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TM^3 - A Modularization Method For Telemedical Services: Design And Evaluation

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TM³ - A MODULARIZATION METHOD FOR TELEMEDICAL SERVICES: DESIGN AND EVALUATION

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Abstract

The paper presents a method (TeleMedicine Modularization Method: TM³) that enables telemedicine providers to modularize their services in order to offer customer-centric and tailored telemedicine services (TMS). Modularization which inherits potential benefits such as reuse, faster development, module-wide innovation and rapid reconfiguration is supposed to become crucial for successful service delivery in the heterogeneous, fast growing and highly specific telemedicine market. This complex environment is characterized by the challenge of integrating IT as well as non-IT and highly person-oriented service parts. Based on a case study informed set of criteria, this design science paper introduces the five-phase TM³. Here, the phases of (1) status capturing , (2) decomposition and (3) matrix generation, (4) interface specification and (5) testing as well as its according activities and artifacts are presented. The method is then evaluated using a) application in use and b) a criteria-based evaluation. The paper contributes to theory with the design and evaluation of a novel modularization method (MM) which is suitable for TMS. By presenting TM³, we also extend the body of knowledge in regards to method engineering and support practitioners in providing tailored service offerings to a steadily increasing number of telemedicine stakeholders.

Keywords: modularization, method, telemedicine, services.

1 Introduction

Telemedicine is the provision of medical services over geographic distances through the use of information and communication technology (DGTelemed, 2011). The global market for such telemedicine services (TMS) is expected to grow from $9.8 billion in 2010 to $23 billion in 2015 (BCC Research, 2011). TMS comprise a very heterogeneous market ranging from TMS, e.g. defibrillators that capture and transfer the patients' heart beat data in order to enable physicians to monitor the patients' heart functions remotely and to trigger alarm functions automatically, to teleconsultation services which enable experts to guide other physicians through the conduction of medical procedures, e.g. in telestroke units (Peters and Menschner, 2012).

TMS providers face the challenge to deliver their services in a fast growing market in which not only the pace and technical advancements represent challenges. It is also about the flexibility to provide customer-centric, "tailored" services to a heterogeneous range of customers. When trying to cope with these challenges, it is of importance to consider the characteristics of TMS: they include IT parts as well as non-IT parts, even highly person-oriented parts, per definition. In such a complex environment, modularization is supposed to enable TMS providers to manage and (re-) configure their service offerings within their overall service portfolio. As each patient's need is slightly different, resulting from different life situations, state of disease, insurance coverage, etc. (Menschner, Prinz, Koene, Köbler, Altmann, Krcmar and Leimeister, 2011), modularization offers the possibility to mass customize individual offerings, allowing individually configured ("tailored") service offerings and optimal treatment at reasonable cost, because all but only the patient-relevant modules are integrated.

Modularity is "a special form of design" that rests upon the basic principles of cohesion and loose coupling (Sanchez and Mahoney, 1996). Cohesion describes the extent of intra-module dependencies. A high cohesion is a requirement for well-specified modules that can be reused and combined with other service modules. Loose coupling means that there are only few inter-module dependencies between the elements of the different modules. So, loose coupling directs to the independence of the modules. Modules are connected by interfaces which have to be specified appropriately, too. In a TMS context, this means that coming from a process-perspective, several processes can be combined to one module while then all together make up one service offering.

