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Maturity Model for IT Service Catalogues
An Approach to Assess the Quality of IT Service Documentation

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ABSTRACT
Information technology (IT) has to face many challenges regarding the increasing business requirements for flexibility, complexity, and availability of IT. Thus, a restructuring of the IT portfolio into IT services is necessary to provide an effective and business-driven IT support. The design of IT service catalogues is generally difficult in the managerial context of an enterprise. The current situation of the IT service structure can hardly be analyzed because no approaches exist that support such an analysis. In this paper we intend to develop a maturity model to assess the current situation of the quality of IT service catalogues. We describe the model structure, its components, and present empirical key findings of its practical application in a benchmarking study.

Keywords
IT service catalogue, maturity model, IT service management, benchmarking study, empirical findings

INTRODUCTION
The increasing IT industrialization results in complex requirements of the design and delivery of IT services. A systematic structure of the IT service portfolio becomes more important to enable a standardized documentation and definition of the IT services offered (Hochstein et al. 2006). This structure is implemented in IT service catalogues. Its design requires the assessment of the current situation. It is essential to identify the baseline and the shaping of an implementation. Maturity models are very suitable to determine the current position objectively. So far, no adequate approach to assess the maturity of IT service catalogues exists in the literature (Rudolph 2008).

The paper aims at developing a maturity model to analyze the quality and service orientation of IT service catalogues. After an introduction and a literature review we describe the structure of the model. The model is applied in the context of a benchmarking study with sixteen companies. There, the existing service documents are analyzed as a basis for deducing the maturity profile. Afterwards, we present the key findings and the limitations of the study. Based on the findings we draw conclusions to the current situation of using IT service catalogues in practice. The paper closes with an outlook on further research.

Increasing Complexity of Requirements, Identifying Customer Needs, Transparency of IT Service Portfolio
The increasing complexity of requirements combined with high cost pressures in IT causes a more efficient delivery of IT services (Uebernickel et al. 2006). In addition, the existing market conditions and the IT penetration in individual life lead to high customer expectations regarding the flexibility and modularity of IT. To face these requirements the IT needs detailed information about the customers’ needs to align and define the IT services according to the business. It assumes that the scope, portfolio, and costs of IT services as well as the underlying processes are made transparent (Böhmann et al. 2005).

Service Orientation of the IT Organization, Inadequate Design and Implementation Guidelines for IT Service Catalogues
The effective implementation of a service structure requires a service oriented IT organization. In most cases, the IT organizations, especially in small and medium size enterprises (SME), are still very technical and IT-asset-minded. But it does not match the current requirements (Dreo Rodosek and Feridun 2003). According to the restructuring of the IT portfolio, the operational and organizational structure must be altered as well.

In spite of high expectations of the customers, the design and maintenance of service catalogues are still very challenging in practice because the scope and objective of designing IT services vary depending on the business model (professional service providers versus in-house service delivery). In many companies the IT service definitions (if existent) are too technical or too
less/much detailed to be transparent for the customers (Garschhammer et al. 2001). The few existing guidelines mention what the design and definition of service catalogues are, but not the ‘how to do’ in practice (Rudolph 2008).

**Qualitative IT Assessments with Maturity Models, Difficulties in Analyzing the Current Situation**

Maturity models show strengths and weaknesses as well as the improvement capabilities categorized into maturity levels. Thereby, the current situation is compared with an achievable target level. The categorization facilitates the execution of company-wide and cross-sectoral benchmarking studies to induce learning processes (Camp 1989). Many companies have heterogeneous IT infrastructures or own approaches for service orientation without using a special framework. That makes analyses of the current situation or the deduction of implementation measures difficult because no objectively-viewed assessment criteria exist (Rudolph 2008). Especially SMEs have scarce resources to develop own assessments.

**LITERATURE REVIEW**

**Service Catalogues as a Communication Basis for Customer and Service Provider**

The IT supply and demand is defined as a service relation that involves the two essential perspectives of ‘service provider’ and ‘customer’ (OGC 2007a). The service provider offers and delivers the service portfolio and is usually executed by the IT organization. In outsourcing relationships professional providers take on this role. The service provider has technical skills and therefore a technical focus on IT. On the other hand, the customer (who is also called service recipient) orders the IT services and is mainly represented by the enterprise departments and the management board. Sometimes other IT organizations like foreign departments or subsidiaries appear as customers. They usually have no technical understanding but a business view on IT. Thus, the IT demand must be aligned with the existing business needs. For this reason, the service catalogue is used as a common communication basis for the IT and the customers to identify amount, scope, quality, and price (Ubernickel et al. 2006; Sturm et al. 2000). That results in the following research question (RQ).

