT also bears vast potential for services. On the one hand IT enables new forms of cooperation and communication in service systems [RS06], on the other hand it enables automation, standardization and new concepts for customer integration [FF05]. Much of service innovation is therefore about the adoption and effective implementation of IT tools [Zy06].

Though the application of IT is different amongst service sectors [Sh06]. KIPOS are still lagging behind on intelligent use of IT. Typical KIPOS are for instance nutritional or health counseling. They are highly individualized, knowledge-demanding and generally delivered face-to-face. Enabling IT potentials for such services raises problems existing design methods do not address [PFC08]. This is partly due to the fact that KIPOS face certain specific specialties, e.g. regulatory issues or retentions upheld by service providers and consumers, which leads to the prevalent notion that KIPOS are not suitable for systematic service engineering. In the case of health counseling, e.g. such specialties include that customers are sick and reluctant, relinquish privacy or are at risk [BB07]. Yet, several new technologies have been developed and introduced, especially in the fields of ambient assisted living or telemedicine, which might lead to service innovations also in these sectors. Despite this fact, only little of these innovations have been put into practice [CMG08][Es09]. This is also caused by a lack of methods to systematically develop economically reasonable and user-friendly IT-enabled services and processes [PFC08].

The objective of this paper is therefore to set the field for service research specially dedicated to KIPOS. We provide a characteristic profile of such services and develop distinguishing characteristics and challenges as a basis for further research activities. These can be useful for development of systematic service engineering methods for KIPOS.

1.1 Service definitions

Amongst others, the term service can be regarded from two perspectives: from a business view and a technical view [Bu08]. Services in a business sense are characterized by intangibility, immateriality, simultaneity of production and consumption (uno-actu-principle), as well as the integration of the consumer as external factor in the process of creation. Service from a technical perspective is a software realized artefact that offers some functionality. Similar findings can be found in [CS06][RS06][ZB03]. For the case of the business-oriented services, service engineering can make contributions by supporting service provision by intelligent usage of information and communication technology [BW09]. Hence, this paper focuses on services from a business view.

1.2 KIPOS

Knowledge-intensive services are defined as follows: during production or process the generation or the use of novel knowledge accounts for a large proportion of the service [Ha99]. These services can be predominantly found in the sectors communication, financials, research and consulting, health care, education, media and logistics. Other authors use the expression "information-intensive" with a quite similar definition: information actions amount for the largest proportion of value created by the service system [AM95]. Information-intensive services additionally involve essential personal or physical interactions. These include amongst others vocational education, consulting, emergency and surgical healthcare, sales and personal resources administration [Gl09].

KIPOS are predominantly existent in sectors such as health care, home care or education [BG06]. Usually they are characterized by a high degree of customer interaction and are bounded to persons or personal knowledge. Other works use the concept of service systems. Those systems combine and integrate different service design contexts [Ma06][Sp07b]. Based on those works, [Gl09] introduces seven contexts for service design ("person-to-person", "technology enhanced person-to-person", "self-service", "multi-channel", "services on multiple devices or platforms", "backstage intense or computational services" and "location-based and context-aware services") which he applies on information-intensive services. Following this approach, KIPOS, as considered in this paper, can be defined as follows:

> *A KIPO service is a complex knowledge-intensive service system, which incorporates one or more person-to-person-encounters as fundamental and integral part of the service.*

A KIPO service though can be enriched by all other service design contexts. Though these criteria provide a general understanding of KIPOS, the level of abstraction however is still rather high. [BA01] considers person-oriented services in general, too, but he underlines the collapse of service production and service consume during the interaction between two people having different needs.

2 Taking a closer look at KIPOS

2.1 Related work on service typologies

In the following section we present a more detailed classification of KIPOS, based on existing service typologies. This will serve as a starting point for deriving challenges KIPOS pose to service engineering methods.

Current research provides various forms of one-, two- and multi-dimensional typologies to characterize services. One of the well-known two-dimensional typologies is the approach of [ML83], who differentiates between the degree of service individualization and the intensity of customer contact, and the approach by [EKR93]. They also use the degree of service individualization, but they examine the degree of customer's interaction as a second dimension. Furthermore, a third approach is to be mentioned, which deals with a systematization based on the type of the performance object and the type of the production of services [LW02]. Finally, [Be90] considers the dimensions services made by provider's personal or objects and services for the provider's customers or objects.

