IT Service Management Frameworks Compared – Simplifying Service Portfolio Management

Schmidt Michael
Leibniz Supercomputing Centre (LRZ)
Garching n. Munich, Germany
Michael.Schmidt@lrz.de

Brenner Michael
Leibniz Supercomputing Centre (LRZ)
Garching n. Munich, Germany
Michael.Brenner@lrz.de

Schaaf Thomas
Ludwig-Maximilians-University (LMU)
Munich, Germany
schaaf@nm.ifi.lmu.de

***Abstract*—The purpose of the IT Service Portfolio Management (SPM) process is it to align an organization's service offering with its IT strategy. It is an integral part of every Service Management System (SMS) and mandated in some way by each IT Service Management (ITSM) framework, but has been less formally researched than more operations-oriented and structured processes like Incident Management. ITSM frameworks often contain quite extensive guidance on particular processes like SPM, which can make them hard to efficiently implement, especially for small and medium-sized organizations. Furthermore, when trying to choose which recommendations to apply for one's organization, telling the commonalities and differences of the various frameworks is anything but easy due to a lack of formalization. This publication presents a model-based approach to compare ITSM frameworks, to distinguish between the most essential and less essential elements of their process guidance and applies this approach exemplary to the guidance for Service Portfolio Management by ITIL, ISO/IEC 20000, MOF and FitSM.**

***Index Terms*—ITSM; ITIL; Service Portfolio Management**

I. Introduction

Although some IT Service Management (ITSM) processes have been implemented in most large IT organizations, only few have adapted all processes recommended by established ITSM frameworks, while most smaller organizations have introduced only some basic ITSM processes or none at all. One reason for this is that, while containing many useful and comprehensive concepts, the most established ITSM frameworks are quite complex and seem to be written primarily for large enterprises. Small and medium-sized organizations often do not have the capacities to establish a Service Management System (SMS) that implements all of these frameworks' recommendations, nor do they have the capabilities or can afford the usually quite significant consulting costs for 'tailoring' many hundreds of pages of ITSM guidance to their needs. Nevertheless, ITSM processes are more and more crucial for organizations in order to stay competitive [1].

A very well-known but also very extensive framework is ITIL, which aims to cover all ITSM aspects one hundred percent. In order to facilitate ITSM adoption by smaller organizations some approaches try to provide a more lightweight IT Service Management (ITSM), like FitSM. They see the Pareto principle as applicable to ITSM processes and, by focusing only on the most important process elements, try to reduce a large part of the process complexity while sacrificing only a small part of its overall effectiveness. However, if one asks himself how these two frameworks relate to each other or which elements differ exactly, an answer is not easy to find.

Regardless of whether one aims to tailor an SMS or simplify existing processes, the question is always how established frameworks can be combined or reduced to achieve this goal. When answering this question, an obstacle is the general issue that ITSM frameworks aren't directly comparable to each other on any but a very superficial level. The major ITSM frameworks use only semi-structured text and non-formal illustrations for presenting their guidance, i.e. none uses formal, standardized modeling methods like UML to present activities, inputs, outputs or roles of processes.

This work addresses this problem with a model-based-approach applied to the Service Portfolio Management (SPM) process, and is structured as follows: Section II contains a brief overview of related work. Section III outlines the applied methodology and introduces the most common ITSM frameworks to which it is applicable (III-A) These ITSM frameworks are analyzed and the basic process elements described within their SPM guidance are identified and integrated into a consistent framework-specific SPM model (Section III-B). The resulting models are compared, demonstrating a large overlap between the frameworks, but also showing which elements are framework-specific (Section III-C). Section IV makes use of the aggregated model to design a framework-independent core model of the SPM process. Finally, key observations made while analyzing and comparing these frameworks are highlighted (Section V).

II. Related Work

While quite a bit of research has been done regarding implementation of ITSM processes, most of it is focused on implementation aspects of the more widely established operational processes like Incident Management or Change Management (e.g. [2]). Comparisons of ITSM frameworks are mostly done by consultancies and ITSM tool vendors and usually stay relatively superficial, concentrating on differences in fundamentals or scope of the process frameworks (e.g. [3] or [4]), but never the processes themselves.

