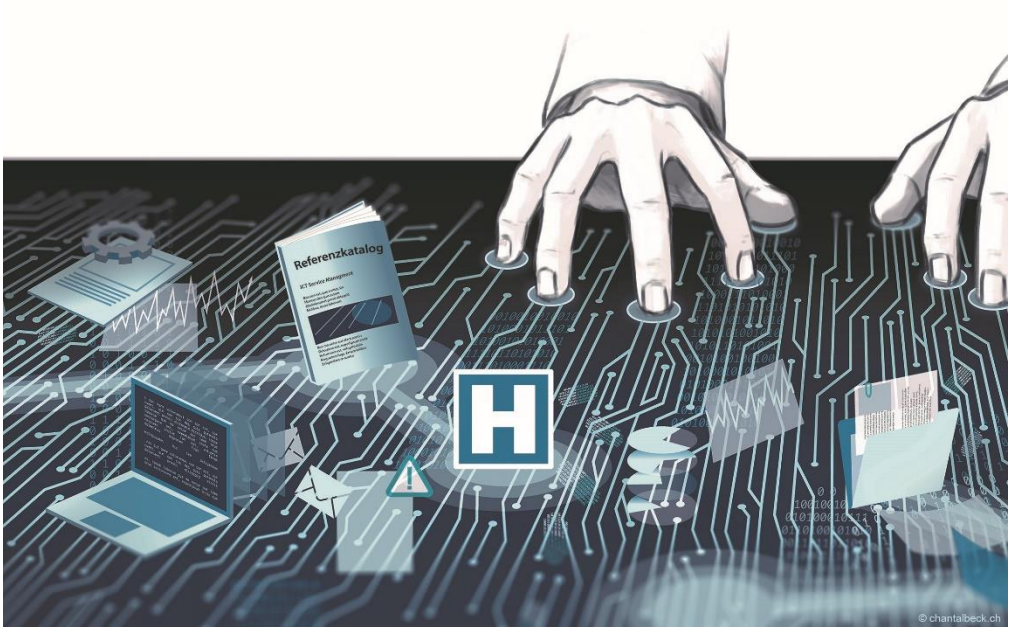
Translation of the German original

Reference Catalogue for ICT Services in Healthcare

Model for ICT Service Management, Controlling and Benchmarking

Version 1.0

December 2019



Editors: Nicole Gerber, Kurt Stuber, Lars Baacke
Translation: John Bennett, Nicole Gerber

A project by Zurich University of Applied Sciences (ZHAW), Institute of Facility Management (IFM), Waedenswil

Available under: www.zhaw.ch/ifm/fm-healthcare/reference-catalogue

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Introduction
Author: Nicole Gerber, ZHAW IFM

Introduction

Starting Position

In the course of digitalisation, the execution of medical services in healthcare organisations and particularly the management of hospitals, care institutions and foster homes iis now scarcely possible without the application of Information and Communication Technology (ICT). ICT and ICT service management in particular play a major role in healthcare organisations.

ICT departments in healthcare institutions face several challenges:

- ICT as a discipline is currently developing rapidly and is increasingly merging with medical technology.
- A heterogeneous, non-transparent development of ICT that took place in the past without standardised service level agreements now faces a growing need for transparency of service provision and cost.
- Trends like eHealth, process automation and sensor technology depend on a powerful ICT.
- The expectations placed on digital solutions are (partially too) high and oppose a historically caused, and compared to other industries, low ICT affinity and digitalisation maturity with a partially lacking overarching (ICT) strategy.
- There is a growing number of legal and security technical requirements to comply with.
- Monolithic software with a lack of interoperability from the past have to be integrated in the current service and architecture landscape.

(Beha, 2016; Drauschke & Rottleb, 2018; Flemming, 2015; Gadatsch, 2013; Gocke & Schneider, 2017; Hartmann & Günther, 2015; Heckmann, 2017; Hipp, 2016; Janssen & Meissen, 2013; Johner, 2016; Klemm, 2018; König, 2015; Kreglinger & Günther, 2016; Lorenz, 2015; Müller, 2017; Oetiker, et al., 2014; Purwin & Günther, 2015; Rockstroh, 2016; Schulze, 2018; Snedaker, 2017; Trill, 2014; Timm & Fazlic, 2017; Tucker, et al., 2013; VUD Verband der Universitätsklinika Deutschlands, 2014; Wurth, 2018; Zaczyk, 2018)

Project «Reference Catalogue for ICT Services in Healthcare»

To meet these challenges, a project consortium between the business partners BEG Analytics, get it services and the Zurich University of Applied Sciences (ZHAW) initiated and conducted the project «Reference Catalogue for ICT Services in Healthcare». The goal of the project was to develop a systematic foundation for ICT departments in healthcare.

In a first step, a literature research was conducted to identify the state of the art with respect to ICT services, ICT service management and ICT service catalogues both in general as well as in the context of healthcare as a basis for further development. The next steps were conducted using the consortial research approach (Österle & Otto, 2009; Österle & Otto, 2010; Österle & Otto, 2010) in cooperation between academia and practice. Based on the findings gained, both the reference catalogue and the model for ICT service management, controlling and benchmarking were developed using an iterative approach.

Target Group of this Reference Catalogue

The target group of this reference catalogue is

- CIOs, ICT managers and ICT service managers
- CFOs or people responsible for cost allocation of ICT services
- Representatives of strategic management in healthcare organisations.

Structure of this Reference Catalogue

After this introduction, the following chapters will follow:

- Chapter 1: Reference Catalogue: Theoretical Background and Concept by Nicole Gerber, ZHAW IFM
- Chapter 2: Model for ICT Service Management, Controlling and Benchmarking by Kurt Stuber, get it services
- Chapter 3: ICT Service Management Benchmarking by Lars Baacke, BEG Analytics
- Glossary
- Appendix

Benefits / Applications of this Reference Catalogue

This reference catalogue can be applied to

- gain a broad understanding of the topic
- support the introduction of a new ICT service catalogue
- refine existing ICT service catalogues
- support the setup of ICT SLAs
- refine existing ICT SLAs
- make ICT service delivery costs transparent
- facilitate benchmarking in the ICT department of a hospital
- develop the ICT service departments of a hospital towards a profit centre
- support governance and compliance

Delimitation

- In this documentation, solely the ICT services in relation with the customer – thus with a focus on the price level – is described. The technical service catalogue – the cost level – will be dealt with at a later point.
- This documentation does not discuss responsibilities of the individual services.
- The way in which the individual services should be bundled in service packages is not examined in this documentation.

Outlook / Next Steps

- Validation of the Reference Catalogue for ICT Services in healthcare incl. the model
- Expansion of the catalogue with technical ICT services and the cost perspective
- Inclusion of the reference catalogue in the “Spital IT Benchmarking Community”
- Inclusion of feedback from the community

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Reference Catalogue for ICT Services in Healthcare

Modell for ICT Service Management, Controlling and Benchmarking

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Chapter 1
Reference Catalogue: Theoretical Background and Concept

Author: Nicole Gerber, ZHAW IFM

Chapter 1 Theoretical Background and Concept

1.1 Introduction to the ICT Service Catalogue

1.1.1 Goal and Benefit of the ICT Service Catalogue

The goal of this catalogue is

- the clarification and transparency of the ICT services offered
- the establishment of a basis to classify and control ICT services
- making a contribution to risk reduction
- the enablement of ICT benchmarking
- the establishment of a basis for the formulation of useful service level agreements (SLAs)
- a system for usage-related cost-splitting and costa allocation of ICT services
- the creation of possibilities for assessing overall solutions (medical + ICT specific)
- the establishment of a basis for clarification and regulation of governance
- the contribution for the definition of compliance requirements in hospitals.

1.1.2 Further Links

Service Catalogue for Non-medical Services in Hospitals (LekaS) Version 2.0 www.zhaw.ch/ifm/fm-healthcare/lekas-e
Reference Model for Non-medical Support Services in Hospitals (RemoS) www.zhaw.ch/ifm/fm-healthcare/remos/en

1.1.3 Contact

Nicole Gerber
Zurich University of Applied Sciences (ZHAW)
Institute for Facility Management (IFM), Competency Group Hospitality Management
Seestrasse 55 / RA / 8820 Waedenswil, Switzerland
nicole.gerber@zhaw.ch
+41 (0)58 934 53 91

1.2 Theoretical Background

In theory and practice, the terms «ICT services», «ICT service management» and «service catalogue» are defined and used differently. In this chapter, there is a brief explanation of what the understanding of the most important terminologies used in this ICT catalogue is.

1.2.1 Definition of «ICT services»

In this documentation, in line with Scholderer (2017) and BSI Bundesamt für Sicherheit in der Informationstechnik (2013), an ICT service is understood as an interaction between humans, (information) technologies and processes that fulfils a specific scope of functional requirements. Automated, person-related, industrial and staff generated ICT services as defined by Vogedes (2011) are included. ICT service is used synonymously with IT service as well as ICT service delivery and IT service delivery.

1.2.2 Definition of «ICT service management»

ICT service management is in this documentation understood as a discipline for a targeted, business process supporting, customer-oriented, user-friendly and cost optimising alignment and orchestration of planning, controlling and (quality) monitoring of ICT services of all (strategic, tactical, operational) levels (BSI Bundesamt für Sicherheit in der Informationstechnik, 2013; Kopperger, et al., 2017).

1.2.3 Definition of «ICT service catalogue»

The understanding of ICT service catalogue in this document is, based on BSI ISO/IEC 20000 (2012), Ebel (2015), EMC2 (2013), Hanhart (2008), Schlegel and Fischer (2010) and Scholderer (2017) as follows:

- a transparent and comprehensibly declared range of service (where necessary with examples and explanations for clearer understanding) with
- a systematology based on a concept,
- appropriate for a specific context (in relation to the services offered and the wording) and
- thereby a tool supporting the fulfilment of requirements and if necessary to set up specific SLAs.

The editors share the view of Scholderer (2017) that an all-embracing service catalogue including every eventuality does not exist, that the goal of a catalogue however is to include the major services particularly for the core business. Pragmatism and practical relevance were therefore prioritized to the demand for absolute completeness.

1.2.4 Challenges of ICT Service Management and ICT Service Catalogues

The management of ICT services is demanding, particularly in a context like healthcare with the challenges described in the introduction above.

The creation of an ICT service catalogue in general and in a form generalised for a whole industry in particular poses many challenges, such as:

- The perspectives of the customers, the suppliers and ICT departments usually differ.
- In an industry, there are different structures and distributions of roles and thus differing needs with respect to type and depth of descriptions.
- It is possible that there are different understandings of facts and definitions.
- Service catalogues can be applied differently.

(Ebel, 2015; Purwin & Günther, 2015; Scholderer, 2017)

1.3 Reference Catalogue: Concept

The Reference Catalogue of ICT Services in Healthcare follows the describing, text-based approach of Scholderer (2017).

1.3.1 Reference Catalogue: General Principles

The Reference Catalogue of ICT Services in Healthcare is an integrative part of the Service Catalogue for Non-Medical Services in Hospitals (LekaS) Version 2.0 (Gerber & Kuchen, 2019). As for the services further described there, the following aspects were defined:

- Description of service
- Service No
- General description of the service
- Included in the service
- Not included in or services defined elsewhere
- Remarks / indications for the healthcare (HC) industry
- Source(s)

The principles for the Service Catalogue for Non-medical Services in Hospitals are explained in detail under www.zhaw.ch/ifm/fm-healthcare/lekas-e

The basic idea of the structuring follows the metamodel illustrated in Figure 1 and results in the listed logic shown in Figure 2.

