A Certification Instrument for Standards Implementation

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Abstract

The area of business process standardisation is a fairly new research area that has received much attention in recent years, both from the academic field, and from the practitioner field. One problem is that it is difficult for standards user organisations to determine that they have correctly interpreted and implemented a standard. Therefore, a certification instrument would help these organisations to achieve a more effective standardisation process, both with respect to time and effort required, and to the cost associated with implementing a standard. This is thus also the main problem covered by the thesis described in this paper. In order to provide an answer to this problem, five research questions have been identified that together can improve the situation. The intended result is a general certification instrument to be used in, or after, standards implementation. To our knowledge, no similar research projects are currently being undertaken, possibly because standardisation is such a new area of research. This research would therefore be a contribution to the research area as such.

1   Problem area description

Presenting the research you perform as a PhD student in a summarising paper is not an easy task. If the potential audience of that paper cannot be assumed to have much pre-knowledge of the research area, the task gets even more difficult. Still, it is a task worth undertaking, since it forces the PhD student to motivate and focus on the research problem, goal and approach. This paper includes such an attempt to describe our research, and begins with some introductory information to describe the research setting (section 1.1) and necessary pre-knowledge to the problem at hand (sections 1.1 and 1.2).

1.1   Inter-organisational business processes in B2B

The main setting for this research is Business-to-Business (B2B) relationships. B2B relationships mean communication and transactions between at least two business partners via the Internet, where technology allows communication to be more frequent, rapid and accurate (TheSpot4B2B, 2001; WebMethods, 2000). There are at least two types of B2B relationships: short-term relationships for single trading occurrences, and more long-term relationships for business relationships that last during a longer period of time. B2B relationships are primarily formed to enhance customer value, and they improve inter-organisational processes, efficiency and competitiveness by enabling rapid, effective real-time links between business partners.

So far with B2B relationships, but what are business processes? Well, they are the IT-supported "heartbeats" driving the organisation, making continuous improvement and evolvement of business processes important. In business

process improvement, organisations are pressured to create closer links with e.g. customers, suppliers, and employees (Bischoff, 2000). One of the most typical characteristics for new types of organisations is therefore the network structure (of e.g. B2B companies), emerging from the many links with collaborators. Business processes can be made more solid through automation, i.e. integration of business systems and data with the Internet and with trading partner systems. However, business processes must first be synchronised and integrated before they can be automated. True end-to-end process integration can offer efficiency in business processes such as procurement and logistics co-ordination (Netfish, 2000), and standardisation of processes is one way to go (see section 1.2). According to Emmerich et al (1999), co-operation between organisations is actually simplified if the same types of standards are used, e.g. a homogeneous way of setting up these documents. XML (eXtensible Markup Language) is useful here, since it is an application-independent way of representing organised or structured data, and since it promises to be application and OS independent (Netfish, 2000).

1.2 Standardisation of B2B processes

Having introduced B2B relationships and business processes, we now turn to the focus for our research – standardisation of B2B processes. The standards concept will be introduced through a simple example: Let us assume we have two organisations (A and B) that wish to co-operate by exchanging information between their business processes (Figure 1). B's process can for example use output from the process in A in order to complete some product or service. The standard in this case provides the glue that enables the two processes to align and co-ordinate their flow of communication and information. It enables two differently organised processes with different input and output to communicate regardless of their respective environments. In more complicated situations, there can be many parallel processes with multiple communication points, where input from one organisation must be usable for the other process and vice versa. However, the principle is the same, meaning that the standard still provides the medium through which communication and information flow is enabled regardless of used platforms.
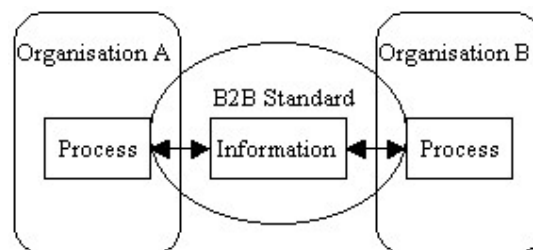