The concept of modularization has been successfully applied for years in production contexts, e.g. the automotive sector or modular architectures of product portfolios (Ulrich, 1995). In this paper, we deal with the modularization of services which we define as "(a set of) activities being part of interactions between the components of service systems" (Leimeister, 2012). Common potentials of service modularization (Schermann, Böhmann, Prilla, Herrmann and Krcmar, 2012) are manifold: reuse – the repeated use of one specific module within different services; faster development – the increase of overall development speed through higher manageability due to smaller objects of consideration (the modules) that have defined interfaces; module-wide innovation – the possibility to concentrate innovation efforts within one strategically important module that is supposed to provide competitive advantages; rapid reconfiguration – the efficient (re-) configuration of modules enables a customer-centric service provision in a mass customization manner. As current research lacks in providing guidance on the systematic modularization of services and to assist TMS providers in leveraging these potentials, a method is developed that allows for exactly such a systematic step-by-step modularization. According to Brinkkemper (1996), a method provides a detailed prescription of how to perform a collection of activities. The term method is closely related to method engineering (Brinkkemper, 1996). Here, method refers to a particular procedure for attaining something (Odell, 1996). A method is hence a process that is planned and systematic in terms of its mean and purpose (Braun, Wortmann, Hafner and Winter, 2005). This understanding needs also be applied for modularization methods (MMs). Characteristic features of methods are goal-orientation (here the modularization of a TMS), a systematic approach (here the clear separation of activities in five phases with dedicated resulting artifacts) and repeatability.

2 Related Work

The principle of modularization has been applied for 100 years in industry-related fields such as the automotive industry, aircraft construction, consumer electronics, and in the manufacturing of personal computers (Burr, 2004). Although many authors have dealt with service modularization already (Bask, Lipponen, Rajahonka and Tinnilä, 2010; de Blok, Luijkx, Meijboom and Schols, 2010; Tuunanen and Cassab, 2011; Voss and Hsuan, 2009) and the concept and effects of service modularization have been elicited (Dörbecker and Böhmann, 2013), it can be seen that the systematic modularization in form of MMs is very rarely applied to the field of services.

Still, we could identify a set of MM dealing with services. Looking from a service system perspective, two of them deal with IT (IT) as well as non-IT (S) services (Böttcher, Becker and Klingner, 2011; Burr, 2002). Other works focus on modularization especially in the context of IT services. Böhmann and Krcmar (2005) have created a systematic approach for the development of modular service architectures in the context of IT. Their approach was subsequently further developed and formalized to the so-called SCORE-method by Böhmann, Langer and Schermann (2009). Sarkar et al.'s (2009) modularization approach applied to a large-scale banking application. A meaningful re-modularization of software systems was generated by Bavota et al. (2010). Corsten and Gössinger (2007) created a method for the modularization of logistic services that relies on the analysis of process dependencies. When considering phase coverage and taking the 5-phases of TM³ as the benchmark, it can be stated that many MM miss to have a dedicated testing phase. In terms of method granularity most MM clearly describe its phases and according activities.

Regarding MM for TMS, it can be concluded that there is still a lack of any MM that also integrate person-oriented services, which is crucial for TMS as these are the services originated in the traditional medical service provision performed by physicians or nurses. Often, these are important parts of the overall TMS offering representing the most trust-building and value-creating ones. It is up to this paper to also address these TMS-specific needs in an adequate manner.

3 Research Design & Method Criteria

The research in this paper is guided by the questions how TMS can be modularized in a systematic way and whether the newly developed method is suitable to enable the modularization of TMS. The research activities in this paper can be characterized as design science research and follow the typical structure of "building" and "evaluating" an artifact (Hevner, March and Park, 2004). This kind of research was chosen and deemed appropriate because "at its core, design science is directed toward understanding and improving the search among potential components in order to construct an artifact that is intended to solve a problem" (Baskerville, 2008). The artifact of this paper is the TM³.

In order to create a MM for TMS that suits current demands and needs at the provider's side, two case studies were conducted comprising four interviews and the intensive study of product documentations and provider brochures. The interviews were conducted at leading German TMS providers in 2012 and comprised interview partners from both, top management and employees. These case studies revealed the following main challenges for TMS providers that we try to break down into criteria that assess TM³'s suitability. They are also used for the criteria-based evaluation of TM³ in section 6.

- Multi-stakeholder perspective: The method needs to able to clearly integrate several stakeholders as this is characteristic for the TMS environment.
- Expansion of the TMS market: The forecasted growth for TMS is realized via a broader orientation along the value chain and by new customers, e.g. within the secondary health market. The arising requirements are supposed to be customer integration capabilities and the methods possible extension to completely new TMS stakeholders.