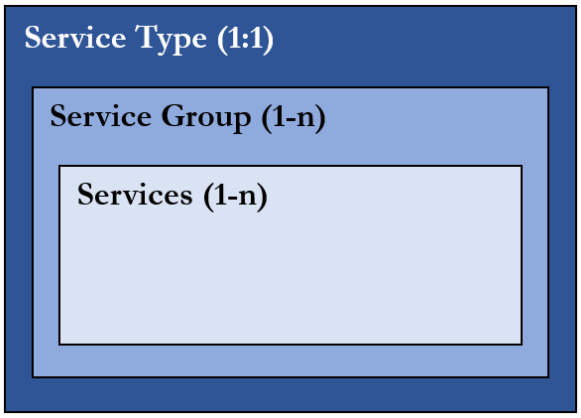

Figure 1: Metamodel of the service structuring

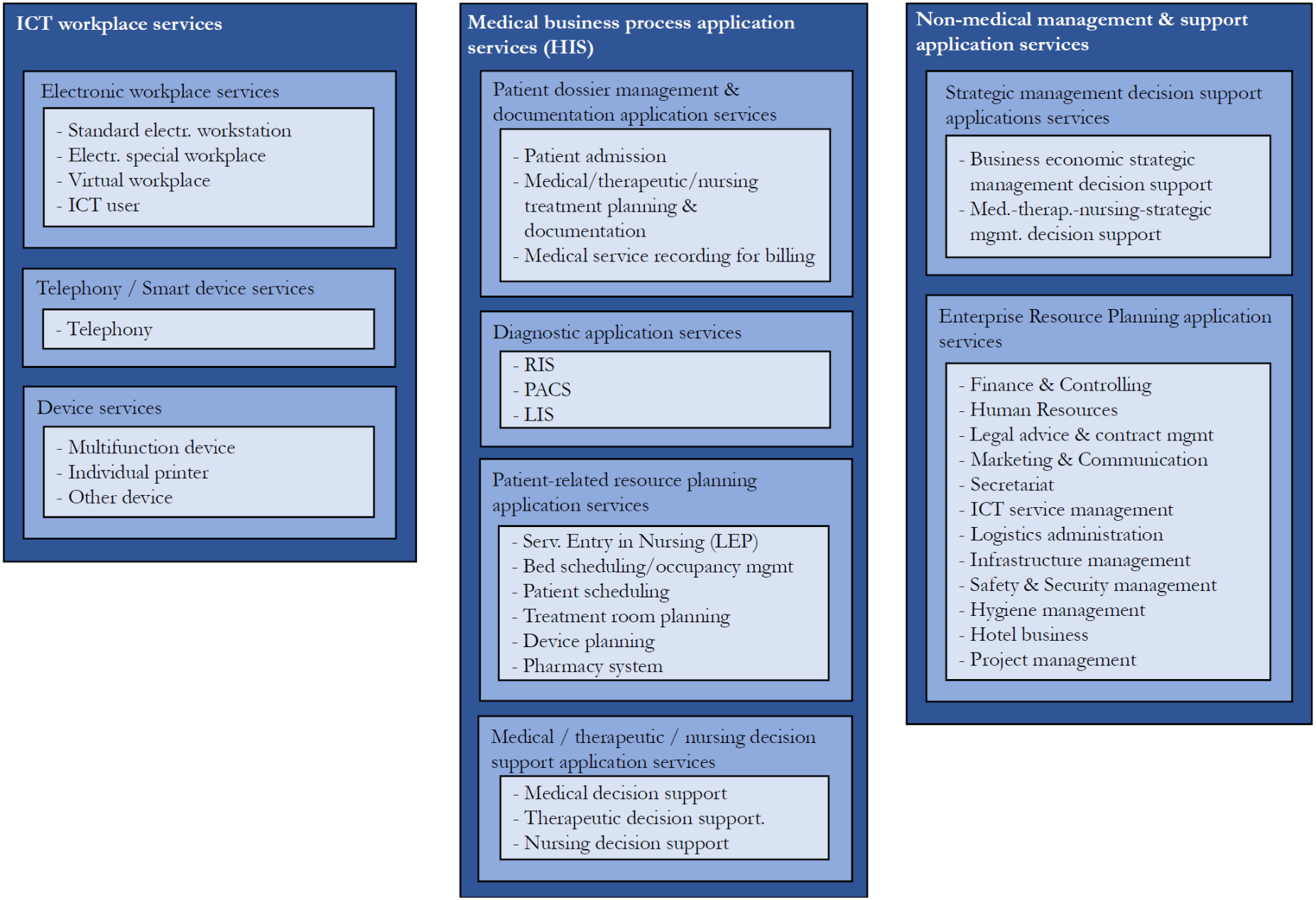

Figure 2: Illustrated service structuring

In LekaS 2.0 (Gerber & Kuchen, 2019, p. 14) the following listing results (table of contents incl. service number):

ICT workplace services 2360
Electronic workplace services 2361
Standard electronic workstation services (physical) 2361.10
Electronic special workplace services (physical) 2361.20
Virtual workplace services 2361.30
ICT user services 2361.40

Telephony / Smart device services 2362
Telephony services 2362.10

Device services 2363
Multifunction device services 2363.100
Individual printer services 2363.20
Other device services 2363.30

Medical business process application services (HIS) 2370
Patient dossier management & documentation application services 2371
Patient admission module services 2371.10
Medical/therapeutic/nursing treatment planning & documentation module services 2371.20
Medical service recording for billing module services 2371.30

Diagnostic application services 2372
Radiology Information System (RIS) 2372.10
Picture Archiving & Communication System (PACS) 2372.20
Laboratory Information System (LIS) 2372.30

Patient related resource planning application services 2373
Service Entry in Nursing (LEP) module services 2373.10
Bed scheduling / occupancy management module services 2373.20
Patient scheduling module services 2373.30
Treatment room planning module services 2373.40
Device planning module services 2373.50
Pharmacy system 2373.60

Medical / therapeutic / nursing decision support application services 2374
Medical decision support module services 2374.10
Therapeutic decision support module services 2374.20
Nursing decision support module services 2374.30

Non-medical management & support application services 2380
Strategic management decision support applications services 2381
Business economic strategic management decision support module services 2381.10
Medical-therapeutic-nursing-strategic management decision support module services 2381.20

Enterprise Resource Planning application services (ERP) 2382
Finance & Controlling module services 2382.01
Human Resources module services 2382.02
Legal advice & contract management module services 2382.03
Marketing & Communication module services 2382.04
Secretariat module services 2382.05
ICT service management module services 2382.06
Logistics administration module services 2382.07
Infrastructure management module services 2382.08

Safety & Security management module services 2382.09
Hygiene management module services 2382.10
Hotel business module services 2382.11
Project management module services 2382.12
Billing for ICT services 2300.10
Quality management of ICT services 2300.20
Quality inspection of ICT services 2300.21
Quality assurance / need for adjustments to ICT services 2300.22

In the appendix, the service descriptions from the Service Catalogue for Non-medical Services in Hospitals (LekaS) Version 2.0 are shown. They can be viewed and downloaded under www.zhaw.ch/ifm/fm-healthcare/lekas-e

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Model for ICT Service Management, Controlling and Benchmarking

Version 1.0
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Chapter 2
Model for ICT Service Management, Controlling and Benchmarking
Author: Kurt Stuber, get it services gmbh

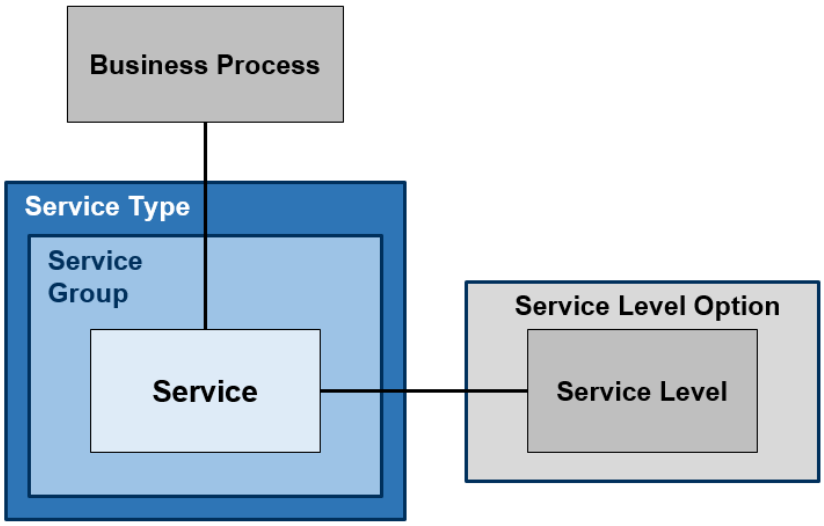
Chapter 2 Model for ICT Service Management, Controlling and Benchmarking

In order to cope with the above-mentioned challenges of ICT service management, the creation of a standardised basis of ICT services is crucial. The model described in this chapter aims to provide a coherent and standardised reference (ICT services and ICT service catalogue). The following areas can potentially profit from this (not exhaustive):

- ICT service management in general
- ICT service cost controlling and benchmarking
- ICT service cost allocation
- ICT governance and compliance
- SLA management

2.1 Service Architecture

The architecture for customer-oriented ICT services were set and defined on the basis of «Best Practice» of get it services. This definition is illustrated in Figure 3.



Legend:

Service types are	- Medical business process application services (HIS) - Non-medical management and support application services - ICT workplace services - Customer-specific services
Service groups are	Structuring elements. A service group consists of several services. Service groups are not described.
Services are	Actual service packages. They can principally be structured in any desired depth and always include a service description
Service level options are	Groups of service levels bundled to service level options e. g. Gold/Silver/Bronze
Service levels are	Quality aspects for ICT services, which are defined between the customer and the service deliverer

Figure 3: Architecture for customer-oriented ICT services

2.2 Service Catalogues

The service catalogues serve as provision of consistent data for all operational services. With respect to different interest groups, a distinction is made between a customer-related ICT service catalogue (customer perspective) and a technical ICT service catalogue (internal ICT perspective).

2.2.1 Phase Approach

In a first phase, the ***customer-related ICT service catalogue*** is available as a standard catalogue and as a basis for an ICT Benchmark. However, in this phase (status March 2019) no standardised technical ICT service catalogue is available yet. This is why the single cost elements have to be mapped directly to the customer services, as shown in Figure 4.

