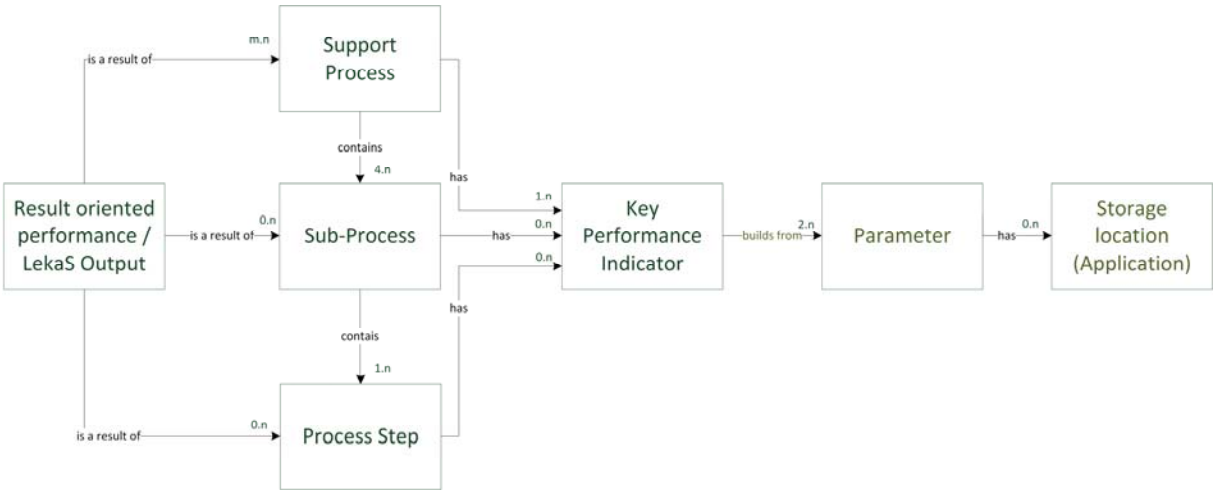
RemoS – Reference Model for Non-medical Support Services in Hospitals

based on LekaS

Version 1.0 – based on German original



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Abstract

The introduction of the diagnosis-related groups/Swiss DRG causes amongst other things a greater demand for transparency, including in non-medical support services [FM] in hospitals. In order to meet this, it is necessary to have a systematic way of measuring and comparing services in order to come up with specific controlling measures when required. So that the key performance indicators can be collected in a correct and comparable manner, it is first necessary to have a common definition of the underlying processes and second, a clarification where and which key performance indicator parameter is generated/stored. To reduce the complexity of the variety of non-medical support services and processes, and to make the connections easily apparent, the goal was to develop a suitable and adaptive reference model. In collaboration with four hospitals and three business partners, the present reference model for non-medical support services in hospitals [RemoS] was developed using the consortium research approach during numerous expert meetings on the basis of the entity relationship method. The model shows the connections between the result-oriented performance taken from the Service Catalogue for Non-medical Support Services in Hospitals [LekaS], the underlying processes, the associated key performance indicators (parameters) and the corresponding software applications. All the corresponding subareas and their detailed documentation are referenced to: the key performance catalogue KenkaS, the process model PromoS and the application catalogue ApplikaS as well as the Guideline for the Application of SAP for Facility Management in Healthcare LesapS and the Assessment, Simulation and Benchmarking Tool for Facility Management in Healthcare. All topics mentioned were separately documented in detail, are linked with each other and can be downloaded and thus applied under www.zhaw.ch/ifm/fm-healthcare/remos.

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List of Abbreviations

ApplikaS	Application Catalogue for Non-medical Support Services in Hospitals [German: Applikationskatalog für nicht-medizinische Supportleistungen in Spitälern]
ASBT-FM	Assessment, Simulation and Benchmarking Tool for Facility Management in Healthcare [German: Assessment-, Simulations- und Benchmarking-Tool für das Facility Management im Gesundheitswesen]
DRG	Diagnosis- Related Group
FM in HC	Facility Management in Healthcare
IFM	Institute of Facility Management
KenkaS	Key Performance Catalogue for Non-medical Support Services in Hospitals [German: Kennzahlenkatalog für nicht-medizinische Supportleistungen in Spitälern]
LekaS	Service Catalogue for Non-medical Support Services in Hospitals [German: Leistungskatalog für nicht-medizinische Supportleitungen in Spitälern]
LemoS	Service Allocation Model for Non-medical Support Services in Hospitals [German: Leistungszuordnungsmodell für nicht-medizinische Supportleitungen in Spitälern]
LesapS	Guidelines for applying SAP for the Facility Management in Healthcare [German: Leitfaden zum Einsatz von SAP für das Facility Management in Healthcare]
PromoS	Process Model for Non-medical Support Services in Hospitals [German: Prozessmodell für nicht-medizinische Supportleistungen in Spitälern]
RemoS	Reference Model for non-medical support services in Hospitals [German: Referenzmodell für nicht-medizinische Supportleistungen in Spitälern]
ZHAW	Zurich University of Applied Sciences [German: Zürcher Hochschule für Angewandte Wissenschaften]