**RQ 1:** Which perspectives of IT service management should be included to assess the maturity of IT service catalogues?

**Existing Approaches and the Practical Need for Guidelines to Design and Define IT Service Catalogues**

IT services cover the development, customization, and operations of IT applications as well as IT infrastructure. They must correspond to the customers’ needs and provide a perceptive customer benefit (Zarnekow et al. 2006). That is why the technical perspective fades into the background in favor of a business-oriented structure (Weill et al. 2002). The service catalogue structure differs in scope, form, content, and detail level because a standardized and generally accepted approach does not prevail in the literature so far (Böhm 2004). The existing approaches with aspects in service catalogue design are shown as followed:

- Approaches with a solely customer focus. The catalogue structure only covers the customer’s perspective and consists of lists with possible definition criteria (e.g. Böni et al. 1999; OGC 2001). This is mostly too abstract for a concrete implementation.
- Approaches that integrate both perspectives. They contain the whole service engineering process including organizational rules and processes. Moreover, they focus on professional service providers and their requirements of IT service design and delivery (e.g. Garschhammer et al. 2001; OGC 2007a; Weill et al. 2002; Zarnekow et al. 2006). This scope does not match the requirements of the SMEs regarding scope, complexity, and implementation costs.

The abstract level of the approaches results in the practical need for concrete (implementation) guidelines that support the design, definition, and maintenance of service catalogues. Although there are some approaches that are tailored to SMEs they concentrate on special characteristics and do not provide any explicit guidelines (Taylor and Macfarlane 2006).

**RQ 2:** What are adequate topics to assess the maturity of IT service catalogues in practice?

**RQ 3:** How mature are the design and definition of IT service catalogues in practice and which topics show the most improvement capabilities?

**Using Maturity Models for Benchmarking Assessments**

The term ‘maturity’ describes a range of results to measure the performance of a defined research object. The range of results covers several uniformly distributed and consecutive scales with achievable quality levels. These levels are defined with context-sensitive quality criteria (ISACA 2005). Maturity models cover similar descriptions for maturity levels with the same superordinate objectives. A widely used area of application is IT benchmarking because maturity models are adequate
instruments for objective assessments (Camp 1989). Maturity models obtain different characteristics because a generally accepted definition does not exist in literature yet (Paulk et al. 1993). Some crucial characteristics are ‘cognitive interest’, ‘method of collecting and analyzing data’, and the ‘research object’ (Ahlemann et al. 2005).

Maturity Models in the IT Service Management Context

A well known IT maturity model is the Capability Maturity Model Integration (CMMI). It is a framework that focuses on the management of software development, purchase, and maintenance processes in software enterprises (CMMI Product Team 2002). The CMMI provides an integrated model with best practices to assess the process quality with the help of a maturity and a capability model. There exist some enhancements like IT-Service-CMM, which is a model for professional IT service providers to support the continuous improvement of service delivery capabilities (Niessink et al. 2005). Moreover, the CMMI is linked to other approaches (e.g. SPICE model).

Firstly, one crucial link exists to the CobiT (Control Objectives and Related Technology), which focuses on the monitoring and control of selected IT management topics using control objectives. The maturity model assesses IT governance processes by means of six maturity levels that are similar to the CMMI capability levels. The topmost level ‘optimized’ refers the target level, which is crucial for the definition of the subordinate levels. The lowest level ‘non-existent’ does not contain any requirements to achieve the target level, so it is neglected (ISACA 2005). Thus, the thirty four CobiT processes are assessed with five maturity levels. Another link exists to the IT Infrastructure Library and its processes application management, IT security, availability management, release management, change management, configuration management, incident management, and Service Desk (OGC 2007a; b).

RQ 4: Which maturity levels are most adequate for the maturity model for IT service catalogues?

RQ 5: How can the maturity levels be parameterized?

RESEARCH DESIGN

Development of the Maturity Model for IT Service Catalogues

The objective of the maturity model is supporting enterprises, and especially SMEs, in assessing their current situation regarding structure, scope, documentation, and service orientation of their IT service catalogues. Thereby, existing strengths and weaknesses are analyzed. The abstract level of the maturity model should enable company-wide and cross-sectoral benchmarking studies. Based on Knackstedt et al. (2009) four steps has been developed (Figure 1).