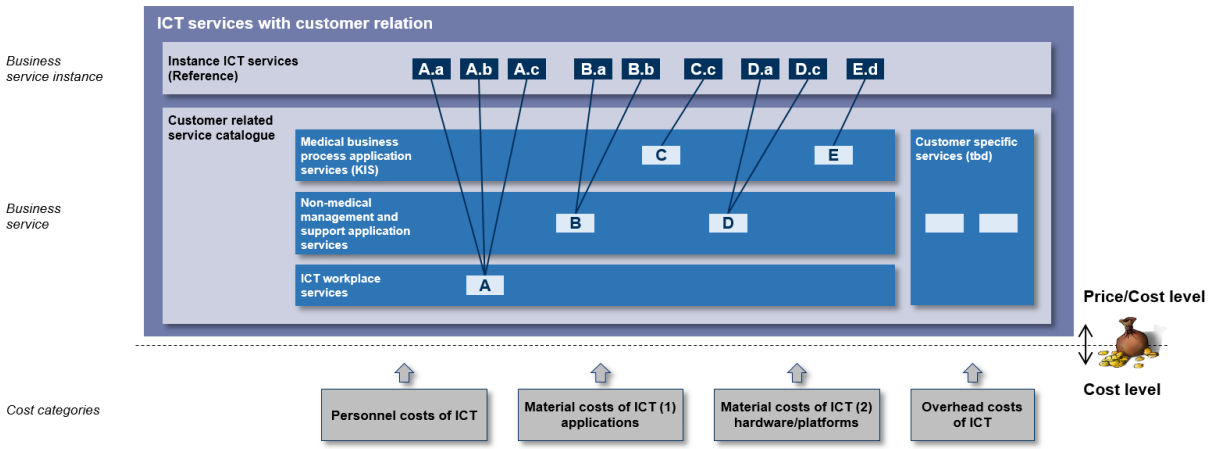


Figure 4: Mapping of customer-related services

In order to increase the transparency of the cost assessment, the ***technical service catalogue*** will be developed in a further phase and made available as a standard catalogue. The experience from different customer projects will be applied in this phase with the aim of accumulating the costs according to pre-defined configuration schemes (expected in September 2019). The corresponding approach is outlined in Figure 5).

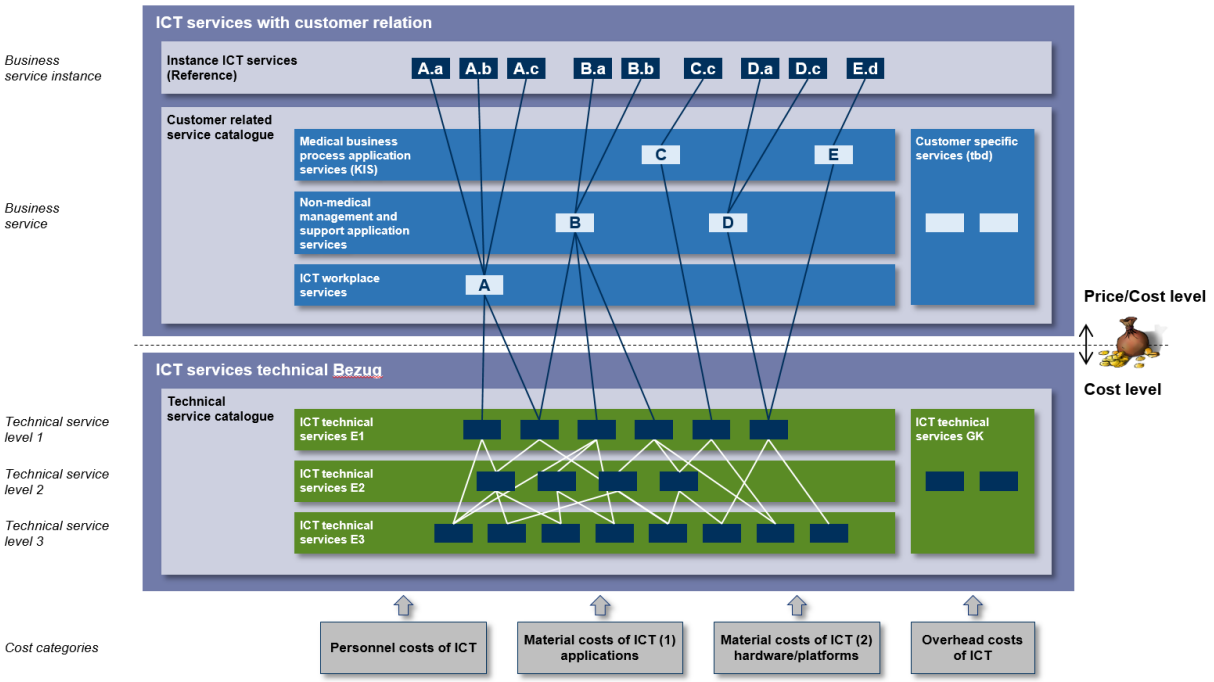


Figure 5: Approach of the pre-defined configuration schemes in the technical service catalogue

2.2.2 Customer-related ICT Service Catalogue

The customer-related ICT service catalogue consists of details pertaining to all ICT services provided to the customer as well as information about the relationships to the business areas and business processes requiring the ICT services. This corresponds to the customer perspective in relation to the service catalogue.

The customer-related ICT service catalogue is an integral part of agreements with customers and includes the following categories of services:

- Medical business process application services (HIS)
- Non-medical management and support application services
- ICT workplace services
- Customer specific services

(cf. Figure 2)

2.2.3 Technical ICT Service Catalogue

The technical ICT Service Catalogue includes details pertaining to all ICT services necessary for the provision of customer services as well as information about the relationships to support components facilitating the provision of customer services. It is not part of the customer perspective (internal ICT view).

The technical ICT service catalogue shows the internal perspective of ICT and supports the ICT employees in the daily service provision. It includes the following categories of services:

- Application / Special services (Level 1)
- Platform / Special services (Level 2)
- Infrastructure / Facility services (Level 3)

(cf. Figure 6)

Figure 6: Types of services within the technical service catalogue

2.3 Service configuration

2.3.1 In general

The service configuration mainly serves the following purposes:

- controlling of the services

- recording dependencies between the various services
- increasing the transparency, e. g. with the cost price

NB This list is not complete!

Service configuration models can be set up differently, depending on their objectives and the and the information they contain. The following orientation is to be understood in terms of cost transparency.

Often, the required cost transparency can be achieved by mapping the technical dependencies as precisely as possible. The maintenance of such constructs involves a great deal of administrative effort and results in a spurious level of apparent detail which does not offer any added value for the cost controlling. The motto «less is more» applies very well here. Therefore, the definitions and the dependencies of the ICT services have to be as purposive as possible.

2.3.2 First phase

As already mentioned, in the first phase only the direct cost allocation to the defined customer services is executed. The types of cost are

- personnel costs of ICT
- material costs of ICT
- overhead costs of ICT

2.3.3 Next phase

In the next phase, the dependencies of the technical service level have to be considered. Every technical service is charged with the costs of the cost groups that have already been defined and via the definition of dependencies (configuration). Service costs are always consolidated from the bottom up according to predefined rules (cross links are not allowed). The highest consolidation level is the customer-related ICT service (in the customer-related ICT service catalogue).

2.3.4 Set of Rules

Cost assessment, technical service catalogue:

- A maximum of 3 technical service levels are defined.
- Services can directly be allocated to technical ICT services on all 3 levels.
- The cost accumulation always takes place per levy from a lower level to a higher level.
- Die levies are defined and checked annually by the ICT management on the basis of logical dependencies.
- The cost accumulation of levels 2 and 3 takes place on the highest level (level 1) of the technical service catalogue.
- Every technical service on level 1 contains the total costs incurred for this technical ICT service (direct cost and levies).

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Chapter 3
ICT Service Management Benchmarking
Author: Lars Baacke, BEG Analytics

Chapter 3 ICT Service Management Benchmarking

3.1 Foundations

The Benchmarking Community for ICT in Healthcare has existed since 2008 (cf. www.it-benchmark.ch). The members are public or private hospitals on different healthcare provision levels as well as rehabilitation clinics and psychiatric institutions.

They compare themselves on a yearly basis with respect to a variety of ICT key performance indicators, ICT costs, their ICT service scope as well as the benefits of special applications. The evaluations are done by means of an evaluation report and individual evaluation sessions as well as in the context of an annual event and a workshop. Thereby, comparison analyses with the population, different reference groups as well as over time (trends) are conducted.

In addition, specific additional topics such as ICT architecture, the electronic patient file, ICT security or ICT service management are discussed. Concerning the latter topic, due to its great relevance within the community, a focus group was founded which contributes to the current project in cooperation with partners from science and practice.

Swiss healthcare organisations increasingly face the challenge to provide their services (sourcing) together with external partners (supplier side) due to the intensifying specialisation and the market dynamics. This is opposed by the increasing expectations on the customer side concerning support of the core business with the help of ICT. Both trends collide with the increasing quality and cost pressures.

It is therefore not only necessary to communicate the service spectrum of an ICT department transparently, but to further develop it together with the customers and the suppliers. It is necessary that cost and quality can to be regulated reliably and according to the requirements, and actively controlled.

However, many organisations do not currently have a suitable description of their ICT services (incl. service levels and service prices). Other organisations are already further along this path or even very mature. The degree of outsourcing is also very different, so there is currently great heterogeneity. In general, suitable standards are lacking. Even though there is meanwhile a relative high transparency with regard to ICT costs, their allocation to specific ICT services has not been resolved in many cases. In addition, a comparison with the ICT services of other organisations is currently not possible due to the lack of comparability of service definitions.

The project addresses these challenges (cf. Figure 7).

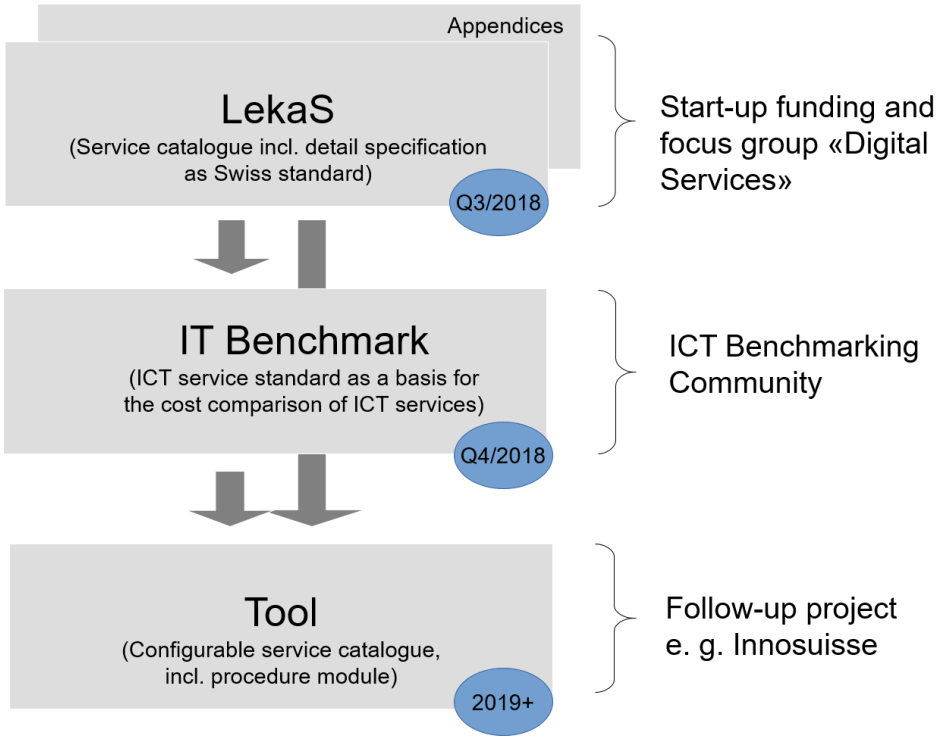

Figure 7: Project phases

In this chapter the results from a benchmarking perspective are explained (costs/pricing) (step 2 in Figure 7).