Figure 1: Business process standard in a relatively simple context

As mentioned, B2B integration requires a standards-based approach to enable organisational partnerships to be flexible in adding or removing applications and partners depending on the organisational needs (Wangler et al, 2001). One can say that the need for standards arises when people want to connect and communicate, and the IT development therefore leads standardisation into new realms. Many different types of organisations can develop standards, at a national and regional level (e.g. ANSI), at an international level (e.g. ISO, IEC and IEEE), or by

industry initiatives (e.g. RosettaNet). Söderström (2001) has compiled a list of reasons for why standardisation is undertaken:

- *Universal connectivity and communication*; i.e. to further enable this without worrying about restrictions in time and space
- *Interoperability and automation of business processes and systems*; e.g. in terms of component-based development
- *Cost reduction and productivity boost*; since productive enterprises get access to efforts spent on non-productive differentiation
- *Efficient application of IT in businesses*; such as speed in setting up supplier/partner networks and ease in integration of new members in virtual organisations

Because of the business interest in standardisation, most available software solutions for B2B co-operation include support for at least one standard, often more. User organisations thus have a freedom of choice in what software tool to use. Even though standards as described above are considered the future, they may bring some problems. Five possible problems are introduced here (Söderström, 2001):

- *Market dominance*; some companies may seek to gain market dominance. This hunt for dominance may cause the standards movement to disintegrate.
- *Failure to account for specific situations*; researchers often prefer to generalise and hence not take specific situations into account.
- *Differing schemas*; each XML-based standard differ in schemas, used business object ontology, and choice of defined business documents.
- *Standards integration*; suggested standards are not well integrated with each other. This could mean that integration of e.g. different organisational processes is not as easily performed as desired.
- *Time*; the standards development activities that exist are often criticised for taking too long, and thus not being able to keep up with the rapid technology developments. Standard size, different levels of standards, and complexity of the standards development process affects users and their ability to integrate standards.

Furthermore, standards may not be used if the responsible development organisations fail to promote why their product is better than all others (Cargill, 1999). The reason is that standard first needs a critical mass of providers and procurers before it sells itself (Egyedi, 1999). Many of the mentioned problems are being addressed by development organisations e.g. in that these organisations, by working together, make better ground for inter-operability between their standards. Regarding the hunt for market dominance, competition is one aspect that drives the development of standards. But the existing co-operation may slow the hunt down, since no single company is likely to be dominant. Since several development organisations consist of more than 40 participating organisations, standards dominance is not likely to mean dominance of a single organisation.

2   Complex of problems
When looking into standardisation, three areas where problems are likely to occur, or areas where specific criticism is put forward, have emerged:

1. *Standards characteristics*: one major problem is that standards are not well integrated and compatible with each other. The reasons are firstly that existing standardisation efforts differ considerably in several aspects, e.g. in what parts and level of detail in business processes they focus on, and what industry sector they are intended to be used in. Secondly, there is a "standards war" for market dominance between different standards and the organisations that develop them. This problem is somewhat ambiguous, since there is also a great deal of co-operation between the standardisation organisations. Thirdly, differences between standards can cause problems for organisations that use different standards to connect, communicate and integrate their processes in a simple way. One example is standards that use different underlying formalisms (mainly EDI and XML), even though XML is dominant here. Since XML is dominant (due to its flexibility compared to EDI), this thesis is delimited to standards that use XML. It should be noted that XML-based standards also differ between them, e.g. in used XML schemas, business object ontology, and choice of business documents to be exchanged.

2. *Standards development*: one problem here is that standardisation development takes much time. The consequence is that standards development cannot keep up with the rapid technology developments, which in turn means that standards could fail to support the most recent technological advancements used in industry and hence that they would not be useful to organisations. Another criticism against standards development is the gap between research (in both academia and industry) and standards practice. Researchers often prefer generalisation of results, possibly leading to ignorance of specific needs and situations in favour of the general aspects. Results could then become too general to be applicable.