- More patients with different needs: The demographic change was mentioned many times throughout the case study. This will not only increase the number of future TMS customers, but also their heterogeneity and diverse needs. That calls for the handling of customizable solutions that can be easily extended, esp. when it comes to multi-disease patients.
- Cost pressure and high competition: The TMS market might rise, but still this requires a new level of flexibility in order to be successful in such a competitive setting. The methods needs to reflect this in providing information about how to form basic (standard) modules which are used in most TMS and realize economies of scale to large extents as well as it needs to provide insights on which service parts stand for typical optional / add-on modules.

4 The Method and its Phases

The TM³ enables telemedicine providers to modularize their services in order to offer customer-centric and tailored TMS. It consists of five phases: (1) status capturing, (2) decomposition and (3) matrix generation, (4) interface specification and (5) testing. For all of these phases, the main activities as well as the resulting artifacts are illustrated in Figure 1 and explained in the subsequent sections.

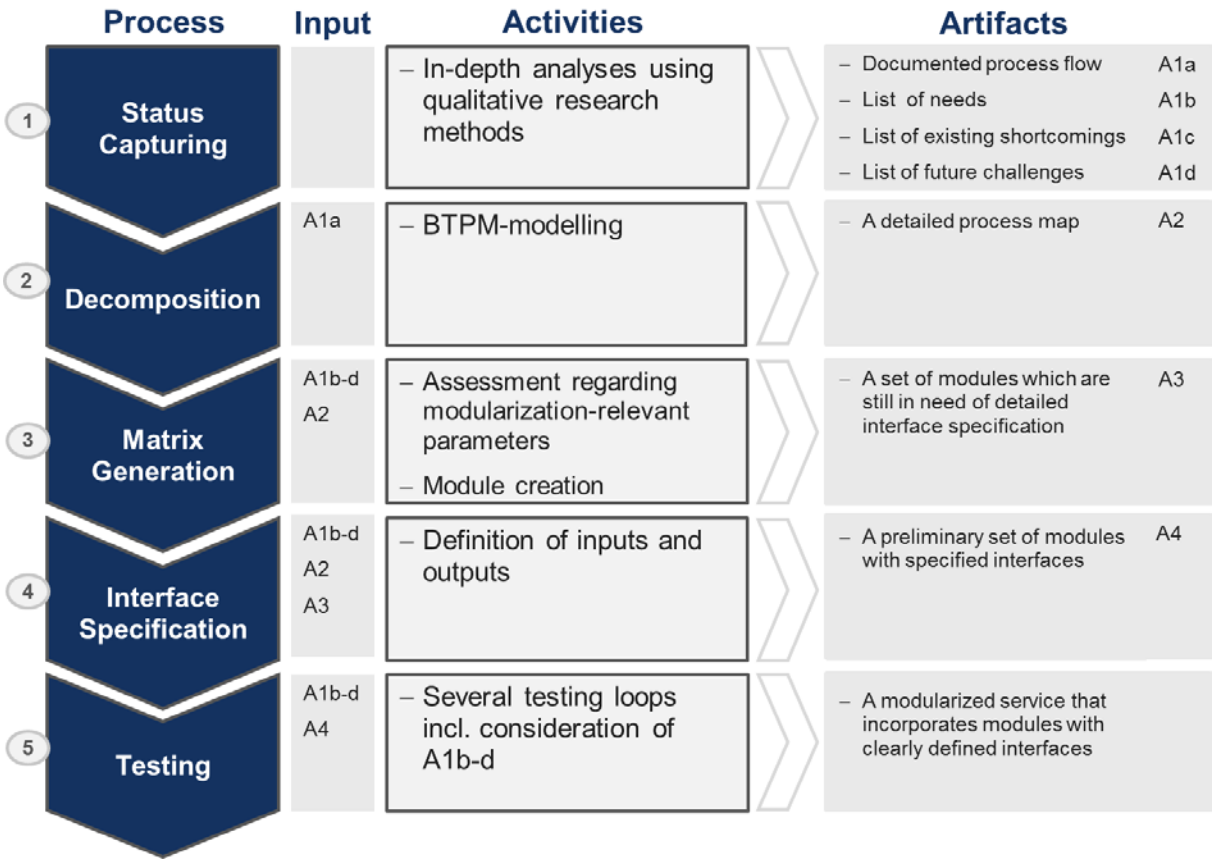

Figure 1: Overview of TM³ with its according phases, activities and resulting artifacts

