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Balancing Customer Requirements and IT Service Standardisation

A Procedural Reference Model for Individualised IT Service Agreement Configurations

IT service providers are increasingly urged to stringently align their service portfolio with the IT support of their customers' business processes. Consequently, both IT expenses and its strategic contribution to value creation are expected to become subject to heightened transparency. Yet, in order to allow for standardised on-demand service request processing within the meaning of IT industrialisation, these services appear too adapted to individual customer needs, particularly as they are subject to continuous changes in business requirements. In order to address this issue, a three-phase procedural model of IT service agreement configuration is introduced: IT services thus remain transformable and configurable via predefined complementary services which are selected by configuring a customer's individual service directory. In addition, the reutilisation of modular commitments in order to compose service specifications aims to maintain standardised IT operations. Serving as a procedural reference model, these configuration phases are introduced in detail regarding activities, roles, techniques and data structure as developed and implemented in Action Research cooperation with two IT providers.

1 Introduction

Professional IT literature repeatedly calls for the stringent alignment of the IT service portfolio with customer business processes (Nieminen and Auer 1998; OGC 2007a; Peppard 2003; Zarnekow et al. 2006). This allows for three highly problematic issues of the IT industry to be addressed: first, IT providers are able to avoid intensifying cost pressures as well as increasing comparability and exchangeability of IT providers in light of the commoditisation of IT (Carr 2003). For customers, the ability to quickly adapt service agreements to their permanently changing business process IT support requirements has become a decisive competitive factor. Second, as a result of the technical orientation of the provider's service commitments and agreements, discrepancies regarding service perception (Rands 1992) and quality (Trienekens et al. 2004; Zeithaml 1988) arise between the customer and the provider. These issues may be resolved by offering customer and business process supporting value propositions (Edvardsson and Olsson 1996) and by acknowledging the user as a co-producer (Vargo and Lusch 2004). Third, particularly in times of economic crisis, IT specialists seldom perceive IT as an adaptable cost pool while its value added for a customer's business often remains non-transparent (Appel et al. 2005; Keel et al. 2007). Business process oriented IT services would reveal the strategic value added of IT and would furthermore allow for transparent cost allocation (Drury 2000; Gomolski 2005; Heine 2006). Simultaneously, the IT industry's attention is increasingly drawn toward the industrialisation of IT service provisioning via efficient standardisation and automation (Zarnekow et al. 2006). By allowing for a demand-actuated, cost efficient, and automated service generation, offerings are aimed to be standardised and systematically structured in a predefined IT service catalogue. The objective is to offer IT services

which are business process oriented and at the same time standardised as well as cost efficient in request processing.

Current service portfolios of IT providers are, however, dominated by individual contracts for the provision of technical resources and personnel services. Services which are initially intended as standardised offers often require 'adaption beyond recognition' of commitments to be contracted (Hradilak 2007, p. 34). The bundling of application, storage, server, network, and client services to an integrated overall service, which is individualised according to the functional requirements of the customer, is only offered to a small extent (Keel et al. 2007). Thereby, the field of application is limited to highly generalised, uniform processes such as customer relationship management (e.g., salesforce.com, inc.).

Adopting Spohrer's (Spohrer et al. 2007) construct of *service systems* as 'dynamic configuration[s] of resources [that] create value' (Maglio et al. 2009), each service relationship between an IT provider and a customer organisation may be classified as such an ongoing service system. One of the primary reasons for the adoption of a resource oriented perspective when specifying IT service offers and agreements is the high degree of individuality of customer demands regarding service functions and service quality, which must moreover evolve in accordance with the continuously changing business environment. Thus, IT service provisioning for such dynamic service systems does not only require customised development procedures, but furthermore calls for continuous adaption. While changes in technical commitments are standardised and accounted for on the basis of personnel services and additional technical resources, business process oriented IT services lack the conceptual basis which would allow for reactions to individual customer requests in a standardised way.

This is the research gap addressed by the work at hand. It provides an approach by which the individualised, continuous adaption of commitments in functionality and performance in accordance with changing customer requirements can be implemented via standardised requests of complementary service propositions. The reutilisation of modulated commitments is furthermore supposed to support the continuation of standardised IT operational processes in case individual customer demands require the design of additional services.

After a short description of the research process, the idea of service 'productisation' as a conceptual basis for on-demand request processing of continuous service adjustments is introduced. Aiming for individualised solutions, Sect. 4 addresses the balance between service individualisation and standardised IT-operational processes by using a three-phase procedure model. The subsequent sections detail each of these phases especially in terms of activities and relevant data entity relationships. Section 8 positions this work relative to existing reference models within the field of IT service management, while Sect. 9 summarises the results and highlights areas for future research.