Step 1: In the literature review we identified adequate approaches with possible design recommendations in form and content. As a result, there exists no empirically tested maturity model for qualitative assessments of service catalogues. Thus, we decided to develop an own model. Referring to the characteristics of Ahlemann et al. (2005), we based the maturity model for service catalogues on the ‘causal model’. This causal model includes descriptions of the maturity levels combined with defined strengths, weaknesses, and improvement capabilities. We collected the data in use of person- and document-related means (e.g. interviews, catalogues, descriptions) and analyzed the data with qualitative means. We oriented the design of the maturity levels to the ‘continuous representation’ view of CMMI by adopting the basic concept for the current model. The service catalogue as the research object was determined as a process area. We split up this process area in critical success
factors (CSF) that allow qualitative assessments. These CSFs were parameterized by main criteria. In addition, each CSF represented several achievable levels expressed as maturity levels. Regarding CMMI, we related the CSFs to ‘specific goals’, the main criteria to ‘specific practices’, and the maturity levels to the ‘capability levels’.

**Step 2:** After structuring the model we defined the CSFs, main criteria, and maturity levels by analyzing possible topics and conditions for a qualitative assessment of service catalogues. Based on a literature review we developed the concept gradually. We visualized the CSFs and main criteria by an Ishikawa chart to demonstrate their interrelation (figure 3). We revised the chart several times to identify content-related main criteria and to sharpen the selectivity likewise. The maturity levels for service catalogues were based on the maturity level definition of CobiT and CMMI (CMMI Product Team 2002; ISACA 2005).

**Step 3:** We conducted a pretest to evaluate the adaptability, selectivity, and significance of the assessment criteria. Therefore, two companies have been assessed with those maturity levels.

**Step 4:** We integrated the results into the further development. Finally, we applied the refined maturity model practically in a benchmarking study with sixteen enterprises. Thus, the model shows a good proof-of-concept.

**Assessment Parameters of the Maturity Model (RQ 5)**

CSFs include characteristics, conditions, or procedures that are crucial for success of the research object. The CSFs are parameterized by main criteria and reflect the object’s performance (ISACA 2005; Watson 1993). The maturity levels are ordered cumulative and strictly consecutive, and symbolize an achievable state (Niessink et al. 2005). Figure 2 points out the interrelation between the assessment criteria.

![Figure 2. Interrelation of CSFs, Main Criteria and Maturity Level (Source: Own illustration)](image)

The maturity model for service catalogues takes over this assessment design. Although the CMMI ‘continuous representation’ view measures the capability, the achievement of maturity levels assumes the existence of those specific capabilities. In addition, each CSF has definite maturity levels that are defined for every main criterion. The maturity level of a CSF results from these single maturity levels. The principle of majority rule is used to summarize the single statements into an overall statement. In the case of a heterogeneous dispersion of the maturity levels they are averaged, whereas the other levels should affirm this average. In addition, the results are justified by explaining the classification. The maturity model includes six CSFs and twenty six main criteria.

**Structure and Definition of the CSFs and Main Criteria (RQ 1 and RQ 2)**

The starting point to structure the CSFs was the differentiation of the two perspectives ‘customer’ and ‘service provider’ (OGC 2007a). Though both have different views on the service catalogue, it is used for common communication. Altogether, the following six CSFs are derived from the literature review and applied in an iterative development process.

**CSF 1** (perception of IT service catalogue by the customer): It describes a subjective impression regarding the perceived achievement of the customers’ expectations and requirements on IT. These expectations and requirements influence the acceptance and application of the catalogue in practice (CSF 5) (Sturm et al. 2000).

**CSF 2** (IT service orientation of the IT service catalogue): The service orientation leverages the customers’ perception (CSF 1), as the operational and organizational structure is customer-focused. This increases the transparency, especially in customer-related processes (Böhmann 2004).
CSF 3 (transparency of the IT service portfolio): It enables the establishment of a common communication basis for the involved perspectives in the delivering process. The catalogue must be communicated clearly and be accessible to customers and service providers (OGC 2007a). Establishing such a transparency is dependent on the implementation level of the service orientation (CSF 2).

CSF 4 (quality of documentation of IT service portfolio and IT service delivery): The design and implementation of a service catalogue increases the transparency of the service portfolio (CSF 3). The documentation requirements can be defined as main criteria. It includes e.g. consistency, level of detail, or comprehensiveness of the service definitions for the customers (OGC 2007a). That also influences the usage level of the service catalogue (CSF 5) and vice versa (Sturm et al. 2000).

CSF 5 (usage level of IT service catalogue): The usage level depends on the customers’ perception of and commitment to the service catalogue (CSF 1) as well as the placement of the catalogue in business and IT. The seamless integration of the catalogue into the customers’ daily business is crucial to establish a wide usage.