Regarding the multi-dimensional typologies the approach by [CG07] is to be referenced, who differentiates between shelf-life, simultaneity, ties to a particular location, individuality and degree of detailing. Another multi-dimensional typology developed by [MM82] characterizes services by means of the duration of interaction, the type of decision-making and the amount of information. [BG96] use a deductive typology to classify services along five complexity dimensions: number of partial processes, heterogeneity of partial processes, individuality, multi-personality and duration of the provision process. None of the classifications is yet detailed enough for a typology of KIPOS. Also further criteria have to be taken into account, e.g. from process or outcome perspective.

2.2 Allocating KIPOS

In order to derive a more formal characterization of KIPOS, we followed an approach of inductive typology to describe services [BG96]. By assembling one-dimensional as well as two- and multi-dimensional typologies, we extended this approach.

We identified various criteria to characterize services. The assembled list of criteria was checked against duplicates and specified properly. They were also checked for authenticity, integrity and clearness. Due to the vast number of service typologies, some criteria overlapped in content, which has been reduced as far as possible. Criteria that were not applicable to KIPOS were omitted, like "range of use", "provider's legal position", "purchasing phase" or "economic function". This resulted in 30 criteria, as shown in Table 1.

Criteria			**indiff.**		
character of output	tangible		2,4	1,3	intangible
execution of service production	personal	1,2,3,4			automated
recipient of service	at people	1,2,3,4			at objects
character of production of service	output-oriented	1,2,4	3		process-oriented
usage of service	for consume	1,2,3,4			for investment
character of service process	material process		2,4	1,3	immaterial process

type of human input	intellectual	1,2,3,4			manual
degree of individualization	individual	1,2,3,4			standardized
degree of freedom in service production	creative	1,4	2,3		repetitive
uncertainties within the process of service production	problematic	1,2,3,4			unproblematic
duration of service	continuous			1,2,3,4	discrete
relationship between customer and provider	formal relationship		2	1,3,4	informal relationship
dominating factor for perceived service quality	person-oriented	1,2,3,4			equipment-oriented
product connection	isolated	1,2,3,4			combined
compulsion to contact	embodied	1,2,3,4			disembodied
place of production of service	tied to location		2	1,3,4	untied to location
temporal effect of provided benefits	permanent	3		1,2,4	non-permanent
elasticity of demand	price-elastic demand		3	1,2,4	price-inelastic demand
elasticity of salary	existential	2,4	1	3	luxury
used input factors	objects			1,2,3,4	personal
exclusion of demand	individual services	1,2,3,4			collective/community services
degree of customer's integration	high	1,2,3,4			low
output object	material objects		2,4	1,3	immaterial objects
character of customer integration	active	1,2,3,4			passive
relationship customer vs. provider	customer-dominant	1	3	2,4	provider-dominant
number of partial processes	high	2,4	3	1	low
heterogeneity of partial processes	high	1,2,4		1,3	low
duration of service provision	long	1,2,3,4			short
number of people involved in process	high	2		1,3,4	low
time aspect (customer's perspective)	time-saving			1,2,3,4	time-demanding

Table 1: Allocation of KIPOS to service characteristics: (1) life counseling, (2) home care, (3) on-the-job training / education, (4) medical consultation. (Criteria based on [BG06][BG96][CG07][EKR93][FF05][LW02][MB09][ML83][MM82][ZB03].

The resulting list of criteria served as a typology and was applied to four examples of typical KIPOS: (1) life counseling, (2) home care, (3) on-the-job training / education, (4) medical consultation. The allocation to the criteria was done separately by the authors and resulted in an agreement rate of more than 90%. The results are shown in Table 1.

Criteria showing a dominant pattern are candidates for representing a fundamental character of KIPOS, as they allowed an explicit allocation. Criteria offering an equal distribution of the examples can be important insofar as they reveal KIPOS that can be designed either way.

2.3 Similarities between KIPOS and other services

Although some of the criteria are self-evident, others need to be explained in more detail. It is also not surprising that KIPOS reflect several characteristics that are commonly associated also with other services. The output of KIPOS is intangible and the recipients of the output are generally people not objects. This fact is obvious, as for example a medical consultation is always oriented to a person. Of course, if a physician conducts a surgery the output is tangible. Yet, the consultative aspect of a medical consultation can be regarded as dominant.