3. *Standards usage*: most standards consist of a number of specifications for different aspects and types of business processes. This in itself may not be a problem, but the lack of descriptions of internal dependencies between these specifications is. For example, let us say that standard A includes three specifications (X, Y and Z). What is unclear is whether each specification can be implemented and used separately, or if all three of them must be implemented due to dependencies between them in order for the standard to be effective and for the organisation to be compatible. The fact that standards may consist of many separate parts often causes them to grow large in size, which adds to the length of development and to the integration difficulties. Complex standards that are difficult to understand, implement and use also make standards integration a more tedious task. Furthermore, standards are often written in an ambiguous language, thus making several interpretations possible. It can therefore be difficult for organisations to know whether or not they have correctly implemented a standard, and only a few standards development organisations provide a "certification service" to assist in this situation.

Many problems concern different interpretations of the standards specifications, their implementation and usage, and how compatibility between organisations that about to co-operate using a standard can be determined in advance through some

form of certification. So far, much of the research has been focused on the technical aspects of the standards, meaning that there are many unanswered questions regarding organisational usage of standards. Therefore, a study involving standards implementation and how organisations are actually working with standards would contribute to the research area. Furthermore, the research would also help provide better ground for what to improve in standards and their complemented guidelines.

There is an underlying assumption that is important to note in this work, being that it is possible for organisations to make mistakes when implementing a standard. Such a mistake could be that an organisation misinterprets a standard's specifications, and thus does not use the standard as intended. The truth-value in this assumption remains to be assessed, even though there are some reasons to expect the assumption to be true. As mentioned, the possibility to misinterpret written documentation is not a new phenomenon. This would indicate that the risk of misinterpretation also applies to standards specifications. Furthermore, guidelines for any purpose are useful and enable organisations to learn and act more quickly than if they adopt the trial-and-error approach. In any case, many unanswered questions regarding organisational implementation and usage of standards remain to be answered. Based on the above discussion, the main thesis statement is:

> **Thesis Statement:**
> *How can an organisation certify that it has correctly implemented a B2B standard?*

Five research questions have been identified that together contribute to fulfilling this goal, and these questions are presented and motivated in sections 2.1 through 2.5. The relationships between these questions will be described in section 2.6, before the research motivations are discussed in section 2.7.

2.1 Current standards implementation

To our knowledge, there does not exist any research overviews of the standards implementation process as such, e.g. with respect to included steps and phases. In fact, many standards are so new, so that no implementation process has been defined for them yet. Still, the SDOs recognise the importance of doing just that. Therefore, the first research question is:

> *How do organisations that are, or are about to be, involved in B2B relationships implement standards that support these collaborations?*

An investigation into, and modelling of, the implementation process would contribute to a better understanding of how standards are actually put into use. Furthermore, standards development organisations that have not yet defined an explicit implementation process for their standard can be guided in how the implementation process for other efforts are conducted. These organisations can

then get a basis for defining such an explicit implementation process for their own standard. From descriptions of the implementation process, information regarding certification and requirements for such an instrument can be extracted in order for this instrument to support the actual way of working in organisations. However, the ways in which organisations implement standards affect how testing and certification is performed, and hence a clear view of the implementation process is needed before the attention is directed at certification itself. An investigation into standards implementation also provides an opportunity to identify possible implementation problems, when adaptations are made, what guidelines that are used/provided, and what phases that are part of the implementation process. This question will be the first part of the licentiate thesis.

2.2 Implementation guidelines

One aspect of standards that clearly affects they way they are implemented is the help provided to the user organisations that perform this implementation. This justifies an investigation into what kind of help that standards development organisations provide to user organisations – if any help is provided at all – in terms of e.g. specifications and documents, on-line services, and help-desk functions.

> *What (types of) guidelines for implementing a standard do standards development organisations make available to their user organisations?*

The help may include advice for e.g. how to conduct the implementation, how to adapt the standard, and how to validate the correctness of the implementation results. The investigation results would clarify if user organisations are satisfied with the kind of support they get, or if they would like to have other types of support. Therefore, looking into what available guidelines there are will both aid standards development organisations to develop the kind of support and guidelines needed and desired, as well as providing input regarding what guidelines that govern standards implementation and how this is done. This question will be the second part of the licentiate thesis.