4.1 Phase 1: Status Capturing

The method's start is all about getting a detailed picture of the object of modularization, i.e. the TMS that is about to be modularized. This is in line with Dubberly et al. (2008) who state that any design or engineering process starts with observations and investigation of the initial situation. We therefore

perform in-depth analyses which are based on common qualitative research methods such as case studies, interviews, observations, questionnaires, document analyses, etc. (Miles and Huberman, 1994) and which focus on the process flow of the service. Also, already-known weaknesses and challenges as well as specific needs for each stakeholder can be captured here.

As resulting artifacts, phase 1 delivers a documented process (flow) in either written or spoken form which also considers the process' stakeholders (A1a) and a set of lists that provide details on needs (A1b), existing shortcomings in the current processes (A1c) and challenges that can be anticipated by the stakeholders already (A1d).

4.2 Phase 2: Decomposition

Here, artifact 1a, the documented process flow, is used to decompose the service to a granularity stage which consists of processes only. This is formalized and visualized using the Blueprint-driven Telemedical Process Modelling (BTPM) language which was especially developed for TMS and is already applied in several TMS settings (Peters and Leimeister, 2013). Inspired by Business Service Blueprinting Modeling (BSBM) (Meis, Menschner and Leimeister, 2010), it is based on Business Process Model and Notation (BPMN) elements, but also integrates the service blueprinting idea that allows to model the TMS stakeholders' interactions transparently. Thus, it can be applied easily as BPMN is commonly known and is enriched by service elements which explicitly consider the person-oriented parts of the service as important. The BPMN-typical pools are used for the according stakeholders and with the help of the lanes, the front- and backstage activities can be represented for the according stakeholder's pool. Thereby, the relevant lines of the service blueprinting approach (Shostack, 1984), e.g. the line of interaction (between the pools) and the line of visibility (between the lanes of a pool), can be represented. Also, BTPM integrates a specific device-lane at the patient's side in order to clearly locate the event here, but to emphasize that no patient-triggered action happened (think of an implanted defibrillator that sends the patient's vital data for monitoring purposes 24/7 automatically). All these features will be of high importance in the next two phases as they enable an adeqaute and comprehensive representation of TMS from a process perspective and give insights about potential TMS module candidates and (re-) configurations and their interfaces.

Phase 2 delivers one artifact which is a detailed process map of the service (A2). It is modeled with BTPM.

4.3 Phase 3: Matrix Generation

The phase of matrix generation builds on the artifacts A1b-d and A2 and decides on where modularization makes sense (resulting in the extent of modularization) and which processes are combined for module formation (resulting in the modules and their boundaries). It is crucial to understand that modularity or the extent of modularization, i.e. the measure on how much of the overall service is finally modular, might not be 100% for most services. The reason for this lies in the fact that there is continuum between a fully integrated and a fully modularized service (Gershenson, Prasad and Zhang, 2004), thus modularity is always a relative measure.

Modularization efforts always need to be dependent on its costs and benefits. While modularization reduces the module-internal complexity, it also increases dependencies between processes which cause higher needs for communication and coordination as well as resource constraints and costs accordingly (Schantin, 2004). This trade-off needs to be taken into account. It is also reflected in the choice of the service provider in making modules be part of basic or mandatory modules of a service offering guaranteeing the main functionalities, or whether the module is defined as optional add-on.

From a granularity perspective, modules can be considered an aggregation of one or more processes (granularity level of the second phase after decomposition). As this method focuses on the

modularization of one service, a service has the lowest granularity level within the scope of this paper while processes have the highest granularity level considered.

Taking the process map of phase 2, this allows a step-by-step or process-by-process assessment of modularization-relevant parameters. The parameters for TM³ are derived from (Peters and Menschner, 2012; Schantin, 2004) and are as follows.