Like many other services, one characteristic of KIPOS is the integration of the customer that also leads to the compulsion to contact. Training on the job e.g. is obviously a service that requires the contact to the customer. Without physical or at least intellectual presence the service will not succeed. This example also explains that the customer's cooperation is necessary. As long as the attendees take part in the training in an active manner, the further training makes sense otherwise knowledge-transfer will not be initiated. Regarding customer integration, KIPOS can be characterized by four dimensions: the degree of integration is high, customer participation is active, it is time-demanding and the customer is embodied into the process. As a consequence, within these services the proportion of person-to-person encounters during service provision is not only immense, but also quite demanding on the customer. Hence, customer behavior, motivation and commitment can be regarded as a risk factor for service provision. As the customer has to be integrated within the process of service production, a large number of direct contacts between provider and customer are necessary. So, besides designing appropriate processes of service production, high quality customer interfaces need to be developed. These can also be realized by IT.

Due to the high degree of individualization, KIPOS have to be considered as problematic. As this criterion is not stated clear in current research literature, "problematic" can be defined as predictability of the process sequence. Especially in health or home care, incidents or unexpected diagnosis can result in a totally different service provisioning process thereafter.

Another revealed criterion is the isolated offering while the duration of the service is discrete. That means KIPOS are not combined with commodities respectively objects. This becomes evident in counseling, where the client is getting recommended actions. It is as well a discrete service, what means KIPOS are produced for a specific need at a certain time – in this case an advice for a specific client problem.

Furthermore, KIPOS are time-demanding from customer's perspective and the provision of service is time-intensive by itself. Performing a counseling is always time-demanding, e.g. because of holding meetings, in which targets and agreements are defined, problems are discussed etc. Simultaneously the process of service provision by itself is also time-consuming as a result of the complexity, the integration of the external factor, or the adaptation of the service.

3 Challenges KIPOS pose to service engineers

Despite similar to other services in certain respects, KIPOS also have some characteristics that makes them special and uncommon. The following sections describe key challenges KIPOS pose to service engineering.

Additionally to analyzing and interpreting the dominant pattern from table 2, we conducted qualitative interviews and collected data as participant observers in various KIPOS settings. In detail, two interviews were made in the field of counseling, one of them with a nutritional counselor, the other with an agency that advises older people in different aspects on how to maintain independent living. Four interviews were conducted with home care service providers. All interviews were recorded and lasted between 30 and 45 minutes. On top, we visited an outpatient clinic and observed three patient-physician encounters, followed by short interviews with the physicians. We took detailed notes during these observations. For the field of education, we could rely on our own experience as university and provider of professional and on-the-job education that completed and influenced our research. The main goal of our interviews and observations was the identification of key characteristics of KIPOS in the fields of health care, counseling and education.

3.1 Every customer has his/her own history

A fundamental key finding of our research is the high degree of individualization in KIPOS, caused by the huge amount of information necessary for adequate service provision. Every customer has his individual biography, medical background, lifestyle etc. As KIPOS need to be designed to fulfill the specific needs of each customer, this results in a big challenge for service providers. Every time they are facing a customer, they have to adapt themselves to the individual situation of the person in front. This is essential to build up trust and to get access. If the customer is not willing to interact with the service provider, no service production will be possible. Due to this, the practical and emotional knowledge (empathy) of the service provider is essential to get access to the customer and to understand his needs. One interviewee mentioned that they document the biography of patients who are suffering from dementia. The documentation helps the care worker to get a better understanding of the life situation of the patient and thus improves the interaction with him. The interaction is prevailing responsible for the perceived quality of the service by the patient. Due to this, the qualification of the care worker and the ability to understand the patient needs is very important for the service provision.

This poses also an enormous challenge to KIPOS development, as establishing an adequate information basis is very time-consuming and additionally relies on information directly communicated by the customer. Recent works try to overcome this deficit by establishing electronic data capture by customers or patients themselves [PML09], yet this is not possible for all kinds of information. With regard to KIPOS, we conclude that an individual information basis is a fundamental key characteristic, which has to be considered by the development of such services.

> "The key challenge for the care worker during the service provision is to win the patient. From the perspective of the patient, it is his private sphere that is entered. The distance not to cross the border is very tight, especially in Home Care. (interview with a home care provider)"

3.2 Emotional tie and stress

Another direct consequence from this is that delivering KIPOS can be emotionally daunting. Especially in home care or life counseling, the service provider need to fully understand a person's history, life-style and emotional being in order to be able to provide the service accordingly. This can be stressful as e.g. customers are sometimes incurable sick, have encountered strokes of fate, or are solely somewhat of a difficult character to deal with. Yet building up an emotional relationship is often inevitable for solid service provision.

