
A model to analyse critical factors in B2B interoperability standards life cycle

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ABSTRACT: In the past different models were defined to represent the life cycle of B2B standards. Starting from there, this work defines a new standards life cycle model aiming to point out the aspects related to the production of Use Profiles and the execution of Conformance and Interoperability Testing. Indeed, at present more than in the past, they are going to play a relevant role in the B2B interoperability standards life cycle, especially when the target domains are characterised by a fragmentation of the actors in place. Then some critical factors that could hamper the adoption (thus the success) of a B2B interoperability standard specification are detected and analyzed in order to extract qualitative suggestions and define performance indicators.

KEY WORDS: standards life cycle, B2B, interoperability.

1. Introduction

This paper tackles the problems related to the life cycle of IT standards in the field of B2B, specifically standards addressing the interoperability in data exchange between different organisations collaborating to achieve their business goals.

The perspective we propose is not focused on the standardisation process itself but on the relationships between *standard building* (design, development and release) and *standard adoption* (implementation, testing, use). The reason for this interest is that B2B interoperability standards are a precondition for competitiveness, especially in domains with a prominence of small and medium organisations.

One of the most recognised criticalities regarding the *standard building* phase is the elapsed time between the beginning of the process and the final delivery of the specifications; nevertheless it is largely the result of constraints of transparency and publicity imposed by the procedures to guarantee adequate quality and consensus.

Regarding the *adoption* phase a number of influencing factors for the success of a standard specification should be considered; for example (Cargil 2011) the existence of reference implementations, the decisions of a group of preeminent players, a normative constraint, an immediate perceived benefit for early adopters.

Unfortunately hardly these factors are found for interoperability standards, especially in domains characterised by the fragmentation of the actors like some industrial sectors. On the contrary, interoperability standards must be largely diffused before producing tangible benefits; frequently the consequence of this peculiarity is a deadlock between expectations and incapability to answer them.

Thus this analysis aims to propose a model of interoperability standards life cycle that puts a magnifying glass on standards adoption in order to discover factors hampering, or boosting, the diffusion and adoption of such specifications.

2. B2B standards life cycle models, an overview

The most referenced standards life cycle model is the one defined by Cargill (Cargill 1995) that was based on five segments: *Requirement collection, Standard development, Profile/product development, Testing and Use*.

Later a literature survey was made (Söderström 2004) where seven standards life cycle models were identified, analyzed and compared and a new extended model was obtained to better evidence some missing although relevant phases.

Indeed the new model proposed by Soderström (Fig. 1) was based on 9 phases with complex inter-relationships and put in evidence three aspects of increasing relevance for B2B standards:

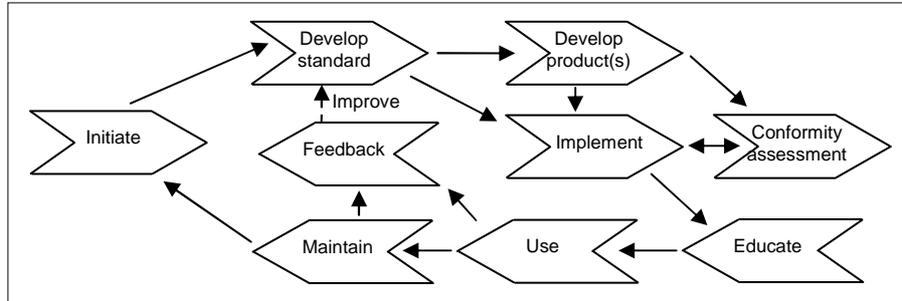


Figure 1. *Extended standards life cycle model (source Soderstrom 2004).*

a) existence of a *Conformity assessment* phase, b) distinction between *Product(s) development* and *Implementation* of the standards inside the organisations, c) necessity (and cost) of *Maintenance* through different releases and versions.

3. The proposed approach to model the B2B standards life cycle

Some authors warn against the existence of different, and sometime conflicting, criteria to decree the success of a standard (Cargill 2011). In our perspective the success criterion is a wider adoption of open and public specifications; thus we aim to detect potential critical factors in standards life cycle and to investigate the means to tackle them. On this purpose, being focused on specifications for documents and processes related to eBusiness data exchange, we need a model that evidences the critical path between standard development and real use for business. *Maintenance*, *Education*, *Feedback collection* phases, although important, are not in our focus.

The recent developments in B2B interoperability standards have evidenced an increasing interest in methodologies and environments for conformity and interoperability testing (Cargill 2011 and Ivezic *et al.*, 2011).

In parallel, building specific *use profiles* is evolving, from huge paper based documentation towards machine-readable artifacts based on XML and related languages, like XML Schemas, Schematron (Brutti *et al.*, 2010).

Thus, starting from the conceptualization of the previous models, we propose a simplification of the overall model centered on testing activities and with a fine grain representation of the *Implementation* and *Use* phases (Fig. 2).

