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A quick scan of best practices in ICT standardisation: What ETSI could learn from other standards bodies

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1 Introduction

1.1 Reasons for this study

For a long time standardisation has been a relatively static process. Within a certain field of activity it was evident how standards had come about and how standardisation institutions could adjust to that standards. Within a given field, demand was relatively homogeneous. Usually, it was clear which Standard Development Organisation (SDO's) was 'qualified' and appropriate to do the job.

Due to various developments, the character of the demand within the field of telecommunication and ICT has changed. These developments include among others: liberalisation, globalisation, fast technological developments and new alternatives, convergence, and furthermore, the combined growth of (IT-) networks, consumer electronics (CE) and application platforms. Because of these changes, the demand for standardisation processes becomes more and more heterogeneous. As a result, the number of consortia and fora has increased over years.

The growth of the number of places where standardisation takes place, and the more complex relationship between these places pose challenges for the 'incumbent' SDO's. These developments take place in an environment in which also the European Union is deliberating upon its own position regarding standardisation.[1]

ETSI, being one of the most recognisable ICT standards bodies and the birthplace of GSM, is facing such challenges. Some even believe it is in an 'identity crisis', transferring from a one-issue SDO into something possibly much wider, and finding a new place in this changing world. In this changing environment, ETSI can possibly learn from other SDO's about their philosophy, their ways of working, and their rules and procedures to sustain or improve ETSI's position as a world leading standardisation body by enhancing or innovating itself.

1.2 Research question

Standardisation institutions have different procedures and regulations, and thereby join up, more or less, to the variable demand. This study aims to gain an insight in the differences and similarities between the used methods at four important standardisation bodies, and how these methods are judged upon by (potential) participants. This insight contributes to the development of a good government policy for standardisation in this changing environment.

[1] For this, see DLA Piper et al (2007), among other things.

1.3 Methodology

This study was conducted between December 2007 and February 2008. Data collection was done by desk research (focussing on academic and non-academic papers discussing the functionalities and structures of the various SDO's). In addition, six semi-structured interviews were held with Heads of Standards of ETSI members, in The Netherlands, Brussels, and the United Kingdom. We also asked our interviewees to talk frankly, not as representatives of their firms, in order to get a genuine view on how SDO's work and how they could be improved.

This study is a quick scan. Best practices are, to a large degree, determined by what people think. Given the number of interviews we did, we cannot claim to be complete or representative. Still, having chosen stakeholders from different actor groups (equipment manufacturers, network operators, public bodies) and including firms with a different background of technological preferences (both 'bellheads' and 'netheads'), we believe we include the most relevant perspectives and do not give preferential treatment to one perspective at the expense of the others – except, possibly, for smaller firms. It is also useful to note that there was a surprising degree of consensus over many of the issues discussed in this report, despite differences in perspective.

Being a quick scan, we heavily rely on a limited set of interviews. We do not aim to present a fully representative or authoritative view, we rather aim to provide interesting and valuable views about the current 'state of affairs' of SDO's in the field of ICT.

We express our gratitude to the interviewees. Without their willingness to cooperate, this report would not have been possible.

2 Brief introduction to four major SDO's

This chapter introduces four SDO's in the field of ICT standardisation, namely IEEE, IETF, OMA, and ETSI. Although there is a very large number of standards bodies working in ICT (some firms are member to more than 150 of these), we selected these four because they are often seen, in their own way, as presenting interesting and successful approaches towards standardisation. All four have a track record of producing (at least some) widely adopted standards. We also aimed at having variety in our sample of SDO's.

Below, we will give, as much as possible, a factual overview of these bodies. In the next chapter, we will see how these bodies are valued by stakeholders and in the literature. We do not use a fixed format, but instead focus on the issues that are particularly interesting for the SDO in question. For the same reason, some SDO's will be discussed more extensively than others.

2.1 IEEE

Originally called the Institute of Electrical and Electronics Engineers, the organisation broadened its activities in such a way that it no longer uses this name but kept its initials. It was founded in the 1960s, but its ancestors date back to the late 19th century. IEEE's Constitution defines the purposes of the organisation as *"scientific and educational, directed toward the advancement of the theory and practice of electrical, electronics, communications and computer engineering, as well as computer science, the allied branches of engineering and the related arts and sciences."*[2]

IEEE is not only a standards body, but also employs various other activities. Arguably, it is best known as a journal publisher: the organisation claims that it produces 30 percent of the world's literature in the electrical and electronics engineering and computer science fields, publishing well over 100 peer-reviewed journals.[3] It also sponsors or cosponsors more than 300 international technical conferences each year.

