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Interaction between Standardisation and Research in Drafting an International Specification on Learning Analytics

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Abstract: Interoperability standards are key enablers for widespread adoption of learning technologies, e.g., new data-driven analytics of learning, an application domain explored in a case study presented in this paper. Standards-making is a design practice that relies on input from research and end-users, involving experts that represent diverse stakeholders spread all over the globe. However, the standards-setting culture and formal rules are sometimes at odds with the culture and practice of research. Based on previous research identifying lack of openness and transparency, and a suboptimal interaction with academic research as issues that could explain lack of success in a European setting, this paper studies how an ongoing international standards project on privacy and data protection policies for learning analytics has interacted with an international academic research community. The results of this study show that establishing feedback loops between standardisation, research, and development is essential in order to produce results.

Keywords: Standardisation, Design Practice, Learning Analytics, Interoperability, Learning Analytics Systems Design, Privacy, Data Protection

1. Introduction

Lack of standards is often mentioned as a bottleneck when discussing how to mainstream new learning technologies and innovative educational practices (Ecke & Pinto, 2008; Vries & Choi, 2010). Per definition bottlenecks should be removed; therefore, one would expect that a lot of resources and manpower were allocated to standards work. This is not always the case; there is a huge gap between the acclaimed need for standards and the actual participation and activity in standards fora.

This paper focusses on a particular challenge of the standards-setting process, namely how interaction between the research and the standardisation communities could be facilitated in order to solicit necessary requirements and ideas for design. The project used as a case in this paper is under the auspices of the sub-committee 36 of the Joint Technical Committee 1 of ISO/IEC (SC36), which is developing standards for learning analytics interoperability (LAI). Learning analytics (LA) is a new domain of applications and practices driven by the easy access to data provided by mobile devices and an increasing number of sensors. The aim is to achieve actionable insights from data derived from the full spectrum of learning and teaching activities. By sourcing analytics with data from both within and outside of formal institutional settings, LA has the potential to boost system integration in learning, education and training (LET), bringing both institutions and vendors together.

In the following we will establish a backdrop on which the case study will be projected. From this background, questions arise related to how to optimise the standards development process by interfacing with academic research. This will be explored in depth in the foreground study.

2. Backdrop: ICT Standardisation for Learning, Education and Training

Standards' dynamics (Egyedi & Sherif, 2008), especially in the field of anticipatory standardisation, imply that specifications and technologies co-evolve, something that requires a well-coordinated interaction between the standards community and the R&D community.

The ways the two communities organise their work, however, are different, and that to a degree that potentially leads to conflicts. The research community is used to confidentiality and strict governance of IPR. Nevertheless, general design ideas and opinions are shared openly. When the standardisation hat is put on, a researcher may experience a different culture, where the norm is secrecy and uncertainty whether non-controversial information may be shared.

Hoel (2014) concluded that the document-for-profit model of formal standards bodies drives a wedge between the standards community and the research community. When the sustainability of the standardisation system rests on the sale of documents open distribution of drafts for input and comments becomes a threat to the standards organisation. In 2014 the European Committee for Standardization (CEN) Workshop on Learning Technologies was disbanded by CEN Technical Board after years of conflict about working process and procedures with the workshop's own experts. The outputs of the Workshop were the basis for standards development in the CEN Technical Committee 353, and when the Workshop died, the TC went to sleep the year after (Hoel, 2014).

3. Foreground: in Search of Input and Comments on Privacy and Data Protection

Reflecting on the background research we see that lack of openness and transparency could be operationalised as lack or insufficient exchange between stakeholders that play different roles in standards-setting and use of the outputs, i.e., (1) the research community, (2) the standards practitioners, and (3) the users of standards. Low output and even low technical quality (Hoel & Mason, 2011) could be attributed to insufficient input from research and development, and insufficient testing and feedback from the implementers of standards. How could this process be improved when embarking upon a new project within the domain of LAI?

Standardisation is a design practice, and therefore it would be worthwhile to look at design science research methodology to learn more about how to design processes for knowledgeable outputs. According to Gregor and Hevner (2013, p. 345) Design Science Research (DSR) activities are positioned in one of four quadrants in the cross-section of application domain maturity and solution maturity. The field of LA (and therefore LAI) is quite immature, both in terms of conceptual understanding and access to applications. Therefore, the solution maturity is low, which positions the design activities as invention of new solutions for new problems, contributing to knowledge creation and exploration of research opportunities.

