



End-User Participation in Standards Setting? Taking the practical work of standards selection, configuration, appropriation and use seriously

[Link to publication record in Manchester Research Explorer](#)

Citation for published version (APA):

Procter, R., Rouncefield, M., Hartswood, M., Slack, R., Soutter, J., & Voss, A. (2003). End-User Participation in Standards Setting? Taking the practical work of standards selection, configuration, appropriation and use seriously. In *Proceedings of the 3rd IEEE Conference on Standardisation and Innovation in Information Technology* (pp. 261-269). IEEE.

Published in:

Proceedings of the 3rd IEEE Conference on Standardisation and Innovation in Information Technology

Citing this paper

Please note that where the full-text provided on Manchester Research Explorer is the Author Accepted Manuscript or Proof version this may differ from the final Published version. If citing, it is advised that you check and use the publisher's definitive version.

General rights

Copyright and moral rights for the publications made accessible in the Research Explorer are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

Takedown policy

If you believe that this document breaches copyright please refer to the University of Manchester's Takedown Procedures [<http://man.ac.uk/04Y6Bo>] or contact uml.scholarlycommunications@manchester.ac.uk providing relevant details, so we can investigate your claim.



END-USER PARTICIPATION IN STANDARDS MAKING?

TAKING THE PRACTICAL WORK OF STANDARDS SELECTION, CONFIGURATION AND USE SERIOUSLY

Alexander Voß, Rob Procter, Mark Hartswood, Roger Slack, James Soutter
SCHOOL OF INFORMATICS, UNIVERSITY OF EDINBURGH

Robin Williams
RESEARCH CENTRE FOR SOCIAL SCIENCES, UNIVERSITY OF EDINBURGH

Mark Rouncefield
COMPUTING DEPARTMENT, UNIVERSITY OF LANCASTER

We argue that a direct involvement of end-user organisations in standards setting is unlikely given the current division of labour in the IT industry. Drawing on material from one of our current case studies of practical IT systems development and use, we illustrate the value of an understanding of end-users' practices to understand the problem of participation in standards making. The picture that emerges from this analysis suggests that a more nuanced view of the role of standards in practical IT work is needed and that direct participation in standards setting is perhaps not the way forward for end-users to influence technological development. Rather, we propose that indirect participation based on facilitation and feedback would allow end-users to influence standards making while seeking solutions to their particular problems in uniquely adequate ways.

Keywords: standardisation, configuration, user perspective, participation

As information and communication technologies (ICTs) play an ever increasing role in daily life, the need for interoperability and for ease of use increases both the importance and visibility of standards. There seems, therefore, to be a strong argument for involving end-users in the development of ICTs so as to ensure that their interests are properly represented and that their needs are taken into consideration. This should, in principle, lead to more successful and beneficial ICT solutions. Over the last decade, there has been much research on the involvement of workers and other individual users in the process of IT systems development (Greenbaum and Kyng 1991, Participatory Design Conference 1992–2002, Schuler and Namioka 1993). Likewise, one can make an argument for the involvement of end-user organisations in standardisation bodies and fora (e.g., ETSI Directorate 1992, Burrows 1999). Issues of participation, openness and accountability are currently much focused on and form key elements in European policy on standardization (e.g., CEN et al. 2003).

However, despite efforts to open up standardisation bodies and industry fora to end-user involvement, few end-user organisations actually do get involved in standardisation activities. Even large players may find it difficult to sustain their participation (Jakobs, Procter and Williams 1999). This is despite repeated failures of the ICT industry to provide solutions that meet end-user needs. It would seem that end-users should have an interest in influencing ICT development. Is it a case of “they just can’t be bothered” or “they don’t know how to do it” or are there underlying fundamental reasons that explain the ‘lack’ of end-user participation? It is not that users are ignorant of standards – after all they deal with standardisation issues in their day-to-day work as they select, combine, appropriate, adapt and configure more or less standardised components to form working ensembles that meet their particular needs. We believe that in order to understand the problem and to make proposals for solving it, one needs to better understand the role that standards play in end-user organisations, especially in the work that IT staff in such organisations do. It is to this understanding that we wish to contribute by presenting material from one

of our studies or IT systems development and use. But first we need to say a few words about the current state of play in standardisation research and our view of how it relates to current developments in information technology.