Formal rules are defined in the IEEE Constitution, the IEEE Bylaws and the IEEE Policies (IEEE, 2007a). This set of documents was last updated by the IEEE Board of Directors in November 2000. More detailed information is also available in the IEEE Standards Association Operations Manual (IEEE, 2007b).

Standards-making in IEEE takes place in the so-called IEEE Standards Association (IEEE-SA). In 2005, IEEE had close to 900 active standards, with 500 standards under development. In the ICT field, the following standards are most probably the best known ones:

- the IEEE 802.3 Ethernet standard;
- the IEEE 802.11 Wireless Networking standards (popularly known as WiFi[4]);

[2] Source: http://en.wikipedia.org/wiki/Ieee.

[3] See http://www.ieee.org/web/aboutus/today/index.html.

[4] Strictly speaking, the term WiFi specifically refers to 802.11 devices certified by the WiFi Alliance.

- the IEEE 1394 'Firewire' standard;
- the IEEE 802.15.1 'Bluetooth standard' (ratified by IEEE but developed by the Bluetooth Special Interest Group - SIG);

Interesting recent standardisation efforts include:

- IEEE 802.16 "WiMax" wireless networking standard;
- IEEE 802.15.4 'ZigBee' standard for low-distance, low-power communications.

It should be noted, however, that IEEE is not only developing ICT standards. In fact, standards issued by IEEE-SA are also used in fields and industries like power and energy, instrumentation and measurement, mobile and stationary batteries (e.g. the IEEE 1625 standard for laptop batteries), nanotechnology, organic electronics, and transportation.

The standards-making process

The IEEE standards development process can be broken down into seven basic steps, as follows:[5]

Securing Sponsorship: An IEEE-approved organisation must sponsor a standard. A sponsoring organisation is in charge of coordinating and supervising the standard development from inception to completion. The professional societies within IEEE serve as the natural sponsor for many standards.
Requesting Project Authorisation: To gain authorisation for the standard a Project Authorisation Request (PAR) is submitted to the IEEE-SA Standards Board. The New Standards Committee (NesCom) of the IEEE-SA Standards Board reviews the PAR and makes a recommendation to the Standards Board about whether to approve the PAR.
Assembling a Working Group: After the PAR is approved, a "working group" of individuals affected by, or interested in, the standard is organised to develop the standard. IEEE-SA rules ensure that all Working Group meetings are open and that anyone has the right to attend and contribute to the meetings.
Drafting the Standard: The Working Group prepares a draft of the proposed standard. Generally, the draft follows the IEEE Standards Style Manual that sets "guidelines" for the clauses and format of the standards document.
Balloting: Once a draft of the standard is finalised in the Working Group, the draft is submitted for Balloting approval. The IEEE Standards Department sends an invitation-to-ballot to any individual who has expressed an interest in the subject matter of the standard. Anyone who responds positively to the invitation-to-ballot becomes a member of the balloting group, as long as the individual is an IEEE member or has paid a balloting fee. The IEEE requires that a proposed draft of the standard receive a response rate of 75% (i.e., at least 75% of potential ballots are returned) and that, of the responding ballots, at least 75% approve the proposed draft of the standard. If the standard is not approved, the process returns to the drafting of the standard step in order to modify the standard document to gain approval of the balloting group.
Review Committee: After getting 75% approval, the draft standard, along with the balloting comments, are submitted to the IEEE-SA Standards Board Review Committee (RevCom). The RevCom reviews the proposed draft of the standard against the IEEE-SA Standards Board Bylaws and the stipulations set forth in the IEEE-SA Standards Board Operations Manual. The RevCom then makes a recommendation about whether to approve the submitted draft of the standard document.
Final Vote: Each member of the IEEE-SA Standards Board places a final vote on the submitted standard document. It takes a majority vote of the Standards Board to gain final approval of the standard. In general, if the RevCom recommends approval, the Standards Board will vote to approve the standard.