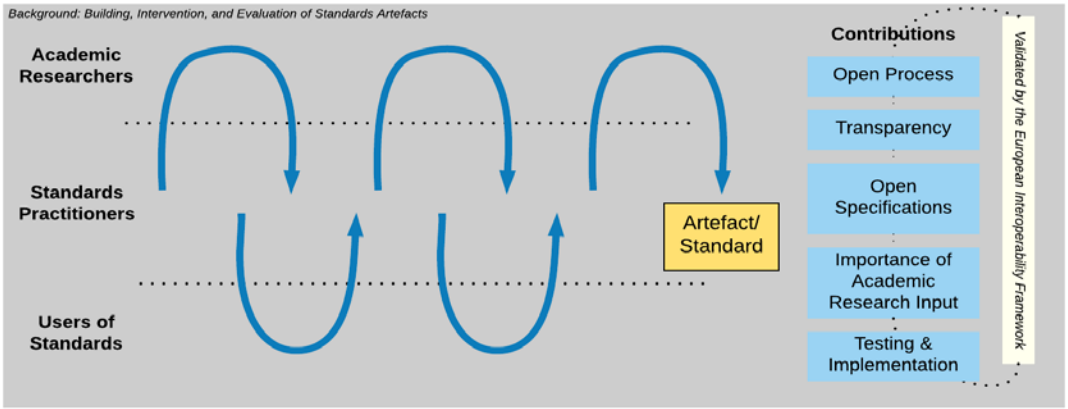

Figure 1. An ideal model of standards-setting coming out of the background research contribution (adaptation of Sein et al., 2011).

While DSR contributes to both descriptive and prescriptive knowledge creation (Gregor & Hevner, 2013, p. 344), the main objective of standardisation will always be to harness prescriptive knowledge. Action Design Research, a near-standing field to DSR, is defined by Sein, Henfridsson, Purao, Rossi, and Lindgren (2011, p 40) as "a research method for generating prescriptive design knowledge through building and evaluating ensemble IT artifacts in an organizational setting". Figure 1 is an adaptation of Sein et al.'s generic schema for IT-dominant Building of the IT artefact, Intervention in the organisation, and Evaluation (BIE) (ibid., p. 42).

The model in Figure 1 assumes that a project initiated in a standards group actively seeks input from research, testing out the developed draft concepts and design ideas with the implementers community through several iterations before finally agreeing to go for a final design, e.g., setting a standard. The output of the BIE process is a contribution to the knowledge base. In Figure 1 we have included the output from the background research, i.e., the importance of academic input, openness and transparency, and open standards for testing and implementation in the adoption community. With the ideal process described in the adapted BIE model in mind, below, we will report the foreground research on standardisation processes observed in a particular project, which addresses challenges of privacy and data protection related to LA.

3.1 Launching a New ISO/IEC TR 20748-4 Project

International standardisation is done according to directives regulating how to establish projects, develop drafts, building consensus, etc. Formal standardisation on national, regional and international level tend to follow similar rules as found in the ISO directives (ISO/IEC, 2016). Technical work is done in technical committees or working groups. Quality assurance and publishing is done by the standard body's management organisation, which is represented in the standards group by a secretary that makes sure the document centric process is followed by carefully archiving written records of progression of work.

Technical work should done be according to the directives, both in spirit and letter; however, sometimes the two are not easily consolidated. Standards experts want to find solutions to wicked technical problems; the standards bureaucracy wants adherence to rules. For example, if appointment by a national body is necessary to take a seat at a working group (WG) table, one cannot just invite a domain expert out of the blue because of possible valuable input. Or, maybe there are ways to combine innovative specification with strict formality?

In the following case study, we present the SC36 project "20748-4", based on participatory observation account of how the lead editor of 20748-4 has experienced the drafting of the technical report.

Preliminaries: The drafting of the reference model of LAI (ISO/IEC TR 20748-1, 2016) – starting 2015 – identified privacy and data protection policies as a cross-cutting concern affecting all LA processes. It had been a struggle to make sure these issues were represented in the model, as privacy had not yet surfaced as an important issue related to LA in some constituencies, and in some standards-setting consortia privacy was beyond the scope of LA systems (Hoel & Chen, 2016).