2.3 Current standards certification

As described above, it is difficult for organisations to assess whether or not they have interpreted and implemented a standard correctly. Therefore, standards development organisations should provide some form of support to their user organisations regarding this matter.

> *How do organisations test, or get certified, that they have correctly implemented a certain standard?*

Only one of the standards we have identified provides a service of this kind. Having a way of ensuring that inter-connectivity will work as desired will probably reduce costs for organisations, since problems and errors are more costly to correct the later in the project they are discovered. Answers to this question will therefore reveal the kind of certification support that is available, and what this

support consists of. The certification process as such, if it exists at all, is in itself only touched upon in literature, and often implicitly at that. This motivates an investigation into the phases, the support provided, whether or not an instrument is used for certification and if so what characteristics this instrument has.

2.4   Certification instrument characteristics

In the standardisation literature, there are few actual descriptions of an instrument or service for certifying that user organisations have correctly interpreted and implemented the standard, and that the standard will work as intended.

> *What characteristics should a test, or certification, instrument for standards implementation have?*

A description of a general certification process and the contents of a certification instrument will contribute to the understanding and enhancement of this aspect. One benefit from using such an instrument would be to help organisations get more efficient use of their standards. Part of this would be to enhance the awareness in organisations of the kinds of problems and errors that may occur when implementing standards. Having such knowledge enables organisations to take preventive actions to eliminate these problems and errors as much as possible before the standard is put into use.

2.5   Certification instrument usefulness versus effort

A certification instrument would, as described previously, bring benefits to both user organisations and standards development organisations. However, care must be taken so that the effort of using this instrument does not exceed the benefits it brings.

> *Does the usefulness of a test, or certification, instrument for standards implementation outweigh the effort needed to implement and use the instrument?*

This does not only concern financial issues like cost, but also the amount of time required to use the instrument. Theoretically, it seems like a certification instrument would bring more benefits than it would problems, and save more money that it would spend, but there are no guarantees. Therefore, it is necessary to examine the usefulness of the instrument in order to be able to argue for its use and why the benefits are greater than the effort needed.

2.6   Summary of the problems

The inter-relationships between the five research questions are illustrated in Figure 2. The figure illustrates the standardisation process, and the areas of improvement from each of the five research questions are highlighted using bolded lines. The inter-relationships between the questions will be argued for using Figure 2.
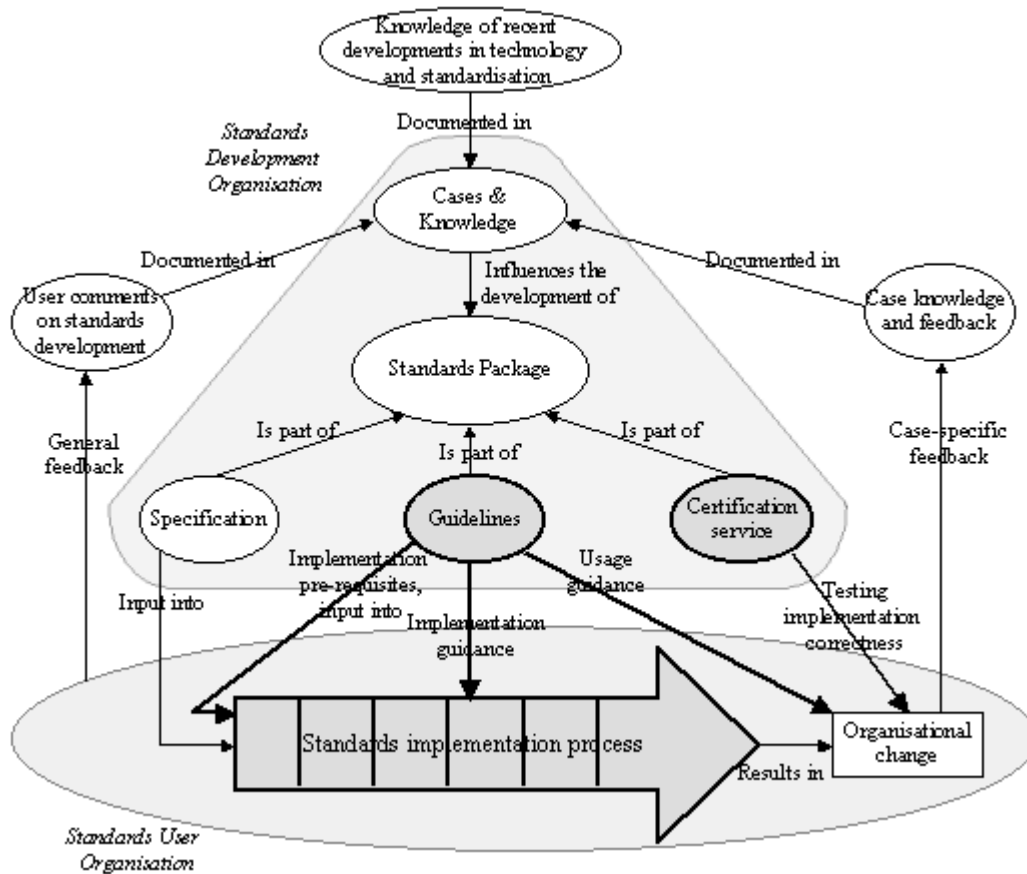
Figure 2: Desirable standardisation process and research questions relationships

