

Managing standards development in emergent fields of technology innovation – a proposed model of key processes in ICT standardisation

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ABSTRACT: The rapid development cycles of ICT put a lot of stress on standards development and standards governance systems. Based on selected frameworks within global knowledge management and standards development this paper constructs a model to identify and evaluate critical stages within standards projects to improve the process of ICT standardisation. The paper is explorative and conceptual. The empirical backdrop of this model development is standardisation practices within the domain of learning technologies.

KEY WORDS: standards development, standards governance, standard management, DSN model, Key Knowledge Sharing Point

1. Introduction

Standardisation of emergent technologies may seem like an oxymoron; and doing “innovation by committee” may stifle more than encourage innovation if the wrong components are selected for standardisation. Nevertheless, the potential upside is so huge that new projects are tried repeatedly.

The scope of this paper is anticipatory standardisation mainly in the field of ICT. The paper develops a model that integrates theories of innovation, global knowledge management, and standards development. The proposed model provide heuristics for designing a standard fit for purpose. The model is discussed in the context of standardisation of information technologies. However, it is not restricted to this application domain.

The need for an “accelerated, simplified and modernised” standardisation process is recognised by the European Commission (EC 2011), and has been discussed in stakeholder communities, e.g., the learning technology community (Hoel, Hollins and Pawlowski 2010), for years. However, to reap the investments in

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research and development projects, and the move towards a more streamlined standardisation process there is a need to understand and improve the full process cycle of standards production, from project scoping to the implementation of standards in products and services. This paper is a first exploration of key processes in such a process cycle.

2. Related work

Innovation theory and knowledge management theory, especially focussing on global knowledge management processes, provide models of knowledge processes that “set the scene” for ICT standardisation projects (Lyytinen and Damsgaard 2001; Pawlowski and Bick 2011). When the actors, project stages and processes are identified more specific models are needed to capture the key processes that determine the quality or success of the ICT standardisation *per se*.

Anticipatory ICT standardisation is innovative of nature. Tidd and Bessant (2009) have presented a simplified model of innovation as a core business process. To build an innovation strategy one has to provide answers to questions like: How can we find opportunities for innovation (*Search*)?; What are we going to do – and why (*Select*)?; How are we going to make it happen (*Implement*)?; and How are we going to get the benefits from it (*Capture*)? An adaptation of this model will be used later in this paper as an overarching framework for describing standardisation efforts in emergent domains.

The simplified innovation model of Tidd and Bessant (2009) is silent about context factors representing enablers or barriers to innovation processes. Pawlowski and Bick (2011) have presented a framework for Global Knowledge Management (GKMF), which includes influence factors as geographical dispersion, communication across time zones, as well as cultural influence factors. Their model is quite complex and serve as an analysis grid for capturing processes that are particularly important in globally distributed knowledge management settings, e.g., organisational and ethnic cultures, barriers (which need to be handled by different interventions), knowledge types that vary across cultures, etc. The GKMF model gives a heuristic to design knowledge management processes, e.g., through the steps of identifying the context and barriers of stakeholders, designing the knowledge sharing processes, providing the support infrastructure, and assessing the success of the project (Pawlowski and Bick 2011).

Standardisation is, according to Hoel, Mason and Pawlowski (2012) described as a multi-directional relationship between Process, Product and Domain. When the domain is known the task to tailor the process and the product begins, which in turn feeds back to the domain. This general model was extended to tap into the technical aspects of standardisation, allowing developers to ask the questions that best contribute to a technically sound standard. Figure 1 shows the Design - Sense-making - Negotiation (DSN) process model and how these processes influence the different parts of a technical standard document though levels and perspectives (*ibid.*).

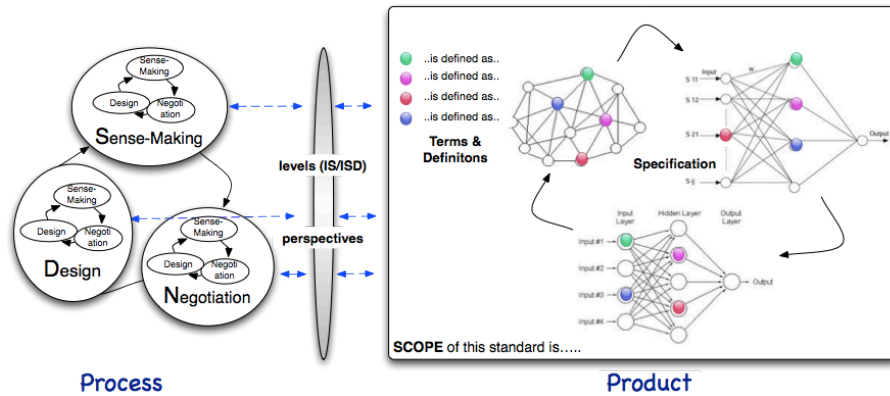


Figure 1. Model of standardisation understood as interaction between process and product, by Hoel et. al. 2011.

