# Towards an Information Model for ITIL and ISO/IEC 20000 process artifacts

Michael Brenner, Thomas Schaaf and Alexander Scherer

***Abstract*—As IT service providers are adoptingmore comprehensive approachestowardsIT Service Management (ITSM), they increasingly need to rely on ITSM software solutions in their day-to-day operations. However, when wishing to integrate ITSM software from one vendor with that of another vendor, the lack of underlying standards becomes woefully apparent. Without a standardized information model for ITSM processes, efficient and integrated ITSM will remain a vision.**

**While in the telecommunications sector, a lot of work has been invested into developing the Shared Information/Data Model (SID), a companion model for the industry-specific process framework Enhanced Telecom Operations Map (eTOM), no equivalent for the more general process frameworks of ITIL and ISO/IEC 20000 is in sight.**

**This paper introduces an approach towards an information model for ITSM processes. The presented method leverages work done for SID, by adapting and complementing SID concepts and content to produce an information model compliant to ISO/IEC 20000 requirements and ITIL recommendations.**

***Index Terms*—IT Service Management, Information Model, SID, ITIL, ISO/IEC 20000**

## I. Introduction

THEefficient delivery of high quality IT services in a constantly changing business environment, meeting ever-growing customer demands, poses a major challenge for many IT service providers. In meeting this challenge, more and more providers are adopting processes as described by the IT Infrastructure Library (ITIL) [1], a documentation of good practice for ITSM, or ISO/IEC 20000 [2], an international standard for ITSM which features a process framework that is, to a large extend, aligned to that of ITIL.

Implementing ITSM processes such as Incident Management or Service Level Management (SLM) is essential for reliable delivery of high-quality, cost-effective IT service services - but the effectiveness and efficiency of such organizational measures is limited without adequate support by IT tools.

A first step in a approaching comprehensive tool support for ITSM in a top-down way is to analyze and model information produced and consumed by ITSM processes, effectively producing an information model for ITSM. Such an information model can be an enabler for the integration of different support tools, dedicated to specific ITSM-related tasks, into one comprehensive ITSM solution. Without it, disjoint data stores, redundant information and discrepancies between data related to the same process artifact will be almost unavoidable.

As discussed in [3], of all established information models, SID is the one most suited to be a basis for a general ITSM information model. SID already includes numerous class definitions (SID entities) that represent process artifacts very similar to those defined or referred to in ITIL and ISO/IEC 20000.

Even though classic telecommunication might constitute a different type of IT service than what the typical addressees of ITIL and ISO/IEC 20000 provide to their enterprise users, the basic processes and concepts should be quite similar. The idea in of the presented approach is to expedite producing a comprehensive ITSM information model by reusing modeling concepts and existing model content of SID.

## II. Approach

The approach is divided into two phases with each phase consisting of four steps. Figure 1 illustrates the general sequence of steps with possible backtracking paths (where a result of one step might necessitate a partial re-execution of a previous step) depicted as dotted lines. In the first phase, “Analysis of ITSM processes”, information requirements for a set of ITSM processes are elicited, process artifacts identified and classified, and the basic relationships between the artifacts and the processes documented. In the second phase, “Information Modeling”, these results are then modeled in a SID-like manner, the relationships between the artifacts further detailed and formalized, gaps filled and inconsistencies reconciled, thus producing an object-oriented information model for the examined processes.

### *A. Phase 1: Analysis of ITSM processes*

Neither ITIL nor ISO/IEC 20000 provides a formal and explicit information model. Instead, both frameworks refer to a number of documents, records and (knowledge) databases for various purposes, like for example the configuration management database (CMDB), the service catalog or service level agreements (SLAs). Altogether, information objects like this form a kind of

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*implicit (partial) ITSM information model*. However, compliance to ISO/IEC 20000 requires processing and storing a lot more information.

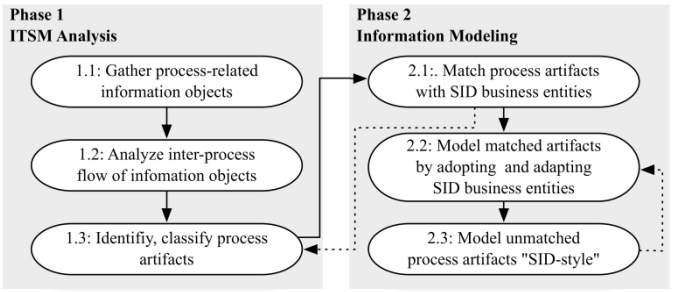


**Figure 1: General Approach**

The goals of the analysis phase of our approach are to derive vital information needs of ITSM processes from their descriptions in ITIL and ISO/IEC 20000, to understand the most important information dependencies in an ITSM process environment, and with that to lay the foundations for an ITSM information model.