2 Research Process

The procedural model is deduced from Action Research in accordance with Susman and Evered (Susman and Evered 1978). It was conducted in cooperation with two German IT providers, one of which operates as a worldwide ICT provider while the second operates as an in-house IT provider for a corporation quoted on the German stock exchange (DAX). The objective of the projects was to develop and test ERP system prototypes for industrialised IT service management. One major research field consisted in the specification of a service offering, which on the one hand may be aligned with the customer's business processes and may be adapted according to individual customer requirements, but on the other hand also allows for standardised, on-demand service request processing. On the basis of several in-formal interviews and workshops, we

compiled prototypic service catalogues and service descriptions which comprise commitments as specified in existing customer service agreements. With the use of questionnaires the derived service specifications and arrangements were subject to iterative testing by the IT providers' employees, potential IT service purchasers and actual users of the IT support. Subsequently, approaches for service specification, agreement and arrangement were developed and the resulting procedure model was conjointly implemented with business representatives. The procedure follows the specification principles of Method Engineering (cf. Braun et al. 2005) in accordance with Heym (1993): accordingly, *techniques* facilitate *roles* in the execution of sequences of *activities*, which lead to specific *outcomes* (Gutzwiller 1994, pp. 11ff.). Serving as a generalised recommendation for structuring IT service agreement configuration processes, the developed procedure serves as a *reference model* (Fettke and Loos 2003; Rosemann and Aalst 2007).

3 Keeping Service Agreements Continuously Adjustable

In order to specifically align IT services to a customer's organisation and its IT requirements, many efforts are directed at customisation and the development of new, individual services (Kaitovaara and Hyötyläinen 2002; Salmi et al. 2008). Approaches within the field of Service Engineering (Mandelbaum 1999) address the definition and description of IT services in process models (Ramaswamy 1996; Scheuing and Johnson 1989). In order to serve different customer requirements using identical technical services, it has been suggested to modularise IT services according to infrastructure and resources and to reuse these modules (Bullinger et al. 2003). Acknowledging the importance of these topics, this article does not solely focus on the initial development process of new services, but rather takes the entire service lifecycle into account in order to balance standardisation and individual customer requirements. As 80% of the costs of IT providers are incurred in the operating or deployment phase of service provisions (Forrest and Brill 2008) the article aims to define configurable IT services in advance in order to enable on-demand request and provision processing.

In this context, the expression 'productisation' (Flamholtz 1995; Simula et al. 2008) was transferred to the service industry by specifying and cataloguing services in order to emphasise the similarities with tangible goods regarding potential systematic development, delivery, and marketing (Alajoutsijärvi et al. 2000). Such predefined services are fully declared in guaranteed functionality and performance – i.e., in *commitments*. IT service offers which are specified in the aforementioned fashion may be requested in a way similar to orders of industrial goods and until then only represent predefined propositions. These IT service offers are thus termed *IT service propositions*. Each request for a service proposition results in a customer-specific *IT service instance*.

We further distinguish between *core* and *complementary* service propositions. Core service propositions support the customer's business in one specific core process such as *Accounting*. Their commitments bundle technical service elements concerning server, storage, hosting, application, and network services. Depending on the business processes requiring IT support, the customer receives a variety of such core service propositions which are supplied for the duration of a long-term contract. The total number of requested service propositions over time – i.e., service instances – stands for the entered commitment situation and together represents the so called *service arrangement*.

Standardised core service propositions must comply with the customer's demands for flexibility and thus require the possibility to initially and continuously adapt the service system to the requirements of the customer's evolving business processes. The simultaneous strive for an optimisation of the IT organisation in particular

implies that the customer's continuous demand for adaption may be served using standardised procedures. More specifically, adaption requirements comprise two dimensions (cf. OGC 2007b, p. 17). On the one hand, it is crucial to ensure utility by entering adequate *functional* commitments. On the other hand, it is decisive to ensure warranty by committing appropriate *performance* parameters at the right time. In order to maintain the flexibility and adaptability of the aforementioned aspects and moreover enable standardised on-demand request processing, we propose to specify complementary service propositions, by which core service commitments may be adapted to suit specific customer requirements in terms of functionality and performance within a specific situation. The purpose of these complementary service propositions is to adjust and configure commitments of the actual service system throughout a core service's lifetime (cf. Brocke et al. 2010a).

By means of previously specifying core and complementary service propositions in parallel with IT-operational engineering and by allowing for optional availability upon request throughout the subsequent operating phase, the following effects are to be generated: (1) providing service receivers with a transparent illustration of their possibilities for the adaption of IT support, (2) standardising initial and continuous change request processes in both, customer interaction and service provision, and (3) making IT value contributions and IT expenses transparent to the customer.

4 Three Phases of Service Engagement Configuration

The productisation of service propositions allows for the individual configuration of service arrangements: by requesting standardised complementary service propositions the customer's business units are able to adapt currently committed functionality and/or quality parameters of a service system under standardised request processing. The phase of this continuous possibility for adaption is entitled *service arrangement configuration*. The configuration exclusively occurs within the scope of a previously agreed service directory.

However, the customer often demands additional possibilities for customisation: first, the service directory must specify, which core and complementary service propositions may be requested by the customer's business units within the scope of the service arrangement configuration. Thus, the directory must be subject to individual specifications by configuring which commitment properties are included in core service propositions, which may additionally be requested by declared complementary service propositions and which are excluded from the range of possible service requests. This is done in the preceding phase of *service directory configuration*.