3.2 Methodological Approach

The new service-oriented benchmarking part is based on the following assumptions:

- A participant either already has an ICT service catalogue (own organisation and/or external partner) or not yet. For the participation in the benchmark, either the existing service catalogue is entered in the online tool or – if no service specification exists – the service catalogue developed in this project and stored in the online tool is reference used (instantiated). It can be adjusted individually after the adoption of the standard (optional step).
- Cost information either exists in relation to the ICT service or not. If they exist, they can be directly allocated to the services either in the form of costs (e. g. with internal service provision) and/or in the form of prices (e. g. with external service supply). If ICT costs are only available in general, they must be allocated to the ICT services.

Thus the assessment procedure basically consists of the steps presented in Figure 8:

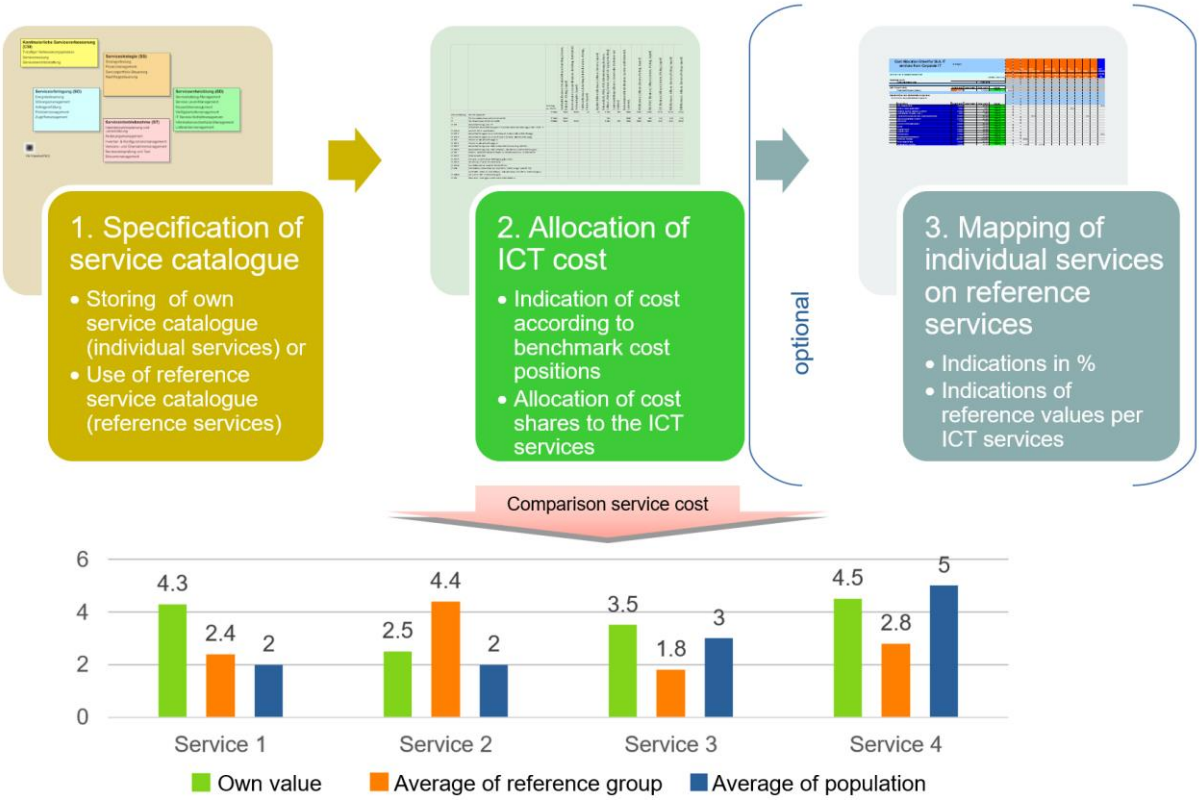

Figure 8: Steps for the benchmark comparison

In the first step, the service catalogue is specified. To do this

- either the service reference catalogue is chosen and is used without any changes (option 1) or
- the stored service reference catalogue is chosen, the services of which are, however, adapted according to individual requirements by by supplementing, eliminating or adapting the content (option 2) or
- a completely new service catalogue consisting of services applicable to the specific organisation or which are obtained via a ICT service provider is set up (option 3).

Further combinations of these options are also possible. The result is an individual service catalogue of the benchmark participant.

After the specification of the service catalogue, the second step is to allocate the ICT costs. Here too, there are two possibilities: In the first case, the service oriented cost are not available yet. In this case, the cost have to be distributed to the individual positions of the individual service catalogue according to the different cost categories. Figure 9 illustrates possible cost categories.

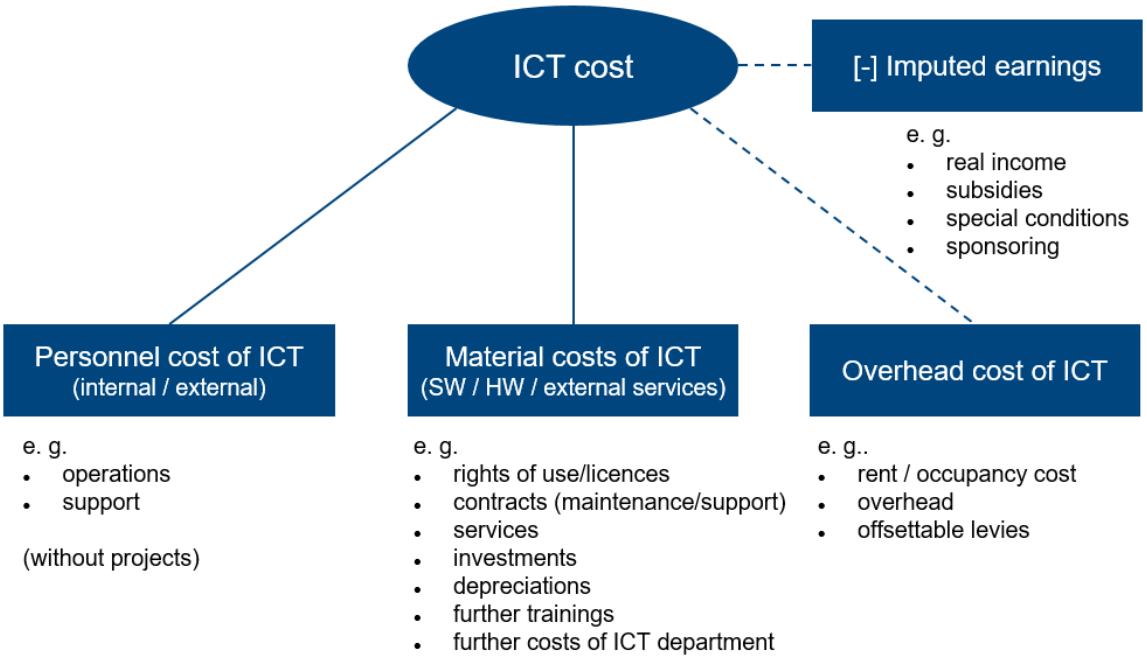

Figure 9: Cost categories

In the second case, either the internal ICT cost are already available in a service oriented form or the ICT services are obtained with an external provider for a defined price. This way, they can be allocated directly to the individual services. Figure 10 gives an overview of both options.

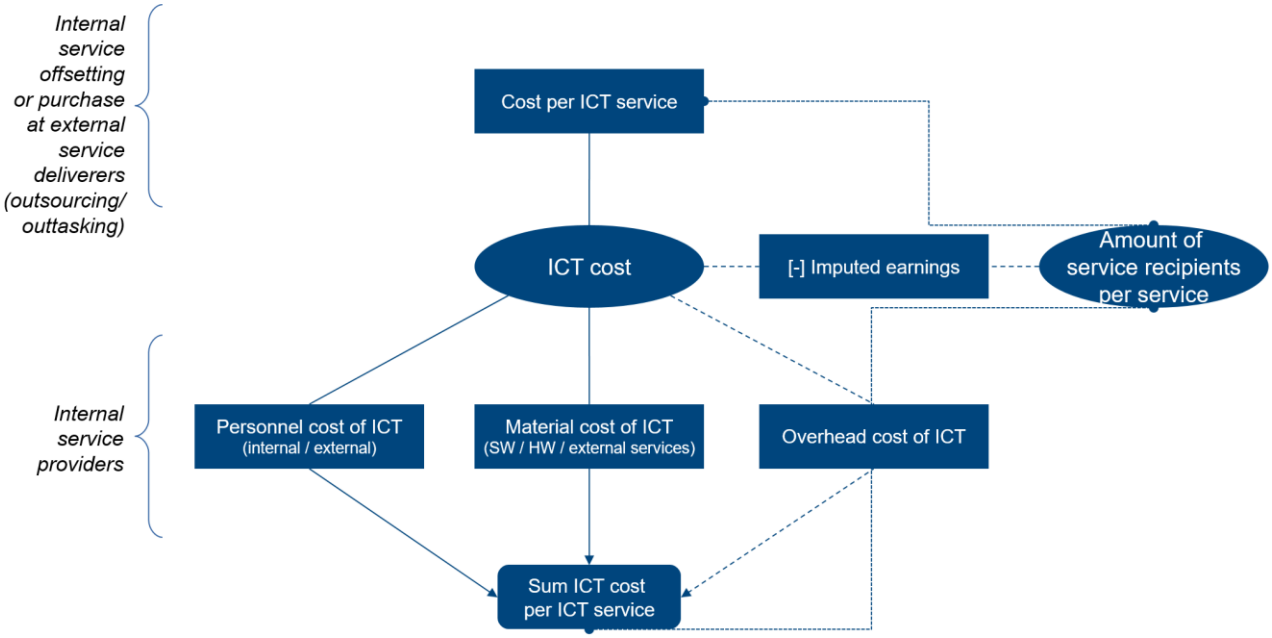

Figure 10: Cost calculation

Another crucial aspect of cost comparison is the quantification of the service subscribers per service, i.e. how many services are purchased in each case. It is of particular importance that the type of service recipient (reference unit) corresponds to the respective ICT service. In the case of physical workplaces and other devices, it is usually the number of devices. In the case of application services, it is usually the number of application users. It is important to ensure that the reference unit remains the same when the reference services are customised.

The third step is only relevant if an own service catalogue has been set up or if the service reference catalogue has been customised. A mapping of the reference services must be made for the individual and for the customised services to enable comparability in the benchmark. The mapping is indicated in percent and describes which part the individual service corresponds to the reference service in terms of content. For orientation, the specifications of the reference services as well as the cost allocation can be consulted.

Granularity plays a special role in mapping. It becomes apparent when taking the Hospital Information System (HIS) as an example that complex applications in particular are not always easily comparable. Different software products sometimes have significantly different functional scopes. While one HIS product focuses on medical and care documentation, another HIS product may also contain functions for planning (staff, resources etc.), controlling, reporting, patient administration and service accounting. The products usually have different pricing and licencing models and cause different service cost.

The granularity of the service reference catalogue takes these differences into account by defining the main functions in the sense of “modules” or “function clusters” of complex applications (e. g. HIS in the medical area, but also ERP in the administrative area) as services. The benchmark participant can now, for example map their complex HIS product to the possible HIS modules and thus simultaneously describe the functional scope of their HIS product. Once again it’s important to maintain the service reference units. These must be the same for all reference services mapped to a software product.

The costs assigned to the individual services are also distributed to the reference services according to the functional mapping.

Figures 11 – 13 describe the overall methodology once again for the three options mentioned.