CSF 6 (planning and control the IT service budget): The service delivery process causes cost that must be covered by a budget. Planning and control of the budget allocation and service charging revert to the prizes or cost rates documented in the service catalogue (Böni et al. 1999).

Figure 3 visualizes the assessment parameters and the impact of the CSFs (grey rectangles) on the maturity assessment of service catalogues. The main criteria of each CSF are depicted as horizontal arrows. Zimmermann (2006) and Rudolph (2008) also show a more detailed description of the main criteria.

**Definition of the Maturity Levels (RQ 4)**

The CobiT maturity model is used as a basis to structure and define the maturity levels for service catalogues (ISACA 2005). Structure and names of the levels are adapted because they measure similar topics and have a stable state. This is a precondition for consistent assessments similar to interval scales. The consistency and classification are assured by the following assumptions (Rudolph et al. 2005):
• Definitely defined maturity levels: It must be clear, when the next higher maturity level is achieved. The maturity levels for service catalogues are defined for each main criterion for more detailed analyses.

• Maturity levels are ordered consecutively to enable continuous improvement: The maturity levels are ordered cumulatively from one (lowest) to five (highest). According to CobiT and the ‘continuous representation’ view of CMMI, the initial level zero is not defined.

• Maturity levels have to be formulated as stable states to enable a precise classification: Five out of six CSFs are defined with five maturity levels for each CSF. On the other hand, CSF 5 was determined with four stable levels regarding the improvement capabilities to be defined. Each CSF is measured separately, so there are no inconsistencies to the other CSFs.

Practical Application of the Maturity Model for IT Service Catalogues

The objective of the practical application was to identify improvements to further refine and develop the maturity model. Sixteen enterprises from the IT manager network CIO-Circle participated in the study. The CIO-Circle is a non-profit networking organization with approximately 800 members. The study was performed with different industries including engineering, retail, financial services, electronics, food & beverages, automotive, public sector, publishing, and logistics. The practical application was conducted reverting to the procedure of benchmarking studies (e.g. Camp 1989). Figure 4 shows the process and its execution.

![Figure 4. Study Execution and Process (Source: Own Illustration)](image_url)

Step 1: The focus of the environment analysis was placed on the identification of further information about business and IT processes. We used it for a more detailed classification of the maturity levels. Using standardized questionnaires, we collected data on facts and figures, level of service documentation and service orientation, usage of service management frameworks, or the service delivery process. In addition, we asked twelve benchmarking partners (participants) in telephone interviews to amend the statements they made. We categorized the participants in the amount of IT users to explain the large heterogeneity of participants. Moreover, we could fade out industry- and size-related biases because we only included the employees using IT services and service catalogues (Zimmermann 2006). We oriented the definition of the categories...
towards the distribution of the participants (Table 1). The results of the business environment analysis were discussed in a workshop.

<table>
<thead>
<tr>
<th>No. of participants</th>
<th>Percentage distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small (&lt; 1,000 IT users)</td>
<td>4</td>
</tr>
<tr>
<td>Medium (1,000-2,000 IT users)</td>
<td>6</td>
</tr>
<tr>
<td>Large (&gt; 2,000 IT users)</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 1. Distribution of the Participants (Source: Own Illustration)

**Step 2:** We collected the existing service documentations of the participants like catalogues, service definitions, service level agreements, and definitions for indicators.

**Step 3:** The data varied in scope and detail, so we edited and restructured the data in the evaluation process to improve the comparability. We analyzed the maturity levels of each participant by including a second researcher into this analysis. This helped to increase inter-rater reliability. In addition, we explained the results and discussed differing classifications. In case of difficulties, we conducted additional telephone interviews with the participants.

**Step 4:** We presented the results and initiated the exchange of experiences to discuss best practices.

The study results matched the expectations of the participants. Thus, the definition, selectivity, and order of the maturity levels could be practically applied with a larger target group.

**EMPIRICAL FINDINGS (RQ 3)**

**CSF 1**

Two third of the participants show improvements regarding the customers’ perception and the identification of demands. Ten participants explain that the customers demand IT services situational without referring to existing service documents like catalogues. Though, six of them have documentations. Eleven participants reply that these demands are only delivered if they match the current service portfolio.

This behavior ascribes to the incomprehensible documentations that are defined in a technical language customers do not understand. This lack of understanding results in an enormous need for communication but it is neglected. If a mainly customer-oriented service portfolio exists, the commitment regarding the usage is often missing. Some participants do not make the service portfolio accessible for customers because no documentation exists. This is intensified as thirteen participants do not involve the customers actively in the service design and change process of the service catalogue. Thus, the customers have no transparency about the IT organization’s behavior (no delivery out of the existing portfolio). Six participants remark that the customers order the IT services referring to the existing service portfolio. This is enforced by the IT organization as the demand is surveyed with tools or integrated in the customers’ business processes.