- Geographical specificity:

  There are processes that require a certain surrounding and others taking place in different locations. Non-virtual processes that are closer (in a geographical sense) might be important to consider here. The pools and especially lanes of the process map provide indicators here.

- Device-specificity:

  Some processes are coupled to a certain device. If so, modularization which is performed in awareness of device specificity tries to avoid frequent media breaks.

- Time-critical path dependencies:

  All processes within paths that run in parallel and are merged later on need to be checked whether they inherit critical time constraints which have crucial effects on the after-merge processes.

- Know-how specificity:

  There are processes which require a high knowledge and know-how which is closely related to the person's educational background performing it. An example for a process with a high know-how specificity is a surgery.

- IT-support / (semi-) automation:

  Here, a check for potential IT-support and (semi-) automation is performed. This is important when it comes to cost reduction purposes. All parts which are not value-creating, but can be considered commodity highly qualify here. The BTPM line of visibility is an indicator for potential qualifiers.

- Personal encounter / customer integration:

  In TMS, many services integrate person-to-person parts; many of these personal encounters make up a high fraction of value-creating moments. Stakeholders, especially customers, can be integrated in the service provision. According to (Glushko, 2009), there are different levels of integration; the highest one being a self-service setting.

Based on this assessment dependency matrices can be drawn which inform the building of modules and their size. As described above a module is characterized by a high cohesion, i.e. strong intra-module ties, and loose coupling, i.e. low inter-module dependencies. Taking the example of geographical specificity and assuming that it would be the sole modularization parameter, this would mean that processes that take place at the same location qualify to be included in the same module. Of course (as geographical specificity is only one of many parameters), the other parameters have to be considered as well. Depending on the method's application context, a weighted consideration of the different parameters makes sense.

As artifact, phase 3 delivers a proposed set of modules (A3) which are still in need of detailed interface specification.

4.4 Phase 4: Interface Specification

The proposed set of modules (A3), a set of lists that provide details on needs (A1b), existing shortcomings in the current processes (A1c) and challenges that can be anticipated already by the

stakeholders (A1d) as well as the BTPM-modeled process map (A2) serve as inputs for this phase. The main goal of this phase is the interface specification of modules which themselves then show a black box character, i.e. they have defined inputs and outputs, but their internal functionalities and activities do not need to be evident to outsiders.

A main challenge here is the different level of interface specification clarity for different service modules. While modules that are "only" technical can have standardized and widely accepted formats for interfaces, e.g. in the form of protocols, the efforts for the precise specification of interfaces for person-oriented service modules are supposed to be higher. Precise in this case correlates with measurability of inputs and outputs.

A preliminary set of modules with specified interfaces (A4) is the artifact of the fourth phase.

4.5 Phase 5: Testing

The final phase of the method runs testing loops for the service with the preliminary set of modules with specified interfaces (A4). It thereby checks (a) whether the modularized service works properly and (b) whether it works efficiently, i.e. better (faster, cheaper), than without modularization.

In this phase the artifacts from phase 1 are also considered when the method is evaluated regarding its potential to address the needs (A1b) and existing shortcomings (A1c) as well as to master the anticipated future challenges (A1d). Phases 3-5 might be iterated as long as no satisfactory results are attained. If this is the case, the results of phase 5 are used as additional and considerable inputs for phases 4 and 5.

The artifact of phase 5 and the overall TM³ outcome is a modularized service that incorporates modules with clearly defined interfaces

5 Method Application

The method was successfully applied. We use a TMS in the field of telemedical blood pressure management and now show the method's applicability phase by phase.

5.1 Status Capturing

The status of the service is captured using interviews and observations at the TMS provider's side. In this case, the service provider gets the monitoring devices from an outside manufacturer and is in direct contact with the patient as the service consumer. The service payment is settled by the health insurance company. The overall service can be separated into seven major steps, namely: patient education / clarification, provision of device, data measurement and transmission, data analysis and adjustment decision, patient contact and adjustment, end of treatment and the final billing of the service.

5.2 Decomposition

The process flow is then formalized and visualized using BTPM. Thus, the whole service is decomposed into its processes. This results in a process map that cannot be shown on such a page. That's why only an exemplary part of it, the patient contact and adjustment, is visualized in Figure 2.

