

Learning Technology Standards Adoption – Process Improvement and Output legitimacy

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Abstract—In the context of a theoretical model on process and product legitimacy of Learning technology standards development and adoption proposed by the authors in 2008, this paper discusses recent activity and progress in the Learning, Educational and Training (LET) standards domain.

In January 2010 experts from Europe and USA gathered in the United Kingdom to discuss the “Future of Interoperability and Standards in Education”. It is the presented position papers, case studies and recorded discourse from this conference, which provides data to which is used to test the validity of the model itself. The Process and Product Legitimacy model was found to still support necessary discourse towards an improved LET standardisation process, even if a new area of discourse related to Intellectual Property Rights was identified as not covered in the model and thus calls for further work.

Keywords—interoperability standards development; standards adoption; standards legitimacy; standards governance

I. INTRODUCTION

The positive role standards play in promoting technology enhanced learning (TEL) is under question. In previous ICALT papers the authors have reflected on the challenges to improve the legitimacy of standards in the domain [1, 2, 3, 4] asserting that standards should be considered as a means towards a goal (interoperability) as opposed to destination. To understand the design challenges of TEL, we have identified the need for a more informed understanding of the domain, i.e., a domain model or theory. The model must provide a more informed view of both the role of standards and the domain itself. Building on an analytical framework of Werle & Iversen [5] the authors presented a framework of input and output legitimacy (Table 1) [3].

In marked contrast to Werle & Iversen we stressed the need for standards to be proven technically robust in “real” implementations. The Learning, Education & Training (LET) domain is a dynamic technical environment; this makes it essential to inscribe stakeholder interests and business needs into the development process. Both the technical maturity and the technical characteristics of a standard (relative to its technological and socio-cultural environment) are essential in ensuring output legitimacy.

The authors proposed that the framework of input and output legitimacy could serve as the starting point in building a more robust domain theory on the standardisation of learning technologies, applying the term Process and Product Legitimacy (PPL) to characterise their model.

II. PERSPECTIVES / CASE STUDIES

In January 2010 a group of international experts and stakeholders in the TEL standards and specifications domain gathered to consider the Future of interoperability standards in Education. About a quarter of the about 40 participants came from outside the UK, including Austria, Belgium, France, Germany, Greece, Norway and the USA [6]. The submitted papers and discourse during the event provided the opportunity to test the assumptions behind the framework proposed by Hoel & Hollins [3] and the validity of the framework itself.

The timing of the meeting and the diversity of participation and efforts to develop and negotiate positions are indicative of the state of affairs in the domain. At the start of the new decade the formal standards bodies in Europe (CEN WS-LT and CEN TC353) have only a small number of

TABLE I. SUMMARY OF WERLE & IVERSEN'S THEORY OF STANDARDS LEGITIMACY, WITH REVISED VERSION BY HOEL & HOLLINS.

| <i>Werle & Iversen</i> | | <i>Hoel & Hollins</i> | |
|--------------------------------|----------------------------------|--|---|
| Input legitimacy | Output legitimacy | Input legitimacy | Output legitimacy |
| Stakeholder representativeness | All 'interests' considered | All 'interests' considered and ideally represented | Inscription of stakeholders' interests |
| Acknowledged SSB | External tracking and monitoring | Open process | Enactment status (is the specification implemented and used in services?) |
| | Open discourse | Balanced choice of SSB | Technical maturity of the specification |

projects, the most active ones focussed on issues related to learner mobility and competencies. Internationally, the subcommittee 36 within the ISO/IEC JTC1 is struggling to deliver results (e.g., within the highly profiled field of metadata for learning resources), although a number of new projects are being launched. The IEEE seems to be no longer active in the domain. The US defence backed Advanced Distributed Learning (ADL) initiative has just started to work on the next generation of Shareable Content Object Reference Model (SCORM), leaving the IMS GLC and the newly established LETSI organisation to scope their work.