The *Implementation* phase results consists of:

- *Use profile definition* defines scenarios for specific domains by restricting pre-existing specifications: restricted XML Schemas, business rules, reference processes, code lists constitute *use profiles* defined by a team of domain specialists;

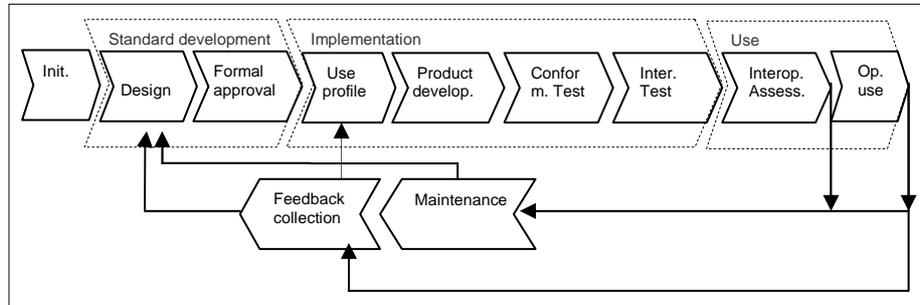


Figure 2. *The proposed interoperability standards life cycle model.*

– *Product development* regards the creation of new products or adaptation of existing ones in order to support the specification;

– *Conformance testing* is the test on system prototypes for violations of the specifications or *use profiles*; it is usually performed by the solution providers;

– *Interoperability testing* involves both solution providers and users (with their systems) and is based on virtual transactions (without any business effect); it aims to test if the real systems are really interoperable; this phase is crucial and allow to reduce problems arising in the following *Interoperability assessment* phase.

The *Use* phase consists of:

– *Interoperability assessment* includes activities of monitoring, problem detection and recovery; it is performed upon real systems and real business transactions; it is very sensitive for users because any problem might have relevant economic consequences;

– *Operative Use* phase is the final one, performed in real business without any further necessity of monitoring and actions by the solution suppliers (with the exception of requests for maintenance or upgrades).

4. Critical factors

It is an acceptable assumption that the difficulty to reach effective interoperability between different implementations of the same specifications increases in parallel to the degree of ambiguity (or degree of freedom) in the specifications (in (Brutti *et al.*, 2010) an attempt to measure the problem).

Our second assumption is that an ambiguity that is unresolved in the initial phases must be resolved in the following ones. For example, the ambiguity should

be usually thwarted through the adoption of *use profiles* for specific domains (Brutti *et al.*, 2011) otherwise, relevant actions of correction or recovery will be required when testing or assessing interoperability.

In parallel it is to notice that, while the first *Implementation* phase involves essentially a customisation team, the following three phases of *Implementation* are managed by a number of system developers. Successively, the *Use* activities involve in parallel an even larger number of final users (customers of product developers).

Thus, tackling an ambiguity in the specifications initially involves a restrict number of profile builders; when this does not happen, it must be successively resolved in parallel by a larger number of product development teams or, in the worst scenario, by each pair of business partners using the specifications.

Consequently, late facing an ambiguity implies more resources (and costs) to be spent (without considering the perception of the users that does not like failures in their real business). Then the creation of clear and effective *use profiles* in the earlier stages reduces, from a general perspective, the requested efforts to recover the problem; on the other hand, the finiteness of resources and time to deliver specifications and profiles hampers the number of supported cases/profiles.

It is to note that, of course, these conclusions come true if the ‘early’ *use profiles* are correctly implemented by the developers and users: to avoid missing elements and misunderstandings the profiles must be entirely expressed through machine-readable artifacts rather than paper based documentation.

The previous assumptions lead us to the following **performance indicators** to be applied on any life cycle represented with this model:

- (efficacy) inversely proportional to the total elapsed time between *Formal Approval* and *Operative Use*;
- (efficiency) the ratio between efforts spent for *Interoperability Testing (spent by developers)* and for *Interoperability assessment (by a multitude of users)*; it expresses the efficiency in resources use;
- (quality) the ratio between efforts spent for *Conformance Testing and for Interoperability Testing*; expresses the quality of the specifications and *use profiles*.

In parallel we observe three **preventing factors** against the achievement of an optimal and successful life cycle of interoperability standards:

- a) the complexity of the real world does not allow to model any possible scenario within a formal *use profile* since beginning;
- b) the dynamicity of the real world introduces changes in the collaboration processes that cannot be managed within the standardisation time scale;
- c) the finiteness of the resources hampers the variety and prescriptiveness of the specifications and use profiles that can be delivered in a defined time.

This model –although qualitative- ~~is~~ aims to facilitate the research for the trade-off between these factors and the optimisation of the key performance indicators.

5. Conclusions and next steps

The proposed model allows to represent the life cycle of interoperability B2B standards through different phases with a focus on aspects concerning conformance and interoperability testing; furthermore it puts in evidence the role of *use profiles*. Based upon the model, some critical factors have been indicated, jointly with possible performance indicators, with the aim to offer the basis for an effective improvement in the interoperability standards life cycle. Our conclusion is that standard design and use profile creation are closely related and crucial in the adoption activities. Thus it is worth to investigate how, since the design phase, the following creation of *use profiles* could be supported and their efficacy improved.

Next steps: a) to investigate the roles and interactions between the involved actors, b) to apply the model on real cases c) to move to a quantitative approach to achieve an objective method to measure the standardisation process's performances.

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