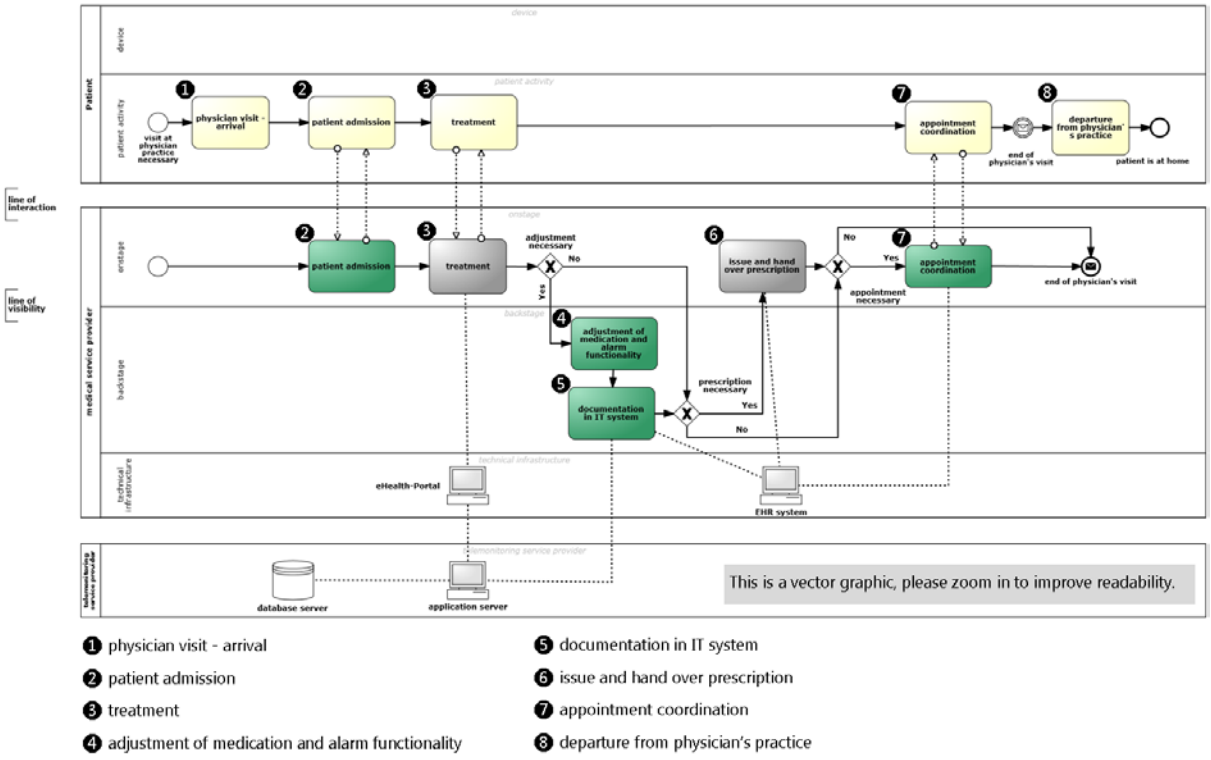

Figure 2: Process map of the service-part "Patient contact and adjustment" modelled with BTPM

There are three pools with stakeholders and lanes within them accordingly, e.g. a patient activity lane and a device lane in the patient's pool as well as an onstage lane, a backstage lane and a technical infrastructure lane in the pool of the medical service provider. It can be seen that the line of interaction and the line of visibility at the left side of the process map and the colour-coding, e.g. for the medical service provider: physician activities are coded grey and nurse activities in dark green.

5.3 Matrix Generation

Performing a process-by-process analysis along the process map we decided to show the methods applicability by choosing and assessing a set of modularization-relevant parameters. For ease of explanation, only three parameters were chosen, namely geographic specificity, know-how-specificity and personal encounter. This is visualized in the dependency matrices in Figure 3 which always compare two processes (P1 – P8, please see the example outlined in section 5.2) and fill the according cell, e.g. P3 and P5 in the personal encounter dependency matrix, with the assessed value, e.g. change from person-to-person to person-to-IT encounter or vice versa. These parameters are assessed regarding their dependency. That is why "0" is chosen for same location / qualification / encounter as it represents no / lowest dependency.