**CSF 2**

The lack of customer perception (CSF 1) is based on the insufficient service orientation. Its importance is already realized and most participants use at least few parts of service management frameworks and standards (e.g. ITIL, ISO 20000). But only four participants orient their service catalogues towards defined IT services or supported business processes. Twelve participants structure their portfolio referring to the hierarchical IT organization. Thus, the documentation was often described for IT internal use. Two participants have no documentation that leads to a missing alignment of the service portfolio to current business needs. In order to achieve higher maturity levels, all participants have to improve their documentation and the underlying processes.

The customers’ understanding of the crucial terms SLA, IT services, and IT service catalogue varies what makes the maturity level analysis difficult. The service portfolio is mainly standardized because a larger variety of services can not have been delivered due to the scarcity of resources. Accordingly, the participants rarely define and determine service levels to ensure the service quality that result in exaggerated customer expectations.
CSF 3

Ten participants describe their services not completely, too abstract, or too technical. A complete documentation (that means fully listed and described all or key points) is made available by three participants. If service documents exist, they were defined in presentations or short lists. One participant explains that the customers do not need more information. Most of the participants have slight service descriptions. Figure 5 shows the results.

Figure 5. Documentation of IT Service Catalogues (Source: Own Illustration)

The formal service structure is defined very inconsistently. Thirteen participants list the names and definitions for service scopes, quality parameter, delivery results, or obligations to co-operate very fragmentary. Only two participants document the crucial services customer-oriented in form and content. Both of them have outsourced parts of their service portfolio, so a detailed service catalogue is designed during the contract phase for these services.

CSF 4

This CSF is closely linked to CSF 1, 2, and 3. Three participants with service portfolio documentation provide transparency to their customers. That establishes a basis for a common communication between service provider and customer. Only two participants use this leverage to enhance the acceptance and practical application of the service catalogue while the others do not push the usage actively. Rather it is used by the customers’ own initiative. Three participants charge the services to the customers to increase the transparency. Most participants show improvement capabilities.

CSF 5

Ten participants mention a slight usage of the service documentation because none existed, or because of a missing service orientation. Moreover, there is no commitment required for the customers to use the catalogue. Six participants refer the lack of commitment to insufficient communication and unavailable accessibility for the customers. Thus, the IT allows many exceptions regarding the IT delivery although IT policies (e.g. for IT security, standardization) existed. Six participants enforce the compliance with the policies, e.g. under organizational compulsion. In these cases the service documentation is widely used.

CSF 6

The documentation level of service catalogues influences the precision of the charging of IT services. Service-oriented charging is aimed at by most participants. Although the project cost can be charged already, the IT cost for supporting the daily business as well as the indirect costs are charged to the departments by rate assessment. Two participants charge the prizes of the outsourcing providers directly to the departments which increases the transparency for the customers.
LIMITATIONS OF THE STUDY

The qualitative research approach shows the following limitations. The research results are not representative because of the amount of participants. The study recorded individual perceptions that can distort the reality. Participants have a different understanding of crucial terms like service, service catalogue, or customer orientation that could bias some results. Further research should tie in with these limitations and execute a benchmarking study with a higher number of participants. The maturity level definitions could be revised to improve the model’s significance.

CONCLUSION AND FURTHER RESEARCH

The need for improvement shown in our study especially refers to structuring and defining the service portfolio. This is a crucial factor to implement many CSFs and main criteria successfully. The IT organizations of the participants know the importance of establishing a service catalogue but it is not applied yet. Reasons for that are deficient know-how, missing documentations of the IT portfolio, insufficient support of the top management as well as difficulties in understanding the customers’ perspective. Our study has shown that using a catalogue in conjunction with a service orientation could solve these problems. Adequate and practical guidelines for structuring and defining the service portfolio, which are needed for such a purpose, are often missing in practice. This makes an application difficult, especially for SMEs with scarce resources. The existing intransparency results in wrong expectations and dissatisfaction of the customers although the IT is doing a good job. The gap between the existing service management frameworks and their practical adoption must be filled. Further research should focus on developing a service structure that supports the classification and definition of the service portfolio as well as a modular and resource-friendly application.

Our study shows that the maturity model can be a helpful instrument to assess the current situation regarding structure, scope, documentation and service orientation of the IT service catalogues. The maturity model enables an assessment with respect to other enterprises. The definition of the assessment criteria has been successfully adopted in practical application.

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