Changes in the Standards Game

The conventional account of standard setting processes and how they may be improved suffers from a number of shortcomings. In particular, it offers a simplified reading of the relationship between standards and particular social interests and has failed to keep up with rapid changes in the last decade in the processes by which standards are developed (Williams 1999). The 'received view' presumed a rather stable standards world involving relatively few standards (or that standards operated in rather separate domains), and in which standards were seen as a simple reflection of the interests and concerns of participants (e.g., Cowan 1992). In this view, the key issue was how to emancipate standard setting first by promoting *de jure* public standards that could combat monopoly effects associated with *de facto* industrial standards and further by broadening out participation and increasing the influence of users over standard setting. This emphasis on the *de jure / de facto* issue has led standardisation research to focus mostly on the standards setting process and to neglect its relation to standards implementation and use. This, in turn, has led to a consideration of individual (families of) standards in isolation, ignoring the complex interactions between different areas of technological development.

In contrast, and in relation to ICTs in particular, we find an enormously complex and dynamic array of standards – matching the dynamism in the development of new component technologies, core capabilities and applications. The standard setting world has been transformed – for example, through the creation of hybrid fora bringing together elements of public and industrial standard setting. The counterposition between *de facto* and *de jure* standards is overcome¹ to some degree. These days standards and products do not come as monolithic blocks but are *configurations* (Fleck 1998, 1992), sometimes taking the form of “pick and mix” assemblages (Brady and Williams 1992) of existing technologies. This points to the fact that development is always open to a certain degree, that closure at any level is often as much an indication of issues postponed as of issues resolved. The configuring together of various pre-existing technologies (standards and products) can happen at a number of levels: in a standardisation forum, at one of the various locations where products are being developed that conform to or make use of (usually many) standards, or at the site of use, when offerings of multiple vendors are combined and embedded in a socio-material environment. Even then, closure is only temporary as people appropriate the candidate ICT solutions to their working practices which are then, in turn, subject to change as *social learning* takes place (Fleck 1993, Williams, Slack and Stewart 2000).

A related point is that standardisation research has often neglected the *heterogeneity of voices* in the standards game, abstracting them away and substituting convenient glosses such as “the market” or “organisations”. While the basic economic motivations for standardisation seem relatively clear, accounts based on them (e.g., Reitwiesner and Volkert 2001) do not help to explain the success or failure of particular standards. It is not enough to state that a standard failed to achieve a large enough market to generate the network externalities needed to prevail. Behind this failure inevitably lies a more complex story. While there have been numerous studies of the process of standardisation and its relationship to technology supply (e.g., Egyedi (2001) on the standardisation of Java), the politics of standards selection and application haven't been explored to the same extent. However, in order to understand and possibly further the role of organisational end-users in standardisation, we need to analyse users' concerns and working practices to see the relation between their normal, ordinary activities and their role in standards setting. While the direct participation of organisational end-users in standardisation processes might seem a potential corrective for the dominant role played by technology suppliers and their interests, it might well introduce its own complexities. So, in addition to the good reasons that individual as well as corporate users have for not participating directly (e.g., Feng 2001, Burrows 1999), there are also good reasons why participation would be highly problematic. In the following, we wish to expand the discussion aiming at a broader concept of *standards making* (as opposed to standards setting) that includes the standards-related work going on outside the arenas of standards setting processes and over a longer period of time. This broadened perspective then gives us a handle for discussing the concerns of end-user organisations, how they get communicated into the standards making process and how this might be better supported.

¹ As is the counterposition between commercial interests and public standards – the emphasis is on aligning interests.

An End-User Perspective on Standards

We draw on material from our ongoing participatory design project in a manufacturing plant producing mass-customised diesel engines (Voss, Procter and Williams 2000, Hartswood et al. 2002). The plant is an ensemble of heterogeneous machinery, ICT systems, social relations and practices that together form the basis of production. Effective, practical integration of various components delivered by different manufacturers is at the heart of the concerns of various IT- and non-IT professionals in the plant. As one IT systems developer puts it: “It’s really a big clockwork” (see also Voß et al. 2002). Only if all pieces work together can the plant operate. This involves not only integration of various kinds of mechanical and ICT systems but first and foremost, the establishing of working practices.