*1) Step 1.1: Gathering ITSM information objects*

The most evident way to derive the information needs of ITSM processes is to identify all information items (pieces of information) implicitly or explicitly required by ISO/IEC 20000 or referred to in ITIL, and subsequently to determine if they constitute or can be distilled into information objects. In order to identify information items, the ITIL guidance and ISO/IEC 20000 documentation are scanned for terms, statements or descriptions of interrelations indicating their necessity of existence in the scope of one or more processes.

*2) Step 1.2: Analyzing the relevance of information objects in the context of ITSM processes*

Every information object of interest is related to at least one ITSM process in one of the following ways:

- Input (I): The information object is an input of one or more activities of the related process.
- Output (O): The information object is an output provided by one or more activities of the related process.
- Ownership (Ow): The information object is owned and maintained by the related process. Every information object is owned by exactly one process. The ownership relationship helps to cluster objects into views, allowing to focus on particular processes when defining an information model.

An analysis of each identified information object in the context of all ITSM processes of interest results in a first broad overview of relationships between ITSM processes and information objects. A simple two-dimensional analysis scheme (cf. Table 1) with the information objects in rows and the processes in columns is used to present the output of this step in a structured way and serves as input for the next step.

*3) Step 1.3: Identifying process artifacts*

In the context of this work, a process artifact is defined as a special type of information object that enables communication and information sharing between processes (e.g. Incident Management and SLM). Consequently, a necessary condition to qualify an information object as a process artifact is given if more than one column of the analysis scheme is not empty, signifying that the information is shared between processes. Information objects with exactly the same sharing pattern are often contained within aggregate process artifacts. Such process artifacts can usually be classified into categories like plans, agreements, reports or records.

| **Information objects** | **Incident M.** | **Problem M.** | **Change M.** | **Release M.** | **Config. M.** | **SLM** | **Capacity M.** | **Availab. M.** |
|---|---|---|---|---|---|---|---|---|
| Service Catalog | I | I | I/O | - | I | O **Ow** | - | - |
| Service Review Result | - | - | - | - | - | I/O **Ow** | - | - |
| Service Level Agreement | I | I | I/O | - | I | O **Ow** | I | I |
| … | | | | | | | | |

**Table 1: Information objects analysis scheme (excerpt)**

To avoid duplicates the analysis scheme should be examined regarding different entries referring to the semantically same concept (e.g. request for change vs. change request).

*B. Phase 2: Information Modeling*

The results from the information requirements analysis form the basis for the information modeling activities described in the following. The goal of this second phase is to integrate the identified process into an object-oriented information model.

*1) Step 2.1: Matching process artifacts with SID entities*

In the first step of phase 2, definitions of SID entities are analyzed and determined if they correspond to identified ITSM process artifacts. If it is discovered that SID entities represent parts or aggregates of identified ITSM artifacts, or that they would represent so far unidentified, but useful artifacts, then a backtracking to 1.3 for fine-tuning can be triggered.. How exemplary process artifacts owned by ITIL SLM can be matched to SID is discussed in Section **Fehler! Verweisquelle konnte nicht gefunden werden.**.

*2) Step 2.2: Modeling artifacts with adapted SID entities*

When a SID entity can be matched to an ITSM process artifact, it is included in the model. Regardless of its original name in SID, it is named according to ITIL and ISO/IEC 20000 terminology. Depending on which related SID elements are also included in the resultant model, its relationships might need to be adapted.

*3) Step 2.3: Modeling unmatched artifacts*

Process artifacts, for which no counterpart in SID can be found, are included in the model using basic SID modeling concepts and naming conventions. Relationships to classes already represented in the model need to be added and the resulting model checked for general consistency.

## III. IMPLEMENTATION

As a proof-of-concept, the method has been applied to the ITIL / ISO/IEC 20000 processes Service Level Management and Configuration Management. In this Section, an excerpt of the model for SLM, updated from the results presented in [4], is used to illustrate the viability of the presented method and discuss practical experiences with it.

