

Extended DEMO-Based SLAs to Specify Customers' Expectations

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Abstract. Currently the services sector gained ground to the manufacturing industry to become one of the most profitable sector and with the greater growth curve. However, the organizations who have been leading the market have a lack of strong conceptual foundation which contributes to the gaps that reduce the services quality. Due to this increase of the gaps became more difficult for the service providers and their customers to align their expectations about the services quality. We propose to reduce the gaps by formally specifying the SLAs, using as foundation the Enterprise Ontology theory. This proposal is a new version of the DEMO-based SLAs with a more complex structure of Service Level Agreement (SLA). We evaluated the new proposal's version by gathering the feedback from experts in the area of SLAs specification. The feedbacks were rather positive since the interviewers agreed with the proposed SLA attributes.

Keywords: Service Science, Service Quality, Service Level Agreement, Enterprise Ontology, DEMO.

1 Introduction

The growth of the service sector has increased the importance of issues such as the quality of services provided to the customers [1]. To this end, various solutions are on the market and solutions based on ITIL or CMMI are among the most used worldwide[2]. The problem is that these solutions have a lack of theoretical foundation which leads to several inconsistencies between their implementations. This lack contributes to increase the gaps present in the gaps models [3] and leads to a reduction in the quality perceived by the customer.

We propose a solution based on Enterprise Ontology [4], and respective methodology DEMO, that intends to reduce the gap between customers' expectations and the perception of them by the service provider [3]. We propose to close this gap by formally specifying the customers' expectations into Services and Service Level Agreements. Several experiments have been performed [5] [6] [7] which allowed us to mature the proposal. In this paper we present the extended version of our proposal that contains a new structure of attributes for the Service Level Agreements (SLAs). Therefore, the research question that our research seeks to answer is: **Can DEMO be used to specify SLAs in order to model customers' expectations?**

Design & Engineering Methodology for Organizations (DEMO) is a methodology for modeling, (re)designing and (re)engineering organizations and networks of organizations. This methodology is based on the Enterprise Ontology (EO) theory. DEMO models are independent of their implementation which helps to build generic models that can be applicable to any kind of services [4]. At first glance it is not very clear the link between EO and the concept of service but recent studies [8] specified a service definition in accordance with EO and also a framework for specifying services [9] that served as basis for our proposal.

To evaluate our proposal personal interviews were carried out with seven experts in the field of Information Systems. These experts work in recognized organizations in the market.

The research method used in this paper was the Design Science Research Methodology (DSRM) which aims at the creation and subsequent evaluation of IT artifacts used to solve identified organizational problems [10].

This paper is structured as follows. In Section 2, we present a brief overview of the literature on the research problem area. Afterwards, we present our proposal, namely our DEMO-based proposal to specify the services quality (Section 3). In Section 4, we explain and show the evaluation process and finally we conclude the paper by reinforcing the main conclusions of this research (Section 5).

2 Related Work

There are some solutions used to specify service quality that are widely used. We now present two of them: Service Level Management and Web Services based Solutions.

Service Level Management is one of the key processes by which organizations manage their services, because it acts as the interface between the customer and the provider. At its most basic level, Service Level Management is involved in the following activities: define, agree, record and manage levels of service. There are a number of key elements required to ensure that services are fit for purpose and use, and remain so throughout their lifetime: service level requirements, targets and agreements [11].

Current Service Level Management solutions have two main flaws. First, they lack a strong conceptual foundation because they were derived from best practices of several years of implementations - not from a well-founded theory. Consequently, the inexistence of a theory may cause incoherencies among those solutions (second flaw). Service Level Management solutions are process-driven and not service-driven. These solutions are designed to work individually as processes but the interactions between these processes (such as Request Fulfillment, Service Level Management and Incident Management) are usually unclear. For instance, the connection between an incident and an SLA is neither clearly explained in ITIL nor in CMMI.