Furthermore, new, emerging customer requirements call for the engineering and configuration of completely new variants of IT service propositions (Bullinger and Scheer 2006). This is done in two subsequent process parts. While the first one as the service design part is explained in its activity steps in (Brocke et al. 2010a), this work details the second part as its commitment description by *service variant group configuration:* in order to simultaneously ensure standardised IT-operational service provisions and short time-to-market of new service propositions, commitments, which were previously entered into in a different context, are modularised and reutilised. Adapting the basic characteristics of modularisation, individual service commitments must be self-contained, loosely coupled, and their relations amongst one another must be clearly defined (Wolters 2002). Therefore, service commitments need to be specified beyond the common extent: in addition to functionality issues, they must provide non-functional specifications regarding quality, point of service delivery, and duty to cooperate (O'Sullivan et al. 2002). Accordingly, three configurational phases can be identified, which are performed consecutively

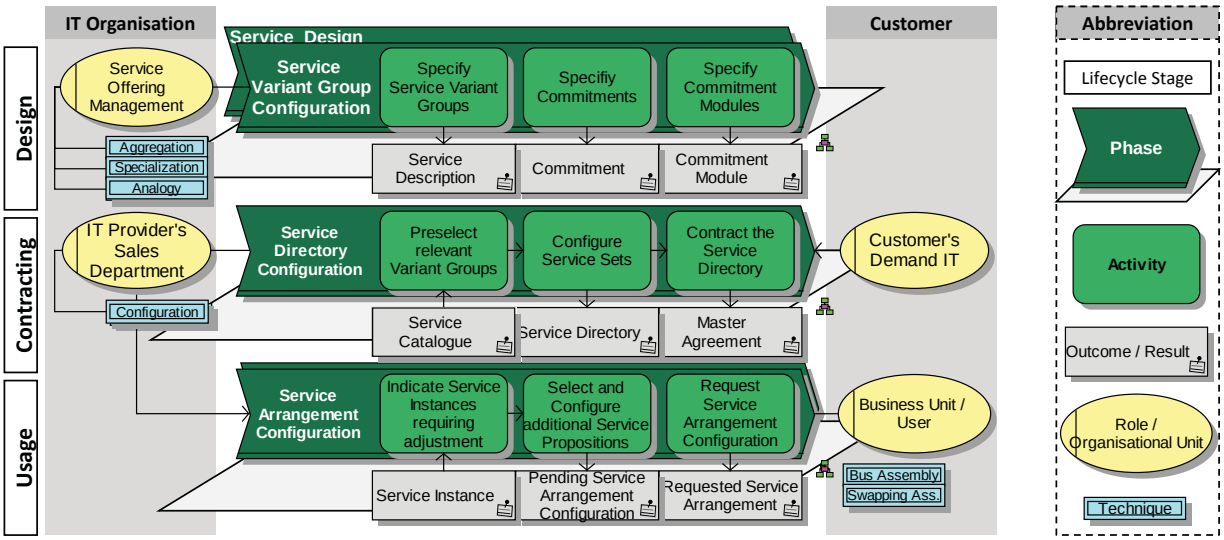

Figure 1: Three-phase configuration for the individualisation of service engagements

in order to comply with individual customer requirements as well as to maintain standardised IT operations. In each phase a specific IT service engagement (i.e., service variant group, service directory and service arrangement) is specified by means of configuration along the service lifecycle stages of Garschhammer et al. (2001b): *service design, service contracting*, and *service usage* (cf. Brocke et al. 2010b). Figure 1 illustrates the resulting procedural model of IT service agreement configuration. Each phase is subject to a more detailed discussion in one of the following sections by considering the elements of Method Engineering (cf. Gutzwiller 1994, pp. 11ff.): the phases consist of a set of activities each of which is described in one subsection in regard to their outcome, involved organisational units (i.e., roles) and techniques. Subsequently, each phase's 'meta model' (Gutzwiller 1994, p. 13), i.e., the conceptual data model (Braun et al. 2005) as the information model of the results (Winter and Schelp 2006) is introduced.

5 Service Variant Group Configuration

The IT provider's service offering consists of a number of service propositions whose specifications are preferably composed of already existing commitments and commitment modules. Thus, existing functions and performance properties are utilised as much as possible in order to enable repetitive procedures in IT operations. However, if customer requirements fundamentally differ from existing service propositions and are nevertheless to be fulfilled, new service propositions, additional variants, and commitment specifications may be specified by the IT provider's service offering managers. These activities are described in the following subsections.

5.1 Specify Service Variant Groups

In order to facilitate engineering tasks and shorten time-to-market of new service offers, existing commitments (i.e., declarations of guaranteed functionality and performance) should be reutilised to specify service propositions. Thus, service propositions are representing unique assemblies of commitments.

Given that a number of commitments may be utilised in order to specify a certain service offer, different combinations of these commitments will result in different variants of interrelated service propositions. Such variants of interdependent service proposition groups are called

service sets. The total number of declared variants of a certain service offer, originating from the same collection of commitments, is termed *variant group*.

The outcome of this activity is the specification of such variant groups by declaring possible variants - i.e., service sets. In other words, commitments suitable for the specification of a certain service offer are selected and those commitment combinations which appear promising are declared as possible sets of service propositions. As a result, the functional and non-functional properties of each of these predefined variants are fully specified and each variant may be engineered in IT-operational provisioning processes.

Two techniques support this activity of service variant group specification in regard to the reuse of commitments: specialisation and aggregation. Formally introduced by Brocke (2007) for adaptive reference modelling, these techniques may be adopted to this context as outlined by Brocke et al. (2010c). The aggregation technique supports the variant group specification by composing existing commitments without alteration. Additionally, the specialisation technique may be applied by detailing service properties and characteristic parameters in terms of predefined generic placeholders while retaining their existing commitment specification.