### A. Exemplary Results

Table 2 shows how some prominent SLM artifacts from ISO/IEC 20000 and ITIL, identified through analysis of [5] and [6], can be mapped to SID entities defined in [7], [8] and [9].

| ITSM Artifact | SID Entity |
|---|---|
| Service | Product, Service |
| Business Service | CustomerFacingService, Product |
| Infrastructure Service | ResourceFacingService |
| Service Level Agreement | CustomerServiceLevelAgreement |
| Operational Level Agreement | *(Internal SLA)* |
| Underpinning Contract | *(Supplier/Partner SLA)* |
| Service Level Target | ServiceLevelSpecification |
| Customer | Customer |

**Table 2: Mapping of SLM concepts and artifacts to SID entities**

Only very few concepts and terms - mostly of a very general nature, like *Customer* - are used in exactly the same way in SID and ITIL, and can therefore be reused unmodified.

For many others (e.g. *Service Level Agreement* [6]), there is a counterpart in SID which is named differently (*CustomerServiceLevelAgreement* [7]). In these cases, the SID entity was renamed, but otherwise reused unmodified, i.e. with all its relations to other classes derived from SID in the resulting information model left intact. Cases in which one SLM artifact or concept mapped to more than one SID entity (for example, ITIL and ISO/IEC 20000 do not differentiate *Product* and *Service* in the way SID does [9] [8]), were treated in a similar fashion: In the information model for SLM, both SID entities were used depending on the context, but renamed according to the ITIL / ISO/IEC 20000 (in effect aggregating them).

Some SLM process artifacts have no equivalent SID entity. For example, the *Operational Level Agreement* in [5] and [6] in fact corresponds to *Internal SLA*, a term which is explained in SID [9], but not included as an entity in the SID model. Figure 2 shows an excerpt of the information model for SLM, yielded by applying the presented method. As can be seen, the result can be used as a core information model, which is more useful as a basis for developing ITSM applications, or planning the integration between them, than the informal, sometimes neither comprehensive nor completely consistent figures and descriptions in ITIL and ISO/IEC 20000. Due to the manifold differences between ITIL and eTOM / SID, constructing the model was not completely straightforward, some design decisions had to be made. Some SID entities, with no counterpart in ITIL, were included because they are useful as classes that other classes can inherit from, thus adding to the usability and expendability of the model (e.g. *Agreement*). Other SID entities were added because they represent artifacts, or parts of artifacts, implicit, but not explicitly named in ITIL processes – for these, no renaming is needed. Finally, some classes needed to be included to address different usage of terms in ITIL and SID and keep the model consistent: Semantically, SID's *ServiceLevelAgreement* would be a super-class of ITIL's *Service Level Agreement*. Consequently, *ServiceLevelAgreement* in the resultant information model is actually the renamed SID entity *CustomerServiceLevelAgreement*. To enable it to inherit indirectly from *Agreement*, the new abstract class *ServiceAgreement* (which is of course quite similar to SID's *ServiceLevelAgreement*) was created.

### B. Experiences

One possible stumbling-block, when implementing the presented method, is the fact that matching general ITSM concepts and process artifacts to SID entities needs a thorough analysis and comparison of all related documents on a semantic level. This proofed to be a labor-intensive task which requires rather in-depth knowledge of ITIL and SID. Contributing to this is the fact that the search for matching SID entities necessitates a broad scan of almost all SID documents most of the time. While there is a basic, preliminary mapping between eTOM and ITIL [10], the mapping between the TM Forum's own eTOM and SID is not nearly elaborated enough to allow the search to be easily narrowed down to one or two documents (let alone specific parts of documents) of the SID suite.

Also, SID does not always comprehensively document the rationale behind the design of its models. Some aspects of SID models, e.g. the occasionally unorthodox use of the UML aggregation association, are rather unintuitive. In these instances. blindly adopting SID can lead to models that are not easily understood by those unfamiliar with SID concepts and model usage.

## IV. RELATED WORK

To the authors' knowledge, no research on the specific topic of creating an information model for ITSM (ITIL, ISO/IEC 20000) process artifacts has been published. Some work addresses the problems of building an ITIL *Configuration Management Database* (CMDB). A CMDB should not only contain a model of the services and the technical infrastructure of an IT service provider, but include information on process artifacts and the relationships between them. However, the latter aspect, i.e. the question of an information model for ITSM process artifacts, is usually not in the focus.

The specification for a CMDB Federation (CMDBf) by the CMDBf Working group [11] defines mechanisms how management data from various sources can be accessed via Web Services, but delivers no accompanying information or data model beyond a simple XML-Schema-based structuring of the management information to be transferred.