- Option 1: The participant does not have their own individual service catalogue and therefore uses the suggested reference services

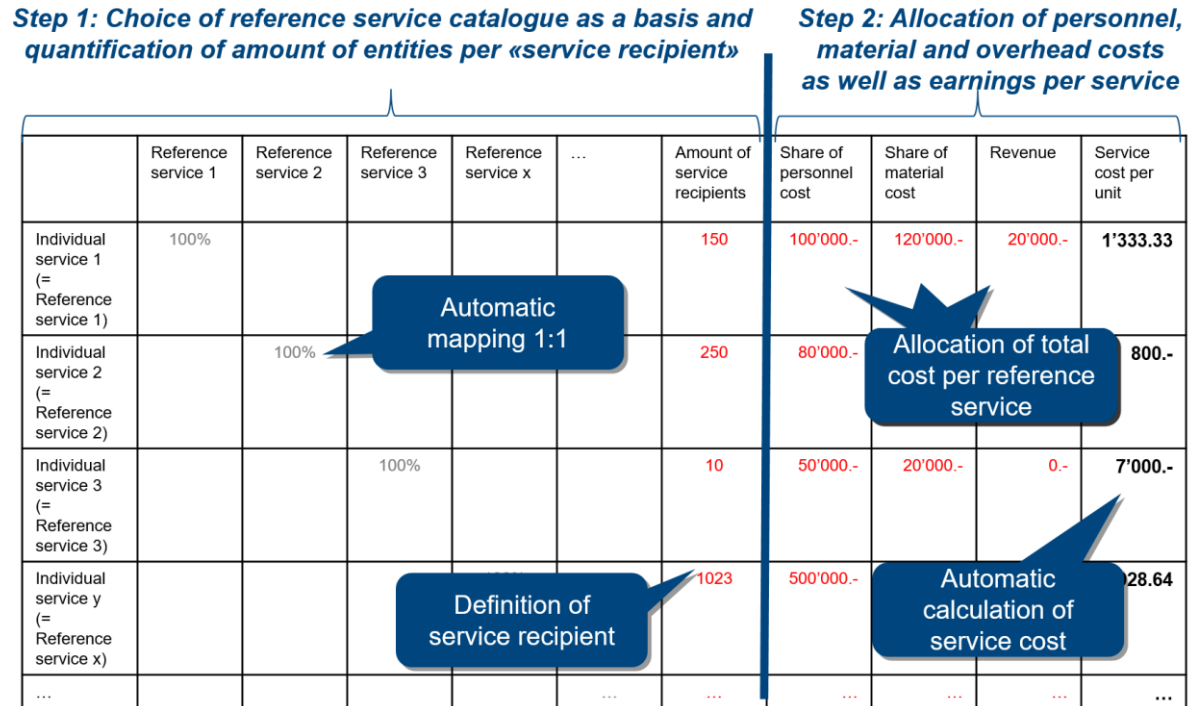

Figure 11: Option 1 of the overall methodology

- Option 2: The participant takes the reference services, however adapts them to the individual requirements of their organisation.

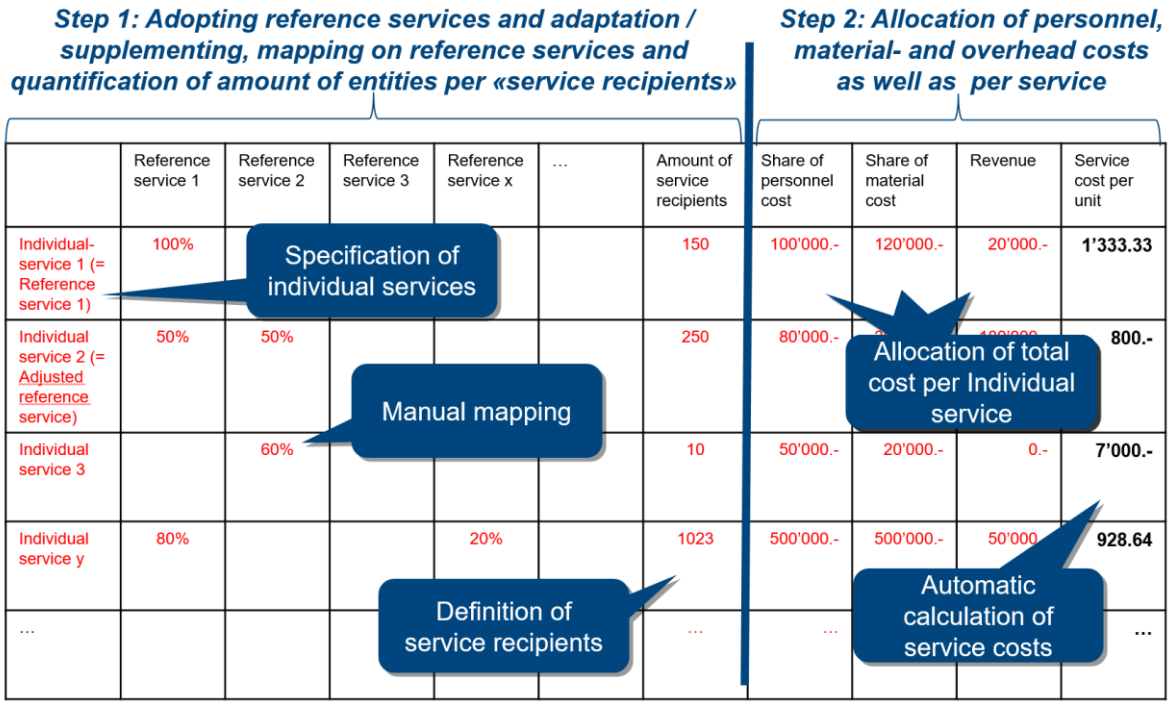

Figure 12: Option 2 of the overall methodology

- Option 3: The participant already has an individual catalogue or obtains defined ICT services with an external partner.

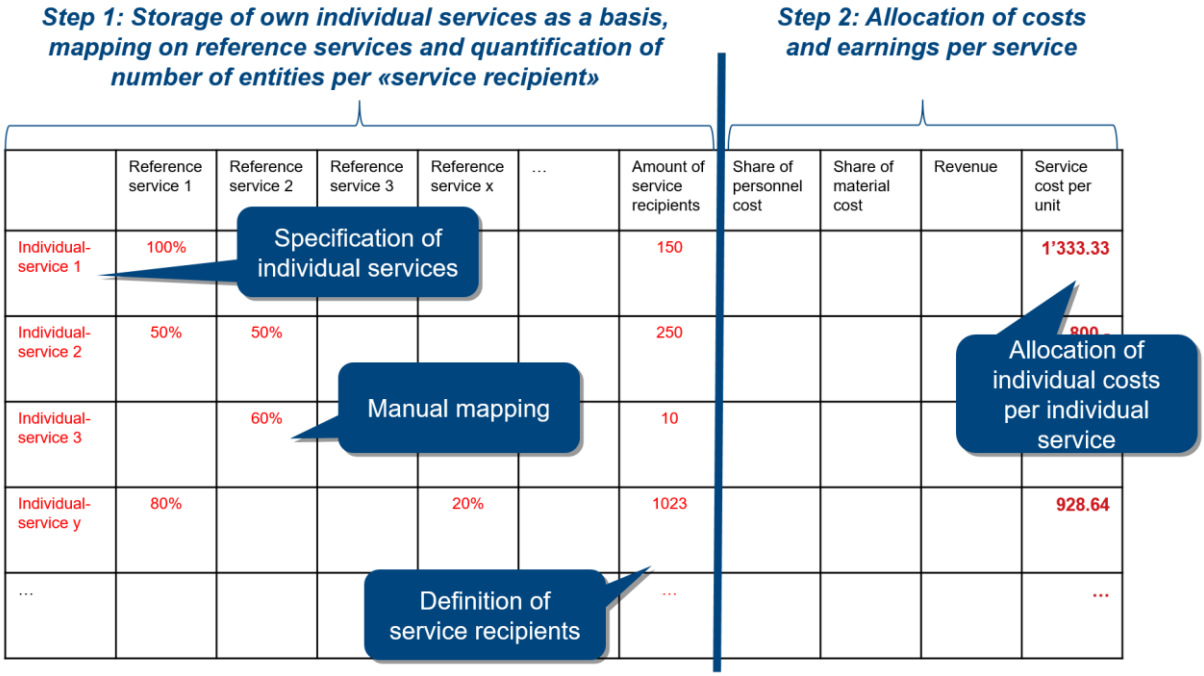

Figure 13: Option 3 of the overall methodology

Combinations of the different options are realistic and possible.

Note: The underlying Reference Catalogue of ICT Services does not claim to be exhaustive (cf. chapter 1.2.3). On the contrary, the focus was on ICT services, that are relevant for a cost comparison, because, for example, they cause high cost or because they have many service recipients. In addition, they should be relevant for all healthcare organisations, if possible. The presentation of special services (e.g. in the context of medical special disciplines) was left out on purpose. It is therefore permissible and plausible if the sum of all service cost is smaller than the ICT total cost within the period under review.

3.3 Evaluation Possibilities

On the basis of the mappings, the evaluation of the service cost in the benchmark is done

- both in relation to the reference services (What's the cost of a reference service in the comparison group and what would the reference services in cost in one's own organisation if they were provided in an identical way?)
- and also in relation to the individual service (What's the cost of an individual service and what would they cost in organisations of the comparison group if they were provided in an identical way?)

As a basis for comparison, within the benchmarking community the following applies:

- the population of the members
- the reference group of similar members as well as
- the development over time.

Evaluation possibilities are, for example, in relation to

- average
- median
- minimum
- maximum
- upper quartile

- lower quartile

In order to enable the comparison of costs across different organisations, the absolute cost data including the corresponding reference values have to be relativised. In doing so, the evaluations such as those listed below are possible:

- Service costs per service reference unit (e.g. per user, per workplace)
- Share of specific service cost in relation to the ICT total cost
- Service costs per inpatient and/or outpatient case, per employee, in relation to turnover, in relation to space, etc., if the corresponding evaluations are comparable and if they permit meaningful conclusions

If the ICT costs are not calculated in a lump sum per service, but are allocated in a differentiated manner according to the above-mentioned cost categories (options 1 and 2), evaluations of personnel and material cost shares as well as possible revenue can be conducted and thus further analyses in terms of specific cost causes and connections.

3.4 Implementation

The comparison methodology has already been stored and evaluated in the benchmarking tool.

This service reference catalogue will be implemented in the benchmarking tool in the third phase of the project. Organisations in healthcare can generate their own service catalogue on the basis of the reference catalogue (instantiation) online and adjust and systematically develop it according to their individual needs. The administrative functions for this are also provided in the online tool.

In addition, one's own service catalogue can itself be offered as reference catalogue for other organisations and used in the sense of a best practice approach. The inclusion of further reference catalogues such as established international standards or best practice approaches is also intended.

The developments required for this are being driven forward in the context of the innovation research in cooperation with university and partners in practice within the Swiss IT Benchmarking Community as well as other interested organisations.

3.5 Conclusion and Outlook

The benchmarking methodology developed, combined with the clearly defined reference service catalogue, allows the comparison of cost and prices for differently "cut" ICT services. It makes it possible to include the in-house as well as the third party services which reflects the reality of mixed sourcing environments. In addition, price comparisons between the different external suppliers are simplified.

The methodology allows the usage of one's own service catalogue, the application of established standards from scientific publications, international institutions and national approaches as well as combinations thereof and can therefore be applied flexibly.