For example, Fig. 2 depicts the variant group 'Managed Workplace'. It predefines all possible service set variants that may be configured and named during subsequent configuration phases (as for example 'Extended' vs. 'Standard Workplace' in Fig. 2). Variant groups consist of combinations of commitments defined in restrictions regarding their possible configurations. IT providers may configure some exemplary service sets as introduced in Sect. 6.2 for proposing these in non-specific service catalogues.

5.2 Specific Commitments

The specification of service offers via aggregation of existent commitments may require the

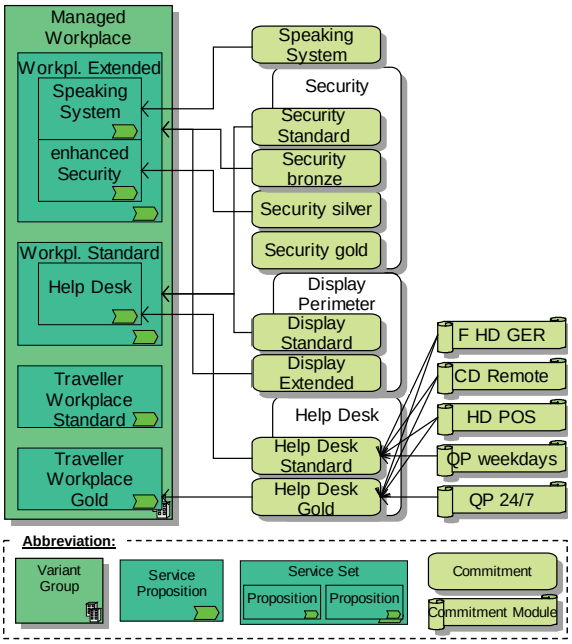

Figure 2: Examples of service propositions

specification of additional commitments if existing ones are insufficient to describe a new service's designated functional and non-functional properties. Commitments are exclusively composed of several commitment modules each of which describes a particular commitment aspect. As the aim is to provide commitments which are self-contained and thus frequently reusable within different contexts, such commitment aspects range from a commitment's functional properties, quality criteria and their measurement method, to service transfer points, the customer's duty to cooperate and technical information (cf. Brocke et al. 2009). Thus, commitments are specified via aggregation of interrelated commitment module variants.

For example, Fig. 2 shows two commitment variants 'Help Desk Standard' vs. 'Gold'. These are compiled by referring to several commitment modules whereby interdependencies restrict possible combinations. When choosing German as the help desk language, interdependencies determine that quality parameters are restricted to the possible choice of 'Help Desk weekdays' whereas support in English is also available 24/7.

5.3 Specify Commitment Modules

New commitment modules need to be specified if a desired commitment cannot be derived with the use of existing modules. Aiming for independence from temporal technical implementation policies and IT-operational procedures, commitment module specifications should only focus on aspects which are relevant from a user's point of view and descriptions should be easily comprehensible (cf. Brocke et al. 2009). In order to facilitate the activity of module specification, the analogy technique (Brocke 2007, p. 66) for adaptive reference modelling may be used as explained by Brocke et al. (2010c) in order to specify modules which bear similar characteristics to others.

When specifying a new module, it has to be allocated to a certain module type. Thus, at the point of commitment aggregation, it can be guaranteed that modules have been selected from all types necessary in order to specify a self-contained commitment. Predefined relationships and interdependencies between commitment modules allow for a consistency check of commitment compilations. Therefore, commitment modules may be defined as univalent or multivalent. Multivalence allows several commitment modules of the same type to be subsumed in one specific commitment.

Returning to our previous example of quality parameters as variants of commitment modules in Fig. 2, the two commitment modules 'weekdays' vs. '24/7' of the type 'quality parameter' represent alternatives and thus a choice needs to be made between the two. This choice is multivalent as additional commitment modules of the type 'quality parameter' may be subsumed in a commitment.

5.4 Data Model

The activities described in the previous subsections result in assemblies of *commitments* which, in turn, consist of *commitment modules*. The according entities and their relationships are modeled in Fig. 3 in the style of reference data structures for complex variant formation by Scheer (1994, p. 116).

An assembly of one core service proposition and various complementary service propositions makes up a *service set*, which may be offered in a *service catalogue*. Each *service proposition* is defined in terms of its *commitments* in regard to committed *functionality* and *performance* as well as its *parameters* to be entered by the customer. A *range of possible parameter values* may limit the *parameters'* characteristics. *Commitments* consist of a number of *commitment modules* of certain *types* such as quality parameters, and points of service transfer. The assembly of *commitment modules* is restricted by *dependencies*. The same is true for the aggregation of *commitments*, which results in *variant groups*. *Variant groups* specify variety in service set configuration by way of specifying for each of their assigned *commitments*, whether these commitments are mandatory, complementary, exclusive or multivalent for the configuration of possible *service sets*.