The BMC Atrium CMDB Common Data Model [12] is a data model for a CMDB, but very focused on modeling infrastructure components. It defines only very few "Logical Entity" classes and does not serve well as an information model for ITSM processes.

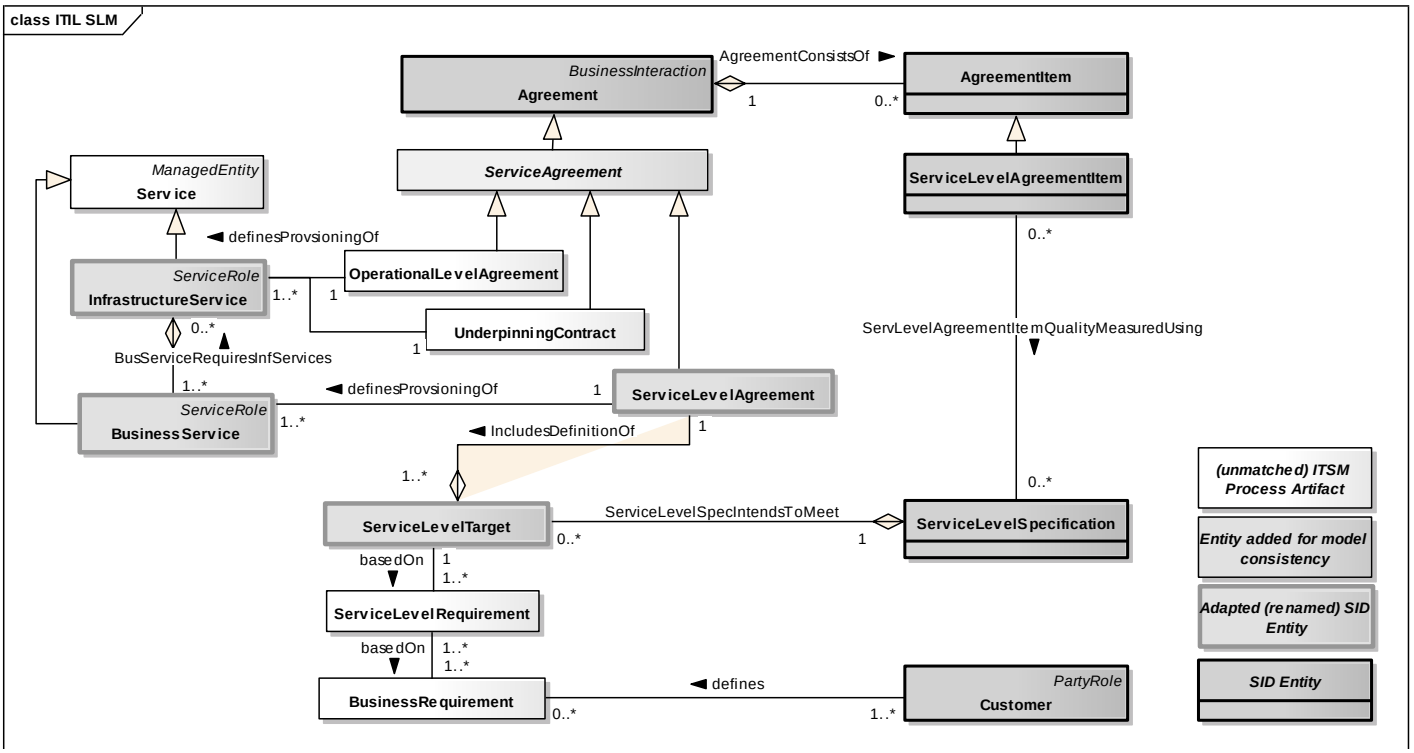


**Figure 2: An excerpt of the information model for ITIL Service Level Management**

A basic object-oriented information model focusing on ITIL process artifacts has been developed in [13]. This was designed without explicit consideration of SID or other information models and is limited to the well-structured ITIL processes (Incident, Problem and Change Management.

## V. Conclusion and Outlook

The approach presented in this paper paves the way to filling this gap by presenting a methodology that helps to systematically identify information requirements from process descriptions and translate these requirements into concrete information model components, considering SID in its capacity as a concrete information model for eTOM. As a proof of concept, the methodology has been initially applied to the ITIL processes of Configuration Management and Service Level Management. Extending the hitherto existing results by applying the approach to further processes is the subject of work in progress.

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