There are some solutions to specify the services quality that originated in the web services community. In [12] the authors show how to use Web Service Description Language (WSDL) and Web Service Flow Language (WSFL) to specify SLAs. However, this work suffers from the web vision tunnel as it is focused on the web services and does not try to specify business services. For instance, the specifications

do not include penalties or prices. The researches in [13], [14] and [15] have the same bottleneck. Despite this trend in the web service community, there are some recent researches that try to overcome the mentioned web service tunnel vision. In [16] a novel framework for specifying and monitoring SLAs for Web Services is introduced: the Web Service Level Agreement (WSLA) framework. This framework is applicable to any inter-domain management scenario such as business process and service management or the management of networks, systems and applications in general. In [17] and [18] business criteria is also included in SLAs. These three solutions represent a new movement in the web service community; however, none is based on a strong conceptual foundation.

3 Proposal

This section corresponds to the design and development step of DSRM. In order to solve the problem of the difference between customers' expectations and the perception of those by the service provider, we propose **DEMO-based Service Level Agreements to specify customers' expectations**.

Our proposal for a SLA structure consists of three areas of concern in each of these areas has its specific attributes. This structure, as illustrated in Figure 1, consists of three areas: SLA Basic Information, SLA Responsibility Information and SLA Specific Information.

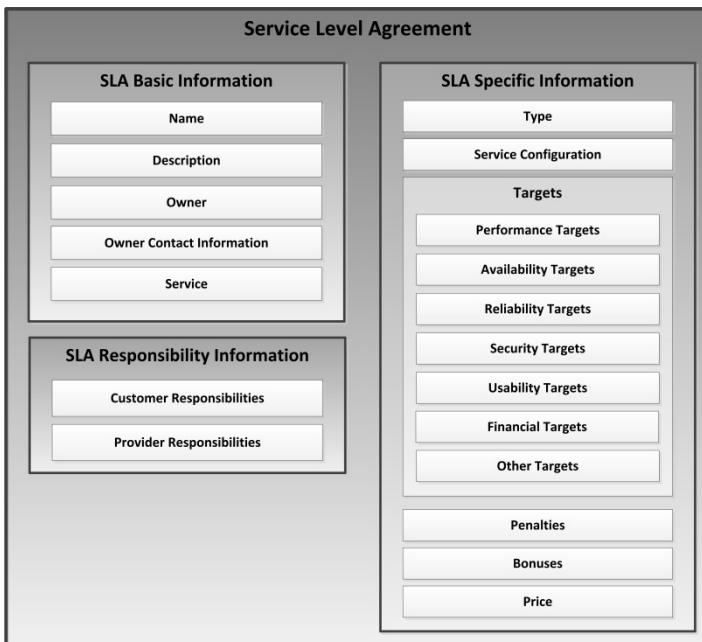


Fig. 1. Structure and Attributes of the DEMO-based Service Level Agreement

The **SLA Basic Information** area contains the generic information expected by anyone when listing all SLAs or searching for a particular SLA. In this area the following attributes are specified:

- *Name* – This attribute defines the name of the Service Level Agreement;
- *Description* – This attribute contains a short description of the purpose of the SLA. This description, together with the SLA Name attribute, helps answer the question “What“;
- *Owner* and *Owner Contact Information* – These two attributes specify the name of the actor who owns the SLA and possible ways of being contacted by the customer or by another entity related to the SLA: the first attribute can be taken from the Actor Transaction Diagram while the second one is supplied by the Owner. These two attributes answer to the question ‘Who is responsible for fulfilling the SLA?’;
- *Service* – This attribute defines the service itself (on which this SLA is drawn) and makes the connection between our proposal and the Generic Service Specification Framework [9].

The **SLA Responsibility Information** area contains the information related to the duties and obligation of actors (customer and provider) when implementing the SLA. This area defines what is expected to be performed by each of the entities involved in this contract, in order to avoid misunderstandings or breaches of contract. In this area the following attributes are specified:

- *Customer Responsibilities* – This attribute lists the actions that the customer has to perform in compliance with this SLA. This information can be found in the Process Model and the Information Used Table (IUT) of DEMO;
- *Provider Responsibilities* – This attribute is similar to that mentioned above but with respect to the service provider.