3. Framework for managing standardisation projects related to emergent domains

The aim of this work is to construct a framework to support a range of knowledge management considerations related to standardisation in emergent domains. The model will be a heuristic for management processes controlled by different stakeholders of standardisation. As such, a design criterion will be to keep the model simple; instead of being complete it should be expandable; and it should reuse components if possible to make it easy to implement.

The DSN model is a component that is proven efficient in analysing standardisation processes (Fomin, Keil and Lyytinen 2003; Viril 2003; Hoel and Pawlowski 2011; Umpapthy, Puroo and Bagby 2011). However, the D-S-N cycle is not so well suited for describing the setting up of a standardisation project or the exploration of the results of a project. We therefore start our exploration by using the broader innovation model by Tidd and Bessant (2009).

The *Search - Select - Implement* and *Capture* processes of the simple innovation model represent different stages of a standards development project. A project starts with exploration of the innovation space, and the end point may be defined as the dissemination of the finished standard.

3.1 First iteration towards a model

Reflecting on the standardisation activities familiar to the authors, the following sequence of events often take place: A project starts with *project scoping*, getting the big picture of the domain, e.g., competency descriptions in the domain learning, education and training. This includes summing up pre-standardisation activities; soliciting stakeholder input; mapping funding opportunities and selecting standard

setting bodies (SSB). The next phase is *specification scoping*, running through the innovation cycles ending up with a well defined scope for the expert group to design, make sense of and negotiate the artefacts making up a standard. Defining a scope for a project and a scope for a technical specification are two distinct processes. In ITLET standardisation Hoel and Mason (2011a, 2011b) have identified a need for improvement of the latter process, focusing on Information Systems Design principles, dependencies on base standards, and the rationale for defining a new specification. When a standard is published a new process of dissemination, adoption and support starts with new requirements and partly new actors.

In summary, this process can be table where the horizontal axis describes Search (innovation opportunity), Select (what to do & why), Implement (how to make it happen), and Capture (how to get the benefits); with the vertical axis describing the same steps as sub-processes (project scoping, specification scoping, DSN processes, and Publishing & Use). Populating such a table using data from current practice the authors observe the following:

Perspectives: Different roles have varying stakes in different parts of the overall process. E.g., a domain expert may be less interested in and involved in Capture, i.e., bringing the finished product to market; or in the initial phases of a project, i.e., scoping the work. A SSB may take less part in the initial stage of a project, relying on stakeholders (industry, government, a.o.) to come up with needs for new standards. Varying involvement in the different phases may lead to or explain differences in perspectives on the different sub-processes.

Contextual factors: Each process has a precursor with its own context, which is more or less available to participants taking part in that particular process. E.g., information about the barriers identified in establishing a project may not be available when designing the scope of the specification.

Risk of quality breakdowns and the need to identify Key Knowledge

Sharing Points: Even if some projects may be severely delayed, very few, at least in the learning technology domain known to the authors, are cancelled. The risk of breakdowns is therefore not a risk of *not* getting a resulting specification document, but a risk that the produced standard is of low quality. The risk is high when key knowledge is not shared. The challenge is to pinpoint when that key knowledge sharing point (KKSP) is manifest (Hoel and Pawlowski 2011a), often when moving from one process to another. However, some transitions are more crucial than others, something that must be addressed in the framework under construction.

Sense-making as a key process: “Sense-making in standardization is about reading the history of experiences and encounters with technology in a new context which calls for new sense-making and the creation of a new technological and social world” (Fomin *et al.* 2003). Sense-making directed towards developing and maintaining a shared design space is the integrating process of standardisation. A viable framework needs to develop questions that will keep this sense-making process going to force actors “to continuously question their established frame and continuously develop new readings” (*ibid.*).