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Over the years, there also has been various work done concerned with approaching ITSM processes in a more structured way by using standardized or at least coherent modeling methods. For example IBM's IT Process Reference Model (PRM) [5] covers a large number of IT processes with semi-formal models using an IBM specific approach. Some of its processes are aligned with ITIL processes and incorporate elements of ITIL's guidance, but PRM does not model ITIL processes. Other companies make a business of selling 'ITIL process models', e.g. IT Process Maps [6], but the approach with which these usually semi-formal models were designed is not transparent.

Some academic work has also addressed building models for operational ITIL processes (e.g. [7]), while published research about formal models for strategic ITIL or ISO/IEC 20000 processes has been focused on data on information modeling, i.e. addresses process artifacts but not activities (e.g. [8]).

To best of the authors' knowledge, no previous work has concerned itself with the creation of comparable models for different ITSM frameworks.

III. Methodology

The basic methodology was developed in a master's thesis by one of the authors [9] where it was applied to various processes. It consists of multiple steps, as shown in figure 1. The first three steps are mandatory to create a comprehensive collection of so called process building blocks, whereas the remaining three steps are an optional extension to make use of this created collection. However, one could also stop after step three to use the building blocks for another purpose.

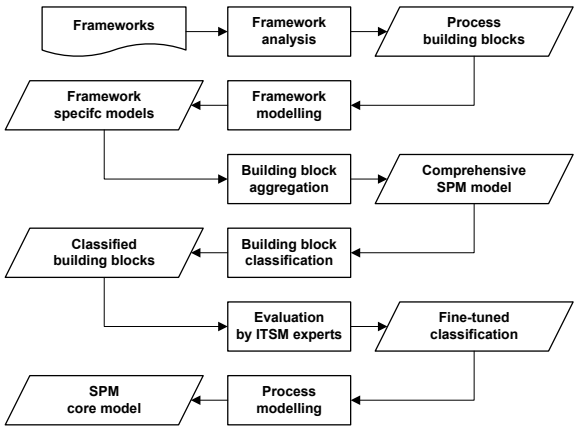

Figure 1: Methodology model

First, the framework guidance is systematically analyzed to identify individual process building blocks (PBB), i.e. artifacts, activities and roles required or recommended for SPM by the framework (see Figure 2). Second, the identified PBBs form the basis for the creation of an SPM model for each framework, consisting of an UML activity and class model to depict roles, artifacts and activities. After a comparison and consolidation, these framework-specific models are merged in a third step in order to create a comprehensive SPM model. This model contains all consolidated PBBs, thus combining the process guidance of all examined frameworks.

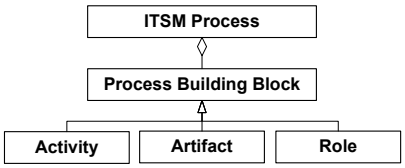

Figure 2: Process Building Blocks

Based on the results created by this methodology, the significance of each PBB contained in the comprehensive model is assessed. This is done using heuristic metrics for estimating importance of a PBB in the process context. Based on benchmark values for these matrix, elements are then classified as negligible or essential for the process in the context of a lightweight approach. To validate this systematic, rather mechanical classification created, it is then reviewed and refined by ITSM experts. Lastly, this collection of essential PBBs is used to create the SPM core model, a systematically reduced version of the formerly created comprehensive model.

A. Considered Frameworks

Considered for this work are the well-known and widely adopted ITSM frameworks ITIL, ISO/IEC 20000, MOF and FitSM [1]. Initially, the IT governance framework COBIT [10] was also considered, but finally excluded because of its high-level structure that is not directly comparable to the remaining ITSM frameworks. The Business Process Framework eTOM was excluded as well, because of its focus on the telecommunication industry. Although some other guidelines related to service provision are very popular as well, e.g. Knowledge-Centered Service, they do not qualify as a process-oriented ITSM framework of the kind considered in this paper.