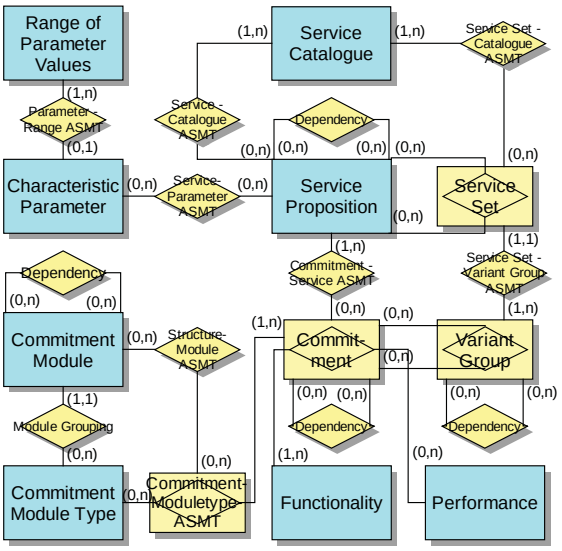

Figure 3: Data structure of commitment configuration [eERM]

6 Service Directory Configuration

In the procedure's second phase a master agreement is contracted, which specifies the range of service propositions that may later be requested by the customer's business units. The number of service propositions is listed in a customer's individual service directory. Therefore, the corresponding activities range from the selection of business relevant service propositions from the IT provider's service catalogue to their customer-specific variant configuration and their contracting which is outlined in a master agreement.

6.1 Preselect relevant Variant Groups

The customer specific pre-selection of relevant commitment propositions which may later be re-quested utilises a comprehensive service catalogue that lists a variety of catalogue service propositions and service sets. Thus, the service catalogue acts as an important instrument for gaining insights into an IT provider's offering. However, it does not contain the entire IT service portfolio but only lists a selection of service sets as propositional configurations of variant groups.

As the initial activity for contracting customer specific service set variants, the service catalogue is investigated in order to identify service sets which fit customer requirements in supporting business processes with IT. Yet customers often demand individual adaptions, such as to exclude, complement, or optionally offer certain functions of the proposed service propositions included in the non-specific catalogue. These adaptions are realised by means of the subsequent service set configuration activity.

6.2 Configure Service Sets

Once a pre-selection of service propositions relevant to a customer's business has been realised, the related service sets may be configured in certain commitments according to a customer's individual requirements. The valid possibilities of such adaptions are limited to those specified in advance via dedicated variant groups in order to allow for standardised IT-operational processes and shorten decision making processes during the master agreement contracting phase.

If customer requirements differ from the configuration possibilities of the predefined variant groups, the process of designing additional service propositions and variant groups may be initiated and performed as introduced in Sect. 5. Thus, the predefinition of IT-operational working instructions and standardised processes for every single service proposition is ensured.

During this activity the technique of configuration of customer specific service sets supports the determination of

- which functionality is part of a service set (choice of commitments by functionality)
- which performance level is offered (choice of commitments by performance of chosen functionality)
- which particular functional or performance characteristics excluded from a core service proposition should be offered as optional requests in the context of complementary service propositions.

Valid alternatives for each of the aforementioned possibilities are specified in advance in the phase of variant group design by distinguishing required versus optional commitment selection, Boolean expressions with the possibility to opt-in certain commitments, and by diversifying univalent versus multivalent characteristics.

The example of the variant group 'Managed Workgroup' in Fig. 2 exemplifies several service set configurations including 'Extended', 'Standard', or 'Traveler Standard' or 'Traveler Gold'. Each service set is configured within possible values of four functional characteristics, namely 'Speaking System', 'Security', 'Display Perimeter' and 'Help Desk'. For each functional characteristic, different variants of combinations with non-functional

properties are each specified by one specific commitment, which, if selected, is included in a service specification. Optional functional characteristics may either be opted-out or offered as a complementary service proposition. For example, the illustrated service set 'Workplace Extended' of Fig. 2 limits the core service proposition to a workplace with an enhanced display perimeter and a basic security level. However, since each of the functional characteristics is specified as multivalent, further performance levels may additionally be selected to be offered as complementary service propositions. The depicted service set configuration opted for two complementary service propositions: one enhances committed performance in security issues, the other adds a speaking system.

6.3 Contract the Service Directory

Finally, the pre-selection and configuration of service sets – i.e., the service propositions of which may later be requested by the customer's business units on an on-demand basis – is contracted as a master agreement. The master agreement lists each service proposition of the configured service sets as an individualised customer service directory and furthermore contains specifications such as contract volume, validity period and signatory powers.

6.4 Data Model

The data model of Fig. 4 shows the necessary entities and relationships in order to implement the introduced activities of the service directory configuration. Contrary to commitment configurations, the configuration of *service directories* and the corresponding contracting of the framing *master agreement* involve the *customer* organisation as well as supportive IT provider's *organisational units* at a specific point in *time* (cf. Scheer 1994, pp. 434f.). *Service catalogues* may be consulted as *samples* for *service set* assemblies. In order to configure *service directories*, appropriate service sets are assembled according to the customer's business requirements. As for service catalogues, service sets may be derived from variant groups by choosing which *commitments* should be included in a core service proposition and which could be requested via complementary service prop-ositions. The configured *service directory* identifies each *service proposition* of the included *service sets* as a *directory service proposition* which may later be requested by users within the customer organisation's departments.