1. Introduction

To start with, the project will be introduced: what was the starting position, the objective and the value proposition of the project, what was the methodology, which topics were not covered and how is the document connected to other subprojects.

1.1. Starting Position

Since the introduction of the diagnosis-related Group/SwissDRG at the latest, the need for more transparency in the non-medical support services in hospitals [FM in HC] has arisen. Before, different independent FM in HC subject areas had been researched like, for example, logistics (Walther, 2005), maintenance (Shohet & Lavy, 2004), or single questions such as allocation of costs (Abel, 2009). Up until now, a view considering the complex interconnections between the subject areas had been lacking.

1.2. Objective

The goal was, therefore, to develop a reference model which enables the topics

- Key Performance Indicators
- Processes
- Applications

to be shown in a comprehensive, interlinked and for all subject areas according to LekaS - the Service Catalogue for Non-medical Support Services in Hospitals – depicted in Figure 1 alike.

The development of the reference model is an integral part which serves as the basis for the comprehensive project “Development of an IT-supported assessment tool and a corresponding implementation manual for relevant Facility Management process application in hospitals on the basis of an adaptive reference model”. The goal of the whole project was to firstly show the connections between non-medical (partial) processes, key performance indicators (parameters) and their storage application in order to define them as a general standard for Swiss Healthcare. Secondly, a customer and user-friendly solution in the form of an IT-supported assessment tool including an introduction manual had to be developed on that basis so that FM in HC can be analyzed systematically and options for action to remove potential weaknesses can be identified and discussed.

1.3. Benefit / Application

With the knowledge gained, it is now possible to reduce complexity, depict connections and to show interdependencies. With this, a comprehensive overview and foundations are available to make transparent the internal connections between single subject areas and the services provided, to identify cost drivers as well as synergy potential and to minimize possible wastage. For the review of the key performance indicator application in the business, an IT-supported assessment tool is available (cf. ASBT-FM, Möller et al., 2017). For strategic discussions and decisions, objective data can be used and used to form compelling arguments. By the means of the standardized definitions, it becomes possible to make comparisons with other hospitals and thus to conduct benchmarking.

1.4. Methodology

As a conceptual basis in the context of FM in HC, all areas of the Catalogue for Non-medical Support Systems in Hospitals [LekaS] (Gerber & Läuppi, 2015) were applied. The context is depicted in Figure 1. For the modelling, the generally accepted modelling principles according to Becker et al. (2012) and Schütte (1998) were followed.

Figure 1: LemoS 3.0 (Gerber, 2016)

The empirical research was conducted with and for practice in the context of the applied sciences on the basis of consortial research according to Österle und Otto (2009 & 2010) (cf. Figure 2). During the whole period of the project “Development of an IT-supported assessment tool and a corresponding implementation manual for relevant Facility Management process application in hospitals on the basis of an adaptive reference model” of almost three years, four Swiss hospitals, three business partners and two institutes from the ZHAW were intensively involved in its development.

The scientific principles of Design Science Research according to Hevner et al. (2004), Peffers et al. (2007), Vaishnavi and Kuechler (2008), Hevner and Chatterjee (2010) and Dresch et al. (2015) were applied, as summarized in Figure 3. The development of and the evaluation were done by expert interviews according to Meuser and Nagel (2009), Liebold and Trinczek (2009) and Gläser and Laudel (2009).