1) ITIL: The Information Technology Infrastructure Library (ITIL) is the most widely used work on ITSM. It is a collection of good practices which have been widely accepted as the de facto standard for effective service management. Since version 3, ITIL has been oriented to the central aspect of the service life cycle (service strategy/design/transition/operation and continuous service improvement). In accordance with this life cycle, SPM is part of the service strategy [11].

2) ISO 20K: ISO/IEC 20000 (ISO 20K) is an international ITSM standard, derived from the older British Standard BS 15000. Its 'normative' part, ISO/IEC 20000-1 [12], defines minimum requirements for an SMS. In contrast to more less formal, more descriptive frameworks such as ITIL, one can assess conformity to this standard through audits, which can serve as a basis for certification by accredited bodies. ISO 20K also contains non-normative parts, most notably the *Code of Practice* in 20000-2 [13], which includes recommendations for implementing ITSM to meet the requirements of the first part. SPM does not represent a separate process within the standard, but its topics and goals form part of the fifth chapter *Design and transition of new or changed services*.

3) FitSM: FitSM is a relatively young framework and describes itself as the *lightweight standard family* for ITSM. Its overall approach, structure and process model is relatively similar to ISO/IEC 20000-1. It was developed within the FedSM project, an initiative of the *7th Framework Program for Research and Technological Development* of the European Commission. FitSM is licensed under the Creative Common License and is therefore freely accessible. Developed from a requirements-driven approach, FitSM offers a mix of minimum requirements, processes and application examples. Although the content of FitSM is relatively compact compared to other described frameworks, it tries particularly to focus on the main objectives of each process. The SPM process [14], [15] is treated explicitly, additionally a role model is defined [16].

4) MOF: The Microsoft Operations Framework (MOF) describes itself as a guide with best practices, principles and activities for the reliability of IT solutions and services [17]. Due to its origin, it is more focused on operations than other frameworks. The implementation guidance often refers to Microsoft technologies. The framework is based on the underlying concept of the IT service life cycle (plan, deliverer, operate, manage), similar to ITIL's lifecycle approach. It consists of four phases, each of which contains several Service Management Functions (SMF). These in turn define a collection of processes, roles and activities required to meet business requirements. SPM can be found as 4th process *Development and evaluation of an IT service portfolio* in the *Business IT Alignment* SMF [18].

B. In-depth framework analysis

For the comparative analysis conducted on the SPM process, the first step was to examine SPM guidance of FitSM, ITIL, ISO 20K and MOF. The goal of SPM is to manage the service offering of an organization and keeping it aligned to the organizations strategy and stakeholder requirements. This enables focusing resources on the most valuable services. The central artifact/output of SPM is a comprehensive overview of all services in their respective life cycle phases (planned, in development, live etc.): the Service Portfolio. All frameworks mentioned above contain guidance on SPM, though exact nomenclature differs in some places (e.g. ISO/IEC 20000's inclusion of SPM in its chapter *Design and transition of new or changed services* defining an explicit process named 'Service Portfolio Management').

Because of the frameworks' different structure and granularity, they do not lend themselves to a direct comparison. FitSM for example, structures its guidance mostly in one-line requirements and other lists through its core standard (FitSM-0 through FitSM-3) which compromise less than 100 pages in total. ITIL's core guidance – the 5 'service-lifecycle' books, which are also the basis for the content taught in the ITIL personnel qualification program – contains well over 1,000 pages of mostly continuous text (though one has to keep in mind, that ITIL includes guidance on 26 processes [19] compared to FitSM's 14).

Still, both frameworks describe similar activities to conduct, roles to fulfill, as well as pieces of documents, records, databases and the like (artifacts) to create and manage for SPM. Therefore it is necessary to identify the lowest common denominator of all process descriptions in order to facilitate an objective comparison. Since these elements each represent a part of the overall process, they are further on referred to as "process building blocks" (figure 2). Despite their structural differences, all frameworks contain guidance on common basic types of process elements. The following types of PBBs were defined in order to formally represent these (cp. Figure 2):

Artifacts: An artifact is an element used in a process to enable or support the achievement of process objectives. Specifically, it refers to entities that are used as part of an activity to store and share information.

Activities: An activity defines a collection of procedures or actions that must be performed. They are executed by a role, and artifacts are both created and used within an activity.