For service engineering, this encompasses certain challenges with regards to resource or personnel allocation. On one hand, service providers need to be kind of emotionally stable, on the other hand, once an emotional tie is established between a worker and a customer, the customer cannot easily be served by another worker.

3.3 High degree of implicit knowledge

KIPOS rely on a high degree of implicit knowledge that is accumulated and used during service provision. In home care e.g. the working staff needs to evaluate and react on the patients' needs and health status. All of the interviewees underlined the importance of practical and emotional knowledge besides qualification. Our interviews revealed that there are different forms of implicit knowledge. It encompasses personal experiences with a certain customer, including emotional insights, a customer's individual history or impressions obtained during interactions. Other forms are experiences on how to read persons, how to interact with persons and to talk with persons, or how to interpret certain statements or actions. In none of the cases we observed there is any form of documentation on this knowledge, yet it is essential for efficient and effective service provision, and also has an influence on perceived service quality.

Another challenge is that documentation of implicit knowledge faces some limitations. On the one hand, it is very time-consuming and therefore often economically unreasonable. On the other hand, implicit knowledge is sometimes of emotional type or a sort of personal experience, which is difficult to document and thus not easy to transfer from one person to another. This complicates standardization and automation of such services. A further consequence of insufficient documentation is that it is hard to implement quality management and assurance measures.

3.4 Service delivery is people-bounded

KIPOS are performed at people and the dominant factor for perceived service quality is the person providing the service. Thus, it can be concluded that KIPOS contain at least some partial processes that must remain as they are: person-to-person encounters that can hardly be standardized or automated. Therefore, a service engineering method needs to be able to identify these irreplaceable "moments of truth". It has to be able to cope with two different settings: such that must remain manual and such that can be standardized and automated. Thus, it needs to develop criteria on how to distinguish between those two.

Although automation is difficult, IT can be used to either assist the person in charge of service provision, or to enhance the interactions between customer and provider [FF05]. A service engineering method has to consider to which extent technology should be used and for which process steps. Yet, the use of IT generates even more challenges. As [GT09] point out, different interaction channels have an impact on customer perception and hence service quality. Service engineering methods have to cope with the fact that services are complemented or replaced by automated services. Other questions include to which extent customers can actually be integrated into the service provisioning processes, and where is an optimal trade-off between customer integration and perceived service quality.

4 Summary and outlook

KIPOS, as defined in this paper, have not drawn quite attention in recent service engineering research. This is mostly due to the wide-spread opinion, that such services possess a characteristic nature that makes it rather impossible to apply systematic engineering tools to their development and to raise IT-potentials. Yet, the rise of new communication and information technology also bears great potential for sectors dominated by KIPOS. The research reported in this paper has set the basis for further research on service engineering for such services. We discuss several definitions of KIPOS and provide a decent characterization. Further, we identify distinguishing features and challenges KIPOS pose for a systematic service development and engineering.

A closer analysis also confirms, that in KIPO service settings, there are processes that should be continued to be delivered personally, as they are the most value creating activities [Es09]. Yet, IT can make a contribution by supporting these processes with IT systems, e.g. by providing information or templates that make the provision more efficient. Additionally, services typically contain sub-processes or activities that are more or less standardized for several clients or do not contribute a lot to creating value. These could be automated and delivered by IT systems to enable scalability. So far, most of recent literature deals with development of IT Services, E-Services, or hybrid products [Be08][BK05][FH07][KLK07]. First efforts to realize IT-potentials for KIPOS have already been successfully made [LDK02][LKK06]. Hence, further research has to assess and evaluate existing service engineering and design methods on their applicability for KIPOS. It has also to be elaborated, what classifies a method and to what extent these methods can be automated.

We are aware that certain aspects of KIPOS are such specific that there will be hardly a possibility to apply standardization, automation or customer integration techniques. Nevertheless, there is a potential for at least partial, intelligent service engineering for KIPOS which needs to be developed to increase efficiency and effectivity of KIPOS or even pave the road for entirely new, IT-enabled KIPOS with new business and service models thus fostering growth and prosperity.

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