Results from investigating the first question will help define a general standards implementation process, with steps and phases. The second question will help identify what kind of implementation guidelines that are needed and how they connect to the different phases. These two questions relate since the implementation process on the one hand is affected by what guidelines that are made available in the different steps and phases. On the other hand, guidelines are affected by where, when and how they are to be used in the implementation process. Both of these questions are part of the licentiate thesis, which will constitute the first part of the doctoral thesis. The licentiate thesis therefore provides the basis for continuing to investigate how organisations get certified today, and what characteristics an instrument supporting that process should have.

The third question will point to how standards user organizations (SUO) today can certify that their actions are correct, if at all such a service is provided by the standards development organizations (SDO). Results from the fourth question will describe what characteristics a certification instrument for correct standards implementation should have, while question number five will examine whether or not such an instrument is worth the time and effort needed for the SUO. These three questions are inter-related, since they all deal with different aspects of certification of correct standards interpretation and implementation. They relate to the previous two questions by providing a last step in the standards

implementation process to ensure correct implementation. The doctoral thesis will consist of the licentiate thesis and some complementing chapters, which will cover the last three questions.

2.7 Research motivations

Each of the questions in the previous sections was motivated, but there are also motivations for the entire research as such. The main goal of the research is, as stated above, to facilitate for organisations to certify that they have implemented a B2B standard correctly. By providing organisations with a certification instrument and guidelines on how to use it, organisations get help in knowing that their interpretation of the standards specifications is correct and enables connectivity and communication with other standards users. Motivations are threefold: *Firstly*, many organisations bought computers and adopted IT solutions during the first IT boom without really thinking about the consequences that this would bring to the organisation and its way of working. By investigating how organisations may be affected by standardisation and how they can be guided in certifying their implementations, organisations that are about to embark on the road of standardisation can be helped to avoid doing similar mistakes. *Secondly*, the results of research into standards certification would be of interest to both academia, standards development organisations, and standards users, thus having a greater chance to actually be useful and used. *Lastly*, organisations in a hyper-competitive business environment cannot afford to lose their ability to connect, collaborate and communicate with both partners and customers, since this in many cases is what brings the competitive advantage over other market players. Helping and guiding these organisations in towards a correctly implemented standard is therefore important to investigate.

A wise person once said that research should be new true and interesting. To our knowledge, no similar research project has been conducted, which makes this research new. If the research is true is difficult to assess. However, the problems do exist in the real world, which would call for the research to be relevant and "true". Finally, the research should be interesting, which of course would depend on who you ask. We believe that the research is interesting, particularly to standards user and development organisations, for the reasons stated above. Furthermore, the results would very likely contribute to standards research, in both academia or in industry, since the research area is new and still lacks knowledge about standards.