Roles: A role determines a set responsibilities within a process, fulfilled by a person, group or business function. Roles are responsible for carrying out activities and can interact with artifacts.

Based on this differentiation, it is possible to break each framework down into a limited set of structurally similar PBBs. These enables a systematic comparison SPM, which wasn't possible for the frameworks themselves, see Figure 3.

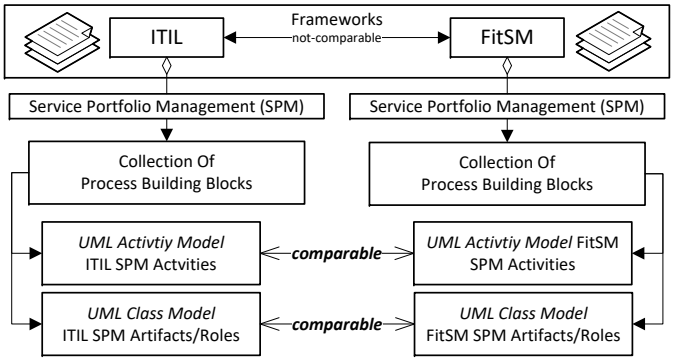

Figure 3: Process building blocks

The extraction of PBBs was done as part of an in-depth analysis within which the content of each frameworks' guidance was examined word by word to identify all required or recommended artifacts, activities and roles with their basic characteristics. Most PBBs could be identified simply by extracting their description (or at least mention) from the texts. However, after creating the process models from the identified PBBs in the first pass and validating if they reflected the respective framework's guidance accurately, it became apparent that at times not all elements for a complete and consistent process model are explicitly defined in the frameworks.

ITIL, for example, mentions that it has to be defined (a) which service details are documented within the service portfolio; and (b) how and when services in the service pipeline are published in the service catalogue; and (c) how

and when services in the service catalogue are finally moved to the retired services. However, it is never actually defined how exactly this should be done or where it should be documented. To address this gap in the model, the artifact *Service Portfolio Policy* was added to the UML class model for ITIL SPM, though it is never defined or mentioned in ITIL under this name. In other instances, defined activities generated outputs, which were not named, necessitating the addition of other artifacts. Therefore, to achieve model consistency and an accurate representation of the frameworks' guidance, models were augmented by these necessary but missing PBBs.

Identification of artifacts and roles was facilitated due to their largely uniform representation within the frameworks. When specifying activities, however, the granularity of the different frameworks differs greatly. While some specify a complete activity and its procedures precisely, others only define individual tasks. This isn't a big surprise considering the fact that each framework aims at a slightly different target group. MOF, for example, aims more to provide concrete guidance for technical operators, while ITIL focuses on more generic guidance for process managers. It was thus necessary to dissect activities even more in order to receive the smallest common denominator. Nevertheless, it was still possible to dissect each framework into a set of comparable activities.

Modeling was done using a Unified Modeling Language (UML) tool, and class diagrams with artifacts and roles as well as activity diagrams of the activities created from this model. Using a modelling tool to create an integrated process model, facilitated a first formal check of the completeness of the models, i.e. the identified PBB sets. The created diagrams later also enabled a combination and comparison of the frameworks on a structural level. As a result, a total 15 UML sub-models (7 ITIL, 3 FitSM, 3 ISO20k, 2 MOF) were generated, which represent well-structured representation of each framework's guidance, which none of the frameworks delivers itself.
In the end, 111 PBBs were identified for the SPM process in total from all frameworks, as shown in Figure 4.

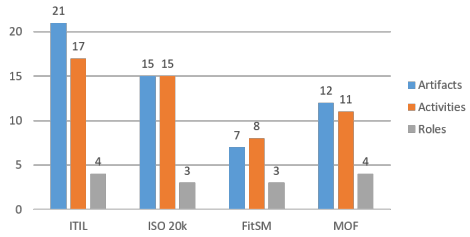

Figure 4: Identified building blocks per framework

C. Aggregation of process building blocks

Although the formerly created PBB collections provide a good overview of each framework, the frameworks themselves are not yet easily comparable. To facilitate a comparison it is necessary to first harmonize and consolidate the PBBs. For example, the artifact Service Portfolio can be found in FitSM, ITIL and MOF with the same name and meaning. Others are similar, like the ITIL artifact Change-Plan, for which near-identical artifacts are defined in every framework, but sometimes under different names (e.g. Service Design and Transition Package in FitSM). To merge duplicates and create one harmonized collection containing only one unique PBB of each kind, a content based comparison was conducted.