One particularly interesting issue in this highly complex environment is how standards are used to ensure the effective interplay of the various socio-technical components to achieve an overall dependable ensemble even in the face of a rapidly changing and demanding environment. Standards are used as resources for producing alignment, for taming possible unfolding heterogeneity and divergence in organisational IT systems. However, the process of actually adopting standards is problematic as standards have to be appropriated locally, i.e., embedded into some existing socio-material setting. There are inevitable tensions between local needs and larger strategic concerns (Rolland and Monteiro 2002) which emphasise how the role of standards needs to be seen in the context of the wider organisational politics and cannot be treated as a straightforward issue of cost/benefit calculations. For example, standards may be used by particular parties within the organisation to pursue their own agenda in relation to the interests of other parties. The outcome of standards selection may well represent the current state of play in the organisation’s politics rather than a globally optimal choice.

There is, then, work to be done before a standard can be effectively selected and appropriated which involves building commitment to the standard in question and making decisions about the deployment of various scarce resources. This decision process is highly contingent and subject to various kinds of uncertainty (e.g., about long-term viability). In the following sections, we wish to address a number of themes that we see emerging from our fieldwork.

Standard vs. Unique Adequacy

Central to production is the Assembly Control Host which controls all processes within the plant, interacting with local systems in the various functional units of the plant (e.g., assembly lines) as well as with the company’s ERP² system (SAP R/3³). The assembly control host is custom-built rather than being part of the ERP system. Although the company uses ERP software, this system does not actually control the plant directly but it relies on the assembly control host as a local system to realise the real time control of the production process:

Interview Transcript⁴: *Relatively early, it became obvious that SAP was not able to control this [plant] here. SAP is really made by accountants for accountants, [...] at that time there were no interfaces for representing a timed behaviour as we had it in mind. [...]SAP positions itself in the market in a way that they say, we have our standard, this works in this way, we have an interface to the outside and anyone can attach their systems to this and work in a different way but we are not interested [...] to attach to the last PLC [programmable logic controller].*

The scope of the SAP package clearly ends at the point where real time control of production processes is required. This has something to do with the way that the underlying software is built but our interviewee comments that SAP is “made by accountants for accountants”, hinting that there might also be a difference in culture underlying this particular design.

Interview Transcript: *[...] SAP develops a model there, how they imagine this, how you control a company and everyone who wants to use the standard has to project their company, their whole organisational structure, to this SAP model but, unfortunately, not all companies are the same but the most companies exists because of some uniqueness where they can say, we can do this especially well [...]. And the conception how SAP imagines a company to work does not fit that so that you have to custom-build things. And even today SAP is not at a point, and we've looked at that, that they could control the plant, certainly not.*

² Enterprise Resource Planning.

³ The company is currently in the process of completing the upgrade from R/2 to R/3.

⁴ From an interview with the manager of the plant systems management group. The material presented has been translated from the original German.

There are, then, limits to the possible fit between a standard offering like SAP and any particular organisation. These limits may be less pronounced in areas like accounting which are highly regulated by law and by professional practice. In the area of production itself there is an endless number of ways in which practices can differ and, clearly, SAP understands this and limits the scope of its software to the areas they perceive as being more uniform, leaving the rest to custom made software that can then attach to the SAP system. This is the role that the Assembly Control Host plays in the overall ensemble. It has been developed and is now operated and maintained by an outside IT subcontractor that works closely with the plant systems management group that oversees all production-related IT in the plant. The subcontractor has tried to market this solution more widely:

Interview Transcript: And [our IT subcontractor] once had the aim, they said they could offer us a better price if they could use the modules for other plants but it has emerged that they couldn't reuse anything, when you asked them afterwards, and that's the point, this plant is unique and there's not much you could use elsewhere. They have certainly realised that now.

The assembly control host software is a uniquely adequate solution for the particular purposes of EngineCo, tailored to the specific contingencies that this company has to deal with. Translating this software to another setting with its own particular practices and contingencies turned out not to be feasible – just as the use of the generic ERP system had. The locally produced systems are integrated with the SAP system as they receive production orders from it and report production status back to it. While the SAP system controls the inventory and performs other high-level functions, the Assembly Control Host controls the processes in the plant, interfacing with a large number of different systems that make up the plant's IT infrastructure: Hewlett Packard Workstations with X Windows Terminals, Siemens programmable logic controllers, Siemens multiprocessor systems, about 150 PCs from Siemens, Compaq, and Dell, VME-bus systems, as well as Sun Workstations and Servers. All these systems are connected to the plant network and, together, control the production process. In addition, these are connected to systems in other companies, for example, to the logistics provider that manages material handling for EngineCo. Recently, a direct connection to a major customer located in another European Country was established to facilitate the exchange of production data.