The last area in the SLA, **SLA Specific Information**, contains the unique information for each SLA that defines the metrics and parameters that must be respected by the service provider to match the needs of the customer. This section answers questions such as “What are the targets?” and “What penalties can be applied if the targets are not met?”. The area is composed by a set of different combinations of targets and actions for each type of SLA. For each SLA type, the following attributes are specified:

- *Type* – This attribute has the same role as the SLA Name in the SLA Basic Information area but in this case the purpose is to identify a specific combination of targets and actions for the SLA. For each type will be specified the service configuration, the targets and the consequences for fulfillment (or not) of the targets, and assigned a price;
- *Service Configuration* – This attribute relates to the specific features of the service that this type of SLA includes. This information is specified by the Service Provider and it has no direct representation in the DEMO models and diagrams, as it is implementation dependent;

- *Targets* – This attribute is composed by six other attributes that relate to six specific metric of SLA and a seventh attribute that allows some flexibility to add other targets. The six targets types that we propose are: performance, availability, reliability, security, usability and financial. These targets may be partially obtained from the State Model, because this model specifies the state space of the P-world. According to [19], a contract between a provider of service and a consumer of service must set targets to measure compliance;
- *Penalties* and *Bonuses* – these two attributes specify the actions to be taken if the targets are not met (Penalties) or possible bonuses if the targets are met (Bonuses). This information is induced from the Action Model of the EO because this model defines the operational business rules of an enterprise;
- *Price* – This attribute assigns a price to the SLA and has no direct representation in the DEMO models and diagrams, as it is implementation dependent.

With these attributes we intend to capture the customers' expectations, easing the task of service providers on perceiving those expectations and thus contributing to solve one of the gaps in services exchange.

4 Evaluation

This section details the evaluation phase of DSRM. Our evaluation strategy can be described using the framework [20] that identifies what is actually evaluated, how it is evaluated, and when the evaluation takes place:

- **What is actually evaluated?** The artifact evaluated is the proposed SLA version (a design product);
- **How is it evaluated?** We used experts' feedback to evaluate the DEMO-based SLA structure and the SLA attributes;
- **When was it evaluated?** It was evaluated ex post, i.e., after the design artifact was developed.

We conducted seven interviews with experts in the service management area in order to collect their feedback about our proposal [21]. These experts hold high positions in international organizations active in providing services and gathering requirements, and have over 10 years of experience in this industry. We interviewed one vice president of sales, three senior operation managers and three services accountable.

For the purpose of the interviews, a few days before we sent them a presentation of our proposal with an explanation of the different attributes and an example of our proposal applied in practice. The interviews were brief, 15 to 20 minutes, and each person was asked to comment the areas that constitute the SLA proposal and respective attributes. They were also asked to suggest new attributes to our proposal, explaining why, and if they agreed that our proposal could be used in a day-to-day business environment.

One of the main conclusions drawn from these interviews was the need to add an attribute that allows some flexibility to the writing of targets that do not fit those six

types. We chose to add a seventh attribute to the SLA Targets named, SLA Other Targets, to tackle this gap. Another conclusion was a poor explanation of each attribute and to simplify the name of each attribute. This conclusion forced us to analyze and develop a better description for all attributes of the proposal. Overall, the seven experts all showed interest in putting the proposal into production.

Therefore, the evaluation **indicates** that the answer to the paper research question is YES, **DEMO can be used to specify SLAs in order to model customers' expectations**. We conclude that, as the EO theory describes the interaction between the customer and the provider in a very formal way and since the Service Level Management acts as the interface between customer and provider, the EO provides a solid basis for formalizing the notion of SLA.

5 Conclusion

The services are booming in the world. This exponential expansion raises an important question concerning the quality services. This quality is affected by 5 gaps demonstrated in the gaps model [3]. Over the years, various solutions have emerged to align the customers' expectations and the perception of those expectations by the service provider, but none solved the problem completely.

In this paper we summarized proposals based on web services and the Generic Service Specification Framework. Web Services, in addition to being focused on processes rather than services, have a lack of strong conceptual foundation. The GSSF lacks detail, leading to different notions of quality by customers and service providers.

In order to solve the gap between customers' expectations and perception of them by suppliers (gap 1), this paper proposes a definition of Service Level Agreement based on DEMO. Apart from the SLA definition, our proposal specifies a structure for the SLAs with three sections as well as attributes for each of these sections.

The interviews with the seven expert practitioners revealed that our proposal was within the requirements of their organizations. They confirmed that our proposal shows a good degree of maturity and would be a useful contribution to reduce the misalignment between the expectations of their clients and the perception that they have of these expectations.

The last step of DSRM, communication, is being achieved through scientific publications (including this paper) aimed at the practitioners and researchers within the service science area.

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