Important is the concept of sponsorship. The Sponsor is a technical group at the IEEE that oversees the technical aspect of projects as they move through their development cycle

[5] Adapted from http://en.wikipedia.org/wiki/Ieee

including preparing ballots and resolving all issues during balloting.[6] Traditionally, one of the IEEE Societies (that also have other activities, like journals) acts as a sponsor for standards. Nowadays, also the Corporate Advisory Group (CAG) can take this role. This offers an alternative route into the IEEE-SA, especially for new and emerging technologies that may not fall within the traditional scope of the IEEE's over 37 technical societies.[7] Interestingly, sponsors also have a key role in the later stages of the lifetime of a standard: an IEEE standard has a validity of only five years; if a sponsor wants to extend that lifetime, it must initiate a so-called *reaffirmation process*.

Voting

In IEEE, voting (called Ballot) is a process that proposed standards go through to ensure technical reliability and soundness. The IEEE has three types of standards balloting (see also the text on corporate memberships, below):

- a traditional balloting process by individuals only;
- a mixed balloting group made of non-individuals and individuals;
- a ballot group made up of non-individuals only (non-individuals can be entities like corporations, organisations, etc.).

In all of these types of balloting groups, each entity (individual or not) has one vote.

Membership

In principle, IEEE membership is for individuals. To be eligible for membership, on must meet certain requirements (mostly related to educational level). Members have unlimited balloting (voting) rights on so-called 'individual projects'. With fees between 38 and 230 US$ there are no substantial financial barriers for participation.

In recent years, the individual membership model was seriously challenged. The individual membership system implicitly assumed that each member that got involved, did so on his or her personal account as a professional engineer and on the basis of his or her expertise and best knowledge. However, over the years, members increasingly represented the position of the firms they worked for (or were paid by). By recruiting more members, firms got more influence on the process and decisions. Responding to such problems, IEEE also developed a so-called *Corporate Membership*. These members are entitled to vote on corporate standards projects. Here, the system is *one member one vote*. For these corporate projects, most rules are the same as for the 'normal' (individual) projects, although there are some differences.[8]

Note that entities in this program are not only firms, but may also be academic institutions, corporations, government bodies, partnerships, consortia, standards-development organisations, etc.

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[6] IEEE (s.a.).

[7] See http://standards.ieee.org/sa-mem/glossary.html.

[8] For more details, the reader is referred to http://standards.ieee.org/corpforum/participation/corpstdspandp.html

Consortia support

Apart from its own standardisation activities and principles, IEEE also offers services to consortia, special interest groups and other alliances. These services help these organisations to mobilise quickly to create specifications, to perform interoperability testing and engage in other activities involving the market penetration of standards.

These services are organised by the IEEE Industry Standards and Technology Organisation (IEEE-ISTO), an organisation affiliated with the IEEE-SA. In the view of IEEE, *'the availability of both consensus and consortia styles within the IEEE gives industry the flexibility to move back and forth between them, selecting the most effective approach to match the status of a technology and the needs of the market.'*[9]

Intellectual Property Rights in IEEE

In the area of intellectual property rights (IPR), IEEE is currently one of the most interesting SDO's around. Following some smaller organisations[10], IEEE is the fist large SDO that pioneers with novel IPR policies. In 2007, the IEEE received a positive Business Review Letter from the US Department of Justice, which essentially gives them the green light to use a voluntary ex-ante licensing policy (Department of Justice, 2007; see also Greenfield & Ohana, 2007). Essentially, the policy provides patent holders with the option to publicly disclose and commit to the most restrictive licensing terms (which may include the maximum royalty rate) they would offer for patent claims that are found to be essential to the standard. In addition, IEEE working group members will be allowed to discuss within certain limits the relative costs and benefits of alternative technologies within technical standard-setting meetings. This move attracted a lot of attention from industry watchers (Greenshield, 2007; Updegroove, 2007, 2007b; Luna, 2007). We emphasise that the ex-ante statements are voluntary. In fact, firms have a wide array of choices. As this policy is relatively new, we summarise these choices in Table 1.