It seems that intense political positioning by the formal organisations is occurring; this at a time when emerging community specification initiatives are attracting LET technology experts focussed on addressing the fundamental concerns of the educational community. The term emergence is one the authors have previously used to characterise the LET technology domain [2, 3, 4]. This is also a consistent theme of a number of the 2010 conference position papers. Other significant issues highlighted in the papers included the need for clear unambiguous scoping of work activities; the concept of developing LET standards positioned within standards “families”; work processes within standards development; organisational processes and stakeholders relations; and intellectual property rights issues.

The authors will in the following provide a summary of the workshop proceedings, identify common themes and analyse these in the context of the PPL framework in order to validate the model. Based on the position papers and workshop the stated conference objective was to identify Opportunities and Barriers to greater collaboration between those engaged in the formal and informal processes and to explore the potential for consensus on solutions.

A. Opportunities for improvement

The group of experts reached consensus on the following opportunities for improvement of the current process:

Process issues:

- Increased adoption through involvement of more stakeholders
- Improve the diversity of participation in standards communities
- Recognise, understand and work with bodies which differ across a range of dimensions - e.g. legal status, respect, trust, openness, business models
- Rapid, iterative development of specifications and pre-standardisation work
- Identify criteria for discontinuing work

Product issues:

- Learn from the culture and lightweight processes from the informal specification community
- Improve quality through early implementation and evaluation

- Build shared concepts between stakeholders

In sorting the identified opportunities for improvement we accept that the distinction between factors that contribute to input vs. output legitimacy is not definite. It could be argued that the informal specification community's emphasis on lightweight processes is more about input factors than the output of standards development. We have, however, chosen to emphasise how lightweight processes could affect the characteristics of the technical standards as such, on the background of discussions in the position papers on how to be conscious of the different “families of standards” [7] and the recommendation to develop “semantic-web-friendly specifications” [8].

B. Barriers to an improved process

The following barriers to an improved standardisation process were identified:

Process issues:

- Lack of inclusiveness in specification processes
- Conflicting understanding of the scope and purposes of standards

Product issues:

- Public procurement policy that does not recognize standards & specifications from a variety of sources
- Lack of early implementation of specifications

New dimension?

- The ability to create derivative works is an ESSENTIAL issue.

The last issue relates to cases when divergence is damaging but also when derivation is prevented. This is a paradox and indicates an issue that is not clearly understood yet (and that has the potential to challenge our model).

C. Solutions

The group of experts reached consensus on the following opportunities for improving the current process:

Process issues:

- Learn from incubation models - moving/supporting community efforts to a state where they might engage with full-blown standards ratification. For example the Apache incubator.
- Support adoption, community engagement & advocacy throughout the whole lifecycle from incubation to adoption and beyond. Identify criteria for candidacy for incubation and moving from one to the other.
- Match agility to the goal/stage of the spec process

- Ensure resources are available throughout the whole life cycle
- Raise awareness, and be transparent, about the way we want to move through this multi-dimensional space.
- Increase effective coordination between the different bodies
- Improve the understanding of policy makers of the diversity of standards and specifications
- Manage the expectations of policy makers
- Many bodies should more effectively disseminate within their existing “rules”

Product issues:

- Identify solutions for the patent and ownership issues with specifications

Both Process and Product:

- Document success and failure stories to identify success and failure criteria

It is interesting to note that when the experts in the field concluded on how to proceed to improve standards the process aspects remain in the foreground, product factors are concealed in the final reasoning, with one notable exception, the complex issue of Intellectual Property Rights (IPR) and the need for the flexibility required to manage derivative works.

III. DISCUSSION

The meeting was by invitation only, and one of the criteria for participation was the pre-submission of a position paper. This, the selection criteria for the participants and the format of the meeting (with a clear separation of the brainstorming / nomination process and consensus process) provide some assurance that the identified issues represent the current views held by leading learning technology standardisation community [6].