Interventions denote activities which aim at positively influencing the processes, such as improving mutual understanding in a global setting (Pawlowski and Bick 2012). Interventions are basically additional, well planned processes and activities using a clear method or tools. As an example, we have previously used concept mapping activities and visual tools to improve the sense-making and negotiation processes (Hoel and Pawlowski 2011b).

3.2 A Simple model of Standard Development Processes and Stages

The next step in constructing the framework is to come up with a model that could be tested, using the first observations as design input. Figure 2 provides a simple model of standardisation processes and stages. A project goes through a number of loops, ending up with a published standard that is brought to market and implemented in products. Each loop starts with an open exploration of possibilities and options, progressing through a selection process, specification and implementation processes, before the resulting artefacts, methods, actions, etc., are handed over to the next stage. The relative importance of sub-processes differ from stage to stage. E.g., the dominating process in project scoping is *searching* to map the new innovation space; while adoption of the finished standard is mainly about *capturing* the benefits of standardisation work. However, at each stage all the sub-processes are present. If not, there is considerable risk of a process breakdown that will negatively effect the quality of the work.

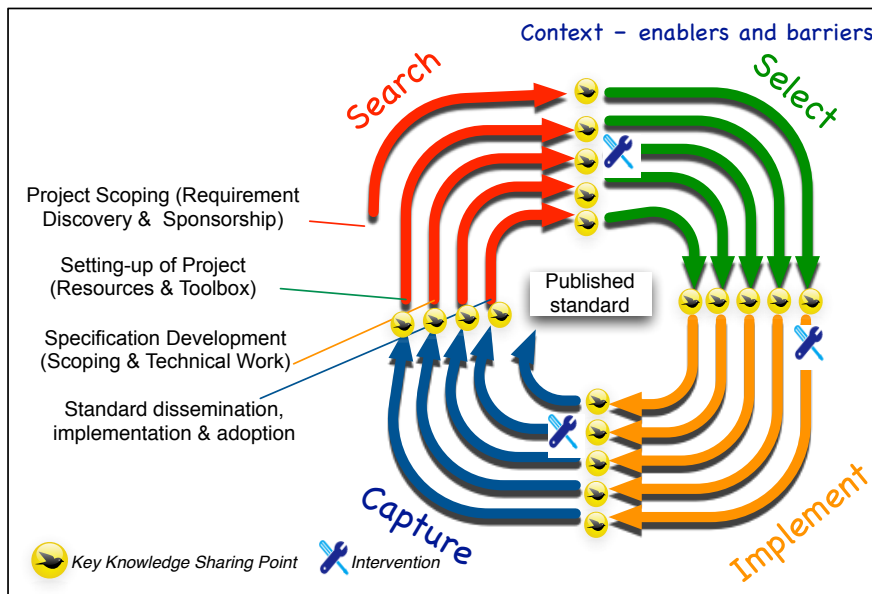


Figure 2. A model of Standard Development Processes and Stages.

Key Knowledge Sharing Points are described as transition points moving from one sub-process to another. At these points one should question if key knowledge is shared with relevant actors. Interventions are embedded processes that make use of dedicated tools, e.g., conceptual modelling, study period, request for comments, etc.

All the processes are framed by context enablers and barriers. These influence factors should be identified and made use of throughout the project.

4. Discussion

The proposed model is offered as a heuristic to better make sense of the ICT standardisation processes and to identify potential breakdowns. In a formal SSB, like ISO or CEN, the directives identify only a minimal set of checkpoints defined by a document template and a balloting scheme (ISO/IEC 2011). Moving draft documents from committee draft stage to an approved standard through several steps of balloting, commenting, and comments resolutions, is supposed to keep the core process of Design - Sense-Making - Negotiation going towards a quality result. However, the punctuations provided by document structure and balloting may not be enough to ask all questions needed. For example, case studies of learning technology standardisation show that questions related to rationale and scope (why) are less supported than questions related to specifying relations between entities (who, what, when, where) (Hoel *et al.*, 2011). The KKSPs of the proposed model defines checkpoints that could be interventions and corrective actions, e.g., making sure the scope is acknowledged throughout the specification process.

5. Conclusions and Further Work

This paper has integrated a number of general models of innovation, global knowledge management and standardisation into a simple model of standard development processes and stages. The model needs to be further developed through an iterative process of design and validation against current practice in ICT standardisation. A suggested direction of development is to create an evaluation framework consisting of the model in Figure 2 and a list of questions to drive the identification of the Key Knowledge Sharing Points that should prompt interventions.

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