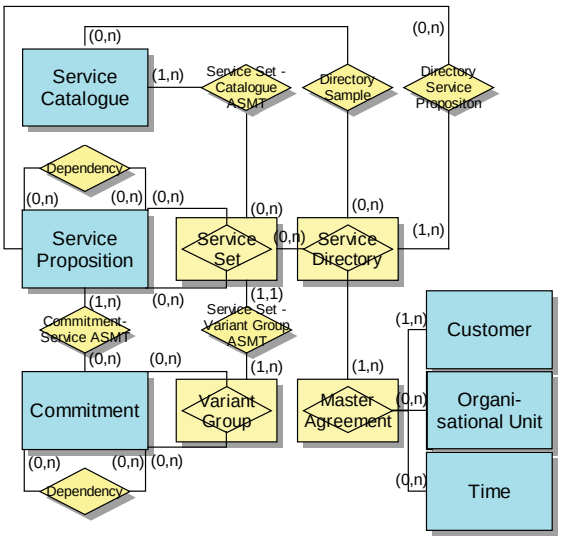

Figure 4: Data structure for the configuration of service directories [eERM]

7 Service Arrangement Configuration

While the service directory configuration phase specifies and contracts a directory of propositions, this phase allows the customer's business units to request the provision of these services and thus instruct the IT provider to set-up and provide committed functionality and performance as specified by the requested service propositions.

In long lasting service systems business requirements for IT services may change (Alter 2006; Kannan and Proenca 2010). Thus, it is necessary to continuously adapt agreed service commitments to such changing requirements (Ivens 2005). Aiming for efficiency in service provision

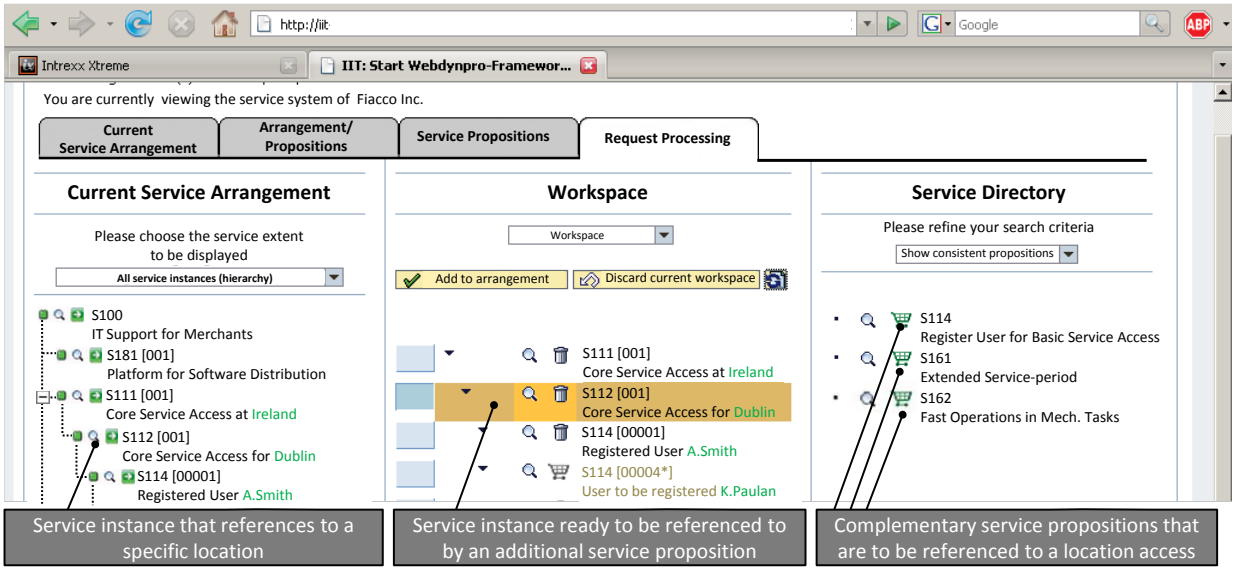

Figure 5: Prototypic implementation of a self-service portal for service arrangement configuration

and on-demand request processing, a continuous adjustment of the service arrangement should be executed via service arrangement configuration by requesting predefined complementary services.

Consistency of additional service requests with the actual service arrangement may be ensured with the help of self-service portals (Archer and Yuan 2000; Clarke and Flaherty 2003). Within the scope of our projects, we developed a self-service process and implemented the prototype of an according online self-service portal for service arrangement configuration (see Fig. 5) in co-operation with IT providers (cf. Brocke et al. 2011).

Three activities are differentiated when adjusting the current service arrangement in the descriptions throughout the following subsections. First, existing service instances that contain commitments requiring adjustment are to be indicated. Secondly, additional service propositions are to be selected and configured according to the customer's change requirements prior to their request which represents the third step.

7.1 Indicate Service Instances with Commitments requiring Adjustment

Service propositions may be dependent on the existence of service instances as defined in dependency tables. Thus, as a first step within this phase, a specific service instance to be altered through additional commitments is to be selected. Therefore, provided views of the current service arrangement are used to browse the service instances and select those instances whose commitments should be altered or enhanced. A service instance, for example, that supports a specific location of the customer's business with IT, may be selected in order to extend remote service support periods for this particular location. Such a selection of existing service instances as required reference for additional requests of service propositions ensures easy traceability of agreed-upon commitments: the customer may later trace added service instances such as, for example, extended service periods per location.

In our service portals the selection of a certain service instance was made possible by implementing a drag and drop from one section of the screen, which shows the service arrangement in a hierarchical structure, to a second part called

'workspace'. Thus, the service instance selection is separated from potentially crowded service arrangement views (as shown for 'core service access for Dublin' in the screenshot of Fig. 5).

7.2 Select and Configure additional Service Propositions

In response to the selection of a service instance, the provided view of the service propositions reduces the offering to those propositions which may be requested in this context while taking into account service dependencies. The user may now select one or more service propositions such as, for example, 'extended service support' in order to change commitments in remote support for a selected location.