3 Research approach and research methodology

The research process involves collecting relevant material. By examining the world in a systematic way, we can assess the adequacy, plausibility, accuracy, fruitfulness, truth and theories of the world (Ackroyd and Hughes, 1992). The purpose of research methods is to help researchers produce more reliable knowledge than what can be achieved through "live-and-learn" knowledge, and to help researchers achieve the following four requirements (Patel and Tebelius, 1987):

1. Control over how their own experiences and values affect the knowledge creation

2. The right kind and enough information about the objects under study
3. Good information quality; and
4. Identify information links, compiling the information and expressing it in an understandable manner

Going now into more detail about this research, we have tried to identify what research methods to use to collect relevant information. Figure 3 illustrates the connection between the thesis and the selected research methods. Literature studies will be used to collect background material, but also to study written information about standards usage, development and consequences. The licentiate thesis research question concerns implementation and usage of standards in B2B business relationships, and also most of the background knowledge. Here, standards use and implementation in theory means studying documents and specifications in which standards and their implementation process are described.
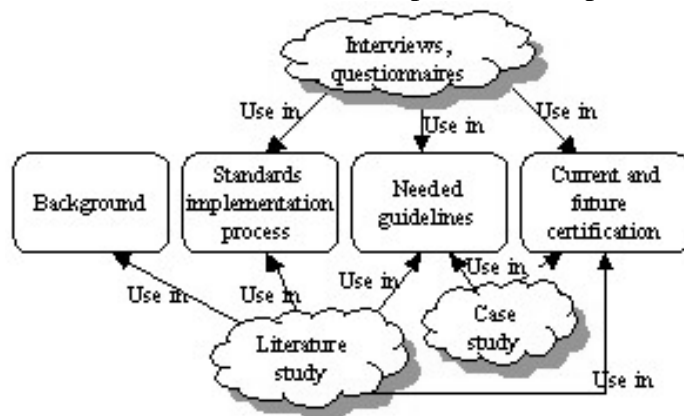

Figure 3: Research methods related to the PhD thesis parts

Interviews (and possibly also questionnaires) will be used to gather information about standards usage, development, consequences and certification. It is possible to use case studies to get a deeper insight into some of the mentioned areas, but this has yet to be decided. The interviews will be transcribed and the resulting text documents will be analysed using a scientific software tool for textual analysis.

Furthermore, at least one case study will be identified, in which issues such as the standards implementation process, expectations and outcomes of standardisation, and lessons learnt will be examined.

4   Expected results and future work

The expected result of the research is primarily a general certification instrument for standards implementation. The instrument will consist of a list of characteristics that a certification instrument must have, using textual as well as graphical descriptions of e.g. instrument contents and usage. A description of how standards are, and can be, adapted in order to preserve organisational uniqueness may also be included here. The certification instrument should help organisations to make their standards usage more efficient. Furthermore, the certification instrument architecture will be described. Only one of the investigated standardisation efforts currently includes a service for validating standards compatibility, and a general certification instrument has therefore yet to be

developed. To our knowledge, no similar research projects are currently being undertaken, possibly because standardisation is such a new area of research. This research would therefore be a contribution to the research area as such. The literature study and the preliminary results from the interview study show that there is a difference in opinion regarding what a standard is and that it comes with positive and negative aspects. However, as mentioned, there are no investigations known regarding e.g. whether or not the positive and negative aspects are really true in practice. As for now, it seems they are mere speculations.

As of today, most of the background material is collected and written about. Some complements are needed, though, e.g. a description of XML and its role in standards. The first interview study with development organisations regarding their view of standards implementation was undertaken in the fall of year 2001, and the second study with the standards customers is planned for spring in year 2002. Concurrently with this second interview study, literature regarding the standards implementation process and guidelines will be undertaken. The literature study will be continuous throughout the thesis process. Regarding the case studies, some contacts with companies in which such an investigation would be possible exist. The preliminary timeline is to present the licentiate thesis in August, year 2002, and the PhD thesis in December, year 2004.

5   Acknowledgements

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