Since not all frameworks have described PBBs sufficiently, their characteristics are sometimes not defined in a very detailed way. Often, knowledge from other frameworks or secondary literature is used to fill in the gaps when implementing the guidance in practice. In the context of this matching, however, only data that is clearly provided by the corresponding framework shall be used to avoid subjective influences. Therefore, we have deliberately refrained from using data that isn't clearly defined by the framework itself or is understandable by common sense.

Besides the fact that the same PBB may have a different name in each framework, it has to be considered that PBBs of one framework could be combined or split within another because of the different granularity. This means that not only single objects were mapped to each other (1 to 1), but rather multiple ones (n to n). Considering these special conditions, it was useful to merge both duplicates and similar PBBs.

Finally, by using this methodology it was possible to merge some of the former 111 PBBs and create a consolidated collection of only 88. Looking at the result, it can be seen that while many artifacts often appear more than once, most activities are already unique. This can probably be attributed to the fact that the frameworks, as already mentioned, have a different perspective on ITSM and therefore consider other procedures to be important in order to achieve the process goal. However, some activities have been found several times, indicating their importance to achieve the process goals.

The aggregated collection was then modelled similar to the framework-specific diagrams. This generated a very large model, which is in fact a super-set of all specific models. Even with the large number of PBBs, the comprehensive diagrams represent a coherent model of the SPM process. This shows that, despite framework specific implementations, their process core is still similar and their guidance 'compatible'. The identified PBB collections however, constitute a direct comparison of process elements between these four frameworks for the first time. They can be used to easily check for PBBs available in the SPM process and the frameworks that implement them. In the end, this enables a comparison to reveal the exact differences between PBBs of two or more frameworks.

IV. The SPM core model

Based on the results formerly created, it was analyzed whether it is possible to modify the comprehensive collection by removing PBBs. The basic idea is to consider only elements crucial to fulfill the SPM objectives and remove all others from the process model to make it more lightweight. To determine PBBs to be removed, a classification is conducted to assign one of two disjoint classes to each of them:

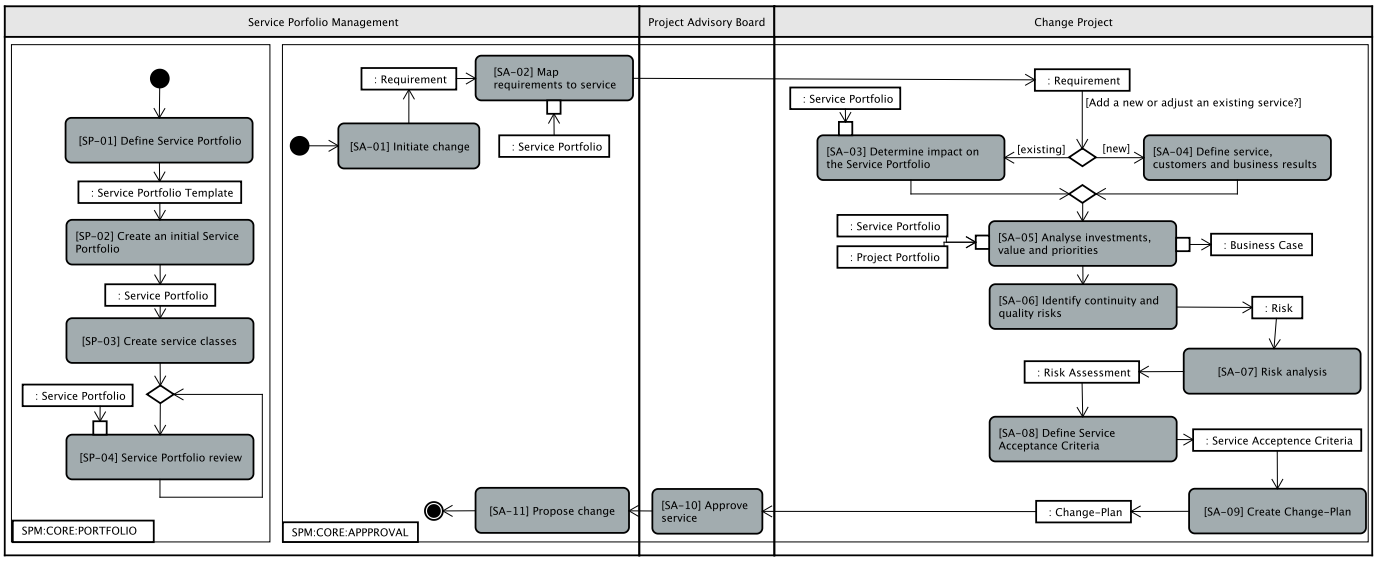

Figure 5: SPM Core Activities

Essential: The PBB is required to a very high degree for the effective execution of the process. Omitting it jeopardizes the achievement of the process objectives.

Negligible: The PBB can be omitted without endangering the effective execution of the process. This includes those that merely improve the process efficiency.

Since there is neither a reference value of how important a PBB is nor a formal method to calculate it, new heuristics had to be found and criteria defined. To classify the PBBs, some metrics were defined based on simple assumptions of artifacts and activities. Two basic values were defined with respect to artifacts. The first one is based on the relevance of the artifact in the literature considered. If an artifact is defined in several frameworks, it can be assumed that it has some importance for the respective process. The second one is based on the degree of integration of the artifact in the process structure. We assume that all artifacts interact in a meaningful way towards the process objectives. Therefore, unless an artifact directly and by itself fulfills a process goal, it has to be logically linked with other PBBs. It is then likely that if it has many interconnections, it is more important than one that is only loosely coupled with other process elements. Both values combined were used for classification by considering an artifact as essential if its values match the predefined domain as shown in table I.

Table I: Artifact assessment matrix

Number of frameworks PBB included in	Associations between PBBs 0	1	2	3+
1 framework	✗	✗	✗	✓
2 frameworks	✗	✗	✓	✓
3 frameworks	✗	✓	✓	✓
4 frameworks	✓	✓	✓	✓

Since the assumptions defined above cannot be applied analogously to activities, other criteria had to be considered. By linking artifacts and activities, it is possible to exclude those that are closely linked to the existence of a negligible artifact. Furthermore, activities that are performed in the context of essential artifacts are probably more relevant to the process. Both statements assume that important activities have to create an appropriate output as otherwise the execution alone would have to provide an intrinsic value. Thus, the assumption made for these artifacts is passed on to the activities, which were classified accordingly. It has to be considered that this conclusion cannot be applied to artifacts in reverse. Furthermore, it should be noted that this classification is only valid from an SPM perspective, since some PBBs might be more important for other ITSM processes.

After the initial classification was conducted, the results were evaluated independently by four ITSM experts. Each participant was able to analyze the classification unbiased, which was made available to them in an online survey. A comparison of the initial classification with the unweighted sum of the answers showed a 95 percent match. The remaining 5% of

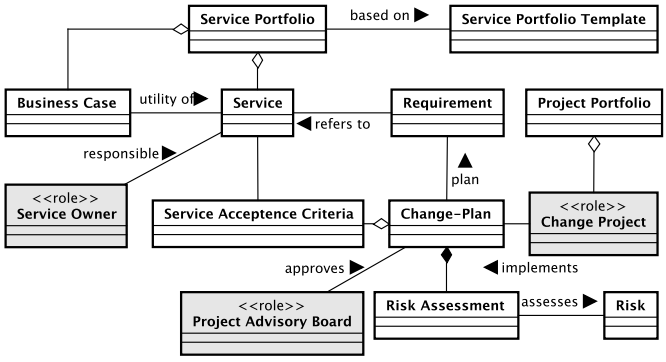

Figure 6: SPM Core Artifacts and Roles

the PBBs were subjected to a more detailed analysis based on the feedback and reassigned accordingly. In the end, this classification provides a basic understanding of importance of each process building block. For subsequent work, however, it is an open issue to examine whether the applied method can be further improved by either enhancing the assessment metrics or the comprehensive model.