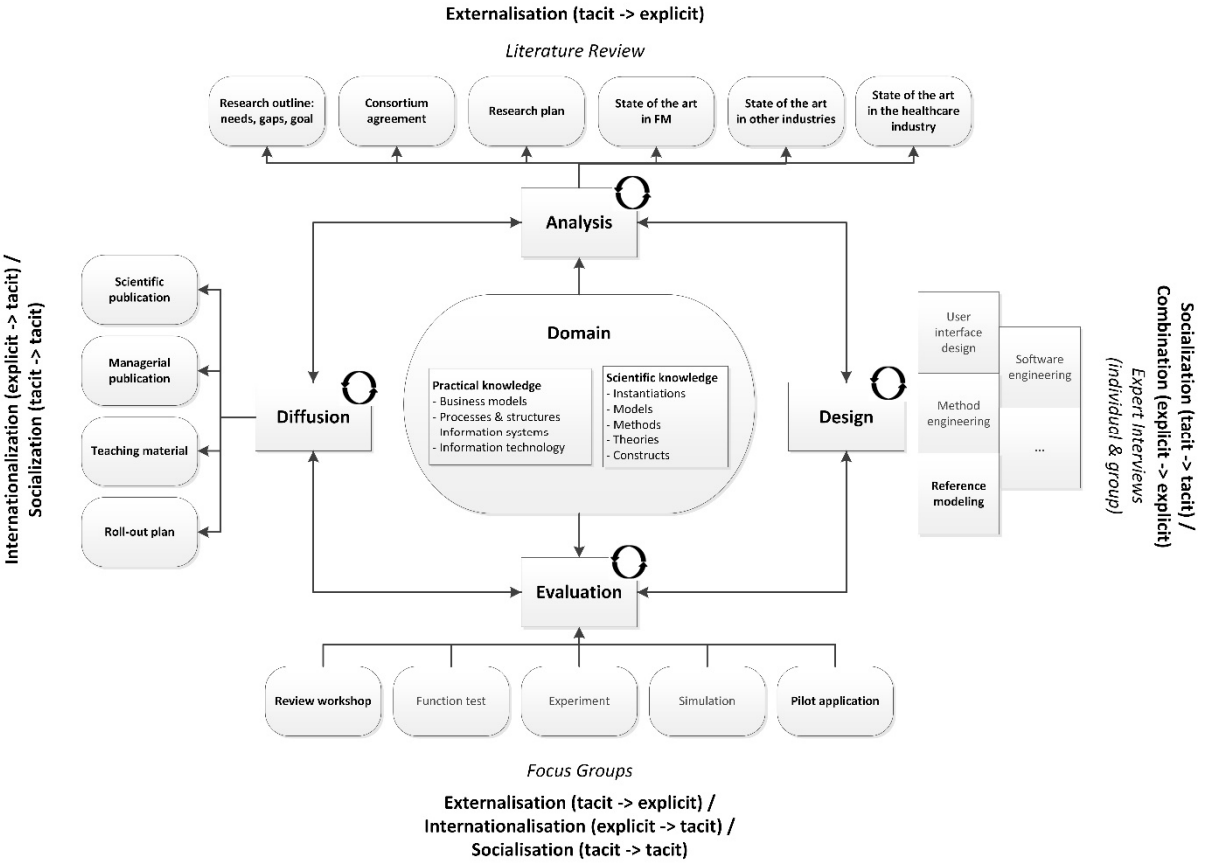

Figure 2: Consortium research approach (based on Österle & Otto, 2009)