While it is composed of more or less standardised components, this technological *configuration* is inevitably tied to the specific practices and contingencies of EngineCo which differ in significant ways from those of other companies. EngineCo produces engines to customer specifications, building first a basic engine which is then customised according to its future use in different kinds of applications, e.g., in building equipment and on ships. For one series of engines alone, there are 19 basic types and 3500 to 4000 different customer configurations. This type of production, mass customisation, differs significantly from mass production, where each individual product is the same. It is the requirements of mass customisation that force EngineCo to seek custom solutions in order to realise its competitive advantage. The role of standards is a complex one as EngineCo seeks to simultaneously utilise standards and their benefits, while at the same time implementing an overall configuration that is decidedly non-standard, that provides answers to the *specific* problems of the company and a competitive advantage over its rivals.

Division of Labour and Organisational Politics

The separation between the systems inside the plant and the company ERP system is reflected in the division of labour. While local IT is largely under the control of the plant system management group, all IT outside the plant is the preserve of the central IT department. These boundaries, however, are constantly being challenged. The introduction of the SAP R/3 system provides a convenient vehicle for the central IT department to extend its influence by offering R/3 based solutions to business problems, often challenging established locally produced solutions. The local plant systems management group tries to counter such efforts by utilising its position close to the end users – like the tortoise⁵ – they are already there when central IT arrives. They are also better equipped to build systems that are uniquely adequate for the task at hand as they have detailed knowledge of the production process acquired through their day-to-day involvement in the running of the plant. The remote central IT department may have higher organisational status and may present R/3 as the strategic tool for comprehensive standardisation and integration but local IT staff can counter this with their familiarity with users' working practices.

Of course, local IT staff present their solutions as part of a larger effort of IT systems integration, too. With the help of the IT subcontractor, they are currently planning to set up an infrastructure for the development of web-based applications. This infrastructure builds heavily on standards such as Java, XML and XSL. While the SAP system represents a top-down approach to standardising IT at EngineCo, this architecture would support a

⁵ or the hedgehog in some countries.

bottom-up, federated approach that could make it easier to tie together existing systems and practices. So, while the central IT department pursues an approach of introducing a strong universal solution that would then be localised (i.e., customised and appropriated), the approach taken by the local IT group and the external subcontractor would facilitate the building of universalised locals (Hartswood et al. 2002) that would be integrated via various translators to form a coherent whole. Whereas SAP provides an organisational template, the proposers of the infrastructure do not seek to standardise work practice in the same way but are concerned more with standardisation of the underlying technology. The question of what is being standardised is answered in markedly different ways.

Another example of the importance of the division of labour is the case of network technologies in manufacturing environments. Fieldbus networks at EngineCo are normally managed by maintenance staff. However, in recent years Ethernet and Internet protocols have made an inroad into the production environment. These technologies are traditionally the preserve of IT departments and the knowledge and tools required to manage them are quite different:

Interview Transcript: [...] they don't have a network analyser and they don't really appreciate this. The knowledge is too complex and consequently there's not much there. [indst.] different standards, there's different responsibilities.

A similar problem occurs at the level of technology supply, where, for example, supplier firms may not be in a position to offer products based on Ethernet but use ArcNet instead, another network technology that is still quite popular for manufacturing applications:

Interview Transcript: [...] the robot can only communicate via ArcNet. If you ask, how much is TCP/IP via Ethernet then they stare at you and say, ok, we might be able to do it, we'll ask. Then they go to their supplier and say now we need this. The price is immense because it's a custom development that's endlessly expensive. What I can do more easily, then, is what we've done, we have a gateway [...].

A strong standard in office environments does not necessarily make a good candidate in a production environment. In principle, Ethernet is not suitable because of its lack of real time performance guarantees, but its low costs make it possible to introduce some level of redundancy and thus meet the particular requirements of the plant. Members of the plant systems management group are keen to use components that are normally used in an office environment in order to cut costs by buying on a market with radically different economies of scale and a larger number of competing suppliers. This, however, changes the working division of labour in the plant as they now take over tasks formerly done by maintenance workers. It might seem that it would be in the interest of the plant system management group to extend their influence by taking over the Fieldbus network but that would then mean that they would have to provide support outwith office hours – maintenance workers work in shifts – which significantly impacts on the list of candidate solutions. In order to fully align with the Ethernet standard, EngineCo would have to invest in training and resources for the maintenance workers to maintain a plant network based on this technology.