As standards and specifications are developed by organisations which differ across a range of dimensions including their legal status, trust, respect, openness and business models [9], it is the actual representation of the stakeholder interest that is highlighted by the experts views we analyse. This is in accordance with our PPL model. In contrast to policy makers (for example, responsible for public procurement policies), the experts do not attribute trust to formal aspects of the Standard Setting Body (SSB) (i.e., ISO, CEN, IMS, etc.). Our data suggests that trust (and respect) is more related to the openness of the process, in addition to the output. This brings diverse community specification initiatives into the picture and renders the question of “acknowledged SSBs”, highlighted in the Werle and Iversen model irrelevant to this particular domain.

In discussions during the meeting it was apparent and agreed that important lessons could be learnt from the

technology incubation models of the open source community in order to move community efforts to a state where it is possible to engage in formal standards ratification. The Apache Incubator model was cited as an exemplar, determining criteria for candidacy, for incubation and for progression from one to the other. This provided a clear opportunity to improve and extend stakeholder engagement in the process (identified as a critical success factor in the PPL model).

One of the key barriers highlighted in the analysed meeting was a perceived lack of inclusiveness in the development process. This aspect is prominently highlighted within the PPL framework as input legitimacy, with aim of considering and ideally representation of all stakeholder interests. It is however contentious to suggest that informal specification development provides for all stakeholder interests by definition. Community standards are developed by the community that requires a solution to a business need. These communities may often consist of a relatively small number of enthusiastic amateurs and consequently opportunities for wider participation may be limited. Geographic location and national policy constraints may also restrict access to participation. National procurement policy is potentially a barrier when local requirements are included within highly detailed specifications and requirements, often underpinned by formal standards, based on the notion of stability and trust by policy makers in highly regulated process. Often this takes place at the expense of considering more appropriate informal community specifications with a perception of instability and lack of trust in the process. The lack of early implementation of specifications in order to “test” them in real world scenarios to be able to address business needs, as distinct from formal conformance testing and informal code-bash (also known as plugfest) activities the former could, in effect, prevent spurious assurance of interoperability efficacy to policy makers. Limited understanding by policy makers, end-users and developers of the scope and purpose of a specification or standard can result in premature or inappropriate guidance or mandation for use.

Whilst wide stakeholder engagement is critical this can result in increased complexity (both in terms of the specification and in terms of stakeholder demands and expectations). This observation shifts focus to the product legitimacy aspects of standards development. The PPL model sees inscription of stakeholders' interests into the very standard as a key aspect, and, as highlighted during the meeting building shared concepts between stakeholders was identified as a key enabler of a successful standard. Modelling could help in this process; this was elucidated in some of the position papers [8, 10]. However, conceptual modelling could also play an important role in enhancing the “inner workings” of the standard. Agreed concept models developed in “deep communication” [8] with stakeholders provide a basis for the development of well formed information models. The conceptual models would typically based on modelling notations with a weaker formalism than used in developing the information models [10], opening up the development process to a broader group of

participants. Recently, we have observed that the standards community is concerned about “the way we do standards”, and that we will see attempts to put forward best practice guidelines for writing interoperability specifications as a follow up of the CETIS conference.

Furthermore, the PPL model is concerned with how the specification is “enacted”, i.e., how the specification is implemented and used (which is related to both internal and external qualities of the artefact). This was highlighted as a major concern of the expert group. The recommendations included increasing adoption through early implementations and evaluations, and to discontinue work that is not based on real needs and proven in widespread implementations.

As to the last aspect of output legitimacy of the PPL model, technical maturity of the specification, this was an issue addressed by the experts. Firstly, there was a strong warning against premature formal standardisation (with the potential adverse effects for example on procurement policies [4]). Research and Development activities within the formal standardisation bodies, whilst not necessarily a barrier, is not constructive to improving process; focus should be on standardising tried and tested specifications.