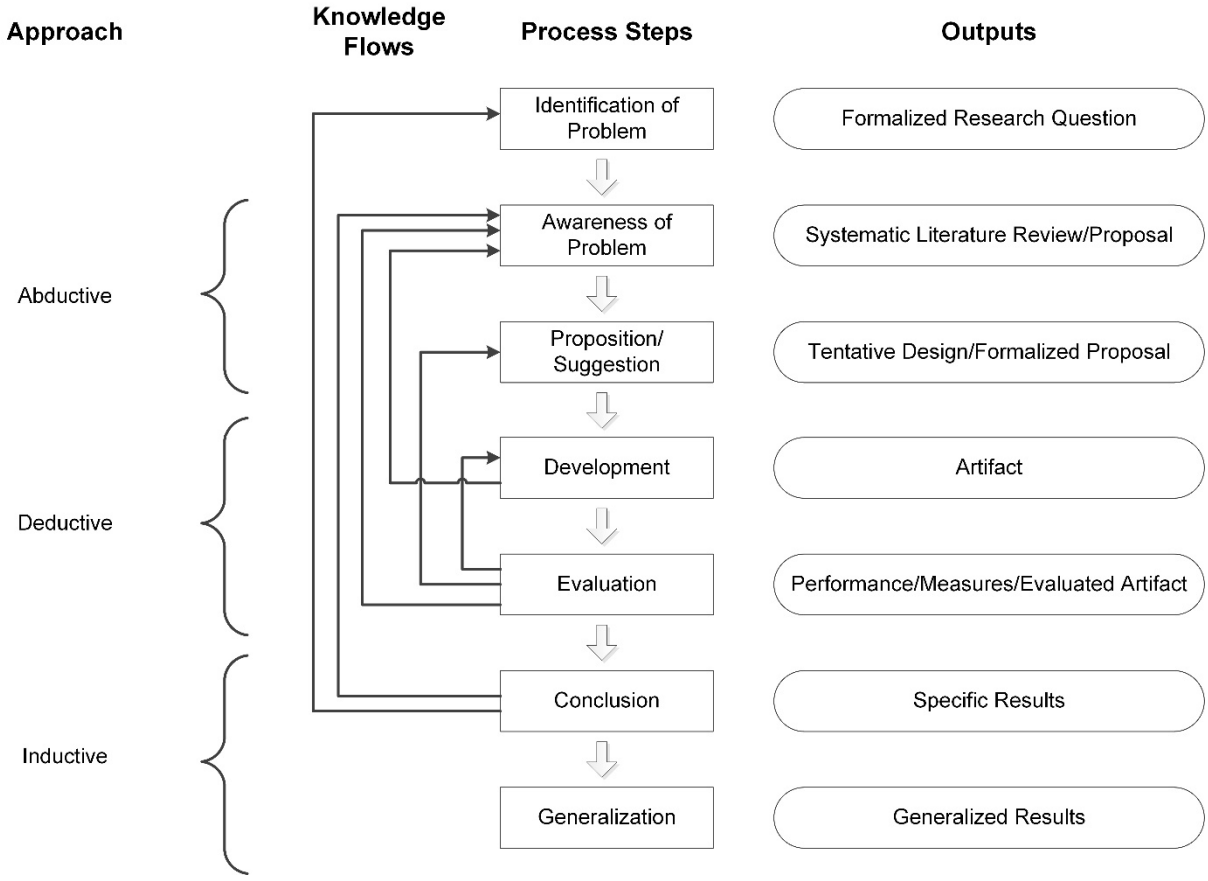

Figure 3: Generalized method of Design Science Research (based on Vaishnavi & Kuechler, 2008 and Dresch et al., 2015)

1.5. Delimitation

A full validation of the model will only be possible once it is being widely applied in practice.

1.6. Links / Connections with other topics

The reference model presented, RemoS, shows the connections between the following aspects which will be covered in greater detail in a modular manner in the respective publications:

- **KenkaS – Key Performance Catalogue for Non-medical Support Services in Hospitals** (Gerber et al., 2016c)
- **PromoS – Process Model for Non-medical Support Services in Hospitals** (Gerber et al., 2016b)
- **ApplikaS – Application Catalogue for Non-medical Support Services in Hospitals** (Gerber et al., 2016a)

In addition, RemoS is the basis for the documents

- **ASBT-FM - Assessment, Simulation and Benchmarking-Tool for the Facility Management in Hospitals** (Möller et al., 2017)
- **LesapS – Guideline for applying SAP for the Facility Management in Healthcare** (Weigele et al., 2017)

All documents are based on the result-oriented performance descriptions of **LekaS, the Service Catalogue for Non-medical Support Services in Hospitals** (Gerber & Läuppi, 2015).

All publications can be downloaded for application at:
www.zhaw.ch/ifm/fm-healthcare/remos.

1.7. Outlook

The reference model will be applied as a basis for systematically demonstrating further interconnections between non-medical support services and to initiate (research) projects relevant for practice.

2. Theory in relation to (Reference) Modelling

For an understanding of the terminology used in the development of the reference model, this chapter explains on the basis of the literature the terms (adaptive) reference model and modelling languages, as well as the generally accepted modelling principles.