Assets, Legacies and Evolution

The timespans for organisations seeking to adapt IT for their purposes and for the development of IT standards are radically different. Business problems are immediate and normally demand a quick solution to address the problem at hand. Standardisation, on the other hand, aims at producing generalisations, candidate solutions that are potentially adequate for a number of purposes. At the same time, new or revised standards may appear faster than an organisation is willing or able to remove its 'legacy' systems and upgrade. Investments made in a particular configuration of technologies may be significant and this situation may not even be seen as something negative, as 'lock-in'. It is only when a problem situation occurs (e.g., database systems no longer being supported) that new paths are considered. A problem that occurs quite frequently in practice is that of the 'angry orphan' where technologies are no longer supported although they still represent adequate candidate solutions for the organisation. For example, ENGINECO has a significant number of workstations installed on the shopfloor that run a custom-built worker information system. This system has been in operation for about ten years now and has been repeatedly adapted to new needs. However, the costs of maintaining the software have increased significantly as it is based on the Windows 3.1 and a DOS-based TCP/IP implementation. The expertise needed to maintain such a configuration is becoming increasingly difficult and expensive to sustain as IT workers these days orient to other relevant bodies of knowledge. Also, running Windows 3.1 on modern PCs is made extremely difficult because graphics drivers for this operating system are not available. This is only one example of many where ENGINECO is forced to change its technical configuration not because it has become obsolete from the organisation's point of view, but because the markets have moved on and systems are left with no viable future. There is a fundamental problem that underlies this situation: the cost of supporting products even after they have been replaced by new ones are continuous costs

and can only to a certain degree be included in the original sales price of a product. In the case of software, which does not decay as many material products do, there is no significant 'after sales' business except through upgrades to new versions. Suppliers are thus interested to produce such versions, preferably based on the next versions of the standards the company has chosen to support, and to encourage or force end users to buy such an upgrade. Microsoft has just switched to a strategy of forcing users to upgrade regularly or to upgrade at a higher price which has caused quite an uproar on the side of the users (e.g., Wilcox 2002). Sooner or later (depending very much on the type of product), the supplier will stop supporting his product, the user will be left alone with their legacy system and may be forced to consider an upgrade or some new path altogether. This need to upgrade may become extremely problematic if the product in question cannot be replaced in plug-and-play fashion. In configurational systems that are tightly integrated, this will often be the case and the costs of switching to a successor will be exacerbated by the costs of changing a working configuration. The advantages of using packaged, standardised modules are lost if the configuration costs outweigh the advantages of standardisation (Brady, Tierney and Williams, 1992).

Another problem is created by the fact that standards are often combined with proprietary extensions (at the level of products) as vendors seek to make their products distinguishable from other offerings. Consider the example of the assembly control host at ENGINECO which was developed using the Ingres relational database management system (RDBMS). The developers did not only use the structured query language (SQL) interface, but used the proprietary tools for system and user interface design. So, while SQL is relatively well standardised and in principle one should be able to replace one RDBMS with another without incurring prohibitive costs, ENGINECO is now in a situation where a move to some other RDBMS would be very expensive as all programs would have to be re-developed.

Interview Transcript: [Our IT subcontractor] always makes an effort to use something with standards. You've got to acknowledge that but sometimes they do it in a way to save money for themselves. For instance, when they use the database Ingres, then they do the screens with Ingres tools, too. That has the disadvantage that you are somehow committed, you cannot act as you like and when you want to migrate from Ingres to Oracle, which is currently being considered, then you have the problem that you have to redesign the screens and that's quite [expensive... Another company] did this better. They didn't do their screens with Oracle but independently.

As this example illustrates, while products may conform to certain standards, they are likely to have some unique features which serve as unique selling points that can effectively destroy the value of the standard when care is not taken in the configuration process to avoid unwanted lock-in to these proprietary extensions and modifications. This issue adds to the problems of non-conformance or lack of scope of standards. For example, SQL defines only a language for formulating queries, but there are a number of issues that are outwith the scope of the standard (and in most cases rightly so) but that would have to be addressed if RDBMS were to become replacement-compatible so that one would be a plug-in replacement for the other. Such issues include character representation, communication with clients and data storage formats for data interchange, to name a few that were recently encountered by ENGINECO and in our participatory design project. Various other standards need to be employed to resolve these issues and vendors of RDBM systems make their choice which of these to support. Multiple translators may be required to integrate a given RDBMS into an information system containing other components.