Working group context: WG8, the working group in question, is the latest WG to be established in SC36, with participation from a wide range of countries, e.g., Australia, Canada, China, France, Japan, Korea, Norway, and UK. Traditionally, editorial roles have been allocated between participants with representativeness in mind, even if the number of active editors has not always matched the nominal number. For the new project, editors from Norway, Canada, Korea and Japan were approved (joined by a second Korean editor at a later stage).

Drafting process: The key to a good drafting process is a well-defined scope (Hoel & Mason, 2012; 2011). The scope of 20748-4 was to specify attributes and requirements for privacy and data protection with the purpose to inform design of LA systems development and LA practices. In delivering on this scope, it is a challenge to solicit requirements and other input, knowing that formal standardisation of this type does have a major problem in engaging with stakeholders that walk the talk (Hoel, 2013).

Another challenge is related to the drafting and consensus process itself. The process is document centric, with emphasis on version tracking and storing in a dedicated repository. Once the document is circulated as a working draft at the preparatory stage, experience from participation in SC36 working groups shows that it is very difficult to suggest restructuring of the text or adding new perspectives. When formal commenting is initiated – with each national body entering comments into a spreadsheet, detailing the issue related to specific text fragments, and suggesting replacement text – the drafting changes mode and takes the form of wordsmithing. Therefore, it is essential to present a draft that is as coherent and finished as possible, before it is being discussed in the working group (and even in the editorial group when it consists of several persons). In some projects, this challenge is addressed by initiating a study period, which could end up with ideas for a draft text. However, in the case of 20748-4 the editorial group was supposed to develop the first working draft from scratch.

Standards drafting as part of research: Even though there was a formal call for contributions, the lead editor of 20748-4 knew that the necessary input solicitation and testing of ideas had to take place outside the standardisation process as such. With the European debacle of the CEN working group fresh in mind (see section 2), it was clear that to push the envelope one had to do a balancing act making sure the formal statues of ISO were observed while brainstorming design ideas. In practical terms that meant keeping a paper trail, feeding the document registry and organise meetings. Research papers that discussed and tested ideas and perspectives were contributed as experts' contributions; WG8 meetings were co-located with academic conferences and meetings; and academic workshops were organised to discuss privacy and data protection issues, engaging the national experts that later would have formal roles in the standard-setting group.

Consensus process: Without knowing the result of the project under study, we can only report on the processes that we have observed so far. By establishing conduits between a research community with an ongoing conversation about issues of ethics and privacy for LA, and the standards community we have created an influx of viewpoints and perspectives that also is reflected in the draft project document. When co-editors step up to representing national positions we will see how draft text will be evaluated against different conceptions that could take the document in different directions.

4. Attempting Innovation while Adhering to the Rules

Projecting the 20748-4 case onto the idealised model of standards-setting coming out of our background research (Figure 1), we see that there is only a partial fit. The interaction between academic researchers and the standard group participants was established; however, the interaction with the users of standards seems to be missing. One might say that user perspectives were communicated through workshops organised as part of academic conferences. But there is no systematic testing of design concepts that are part of the 20748-4 project. This is a weakness, however, that is inherent in anticipatory standardisation, where there is no clearly defined need when projects are initiated, and where the stakeholders are busy inventing new technologies, with no time for applying standards to level the playing field (Baskin, Krechmer, & Sherif, 1998; Jakobs, 2003; Umapathy, Purao, & Bagby, 2011). How the technical report on privacy and data protection policies for LAI will be received by vendors and educational stakeholders will only be known after publication. However, it is clear from the start that standards of this nature need to go through several development cycles to be able to serve its purpose.

Another observation comparing the case with the model in Figure 1 is that, in practice, there is an overlap between the roles of academic researchers and standards practitioners. In Action Design Research, teams are built where researchers work together with practitioners to design and test artefacts. In research on how Research and Development (R&D) interact with standardisation one has focussed on how the different institutional contexts interact, and which barriers there are for effective knowledge and technology transfer (Interest, 2007).