Such a change in commitments may either result in the extension of a bus of existing commitments (e.g., additional functionality like a speaking system in addition to a core service's functions) or in the replacement of commitments (e.g., extended instead of standard service support time ranges instead of standard ones) (cf. Brocke et al. 2010c).

The selected service propositions are then treated as service instances although they are not yet provisioned. This kind of pre-instantiation allows the customer to go on to select further service propositions based on previous choices and request a bundle of dependent service propositions. The service portals implemented in our projects thus resulted in a separation of three screen sections: the first one shows the service arrangement, the second represents the 'workspace' and the third depicts the directory of available service propositions which is sensitive to the workspace's selection of service instances (see Fig. 5). In our service portals the selection of service propositions was again made possible by implementing a drag and drop from the directory view to the workspace. Thus, the workspace includes both service instances and selected but not yet provisioned service propositions (as illustrated by the user registration of 'K. Paulan' in Fig. 5).

Striving for efficient IT operational processes, the customer enters all individual data and characteristics of a service instance within the procedural service arrangement configuration phase. The data serves as standardised parameters for service provisioning adapted to the customer's needs. Examples of parameterisation include address data, the customer's role concept, or design of reports, but also deployment data and scripts of interfaces or releases to be deployed. Such data is entered as text, templates, or script uploads, adapting the service propositions to the customer's business. Likewise, references to other service instances as formulised in dependency tables are to be entered as parameters when requesting a new complementary service proposition. Thus, all data necessary for standardised, on-demand request processing are entered at the point of service arrangement configuration.

Customer feedback from our implementation of self-service portals revealed that the use of parameters in order to individualise the labeling of service instances enhances traceability of the service arrangement. For example, the general service proposition 'Provide service access to workplace' changes into 'Access for workplace <customer individual workplace label parameter>' once instantiated and parameterised. The depicted service arrangement in Fig. 5 highlights individual customer labels for service instances in green.

7.3 Request Service Arrangement Configuration

Once all selected service propositions are configured and parameterised, the portal user may request the resulting modification of commitments and thus contract the resulting configuration of pre-instantiated service propositions. The portal's attention to service dependencies and completeness of the data entered in order to parameterise service propositions ensures consistency of the requested commitment adjustment with the current service arrangement.

Once requested, the parameterised service propositions are listed as service instances in the portal's service arrangement section. In order to sustain easy traceability these service instances are marked as 'not provisioned' until the committed service may be delivered. Similar to industrial goods, bills of provision are sent out after the set-up for notification of service accessibility has been completed.

7.4 Data Model

In accordance with the reference data structure for industrial sales processes by Scheer (1994, pp. 428f., 434f.), the general entity type *Sales Document* dominates the data model of the service arrangement configuration phase. Sales documents are related to portal users of the customer organisation who configure and request service adjustments at certain points in time. Contrary to items modeled for goods industries, service-related sales documents are assigned *Sales Document Instances*, i.e., selected and assembled service propositions within the scope of a *master agreement's service directory*. Once selected, each of these *directory service propositions* is pre-instantiated, parameterised, and referenced to other service instances according to *dependency* tables. *Parameterisation values* are restricted to *value ranges* that have been predefined for each parameter during the service design phase (see Sect. 5).

The current service arrangement of the service relationship between the customer and the IT provider is documented as the amount of currently *requested service instances* and their interrelations, i.e., *references*. However, data of already *terminated service instances* are also available in order to provide access to the history of service instances and arrangements. As for functional and performance related changes, the *termination* of service instances is initiated by requesting complementary service propositions. The selection and configuration of such additional, not yet requested service propositions is modeled as the number of *temporal service proposition configurations* which are pre-instantiated and refer to other temporal or already requested service instances. The number of temporarily assembled service propositions in a portal's 'workspace' makes up a not yet requested, i.e., *pending service arrangement configuration*. Such a configuration may be *requested* for provision and is thus converted to a *requested service arrangement* consisting of *requested service instances*.

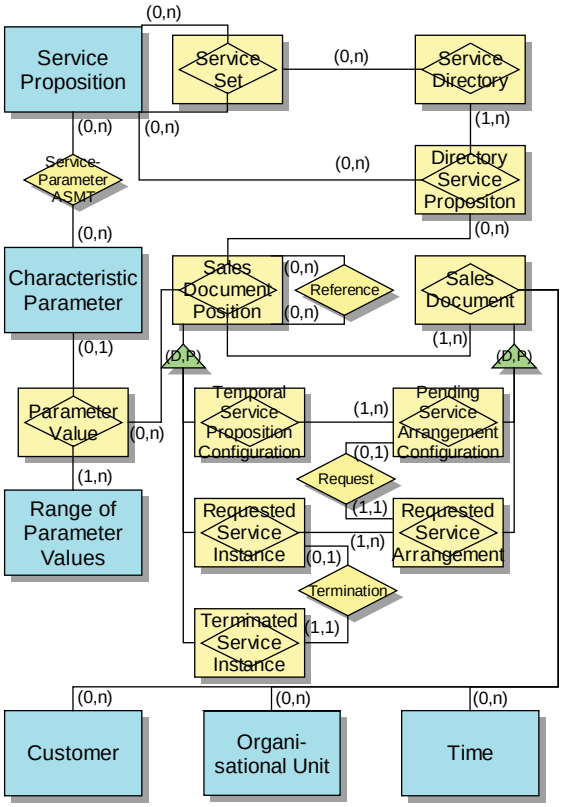

Figure 6: Data structure for service arrangement configuration [eERM]