Since the development of standards and of products takes time, the suppliers have to anticipate the needs of users. Development of standards and of products is thus based to a certain extent on assumptions about needs that have not yet materialised and that no one has experience with. Once the experience is made, the focus of attention has often moved elsewhere. The problem of informing the design of products extends to the problem of informing the design standards. Studies of technologies in use (Fleck 1993) have demonstrated how needs evolve, e.g., as people learn about new potential uses of a set of technologies. For example, a wireless LAN was installed in the plant to guide forklift truck drivers to their destinations. While the computer used on the forklift is a proprietary product, it uses a standard WLAN card, so its supporting infrastructure is now used for various other purposes.

Discussion

We want to unpack some of the implications of our arguments for various interest groups around the standards game. First, we should say that with regard to standardisation researchers our message is that it is important to look at what we might call the practical business of selecting and appropriating standards and standards based products. The selection is by no means clear-cut – rather it involves a complex process of negotiation that cannot be reduced to a play of what are a relatively small number of variables. To our minds, the central problem of research that treats

standards selection in this way provides an impoverished account of the struggles that go on, in and around standardisation. We need to look at the overall process of *standards making* so as to take seriously the work that goes on outside the standards setting process. Successful standards are not developed in committees, but in *use*. Individual standards are not developed in isolation, but with a view to how they fit into the existing landscape of technologies, alliances are formed (e.g., between Java and XML) and families of standards (e.g., the various XML standards) emerge that are closely tied together but where the elements remain distinguishable. These complex relationships have a crucial influence on standards making. From a user point of view, what is important is often not the technical specification but the overall picture of how standards might fit into the IT landscape and how they might provide answers to the generic and specific questions posed.

There are related messages for standards setting bodies - both Standards Development Organisations (SDOs) and industry consortia - and organisational end users. We are sceptical about the prospects of direct involvement of organisational end-users in standards setting activities for a number of reasons that our fieldwork material has helped to highlight. For example, even if end-users made significant resources available for this, the large number of technologies they are concerned with would mean that these resources would be stretched thin very quickly. Further, there are also questions about who should participate - as our discussion of the division of labour in IT has shown, there is not always an obvious answer to this. Users do orient to standards, they follow their biographies and make decisions based on the knowledge acquired. Managing complex configurational systems, ensembles of various technological offerings and keeping informed about related standardisation activities requires quite substantial resources. These costs can be significantly reduced if information is made available in a form that enables decision makers to relate the biographies of standards to the biographies of their systems.

While it seems clear to us that most end-users would stop short of getting directly involved in SDOs or consortia, there are a number of areas in which *participation by representation* might be a path worth pursuing. Although end-users are not directly involved in most standardisation processes, they “are nevertheless present in the form of opinion polls, usability studies, personal anecdotes, and designers’ biases and stereotypes” (Feng 2001). Feng speaks of users being “invoked, as something to be mobilized to support one position or another” (ibid.). In the absence of direct participation, then, the task at hand is to investigate and to unpack what ‘the users’ want and to establish fora where an exchange of knowledge and negotiations about the contents of technology can take place. For the process of developing bespoke or configured IT systems, we have proposed an approach that aims to bridge the gap between users and designers by introducing an IT facilitator who would be an accepted member in both groups (Hartwood et al. 2002). The importance of the role of the facilitator lies in their ability to make user needs accountable to designers concerned with generic requirements without losing sight of the ethnographic particulars, the particular practices and interests of the users. We suggest that a facilitation approach to end-user representation in standardisation is not only appropriate but also feasible since it can build on existing channels of communication and does not require that the standardisation process be modified in ways that would conflict with the aim of making standardisation more agile.

There are already a number of interest groups that provide a basis for participation in standards setting, e.g., ANEC, the European Association for the Co-ordination of Consumer Representation in Standardisation (www.anec.org). This non.-profit organisation, founded in 1995 is “funded by the European Commission and EFTA [... and] is a full member of ETSI, an associate member of CEN and an observer of CENELEC” (ANEC 2003). ANEC has an explicit agenda aimed at influencing technological development at an early stage through standardisation, in order to ensure that the interests of individual end-users, e.g., product safety, as well as the interests of the wider society, e.g., environmental protection, are taken into consideration.