In the case we have reported, the role as researcher and the role as standards practitioner are often maintained by the same person. However, the acting out of the particular role is heavily influenced by the setting. In SC36, some participants fill roles as professors at national universities, and when observed in their own cultural context they act, as expected, very strongly and vociferously. In the setting of an international standards meeting, however, many of the same persons are hardly uttering a word and are very reluctant to expose their obvious mastery of the subjects in question. In order to establish the necessary basis for any design to take place, this pattern of acting out established roles needs to be broken. The work culture and directives of the formal standards organisation serve, as we have shown, as a considerable barrier against taking on multiple roles, switching between representing one's country or a stakeholder group, and entering a more open brainstorming and creative role. Therefore, in standards-making of the type described in this paper, there is a need to establish a repertoire of instruments to be used to soften the barriers against crossing role barriers.

What instruments do standards experts have in their toolbox to increase the knowledge base, on which anticipatory specification work builds? Are the rules intended to protect intellectual property and the standardisation organisation's business interests barriers to knowledge exchange?

In the case of subcommittee like SC36, the influence of the central Technical Management Board (TMB) is mostly felt when projects are marked red because the deadlines are exceeded. How information is exchanged and the experts communicate are not interfered with from ISO TMB,

providing the usual paper trail is followed and the committee as such is not under special observation because of mismanagement or conflicts. If the experts want to do expansive knowledge seeking and exchange, not much could prevent them from doing so. The barriers are mostly cultural. Formalities are invoked only if there are disagreements, as long as the minimum level ISO document management process is followed.

5. Discussion – Identifying Research Gaps

Standardisation work typically involves conceptual, technical, and political activities that together are focused on achieving consensus among a group of stakeholders. The outcome – a standard – is essentially just a document that represents a stable reference point and sometimes includes detailed technical specifications. How this document is viewed, however, both by the stakeholders and the standard-makers may differ considerably (Ecke et al., 2008). In some countries, standards are seen as vehicles for execution of national or regional government policies. China may here serve as a case in point. While in other countries more driven by market economy, like in Europe and USA, standards are recommendations that is up to the market to embrace. We would therefore claim that to understand the process and outcome of a particular standardisation process, one need to understand the national policy context of the national experts taking part in the project. This is an area where little research is done till now.

Standardisation is also a design activity that has much in common with innovation processes, both in the technical, organisational and political fields. In this paper we have pointed to the importance of relating to methods and approached from the academic research field, where for example openness and transparency play important roles in promoting innovation. Interestingly, when the European Commission in 2017 published a new and updated version of the European Interoperability Framework (EIF) these principles got a prominent role (EC, 2017). In the new version openness is an underlying principles that is defined in terms of a preference for open data (Recommendation 2), open source (Rec. 3), and open specifications (Rec. 4). The new version of EIF also underlines the principle of transparency. In the EIF context, transparency refers to enabling visibility ("allowing other public administrations, citizens and businesses to view and understand administrative rules, processes, data, services and decision-making"); ensuring availability of interfaces with internal information systems; and securing the right to the protection of personal data. Under which conditions in a standardisation setting will innovation thrive, and what roles do the academic research principles like openness and transparency play for the process of standards-making and quality of specifications? This is another under-researched field we have identified in this paper.

Standardisation processes are also about group dynamics, often in a multi-cultural setting. It is important to understand how particular groups deal with the different processes of standards-making, described in Fomin, Keil, and Lyytinen (2003) as Design, Sense-making, and Negotiation. Hoel and Pawlowski (2012) expanded on that model and constructed the new concept of Key Knowledge Sharing Point focusing on the intersection of Key Knowledge, Key Sharing Point, and Key Timing.

The third research gap identified in this paper is to find a better understanding of when exchange of key knowledge is necessary to support a process that both results in good design and consensus.

This paper has contributed to the understanding of how standards-making is situated in a multi-cultural, working group specific, and domain specific context. However, we would claim there is more research needed to fully understand how to design a process that will give an optimal result embarking upon a new work item in ICT standardisation for learning technologies.

6. Conclusions and Further Work

This paper is part of an ongoing reflection on our own practice in the field of design for learning technologies, in particular through international standardisation. We have established a background of what we would understand as best practices related to the management of standardisation processes that would support innovation, especially in creating anticipatory standards. On this background we have projected the case study of an ongoing project in the field of privacy and data protection for learning analytics. Based on this case study we have reflected on the relationship between the academic research

community, the standards community and the adopters of standards. The case study has contributed to identifying several gaps in our knowledge about the processes in question. These research gaps should be addressed in further research to be done as a continuous endeavour to improve design through action design research.

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