The analysis of service costs is an important first step in the benchmarking process in order to increase transparency of the ICT costs and to allow a usage-related service cost allocation. If in the benchmarking process significant differences are identified, a detailed analysis of the respective ICT cost is essential, because even in mature ICT service management contexts, the allocation formula (allotment of the resulting costs to different technical and business services) might be heterogeneous.

Against this background, the aim is to expand the customer-oriented reference services to include the technical perspective, including the consideration of a multi-level distribution mechanism.

In the future, additional service levels will be stored, with which the quality level of ICT services can be determined and service cost can be assessed better.

Glossary

Application	Computer programme for the execution of functionalities
ICT service	Interaction between humans, (information) technologies and processes in the context of a specific scope of functional requirements (cf. chapter 1.2.1)
ICT service catalogue	A transparent and comprehensively declared service offering with a concept-based, context-adjusted systematology as a tool to enable compliance with requirements and if necessary to set up SLAs (cf. chapter 1.2.3)
Customer specific ICT service	Is an ICT service, which is provided for the customer (e.g. usage of an ERP application). It supports corresponding business areas and business processes of the customer. Requirements/specifications of a customer-related ICT service are defined between the customer and the ICT department.
Module	Self-contained functional entity of a software
Service	Result-oriented performance
Service management	Discipline of the goal-oriented, business process supporting, customer-oriented, user-friendly and cost-optimised alignment and orchestration of planning, controlling and (quality) monitoring of ICT services on all (strategic, tactical, operational) levels (cf. subsection 1.2.2)
Technical ICT service	Is an ICT service, provided by ICT subject areas (ICT internal) (e. g. SAP platform service, server service). Multiple technical ICT services in combination (service configuration) always support one or several customer-related ICT services. Requirements/specification for a technical ICT service are defined within the ICT department.

References

Beha, H.-D., 2016. Der Krankenhaus-IT-Leiter - Eine aussterbende Spezies. *Krankenhaus-IT,* Volume 6, S. 38-39.

BSI Bundesamt for Sicherheit in der Informationstechnik, 2013. HV-Kompendium V 1.6, Chapter 8. Bonn: BSI, Band G.

BSI ISO/IEC 20000-2:2012, 2012. *Information technology - Service management - Part 2: Guidance on the application of service management systems*.

Drauschke, S. & Rottleb, R., 2018. Anlass and Konzeption von IT-Projekten im Healthcare - Den Changeprozess professionell angehen. *Krankenhaus-IT,* Volume 01/2018, S. 38-40.

Ebel, N., 2015. *Basiswissen ITIL 2011 Edition - Grundlagen and Know-how for das IT Service Management and die ITIL-Foundation-Prüfung.* Heidelberg: dpunkt.verlag.

EMC2, 2013. *IT-as-a-service solutions for healthcare providers - Best Practices for ITaaS in Healthcare Environments - EMC Healthcare Solutions.*

Flemming, J., 2015. Digitalisierung: wie weit wir sind, was kommen wird. *Krankenhaus-IT,* Volume 4, S. 10-14.

Gadatsch, A., 2013. *IT-gestütztes Prozessmanagement im Healthcare - Methoden and Werkzeuge for Studierende and Praktiker.* Wiesbaden: Springer Vieweg.

Gerber, N. & Kuchen, O., 2019. *Service Catalogue for Non-medical Services in Hospitals (LekaS). Version 2.0. Translation of the German Original.* Waedenswil: Zurich University of Applied Sciences, Institute of Facility Management.

Gocke, P. & Schneider, H., 2017. Krankenhausmanagement – Strategien, Konzepte, Methoden. In: J. F. Debatin, A. Ekkernkamp, B. Schulte & A. Tecklenburg (Hrsg.). Berlin: Medizinische Wissenschaftliche Verlagsgesellschaft, S. 642-650.

Hanhart, D., 2008. *Mobile Computing and RFID im Facility Management - Anwendungen, Nutzen and serviceorientierter Architekturvorschlag.* Berlin Heidelberg: Springer.

Hartmann, L. & Günther, U., 2015. Moderne IT-Strukturen im Krankenhaus. *Krankenhaus-IT,* Volume 2, S. 30-31.

Heckmann, S., 2017. Healthcare-IT-Systeme der Zukunft - offen and beliebig kombinierbar?. *Krankenhaus IT,* Volume 02/2017, S. 28-29.

Hipp, R., 2016. IT: Statt Business Partner als interner Dienstleister ignoriert. *Krankenhaus-IT,* Volume 3, S. 25.

Janssen, H. & Meissen, T., 2013. Zukunftsorientierte Ausgestaltung der IT-Strategie im Krankenhaus. *Krankenhaus-IT,* Volume 2/2013, S. 30-31.

Johner, C., 2016. Notwendige Qualifikationen in der Healthcare-IT - Aktuelle and künftige Situation. *Krankenhaus-IT,* Volume 5, S. 52-53.

Klemm, D., 2018. Auf dem Weg zur wirklich digitalen Organisation - Kernhandlungsfelder for ein ganzheitliches Zielbild. *Krankenhaus-IT,* Volume 01/2018, S. 22-23.

König, M., 2015. Interdisziplinäre Kommunikation and produktive IT-Investitionen - Das Krankenhausmanagement als wichtiger Katalysator. *Krankenhaus-IT,* Volume 5, S. 14-16.

Kopperger, D., Kunsmann, J. & Weisbecker, A., 2017. Handbuch IT-Management - Konzepte, Methoden, Lösungen and Arbeitshilfen for die Praxis. In: E. Tiemeyer (Hrsg.). 6., überarbeitete and erweiterte Auflage. München: Hanser, S. 461ff..

Kreglinger, K. & Günther, U., 2016. Einkaufs- and Logistiksysteme in klinischen Einrichtungen. *Krankenhaus-IT,* Volume 2, S. 22-24.

Lorenz, W.-D., 2015. Digitalisierung: Die "Killerapplikation" for das digitale Krankenhaus. *Krankenhaus-IT,* Volume 4, S. 6-9.

Müller, W., 2017. *Das Healthcare hat ein Zukunftsproblem. http://www.digitalewelten.ch/it/das-Healthcare-hat-ein-zukunftsproblem*

Oetiker, M., Meyer, C. & Westerhoff, C., 2014. Prozesse stärken durch flächendeckendes Vernetzen. *clinicum,* Volume 2, S. 112-115.

Österle, H. & Otto, B., 2009. *A Method For Consortial Research*.

Österle, H. & Otto, B., 2010. Consortium Research - A Method for Research-Practitioner Collaboration in Design-Oriented IS Research. *Business & Information Systems Engineering,* Volume 5, S. 283-293.

Österle, H. & Otto, B., 2010. Konsortialforschung - Eine Methode for die Zusammenarbeit von Forschung and Praxis in der gestaltungsorientierten Wirtschaftsinformatikforschung. *Wirtschaftsinformatik,* Volume 5, S. 273-285.

Purwin, U. & Günther, U., 2015. IT-Leistungskataloge and -Leistungsverrechnung. Methoden and Werkzeuge zur Steuerung der Wirtschaftlichkeit in der IT (Teil 1). *KU Gesundheitsmanagement,* Volume 3, S. 73-76.

Rockstroh, M., 2016. Das vernetzt Krankenhaus der Zukunft. *Krankenhaus-IT,* Volume 3, S. 26-28.

Schlegel, H. & Fischer, M., 2010. *Einführender Überblick.* Wiesbaden: Vieweg + Teubner.

Scholderer, R., 2017. *IT-Servicekatalog - Services in der IT professionell designen and erfolgreich implementieren.* Heidelberg: dpunkt.verlag.

Schulze, J., 2018. Digitale Transformation in einem Unternehmen - Wie sich die IT-Organisationen ausrichten müssen. *Krankenhaus-IT,* Volume 01, S. 28-29.

Snedaker, S. T., 2017. *Leading Healthcare IT - Managing to Succeed.* Boca Raton: CRC.

Timm, A. & Fazlic, R., 2017. Das KIS der Zukunft. *Krankenhaus-IT,* Volume 02/2017, S. 10-12.

Trill, R., 2014. *Vom Schrauber zum Informationsnetzwerker - ein Paradigmenwechsel bei den Dienstleistungsprozessen in der Krankenhaus IT.* Wiesbaden: Springer Gabler.

Tucker, A. L., Heisler, W. S., Janisse & Laura, D., 2013. *Organizational Factors that Contribute to Operational Failures in Hospitals.* Harvard Business School.

Vogedes, A., 2011. *Ansatz eines Kapazitätsmanagement for die Erbringung von IT-Dienstleistungen*.

VUD Verband der Universitätsklinika Deutschlands, 2014. *Medizinischer Fortschritt braucht leistungsstarke IT-Lösungen. Road-Map des VUD for die Weiterentwicklung der IT-Infrastruktur*.

Wurth, A. P., 2018. Krankenhaus 4.0 - sind wir schon bereit?. *Krankenhaus-IT,* Volume 01, S. 75-76.

Zaczyk, S., 2018. IT-Servicemanagement: Praxisnutzen and Wirtschaftlichkeit verbessern - Entdeckungsreise zu neuem Potenzial. *Krankenhaus-IT,* Volume 01, S. 30-31.

Appendix

Catalogue contents **Management support services**
Area ICT services - Result-oriented service descriptions

Description of service	Service No	General description of the service	Included in the service	Not included in or otherwise defined services	Remarks / indications for healthcare (HC) Industry	Source(s)
ICT services	**2300**	Information and Communication Technology (ICT) services	ICT workplace services; medical-therapeutic-nursing business process application services (HIS); management application services	Medical informatics (-> medical core business); Maintenance of equipment (-> see 1160 et seq.); see also sub-services		
Service planning ICT services	**2300.01**	Setting objectives and defining success factors, and making preparations for performing services in the area of ICT services				Referring to The W. Edwards Deming Institute (n.d.) The PDSA Cycle
Management of ICT services assignments	**2300.02**	Organization and coordination of ICT services assignments	Acceptance of orders; clarification of specific order contents and requirements; coordination of order execution; information on order status; ensuring customer satisfaction			Referring to The W. Edwards Deming Institute (n.d.) The PDSA Cycle
ICT workplace services	**2360**	Company-wide provision of ICT for workplaces	Electronic workplace services; telephony / smart device services; device services			Referring to Kleiner (2013) IT Service Management - Aus der Praxis für die Praxis; Scholderer (2017) IT-Servicekatalog - Services in der IT professionell designen und erfolgreich implementieren [Original in German]
Electronic workplace services	**2361**	Company-wide provision of electronic workstations	Standard electronic workstation service (physical); Special electronic workstation Service (physical); Virtual workstation service; ICT user service (Login)			Referring to Kleiner (2013) IT Service Management - Aus der Praxis für die Praxis; Scholderer (2017) IT-Servicekatalog - Services in der IT professionell designen und erfolgreich implementieren [Original in German]
Standard electronic workstation services (physical)	**2361.10**	Provision of electronic standard workstation	Hardware: all tasks related to the lifecycle of thin clients/computers (desktop, notebook), peripherals (screen, keyboard, mouse), (W)LAN connections	Procurement (see 2550 et seq.); Warehousing (see 2490 et seq.); Disposal (see 1173.13); ICT User Service (Login) (see 2361.4)		Referring to Kleiner (2013) IT Service Management - Aus der Praxis für die Praxis [Original in German]; Scholderer (2017) IT-Servicekatalog - Services in der IT professionell designen und erfolgreich implementieren [Original in German]