Similarly, organisational end-users have the opportunity to participate indirectly via the various trade organisations that are already well-established in many countries, such as the Verein Deutscher Ingenieure (VDI, www.vdi.de) in Germany. In fact, such organisations already do provide fora for discussing technical developments and they do inform their members about standards setting activities. For example, a number of local chapters of the VDI have working groups on information technology which aim to provide “a forum for the discussion of technological innovation in the IT sector” which furthers “the dialogue between users on the one hand and developers and researchers on the other” (VDI Kölner Bezirksverein). Other potential fora for indirect participation are organisations such as SHARE (www.share.org), an organisation representing users of IBM products or NIST (www.nist.gov), a US federal agency representing the US government.

A role of interest groups and working groups in standardisation efforts would match well with hybrid approaches to standardisation which are becoming increasingly popular as SDOs open up their processes to input from consortia. While some have argued that this move opens up the relatively protected domain of SDOs to the turf wars of the IT industry, we would argue that it could also open up opportunities for interest groups to participate by, e.g., submitting specifications of requirements that standards submitted by consortia or developed by

SDOs would have to meet. Interest groups could also, through the experiences made by their members, play an important role in certification, playing the role of trusted parties whose approval of a standard would further its market acceptance (Köhntopp and Ruhmann 1999).

Conclusions

In summary, we might say that standard setting bodies (SDOs or consortia) need to take on the work of making standards successful, not by trying to improve the standard *per se*, i.e., its (technical) contents but by taking on the work of achieving alignment with private interests and of making standards relevant to practitioners. To put it bluntly, “the aim of an *ex ante* standard must be to become an industry standard” (Williams 1999). Thus, if a public standard does not succeed in enrolling private interests, it becomes obsolete. Essentialist models of the relationship between interests, standards and artefacts will hinder this as they fail to come to grips with the changed world of standards used in the context of configurational systems, tied into a complex and non-linear history of technological development. This has led to proposals for user involvement that has essentially grafted participation onto an existing process – the proposals aimed at bringing the users into the standards setting process. This is where we see the parallel with participatory design and, indeed, the problems experienced are similar: users lack technical expertise and are unable to anticipate their future needs. In contrast, we propose an orientation to standards *making* that integrates standards formation and implementation and addresses just how users engage with standards across the product/standards life-cycle. This has implications for standardisation researchers in that they need to direct their attention to the practical work of standards selection, appropriation and use (instead of just looking at derivatives such as market shares etc.) as we have demonstrated in this paper. For standards setting bodies, this means making their work accountable to and relevant for practitioners in both vendor and user organisations in order to achieve alignment and in order to facilitate the management of such an alignment. The aim should be to reduce the risks of aligning to a standard, e.g., by not only publishing a technical specification but by also making available information about the current market position of the standard as well as its envisaged future development. Only if the standards making process is made accountable in this way can user organisations properly evaluate how a standard is relevant for them. Further, it is only on such a basis that they can provide feedback into the standardisation process.

References

- ANEC (2003), Consumer Requirements in Standardisation relating to the Information Society. European Association for the Co-ordination of Consumer Representation in Standardisation, Brussels, January, available from www.anec.org
- Brady, T., Tierney, M., and Williams, R. (1992). The Commodification of Industry Applications Software. *Industrial and Corporate Change* 1(3), pp. 489–514.
- Burrows, J. H. (1999). Information Technology Standards in a changing world: the role of the users. *Computer Standards & Interfaces* 20, pp. 323–331.
- CEN, Cenelec, ETSI, EC, EFTA (2003). General Guidelines for the Cooperation Between CEN, Cenelec and ETSI and the European Commission and the European Free Trade Association. *Official Journal of the European Union*, C 091, 16.04.2003.
- Cowan, Robin (1992). High technology and the economics of standardization. In M. Dierkes and U. Hoffmann (eds) *New Technology at the Outset: social forces in the shaping of technological innovations*, Campus-Verlag and Westview. Chap 14, pp. 279–300.
- Egyedi, T. M. (2001). Why Java Was Not Standardized Twice. Proceedings of the 34th Annual Hawaii International Conference on System Sciences (HICSS-34), Volume 5.
- ETSI Directorate (1992). Progress on User Participation in the Standardization Process. Presented at the 3rd Interregional Telecommunications Standards Conference, Tokyo.
- Feng, Patrick (2001). Invisible Users: Challenges to User Participation – The Case of Technical Standards. *Proceedings of the International Summer Academy on Technological Studies: User Involvement in Technological Innovation*. Deutschlandsberg, Austria, July, pp. 53-63.
- Fleck, J. (1988). Innofusion or diffusion? The nature of technological development in robotics. *Edinburgh PICT Working Paper No. 4*, Programme on Information & Communication Technologies, Research Centre for Social Sciences, Edinburgh University.
- Fleck, J. (1992). Innovation During Implementation: Configuration and CAPM. *Edinburgh PICT Working Paper No. 37*, Programme on Information & Communication Technologies, Research Centre for Social Sciences, Edinburgh University.
- Fleck, J. (1993). Innofusion: Feedback in the Innovation Process. In: F. A. Stowell et al. (eds.), *Systems Science*. Plenum Press. pages 169–174.
- Hartwood, M., Procter, R., Rouncefield, M., Slack, R., Voss, A. and Williams, R. (2002). Building Information Systems as Universalised Locals. *Journal of Knowledge, Technology and Policy* 14(3).