Based on this we present an SPM core model, which is a minimum process representation based on all essential PBBs selected from the formerly created comprehensive model. Figure 6 graphically displays the structural relationship of the listed artifacts and roles, excluding the process management roles (Process Manager, Process Owner), which are not part of the process itself. Since the presented diagram connects the PBBs seamlessly, it can be assumed that the overall process is still structurally complete. Otherwise, there would be orphans or elements which can't be logically connected to the model. This shows that despite omitting a large part of the PBBs, a consistent picture still emerges. Since this represents a minimum model that was cut out of the comprehensive one, it is possible to reconnect removed elements if necessary.

In order to show the same for the core model activities, they were depicted similar to artifacts and roles (figure 5). A closer look at the overall process reveals that the SPM can basically be divided into two strands of action. First, the creation and management of an IT *service portfolio*, which ensures that the IT services reflect the organizations management strategy. Second, *service approval* of new or changed services to ensure their alignment to the portfolio before it is transfer into productive operation. In these cases, too, there is a seamless process flow that links the activities with each other. Both modules, though they are just a minimum representation, contain all activities necessary to complete the process objectives.

V. Discussion

It was demonstrated that it is possible to describe ITSM frameworks as a set of artifacts, roles and activities, which was shown for the SPM process of the named frameworks. These PBBs were then used in a comparison which showed that certain overlaps exist between the frameworks. Based on this, the SPM core model was created, which is the smallest common denominator of all frameworks.

That this approach yields valid results was shown exemplary for a comparison of SPM process guidance by the well-known and widely adopted framework ITIL, ISO 20K, MOF and FitSM. SPM guidance of these frameworks was analyzed and a SPM activity model as well as a combined SPM artifact and role model created for each framework. In total these models include 111 prescribed, recommended or (for model consistency) necessary PBBs, i.e. SPM activities, SPM artifacts and SPM roles. A consolidation to 88 unique PBBs was achieved with further in-depth comparison of the framework guidance on a semantic level. The resulting collection represents a superset of all PBBs of SPM process guidance by all frameworks. These models also show that if one were to implement all the guidance of some of these frameworks, one would – especially in the case of ITIL – almost necessarily end up with a process of significant complexity and therefore considerable implementation and maintenance cost.

To create a generic and sound basis of the 'process tailoring' therefore often needed for ITSM implementations in small and medium-sized organizations, a 'core process model' for SPM was created. This model is not simply the intersection of the guidance of the examined frameworks, but is built on a classification into essential and non-essential elements based on formal criteria applied to the process models, the results of which were then reviewed by ITSM professionals. Despite the reduction to 'essential elements' only, shedding about two thirds of the original elements, the remaining artifacts and activities could still be consolidated to form a coherent process without any formal gaps or inconsistencies. This model constitutes an essential SPM process. When implementing SPM in an organization, this process can be easily extended as required, an approach that is usually much more efficient than tailoring down an unnecessarily complex reference process.

Another interesting observation was made during the framework comparison. On the one hand, the ITIL guidance consists of several pages of text, which content is generally seen as very heavy. On the other hand, ISO20k claims to state only minimum requirements for an SMS, even consists of only a few text blocks and is commonly considered to be very compact. However, if one compares them based on PBBs defined therein, it can be seen that the pure number is similar (figure 3). Furthermore, it can be seen that FitSM, which claims to be a lightweight approach, is indeed the most compact framework in terms of PBBs defined.

VI. Conclusion

Though implementing formal ITSM processes is an extensively discussed topic, comparisons of the various applicable frameworks have so far been rather generic and superficial. While the high-level nomenclature of frameworks like ITIL, ISO 20K and FitSM is somewhat aligned, their methods for presenting guidance on particular processes is hardly standardized and differs significantly from framework to framework, making apples-to-apples comparisons on a process-level difficult if not impossible. A possible solution to this problem is to model the guidance of these different frameworks using standardized model types and model elements (i.e. a common meta-model). The resulting models can then be compared with relative ease. This work presented a step-by-step approach towards this.