(Source: Gerber & Kuchen, 2019, p. 49)

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Description of service	Service No	General description of the service	Included in the service	Not included in or otherwise defined services	Remarks / indications for healthcare (HC) Industry	Source(s)
Electronic special workplace services (physical)	**2361.20**	Provision of electronic special workstation	Hardware: all tasks related to the life cycle of the power station, docking station, special equipment, rental equipment, etc; Software: installation and configuration of software in connection with extended hardware, installation and configuration of special individual/optional standard applications; Network/system access: installation and configuration of remote access (RAS); Support: Special training courses	Procurement (see 2550 et seq.); Warehousing (see 2490 et seq.); Disposal (see 1173.13)		Referring to Kleiner (2013) IT Service Management - Aus der Praxis für die Praxis [Original in German]; Scholderer (2017) IT-Servicekatalog - Services in der IT professionell designen und erfolgreich implementieren [Original in German]
Virtual workplace services	**2361.30**	Provision of virtual workplace	Licensing for workstation, provision of necessary memory/CPU	IT user service (login) (see 2361.4)		Referring to Kleiner (2013) IT Service Management - Aus der Praxis für die Praxis [Original in German]; Scholderer (2017) IT-Servicekatalog - Services in der IT professionell designen und erfolgreich implementieren [Original in German]
ICT user services	**2361.40**	Provision of ICT users / login	Logon: setting up user account/ profile; Software: provision of the basic software required for operation, standard applications (Office products, e-mail/messaging, virus scanner, etc.) incl. licensing of the software; Network/system access (internal/ external): internet/intranet access, (printer) server access, storage access according to user profile; Support: User support, standard training			Referring to Kleiner (2013) IT Service Management - Aus der Praxis für die Praxis [Original in German]; Scholderer (2017) IT-Servicekatalog - Services in der IT professionell designen und erfolgreich implementieren [Original in German]

(Source: Gerber & Kuchen, 2019, p. 50)

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Description of service	Service No	General description of the service	Included in the service	Not included in or otherwise defined services	Remarks / indications for healthcare (HC) Industry	Source(s)
Telephony / Smart device services	**2362**	Provision of telephony and smart devices	Telephony service (physical + login)			Referring to Kleiner (2013) IT Service Management - Aus der Praxis für die Praxis [Original in German]; Scholderer (2017) IT-Servicekatalog - Services in der IT professionell designen und erfolgreich implementieren [Original in German]
Telephony services	**2362.10**	Provision of telephony (physical + login)	All tasks related to the lifecycle of fixed line, mobile smart tablet devices; Logon: set up user account/ profile; Support: user support, standard training	Procurement (see 2550 et seq.); Warehousing (see 2490 et seq.); Disposal (see 1173.13)		Referring to Kleiner (2013) IT Service Management - Aus der Praxis für die Praxis [Original in German]; Scholderer (2017) IT-Servicekatalog - Services in der IT professionell designen und erfolgreich implementieren [Original in German]
Device services	**2363**	Provision of devices	Multifunction device service; single station printer service			Referring to Kleiner (2013) IT Service Management - Aus der Praxis für die Praxis [Original in German]; Scholderer (2017) IT-Servicekatalog - Services in der IT professionell designen und erfolgreich implementieren [Original in German]
Multifunction device services	**2363.10**	Provision of multifunction devices	Hardware: All tasks related to the life cycle of multi-function software devices; Software: Installation + configuration of multifunction devices	Procurement (see 2550 et seq.); Warehousing (see 2490 et seq.); Disposal (see 1173.13)		Referring to Kleiner (2013) IT Service Management - Aus der Praxis für die Praxis [Original in German]; Scholderer (2017) IT-Servicekatalog - Services in der IT professionell designen und erfolgreich implementieren [Original in German]
Individual printer services	**2363.20**	Provision of single station printers	Hardware: all tasks related to the lifecycle of individual workplace printers; Network/system access: Configuration of print server access; Support: user support, standard training	Procurement (see 2550 et seq.); Warehousing (see 2490 et seq.); Disposal (see 1173.13)		Referring to Kleiner (2013) IT Service Management - Aus der Praxis für die Praxis [Original in German]; Scholderer (2017) IT-Servicekatalog - Services in der IT professionell designen und erfolgreich implementieren [Original in German]

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Description of service	Service No	General description of the service	Included in the service	Not included in or otherwise defined services	Remarks / indications for healthcare (HC) Industry	Source(s)
Other device services	**2363.30**	Provision of other devices	Hardware: all tasks related to the lifecycle of other devices; Network/system access: configuration of print server access; Support: user support, training	Building and medical technology (see 1160 et seq.) Operation & maintenance non-medical / medical / mobile fixed assets and outdoor areas; 1191 et seq. Operation & maintenance of immovable medical property, plant and equipment; 1192 Operation & maintenance of medical mobile property, plant and equipment)		
Medical business process application services (HIS)	**2370**	Provision of software applications and modules for medical, therapeutic and nursing business processes; Medical Information System	Patient dossier management and documentation application services; Diagnostic application services; Patient-related resource planning application services; Medical/ therapeutic/nursing decision support		ehealthsuisse, Competence and Coordination Office of the Confederation and Cantons; Swiss Academy of Medical Sciences; Swiss physicians FMH (2013) Legal foundations in everyday medical practice; Swiss Confederation (2015) Patient rights and patient participation in Switzerland	Referring to Dugas (2017) Medizininformatik - Ein Kompendium für Studium und Praxis p. 109 ff [Original in German].; Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte [Original in German]; Winter et al. (2005) Krankenhausinformationssysteme. p. 552 et seq. [Original in German]
Patient dossier management & documentation application services	**2371**	Provision of software applications and modules for patient dossier management and documentation	Application services for patient admission; medical/therapeutic/ nursing treatment planning and documentation, and medical service recording and billing		ehealthsuisse, Competence and Coordination Office of the Confederation and Cantons; Swiss Academy of Medical Sciences; Swiss physicians FMH (2013) Legal foundations in everyday medical practice; Swiss Confederation (2015) Patient rights and patient participation in Switzerland	Referring to Dugas (2017) Medizininformatik - Ein Kompendium für Studium und Praxis p. 81 et seq. [Original in German]; Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte [Original in German]; Lehmann (2005) Handbuch der Medizinischen Informatik [Original in German]

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Description of service	Service No	General description of the service	Included in the service	Not included in or otherwise defined services	Remarks / indications for healthcare (HC) Industry	Source(s)
Patient admission module services	**2371.10**	Provision of software applications and modules within the scope of patient admissions				Referring to Dugas (2017) Medizininformatik - Ein Kompendium für Studium und Praxis p. 81 et seq. [Original in German]; Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte [Original in German]; Blobel (2005) Elektronische Patientenakte p. 564 et seq. [Original in German]
Medical/therapeutic/nursing treatment planning & documentation module services	**2371.20**	Provision of software applications and modules within the scope of medical, therapeutic and nursing treatment planning and documentation.	Documentation and archiving of medical/therapeutic/nursing patient data incl. treatment process, result, diagnosis, medication, nursing and laboratory data; surgical documentation			Referring to Dugas (2017) Medizininformatik - Ein Kompendium für Studium und Praxis [Original in German]; Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte [Original in German]; Zaiss et al. (2005) Medizinische Dokumentation, Terminologie und Linguistik p. 89 et seq. [Original in German]; Winter et al. (2005) Krankenhausinformationssysteme. p. 552 et seq. [Original in German]
Medical service recording for billing module services	**2371.30**	Provision of software applications and modules for medical service recording regarding the billing of the case				Referring to Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte [Original in German]; Ingenerf & Stausberg (2005) Klinische Arbeitsplatzsysteme. p. 640 et seq. [Original in German]

(Source: Gerber & Kuchen, 2019, p. 53)

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Description of service	Service No	General description of the service	Included in the service	Not included in or otherwise defined services	Remarks / indications for healthcare (HC) Industry	Source(s)
Diagnostic application services	**2372**	Provision of software applications and modules for (instrumental) diagnostics	Radiology Information System (RIS); Picture Archiving and Communication System (PACS); Laboratory Information System (LIS)		ehealthsuisse, Competence and Coordination Office of the Confederation and Cantons; Swiss Academy of Medical Sciences; Swiss Medical Association FMH (2013) Rechtliche Grundlagen im medizinischen Alltag; Swiss Confederation (2015) Patientenrechte und Patientenpartizipation in der Schweiz	
Radiology Information System (RIS)	**2372.10**	Provision of software applications and modules within the framework of radiological facilities	Processing of alphanumeric data in connection with radiological examinations and diagnostic reports			Referring to Dugas (2017) Medizininformatik - Ein Kompendium für Studium und Praxis p. 123, p. 129 et seq. [Original in German]; Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte [Original in German]; Ingenerf & Stausberg (2005) Klinische Arbeitsplatzsysteme. p. 640 et seq. [Original in German]
Picture Archiving & Communication System (PACS)	**2372.20**	Provision of software applications and modules for the management of imaging processes	All methods for generating image data, making them available in real time and archiving them digitally / image archiving and communication system			Referring to Czap (2013) Picture Archiving and Communication System (PACS); Dugas (2017) Medizininformatik - Ein Kompendium für Studium und Praxis p. 123, p. 129 et seq. [Original in German]; ehealthsuisse (n.d.) Patientendatenmanagementsysteme [Original in German]; Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte [Original in German]; Winter et al. (2005) Krankenhausinformationssysteme p. 573 f. [Original in German]

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Description of service	Service No	General description of the service	Included in the service	Not included in or otherwise defined services	Remarks / indications for healthcare (HC) Industry	Source(s)
Laboratory Information System (LIS)	**2372.30**	Provision of software applications and modules for laboratory diagnostics	Laboratory tests based on clinical matters incl. sampling, sample marking, sample transport, sample acceptance, sample identification, sample distribution, laboratory analysis, quality control, validation, report transmission, interpretation, billing			Referring to Dugas (2017) Medizininformatik - Ein Kompendium für Studium und Praxis p. 123, p. 133 et seq. [Original in German]; Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte [Original in German]; Winter et al. (2005) Krankenhausinformationssysteme p. 574 f. [Original in German]
Patient-related resource planning application services	**2373**	Provision of software applications and modules for patient-related resources	Service recording in nursing (LEP); bed scheduling / occupancy management; patient scheduling application service; treatment room planning application service	Procurement (see 2550); warehouse (see 2490),		Referring to Dugas (2017) Medizininformatik - Ein Kompendium für Studium und Praxis p. 119 et seq. [Original in German]; Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte p. 568 f. [Original in German]
Service Entry in Nursing (LEP) module services	**2373.10**	Provision of software applications and modules for the recording of services in maintenance				Referring to Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte; Lehmann (2005) Handbuch der Medizinischen Informatik
Bed scheduling / occupancy management module services	**2373.20**	Provision of software applications and modules for the disposition of beds and for the management of their occupancy	Overview of bed occupancy and associated transfer functions			Referring to Dugas (2017) Medizininformatik - Ein Kompendium für Studium und Praxis p. 119 [Original in German]; Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte p. 455, p. 630 [Original in German]
Patient scheduling module services	**2373.30**	Provision of software applications and modules for patient scheduling				Referring to Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte. p. 455, p. 630 [Original in German]; Lehmann (2005) Handbuch der Medizinischen Informatik [Original in German]

(Source: Gerber & Kuchen, 2019, p. 55)