- Hartswood, M., Procter, R., Slack, R., Voß, A., Büscher, M., Rouncefield, M. and Rouchy, P.. (2002). Co-realisation: Towards a Principled Synthesis of Ethnomethodology and Participatory Design. Pors, J. K., Henriksen, D., Berg, M. and Winthereik, B. (eds.), special issue on Ethnography and Intervention, *Scandinavian Journal of Information Systems* 14(2).
- Jakobs, K., Procter, R. and Williams, R. (1998). User Participation in Standards Setting – The Panacea? *ACM Standards Review* 6(2), June 1998. pp. 85–89.
- Jakobs, K., Procter, R. and Williams, R. (1999). Shaping IT Through Participation in Standards Setting – A Practicable Alternative for Users? In Brooks, L. and Kimble, C. (Eds.) *Proceedings of UKAIS'99, the UK Academy for Information Systems Conference*, University of York, April 7th-9th.
- Köhntopp, M. and Ruhmann, I. (1999). Trust through Participation of Trusted Parties in Technology Design. In: Müller, G., Rannenber, K. (eds.), *Multilateral Security in Communications – Technology, Infrastructure, Economy*. Addison-Wesley-Longman, München, pp. 499–514.
- Proceedings of the Participatory Design Conference (1992–2002). Computer Professionals for Social Responsibility, P.O. Box 717, Palo Alto, CA 94302, USA. <http://www.cpsr.org>
- Rolland, K. and Monteiro, I. (2002). Balancing the local and the global in infrastructural information systems, *The Information Society*, 18(2):87–100.
- Reitwiesner, B. and Volkert, S. (2001). On the Impact of Standardization on the provision of ERP-Systems as Mission Critical Business Infrastructure. Dittrich and Egyedi (eds.), *Standards, Compatibility and Infrastructure Development. Proceedings of the 6th EURAS Workshop*. 28–29 June 2001 Delft, Delft University of Technology.
- VDI Kölner Bezirksverein e.V. Arbeitskreis Informationstechnik. Accessed 30th May 2003, available at http://www.vdi.de/vdi/vvo/b_vereine/koeln/bezirksgruppen/07156/index.php
- Voß, A., Procter, R., and Williams, R. (2000). Innovation in Use: Interleaving day-to-day operation and systems development. *PDC'2000 Proceedings of the Participatory Design Conference*, T. Cherkasky, J. Greenbaum, P. Mambrey, J. K. Pors (eds.), pp. 192–201, New York. Computer Professionals for Social Responsibility, P.O. Box 717, Palo Alto, CA 94302, USA.
- Voß, A., Procter, R., Slack, R., Soutter, J. and Hartswood, M. (2002). “It’s All a Big Clockwork”: Achieving Dependable Systems in Practice. *Proceedings of the 1st DIRC Conference*, the Royal Statistical Society, London, Nov.
- Wilcox, J. (2002). *Licensing program angers MS customers*. ZDNet Australia. Available at: <http://www.zdnet.com.au/newstech/enterprise/story/0,2000048640,20265203,00.htm> Accessed 30th May 2003.
- Williams, R. (1999). ICT standards setting from an innovation studies perspective. In Jakobs, K. and Williams, R. (eds.) *Standardisation and Innovation in Information Technology*, Proceeding SIIT '99 1st IEEE Conference on Standardisation and Innovation in Information Technology, Aachen: Germany 15 – 17 September. IEEE: Piscataway NJ
- Williams, R., Slack, R., and Stewart, J. (2000). *Social Learning in Multimedia*. Final Report of the EC Targeted Socio-Economic Research Project: 4141 PL 951003, Research Centre for Social Sciences, The University of Edinburgh.