Besides the application of this approach towards other ITSM processes, planned future work aims to improve the metrics and values used for the classification of PBBs. The current classification method gauges the value of implementing a particular PBB toward the overall effectiveness of a process, but does not consider cost. Efficiency of process implementations could be helped by developing heuristics for estimating the relative implementation costs of PBBs or groups of them.

REFERENCES

[1] *Delivering Value to Today's Digital Enterprise: The State of IT Service Management, 2017*, Forbes Insights, 2017.

[2] R. Rebouças, J. Sauvé, A. Moura, C. Bartolini, and D. Trastour, "A decision support tool to optimize scheduling of IT changes", in *Integrated Network Management, 2007. IM'07. 10th IFIP/IEEE International Symposium on*, IEEE, 2007, pp. 343–352.

[3] S. Watts, *ISO 20000 vs ITIL: What's the Difference and How Are They Related?*, https://www.bmc.com/blogs/iso-20000-vs-itil-whats-the-difference-and-how-are-they-related/, BMC, 2017.

[4] *ITIL vs. ISO/IEC 20000: Similarities and Differences & Process Mapping*, http://info.advisera.com/20000academy/free-download/itil-vs-iso-iec-20000-similarities-and-differences-process-mapping, 20000Academy, 2014.

[5] *IBM Process Reference Model for IT – Sequencing the DNA of IT Management*, version PRM-IT 3.0, IBM, 2008.

[6] *The ITIL Process Map*, https://en.it-processmaps.com/, IT Process Maps, 2018.

[7] M. Vicente, N. Gama, and M. M. da Silva, "Using ArchiMate to represent ITIL metamodel", in *Business Informatics (CBI), 2013 IEEE 15th Conference on*, IEEE, 2013, pp. 270–275.

[8] M. Brenner, T. Schaaf, and A. Scherer, "Towards an information model for ITIL and ISO/IEC 20000 processes", in *Integrated Network Management, 2009. IM'09. IFIP/IEEE International Symposium on*, IEEE, 2009, pp. 113–116.

[9] M. Schmidt, *Ein Fachkonzept für ein leichtgewichtiges Serviceportfolio-, Servicekatalog- und Service-Level-Management (A specification for lightweight Service Portfolio, Service Catalogue and Service Level Management)*, German. 2016.

[10] J. W. Lainhart *et al.*, *COBIT 5: A business framework for the governance and management of enterprise IT*, COBIT 5, ISACA, 2012, ISBN: 9781604202458.

[11] *ITIL Service Strategy*, 2nd ed., ser. IT Infrastructure Library. The Stationery Office, 2012, ISBN: 9780113313853.

[12] *ISO/IEC 20000-1:2011*, 2nd ed., ISO/IEC 20000, International Standard Organization, Geneva, Switzerland, 2011.

[13] *ISO/IEC 20000-2:2012*, 2nd ed., ISO/IEC 20000, International Standard Organization, Geneva, Switzerland, 2012.

[14] *FitSM-1: Requirements*, The FitSM Standard Family: Standard for lightweight IT service management 1, version 2.1, ITEMO, Jun. 14, 2016.

[15] *FitSM-2: Objectives and activities*, The FitSM Standard Family: Standard for lightweight IT service management 1, version 2.2, ITEMO, Jun. 14, 2016.

[16] *FitSM-3: Role model*, The FitSM Standard Family: Standard for lightweight IT service management, version 2.2, ITEMO, Jun. 14, 2016.

[17] *MOF Overview*, Microsoft Operations Framework, version 4.0, Microsoft, US, 2008.

[18] *MOF Business IT Alignment SMF*, Microsoft Operations Framework, version 4.0, Microsoft, US, 2008.

[19] *Definitive ITIL 2011 & 2007 Edition Process & Function Lists*, https://www.pinkelephant.com/uploadedFiles/Content/ResourceCenter/PinkPapers/DefinitiveITIL2011and2007EditionProcess.pdf, Pink Elephant 2011, 2011.