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Description of service	Service No	General description of the service	Included in the service	Not included in or otherwise defined services	Remarks / indications for healthcare (HC) Industry	Source(s)
Treatment room planning module services	**2373.40**	Provision of software applications and modules for planning treatment rooms		Space management (see 1420)		Referring to Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte. p. 455, p. 630 [Original in German]; Lehmann (2005) Handbuch der Medizinischen Informatik [Original in German]
Device planning module services	**2373.50**	Provision of software applications and modules for planning devices		Maintenance of equipment (see 1160)		Referring to Dugas (2017) Medizininformatik - Ein Kompendium für Studium und Praxis p. 119 et seq. [Original in German]; Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte p. 455, p. 630 [Original in German]
Pharmacy system	**2373.60**	Provision of software applications and modules for the pharmacy		Internal ordering of medical supplies and services (see 2550.93); operational procurement of medical supplies and pharmaceuticals (see 2551.11); tactical procurement of medical supplies and pharmaceuticals (see 2552.11)		Referring to Dugas (2017) Medizininformatik - Ein Kompendium für Studium und Praxis. p. 120 et seq. [Original in German]; Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte; Lehmann (2005) Handbuch der Medizinischen Informatik [Original in German]
Medical / therapeutic / nursing decision support application services	**2374**	Provision of software applications and modules for medical / therapeutic / nursing decision support	Medical, therapeutic, nursing decision support		ehealthsuisse, Competence and Coordination Office of the Confederation and Cantons; Swiss Academy of Medical Sciences; Swiss Medical Association FMH (2013) Rechtliche Grundlagen im medizinischen Alltag; Swiss Confederation (2015) Patientenrechte und Patientenpartizipation in der Schweiz	Referring to Dugas (2017) Medizininformatik - Ein Kompendium für Studium und Praxis p. 209 et seq. [Original in German]

(Source: Gerber & Kuchen, 2019, p. 56)

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Medical decision support module services	**2374.10**	Provision of software applications and modules for medical decision support				Referring to Dugas (2017) Medizinformatik - Ein Kompendium für Studium und Praxis. p. 209 et seq. [Original in German]; Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte; Lehmann (2005) Handbuch der Medizinischen Informatik [Original in German]
Therapeutic decision support module services	**2374.20**	Provision of software applications and modules for therapeutic decision support				Referring to Dugas (2017) Medizinformatik - Ein Kompendium für Studium und Praxis. p. 209 et seq. [Original in German]; Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte; Lehmann (2005) Handbuch der Medizinischen Informatik [Original in German]
Nursing decision support module services	**2374.30**	Provision of software applications and modules for nursing decision support				Referring to Dugas (2017) Medizinformatik - Ein Kompendium für Studium und Praxis. p. 209 et seq. [Original in German]; Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte; Lehmann (2005) Handbuch der Medizinischen Informatik [Original in German]
Non-medical management & support application services	**2380**	Provision of software applications and modules for software applications and modules for the strategic management of a hospital	Applications and modules for medical and non-medical sustainability management; quality management; risk management; identity management; resource/sourcing management; asset/portfolio management; ICT management; management information system; enterprise resource planning application services			
Strategic management decision support applications services	**2381**	Provision of software applications and modules for strategic information generation and processing for management	Business economic-strategic and medical-therapeutic-nursing-strategic management decision support			Referring to Laudon et al. (2016) Wirtschaftsinformatik - Eine Einführung [Original in German]

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Business economic strategic management decision support module services	**2381.10**	Provision of software applications and modules for the non-medical-strategic management of a hospital	Applications and modules for non-medical sustainability management; quality management; risk management; identity management; resource/sourcing strategy; asset/portfolio management; IT management; management information system MIS; decision support systems EUS/ Decision Support Systems DSS; management support systems FUS / Executive Support Systems ESS			Referring to Gabriel (2016) Managementinformationssystem [Original in German]; Laudon et al. (2016) Wirtschaftsinformatik - Eine Einführung p. 410 et seq., p. 718 et seq. [Original in German]
Medical-therapeutic-nursing-strategic management decision support module services	**2381.20**	Provision of software applications and modules for the medical-therapeutic-nursing-strategic management of a hospital; planning, monitoring, control and evaluation of medical and nursing treatments on a strategic level	Applications and modules for medical sustainability management; quality management; risk management; identity management; resource/sourcing strategy; asset/portfolio management; ICT management			Referring to Haas (2005) Medizinische Informationssysteme und Elektronische Krankenakte p. 549 [Original in German]
Enterprise Resource Planning application services (ERP)	**2382**	Provision of software applications and modules in the areas of finance & controlling, human resources / HRM, legal advice, marketing & communication, secretariat/administration, ICT services management, logistics, infrastructure, hygiene, safety & security, hotel business and project (portfolio) management.	Module services for Finance & Controlling; HRM; legal; communication & marketing; administration; ICT service management; logistics; infrastructure management; Safety & Security; hygiene; Hotel business; Project Management			Referring to Dugas (2017) Medizinformatik - Ein Kompendium für Studium und Praxis p. 120 [Original in German]; Gabriel (2016) Planungssystem [Original in German]; Gronau (2018) Enterprise Resource Planning [Original in German]; Laudon et al. (2016) Wirtscahftsinformatik - Eine Einführung p. 450 et seq. [Original in German]; Winkelmann (2013) Enterprise Resrouce Planning [Original in German]
Finance & Controlling module services	**2382.01**	Provision of software applications and modules in the area of Finance and Controlling (see 2510 et seq.)	Medical and non-medical finance			Referring to Dugas (2017) Medizinformatik - Ein Kompendium für Studium und Praxis p. 122 [Original in German]; Laudon et al. (2016) Wirtschaftsinformatik - Eine Einführung p. 416 f., p. 620 [Original in German]

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Human Resources module services	**2382.02**	Provision of software applications and modules in the area of Human Resources/HRM (see 2520 et seq.)				Referring to Dugas (2017) Medizinformatik - Ein Kompendium für Studium und Praxis p. 122; Laudon et al. (2016) Wirtschaftsinformatik - Eine Einführung p. 417 f., p. 620
Legal advice & contract management module services	**2382.03**	Provision of software applications and modules in the area of legal advice (see 2530 et seq.)				Referring to GEFMA 400 (2013) Computer Aided Facility Management CAFM - Begriffsbestimmungen, Leistungsmerkmale [Original in German]
Marketing & Communication module services	**2382.04**	Provision of software applications and modules in the area of Marketing & Communication (see 2544 et seq.).	CRM			Referring to Dugas (2017) Medizinformatik - Ein Kompendium für Studium und Praxis p. 120 et seq. [Original in German]; Laudon et al. (2016) Wirtschaftsinformatik - Eine Einführung p. 421, p. 620 [Original in German]
Secretariat module services	**2382.05**	Provision of software applications and modules in the secretariat/ administration area (see 2560 et seq.)	Standard commercial software			
ICT service management module services	**2382.06**	Provision of software applications and modules in the area of ICT service management (see 2300 et seq.)	Support of business processes and functions through ICT			Referring to Tsarnekov (2012) Management von IT-Dienstleistungen [Original in German]

(Source: Gerber & Kuchen, 2019, p. 59)

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Logistics administration module services	**2382.07**	Provision of software applications and modules in the area of logistics	Software applications and modules in the areas of procurement medical + non-medical incl. pharmacy (see 2550 et seq.); supplier management; warehousing (see 2490 et seq.); transport (see 2590 et seq.); disposal & recycling (see 1170 et seq.)			Referring to Dugas (2017) Medizininformatik - Ein Kompendium für Studium und Praxis p. 120 et seq. [Original in German]; GEFMA 400:2013 Computer Aided Facility Management CAFM - Begriffsbestimmungen, Leistungsmerkmale; Koch et al. (2013) CAFM-Software und CAFM-Systeme p. 251 - 267 [Original in German]; Laudon et al. (2016) Wirtschaftsinformatik - Eine Einführung p. 420, S. 620 [Original in German]; Marchionini et al. (2013) Zum Verhältnis von Facility Management und CAFM p. 5 - 8 [Original in German]
Infrastructure management module services	**2382.08**	Provision of software applications and modules in the area of infrastructure	Software applications and modules in the areas of maintenance (see 1410 et seq., 1990.10 et seq, 1200 et seq.); land management (see 1420 et seq. 1100 et seq., 1140 et seq., 1400); energy (see 1170 et seq.)			Referring to Dugas (2017) Medizininformatik - Ein Kompendium für Studium und Praxis p. 122 [Original in German]; GEFMA 400:2013 Computer Aided Facility Management CAFM - Begriffsbestimmungen, Leistungsmerkmale p. 1 - 2 [Original in German]; Koch et al. (2013) CAFM-Software und CAFM-Systeme p. 251 - 267; Marchionini et al. (2013) Zum Verhältnis von Facility Management und CAFM p. 5 - 8 [Original in German]
Safety & Security management module services	**2382.09**	Provision of software applications and modules in the area of Safety & Security	Software applications and modules in the area of safety & security (see 2110 et seq., 2120 et seq.)			Referring to GEFMA 400:2013 Computer Aided Facility Management CAFM - Begriffsbestimmungen, Leistungsmerkmale [Original in German]; Marchionini et al. (2013) Zum Verhältnis von Facility Management und CAFM p. 5 - 8 [Original in German]

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Hygiene management module services	**2382.10**	Provision of software applications and modules in the area of z	Software applications and modules in the areas of cleaning; disinfection (see 1300 et seq.); reprocessing of medical devices (see 1390.91)			Referring to GEFMA 400:2013 Computer Aided Facility Management CAFM - Begriffsbestimmungen, Leistungsmerkmale [Original in German]; Koch et al. (2013) CAFM-Software und CAFM-Systeme p. 251 - 267 [Original in German]; Marchionini et al. (2013) Zum Verhältnis von Facility Management und CAFM p. 5 - 8 [Original in German]
Hotel business module services	**2382.11**	Provision of software applications and modules in the area of hotel business	Software applications and modules in the areas of catering (see 2219 et seq.); textiles (2240 et seq.); accommodation management/operation of properties (see 2290); various hotel services (see 2200 et seq.)			Referring to Dugas (2017) Medizinformatik - Ein Kompendium für Studium und Praxis p. 120 et seq. [Original in German]
Project management module services	**2382.12**	Provision of software applications and modules in project and project portfolio management	Software applications and modules for planning and controlling projects (project structuring, change management, risk management, milestone planning, project budget, project controlling/reporting)			Referring to Morgroth (n.d.) Projektmanagement-Werkzeug [Original in German]
Billing for ICT services	**2300.10**	Billing and internal or external invoicing of services rendered in the area of ICT services				Referring to The W. Edwards Deming Institute (n.d.) The PDSA Cycle
Quality management of ICT services	**2300.20**	Implementation of the quality management strategy in the area of ICT	Quality inspection; quality assurance / improvement; measures to achieve quality objectives; maintaining quality documentation			Referring to The W. Edwards Deming Institute (n.d.) The PDSA Cycle
Quality inspection of ICT services	**2300.21**	Monitoring the results, structures and processes in the area of ICT and examining them with regard to development and success, or problems and need for improvement	Quality audits			Referring to The W. Edwards Deming Institute (n.d.) The PDSA Cycle

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Quality assurance / need for adjustments to ICT services	**2300.22**	Integrating findings from quality testing in the form of target or method adjustments and/or extending the learning improvement cycle in the area of ICT				Referring to The W. Edwards Deming Institute (n.d.) The PDSA Cycle

(Source: Gerber & Kuchen, 2019, p. 62)