The accumulated dependency matrix adds up all three matrices and represents the overall dependency between the processes 1-8 from our example "patient contact and adjustment". Because of the addition of matrices, low numbers in the cells of the accumulated matrix highly qualify two processes for a joint module as they represent the sum over all three dependency matrices. Here, the accumulated dependency matrix suggests forming modules out of P2 and P7, P3 and P6, P4 and P5 as well as P1 and P8. This set of modules is still in need for specified interfaces. We do not weight the parameters here.

Geographical specificity

	P1	P2	P3	P4	P5	P6	P7	P8
P1	0	3	3	3	3	3	3	0
P2	3	0	0	0	0	0	0	3
P3	3	0	0	0	0	0	0	3
P4	3	0	0	0	0	0	0	3
P5	3	0	0	0	0	0	0	3
P6	3	0	0	0	0	0	0	3
P7	3	0	0	0	0	0	0	3
P8	0	3	3	3	3	3	3	3

Legend
- 0 same location
- 1 other floor
- 2 other building
- 3 other suburb
- 4 other city

Know-how specificity

	P1	P2	P3	P4	P5	P6	P7	P8
P1	0	3	5	3	3	5	3	0
P2	3	0	3	0	0	3	0	3
P3	5	3	0	3	3	0	3	5
P4	3	0	3	0	0	3	3	3
P5	3	0	3	0	0	3	0	3
P6	5	3	0	3	3	0	3	5
P7	3	0	3	3	0	3	0	3
P8	0	3	5	3	3	5	3	0

Legend
- 0 same qualification
- 1 slight difference
- 3 medium difference
- 5 big difference

Personal encounter

	P1	P2	P3	P4	P5	P6	P7	P8
P1	0	1	1	1	1	1	1	0
P2	1	0	0	2	2	0	0	1
P3	1	0	0	2	2	0	0	1
P4	1	2	2	0	0	2	2	1
P5	1	2	2	0	0	2	2	1
P6	1	0	0	2	2	0	0	1
P7	1	0	0	2	2	0	0	1
P8	0	1	1	1	1	1	1	0

Legend
- 0 same encounter
- 1 change from no to personal encounter
- 2 change from person to IT or vice versa
- 3 change from p2p to fully automated

Accumulated dependency matrix

	P1	P2	P3	P4	P5	P6	P7	P8
P1	0	7	9	7	7	9	7	0
P2	7	0	3	2	2	3	0	7
P3	9	3	0	5	5	0	3	9
P4	7	2	5	0	0	5	5	7
P5	7	2	5	0	0	5	2	7
P6	9	3	0	5	5	0	3	9
P7	7	0	3	5	2	3	0	7
P8	0	7	9	7	7	9	7	3

Figure 3: Three dependency matrices of chosen modularity parameters and their accumulated dependency matrix

5.4 Interface Specification

When thinking of the interfaces, one has to look at the processes in detail. Regarding our module candidates, it is about: the check-up and the prescription by the physician (P3 and P6), the IT-wise documentation of the medication adjustment and the update of the patient's health record by the physician's assistance in the back-office (P4 and P5) and the patient's arrival at and departure from the physician's practice (P1 and P8). For the first module, the in- and outputs are clearly defined. The input is the patient and an empty prescription form, the output is a patient after check-up and a filled prescription form. Here, the black box character of a module can be shown perfectly. For all other processes, it is absolutely not important how the patient's check-up was exactly performed – the physician is considered to perform it adequately.

5.5 Testing

When testing the modularized service, the last identified module candidate cannot be proven correct / working. The patient's arrival at and departure from the location of the medical service provider is not to be included in one module in a reasonable manner. The reason for this incorrectly suggested module in this case is the non-consideration (for example purposes) of the parameter time-critical path dependencies within the accumulated dependency matrix. As an overall summary, the method clearly shows that it enables TMS providers to modularize their services. In our demonstrated part, the modularization extent of the original service setting is 50% (4 out of 8 processes modularized). Avoiding media breaks and having joint inputs and outputs the service after the method's application is a) working and b) supposed to work better than before.