8 Related Work

Reference models which are utilised in order to provide effective and efficient IT service management have been developed by practitioners and respective consorts, as well as by the academic field. The 'IT Infrastructure Library' (ITIL) (OGC 2007a) – a framework developed by practitioners – could thus for instance be established as the de facto standard in IT organisations (Brenner et al. 2006b) whereby the adaptation of process

structures including planning, supporting, and controlling procedures of the IT organisation, such as, for example, the detection and removal of defects is particularly emphasised. An explicit 'service design' phase proposes basic organisational structures and a strong focus on customer and purpose, yet fails to detail structures, processes and techniques of service configuration and is characterised by a low degree of detail in regard to formalisation (Brenner et al. 2006a). ISO20000 (ISO/IEC 2005) allows for an adequate certification of IT organisations and primarily reviews process introduction of continuous optimisation. The 'Microsoft Operation Framework' (MOV 2004) is based on ITIL, yet cannot be deemed technological-independent and does not provide specifications regarding commitment oriented issues.

The 'enhanced Telecom Operation Map' (eTOM 2004) describes the provisioning on the process level, specifically for the telecommunications sector and, in the context of the NGOSS initiative (NGOSS 2004), forms the basis for potential process automation. This program is complemented by the 'Shared Information/Data Model' (SID) which comprises object oriented modelling aiming for the specification of business process oriented service management information (Forum 2008). With disregard of the deficits of attribute specification (Sailer 2005) it offers an initial basis for the adaption to IT service management in regard to data modelling as one part of procedural reference models.

As an information model of 'Web Based Enterprise Managements' (WBEM) the 'Common Information Model' (CIM) (DMTF 2010) represents a reference model for network, system, and application management providing descriptions of the required management information and functions through a software system. The CIM core scheme defines basic classes, which are generalised to the extent that they can be used for all aspects of system management. Nevertheless, the focus is on technical service implementation (Garschhammer et al. 2001b).

The 'Control Objectives for Information and Related Technology' (CobIT) reviews IT management in regard to compliance with legal requirements and quality standards through the analysis of existing processes, during which, however, the definition of control parameters is of primary concern (Lainhart and John 2000).

In providing a scientific reworking of the topic within the context of the service level management field Lewis' (Lewis 1999) work may be utilised as a basis in order to connect customer oriented commitments to IT operational parameters. Nevertheless, process requirements continue to be disregarded (Brenner et al. 2006b) and merely one aspect of commitment design is examined.

The 'MNM-Service-Model' (Garschhammer et al. 2001a,b) revisits the gap between business process and resource oriented services and thus also between provisioning and service management. A threefold view model facilitates the design of services within the IT organisation. Yet, it utilises the status of already specified services as a basis without considering the services' design procedure.

Two maturity level models for service providers furthermore serve as a basis: the 'IT Service Capability Maturity Model' (Niessink et al. 2005) depicts maturity levels specifically for IT providers, which are characterised on an individual basis via key process areas that specify objectives and activities. Within the scope of the 'eSourcing Capability Model for Service Providers' (Hyder et al. 2006), activities introduced in the fields of 'Contracting Management' and 'Service Design' spanning the initialisation phase of the sourcing life cycle represent relevant input for the work at hand. Both maturity level models are, however, only described in regard to their activities, yet their data and techniques are not modeled in concrete fashion.

9 Summary and Outlook

Business process oriented IT services are often highly individualised in agreed commitments and

are moreover subject to continuous changes in customer requirements. To nevertheless allow for standardised IT operations it was proposed to productise complementary service propositions and specify them by reusing modular commitments. This enables individualisation according to customer requirements in a three phase procedure while maintaining standardised IT-operational on-demand request processing. The continuous adaption of service systems' commitments is fulfilled via predefined and fully engineered complementary service propositions. Potential commitment alteration is defined by a selection of fully specified service propositions previously configured in a customer service directory. The combination of existing commitment modules for the specification of additional commitments supports efficiency in contract initiation and the coverage of service provision through standardised processes. The resulting procedural model of IT service agreement configuration may serve as a reference model in order to increase effectiveness and efficiency when applied or adapted in specific situations (Becker et al. 2004).

Repeated implementation of this methodical procedure has resulted in high acceptance in customer organisations. Representatives from these organisations verified a significant impact of the resulting service models on traceability and changeability of service arrangements as well as the models' effects on diversification and customer loyalty. Moreover, IT operations experts confirmed increased standardisation capabilities when applying the procedure model.

This article is limited to the contracting view of IT services and does not discuss the provider's internal modelling of individual provisioning activities and supply processes in the IT organisational. Consideration must also be given to the fact that the presented data structure represents just one of several possibilities for modelling such structures. Moreover, so far it has only been developed and implemented in the context of a small number of projects in collaboration with IT providers.

Nevertheless, expert workshops and first prototypic implementations confirm that the procedural model and its data structure bear high potential in the context of continued standardisation efforts within IT organisations while customer representatives of the cooperating IT provider organisations highly valued the resulting transparency and flexibility of the service arrangements. The continuation of a detailed conceptualisation and implementation of the presented self-service portal for IT service propositions constitutes an additional field of activity, which will be continued to be pursued in the future.

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