2.1. Reference models

The word **model** originates from the Italian word. ‚modello' (pattern, example). A model

- is a simplified, abstracted illustration of reality or a section of it
- should result in a reduction of complexity by using a restricted set of key variables
- should serve a specific question or task
- is constructed for a specific purpose depending on a modelling goal or use context (model of what, for whom, when, for what)

(Becker et al., 2012; Delfmann, 2006; DIN-Fachbericht 80:2000; Goeken, 2003; Haux et al., 1998; Kruse, 1996; Scheer, 2002; Stachowiak, 1983; vom Brocke, 2003; cf. chapter models in PromoS, Gerber et al., 2016c und KenkaS, Gerber et al., 2016e)

The word **reference** means both, “recommendation” and “relationship” in Latin. A reference model

- is a model with recommendatory character, which is referred to
- should be reusable and adaptable and should thus potentially save cost
- should have a link to a business sector and/or represent practical knowledge of a specific context
- can be developed from theoretical or practical knowhow
- interrelates content and/or models to each other
- can have an actual or a target character

(Braun et al. 2007; Delfmann, 2006; DIN-Fachbericht 50:1996; DIN-Fachbericht 80:2000; Fettke & vom Brocke, 2013; Kruse, 1996; Scheer, 2002; Schmincke, 1997; Thomas, 2006; vom Brocke, 2003; Winter et al., n.d.)

An **adaptive reference model** is, according to Delfmann (2006), when a reference model can be (re)used for different usage context.

2.2. Modelling languages

A modelling language

- is an artificial language
- can be textual or graphical
- can be informal, semi-formal or formal
- enables the description of a situation within a subject field in a diagrammatic form
- should be intuitively understandable for different stakeholder groups
- should serve to bring clarity to complexity

(Delfmann, 2006; Schlieter, 2012.; Becker et al. 2012; Herrler, 2007; Bartsch, 2010; cf. chapter modelling languages in PromoS, Gerber et al., 2016c und KenkaS, Gerber et al., 2016e)

2.3 Generally accepted modelling principles

In order to increase the quality of the developed models, the established “Generally accepted modelling principles” by Becker et al. (2000), Schütte (1998) and Rosemann (1996) were applied.

They are:

- **Principle of correctness:**
  A model is syntactically correct when it is complete, correct and consistent according to the underlying meta-model. Semantic correctness means that it is free of contradictions and up-to-date.
- **Principle of relevance:**
  All necessary aspects of the real world are usefully represented in the model and all aspects from the model also appear in the real world.
- **Principle of economic efficiency:**
  It should be ensured that the model has no irrelevant aspects and that the time taken to create the model is in proportion to its use.
- **Principle of clarity:**
  The model should be understandable, clear and descriptive.
- **Principle of comparability:**
  Connected models should be harmonious and free of discrepancy and should be transferrable into one another if needed
- **Principle of systematic structure:**
  Different model views have to be designed to be capable of integration

(cf. chapter Generally accepted modelling principles in PromoS, Gerber et al., 2016c and KenkaS, Gerber et al., 2016e)

As models are developed out of specific perspectives, the extent to which they are appropriate has to be decided on a case by case basis.
(cf. chapter 3.3 Provisional validation of the model).

3. RemoS – Reference model for non-medical support services in hospitals Version 1.0

RemoS – the Reference model for non-medical support services in hospitals is illustrated in Figure 4. In this chapter, the steps taken and the principles of the creation chosen as well as the content of the model will be explained. In addition, a provisional validation is performed.

3.1 Choice of the modelling language

In order to represent the topics of key performance indicators, processes, applications and LekaS services referred to in chapter 1.2 in an interconnected and coherent manner, the Entity Relationship Method according to Chen (1976) was chosen.

3.2 Connections within the reference model

The reference model RemoS depicted in Figure 4 consists of the following aspects:

In LekaS, the Service catalogue for non-medical support services in hospitals (Gerber & Läuppi, 2015), the services carried out are described in a results-oriented manner. These services are the result of the underlying processes. A described **result-oriented LekaS performance / LekaS output** can

- appear in several support processes and in one support process there are several LekaS-performances
- have a definition of a Sub-Process, but not mandatorily
- have a definition of a Process Step, but not mandatorily

Every **Supporting Process**

- consists of at least four Sub-Processes (Plan, Do, Study, Act); Details see PromoS, Gerber et al., 2016c), but it can show an undefined number of them
- has at lest one key performance indicator in KenkaS – Key performance catalogue for non-medical support services in hospitals (Gerber et al., 2016e), but it can show many more of them

Every **Sub-Process**

- consists of at least one process step (details see PromoS, Gerber et al., 2016c), but it can show many more of them
- has none to an undefined number of key performance indicators in KenkaS – Key performance catalogue for non-medical support services in hospitals (Gerber et al., 2016e)

Every **Process Step**

- has none to an undefined number of key performance indicators in KenkaS – Key performance catalogue for non-medical support services in hospitals (Gerber et al., 2016e)

Every **Key Performance Indicator**

- consists of at least two parameters (otherwise it is “only” a number, see chapter Theory in connection with key performance indicators and key performance indicator modelling in KenkaS (Gerber et al., 2016e)

Every **Parameter**

- doesn’t have to be recorded but can be recorded an undefined number of times in a software application (remark: ideal would be once, all other variants show room for optimization in the software architecture cf. ApplikaS – Application catalogue for non-medical support services in hospitals (Gerber et al., 2016b)

3.3 Provisional validation of the model

As explained in chapter 1.5, currently only a provisional validation of the model according to the generally accepted modelling principles can be undertaken.