6 Criteria-based Evaluation

The newly designed TM³ is not only evaluated by application in use as section 5 has shown. The suitability of the method is also proven by taking the criteria presented in section 3 for another evaluation cycle. This is in line with (Hevner, 2007).

- Multi-stakeholder perspective: The consideration of new stakeholders is part of TM³ through their integration within the in-depth analysis of phase 1; also the process map built in phase 2 fully integrates them as BTPM can be modularly extended for each and every new stakeholder.
- Expansion of the TMS market: TM³ realizes customer integrated again through the in-depth analysis of phase 1, but also by the considerations regarding the dedicated modularization parameter "personal encounter / customer integration" of phase 3 and by the interface specifications of phase 4 which builds on the BTPM-specific line of interaction of phase 2. The method's possible extension to new TMS stakeholders is outlined already.
- More patients with different needs: This is the core of TM³ - making TMS providers ready to deliver customer-centric, tailored service offerings. With the help of the dependency matrices of phase 3 and the interface specifications of phase 4, modularization takes place that is designed for this purpose.
- Cost pressure and high competition: Cost pressure and high competition call for the realization of economies of scale and intelligent and innovative solutions. Both characteristics are achieved with the application of TM³. On the one hand this method gives clear indicators for basic (standard) modules (assuming the analysis of more than one service by the TMS provider). As a result, efficient reuse of modules is realized. On the other hand module-wide innovation and fast development cycles foster new services that provide competitive advantages.

7 Limitations & Future Research

The TM³ is suitable to support TMS providers in their modularization efforts and goals by providing a systematic, five-phase cooking plan. Still, it has some limitations that need to be considered as they also provide valuable starting points for future research activities in the field of TMS modularization and MM for services. The method's focus is still one single TMS the provider is about to modularize. When thinking of following agendas, the modularization of whole service portfolios is supposed to strengthen the shown modularization benefits. This is especially true for the reuse of modules over a TMS provider's portfolio. In this context, one can also think of creating completely modularized service architectures with Service Oriented Architecture (SOA)-like and TMS-specific service repositories that integrate not only IT services, but also non-IT, person-oriented services. In this context, potential transferability, especially to other smart interactive services (Wünderlich, Wangenheim and Bitner, 2012), opens up an interesting area of future research. In this context, the role of TM³ for information system development as well as for new product and new service development needs to be assessed and its potential use as part of service engineering methods require further consideration (Menschner, Peters and Leimeister, 2011).

Also, only phase 2 is explicitly tool-supported as the BTPM process maps are created using a web-based modelling tool. Here, other phases might be adequately supported in the future as well. Another limitation arises through the space constraints of the paper, e.g. it was not possible to illustrate the whole process map of our exemplary service. We are convinced that the phenomenon known as modularity trap (Ernst, 2005), i.e. that such systematically established modular systems limit radical innovations, is not prevalent in MM for TMS (because of their specific, non-IT-exclusive nature) and in TM³, but this needs to be observed in consecutive research.

8 Conclusion and Expected Contribution

This paper presents the design and two-phase evaluation of TM³, a method which helps telemedicine providers to modularize their existing service offerings. Thus, they are able to increase their responsiveness in the fast-changing environment of TMS and respect and respond to the heterogeneity of their users and customers through individually "tailored" service offerings. The method is described with all its five phases, their according activities and resulting artifacts which then serve as inputs for following phases. The artifact's evaluation is conducted in a twofold manner: by application in use and criteria-based. As we could show through the design, application and evaluation of TM³, we not only extend the body of knowledge in regards to method engineering and support practitioners in providing individually tailored service offerings to their steadily growing customer base; we also show the method's suitability and resulting improvements and benefits at the provider's side. Our next steps are the application of TM³ in further TMS and its iterative refinement which we want to support with additional evaluation loops.

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