Second, the technical quality of the specification against installed base (e.g., XML-based standards as IEEE LOM) or emergent, potentially powerful future frameworks (e.g., web architectures, RDF-based / linked data) was touched upon by some experts [7, 8]. However, this aspect is at the moment not in the foreground of the discussion judged from the summary of the expert discussion [11].

One issue overlaps both process and product aspects of a specification: the issue of ownership, licensing and the copyright of specifications. This restricts the abilities of SSBs to work together effectively and to exploit specifications created by community specification initiatives. It also restricts these initiatives in their efforts to build on existing work and not replicating what is already done by others.

Over some time now we have observed that the LET community has challenged the paper and pay-per-publication based business models of the formal standards bodies. It was apparent that the IPR issues related to standards are more complex than they might first appear. Once we are able to manage or indeed circumvent the hurdles of the formal SSBs and start applying licensing schemes from the Open Content movement (e.g., Creative Commons) we realise that the concept of derivative works requires unpacking [11, 12].

The spectrum of intellectual contribution to a standard might be very broad indeed, spanning from input to the development of the conceptual model; to development of the technical work; to the creation of published documents, all phases in standards development that pose different IPR challenges [12]. This makes it clear that whilst IPR issues are often related to standards as published document standardisation a complex activity system that, given the demands from the emergent practices in the LET domain, needs alternative and new forms of IPR management.

IV. VALIDITY OF THE PPL MODEL

On the basis on our analysis of the expert paper contributions and additional data provided by the January 2010 CETIS experts meeting the authors assert that the PPL framework developed in 2008 has validity. In order to provide a more informed and rich picture of the standards domain we do, however, suggest that additional work is required in refining, or extending, the model to incorporate the intrinsic qualities and values of the standard itself through detailing output or product legitimacy factors. Even so, the model will be just able to explain a limited field of this vastly complex domain. We recognise there are deficiencies in the model and that focusing on legitimacy factors merely along a two dimensional plain has its limitations. The model could be further extended to consider cultural dimensions to standards development, and (using established business terminology) in analysing the relative strengths, weaknesses, opportunities and threats of community and the formal standards bodies development processes and recognition. As evidenced through the papers and meeting the distinctions between these processes are often blurred and on a continuum as opposed to explicit and distinct characterisations. In addition to recognising the stakeholder and dissemination dimensions we need to, arguably, think of standardisation as a co-ordinated design activity which involves a variety of stakeholders and both individuals and organisations and the cultural baggage brought by them to the process.

The paradoxes of derivative works give an impetus to develop the model in further directions. The paradox relates to the fact that there are cases in standards development when divergence is damaging, but also when necessary derivation is prevented [12]. We have to understand this paradox, and more than only understanding standardisation from a stakeholder / dissemination point of view, we have to understand standardisation as a co-ordinated design activity involving both individuals and organisations. Not only have the actors conflicting interests, played out at different stages of the standards development life cycle, the educational technology standardisation is as such filled with “conflicting issues” [12, 13]. These issues are clearly related to both input and output legitimacy of process, demonstrating the strength of the PPL model. However, the model is just as good as it is able to support the necessary discourse towards an improved LET standardisation process.

V. CONCLUSIONS

Whilst there is evidence of pockets of progress in improving educational technology interoperability, significant challenges to both process and product legitimacy still remain. We assert the PPL model should be considered as an important tool that might enable audiences to unpack some of the complexity inherent in the standardisation process.

An overarching barrier to an improved process is understanding the drivers and motivations of an extremely diverse group of stakeholders in the domain and managing

the often conflicting expectations of those stakeholders. The authors concur with the organiser of the 2010 meeting on the Future of Interoperability and Standards in Education that awareness of the diversity of the standards system, improved transparency across the system, and increased effective co-ordination between different bodies are key elements in a strategy to overcome the identified barriers [9]. Only through open discussion within the LET community is it possible to learn from approaches in the more informal communities and other standards domains to strive for a consensus about a more robust set of success and failure criteria for learning technology standards development.

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