Developing the model in conjunction with real life practice guarantees that the principle of relevance and the principle of syntactical correctness are maintained. The project team believes that the principle of clarity, systematic structure, semantic correctness and comparability are also adhered to (see the connections in KenkaS, Gerber et al., 2016e; PromoS, Gerber et al. 2016c, ApplikaS, Gerber et al., 2016b), but it has to be reassessed following introduction into practice. Whether the principle of economic efficiency applies depends on how often the model will be implemented in practice and this evaluation can only be conducted later on.

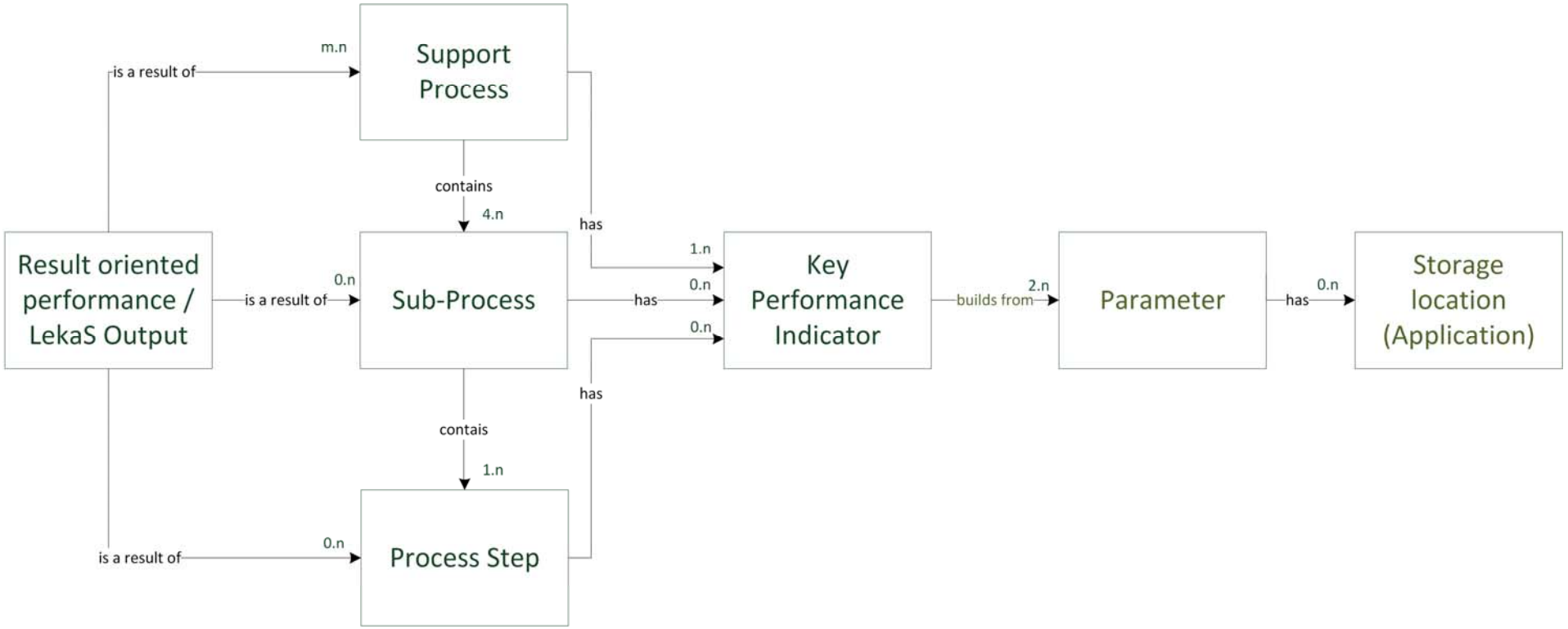

Figure 4: Reference model for non-medical support services in hospitals [RemoS]

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