Table 1: Options for IPR holders in the IEEE IPR policy[11]

A patent holder can choose to respond to a request from IEEE in one of five ways:
First, it may either choose not to provide any licensing information, by not submitting a Letter of Assurance (LOA) or submitting a letter stating that it is unwilling or unable to make any commitment about its future licensing intentions. At the time the draft standard is published, IEEE will announce that essential patent claims may exist for which no LOA has been received.
Second, after a reasonable and good faith inquiry, a putative patent holder may submit an LOA stating that it is not aware that it owns, controls, or otherwise has the ability to grant a license to any patent claims that might become essential to the IEEE standard
Third, a patent holder may submit an LOA stating that it will not assert any claims against anyone who uses its essential patented technology to implement the standard.
Fourth, a patent holder may submit an LOA stating that it has patents that might be essential to the IEEE standard and that it is willing to license the essential claims of those patents to those seeking to implement the standard either "without compensation" or under "reasonable rates" with all other terms and conditions on a RAND basis.
Fifth, if a patent holder commits to license its essential patent claims under RAND terms, it may voluntarily augment

[9] IEEE (s.a.). IEEE Standards Association Corporate program: a new choice in standards development, p. 6.

[10] VITA and P.25 are the first (and smaller) organisations that introduced such a policy, slightly earlier than IEEE did (Luna 2007, p. 52).

[11] Based on Department of Justice, 2007. For more detail, we refer to this document.

its LOA by including details about those terms for each essential claim. Such details may include a not-to-exceed license fee or rate commitment, other material licensing terms, or a sample licensing agreement.

2.2 IETF

The Internet Engineering Task Force, originally a U.S. government activity, develops and promotes Internet standards, in particular the TCP/IP protocol suit. It was established in 1986. Initially government-funded researchers joined its activities, but in 1991 doors were open to any interested party. The TCP/IP protocol is possibly one of the most used and most successful protocols in the world, and is also the basic building blocks for many other system standards, such as 3GPP.

In many respects, IETF is completely different from other SDO's in the field of ICT. This is most evident from its membership rules (or, better, the lack of it). Involvement and contribution to the IETF processes is on individual basis. There is no such thing as a formal membership or membership environment. People become active in IETF by participating in discussions on mailing lists, contributing drafts on technology, or simply showing up at meetings. As put by some: "Technical competence is the only requirement for contributing; there is no such thing as membership". Also, there is no formal voting mechanism: IETF uses the principle of 'rough consensus' (see below). IETF's current shape and practices are, for a large part, the result of the rather specific culture and attitude of the individuals that were involved in the early development of the internet.

Organisation

In IETF, standardisation activities are performed in working groups. These are grouped into so-called *areas*, headed by an Area Director. The Area Director appoints the Working Group chair. Given the process of rough consensus, the role of this chair is important: it is this person that determines at what point 'sufficient consensus' is reached. The area directors, together with the IETF Chair, form the Internet Engineering Steering Group (IESG), which is responsible for the overall operation of the IETF.

The standards-making process

The so-called RFC document ('Request for Comments') is one of the cornerstones of the IETF standards-making process. In fact, this process itself is published as an RFC, namely RFC 2026 (BCP 9).[12] Eventually, if adopted, the RFC can get the status of Internet Standard or, if the content is not a technical standard, a Best Current Practice (BCP). (Note that even if a document gets a more formal status, such as BCP, the original RFC name and number is kept.)

A very detailed description of IETF is beyond the scope of this report, but essentially the standardisation process at IETF is basically a specification evolving through a set of maturity levels. These levels are known as "Proposed Standard", "Draft Standard", and "Internet Standard". Particularly the promotion to a "Draft Standard" is a major advance in status. One of the key requirements is that "at least two independent and interoperable implementations from different code bases have been developed, and for which sufficient

[12] IETF (1996). Note there have been some amendments to this RFC; see the IETF website for details.

successful operational experience has been obtained. [...] If patented or otherwise controlled technology is required for implementation, the separate implementations must also have resulted from separate exercise of the licensing process."[13] Apart from demonstrating interoperability, meeting requirement creates the assumption IPR are available at reasonable terms.[14] As such, this requirement relieves IPR problems.

IPR policy in IETF

One other area in which IETF is rather different from other standards bodies is that of intellectual property rights. Originally, IETF required members to forego intellectual property protection for a standard altogether. Under pressure from members, this later was changed (Lemley, 2002, p. 92 and p.133). Although the current IETF's policy does know the concept of RAND, its whole policy is rather different from the RAND policy of, say, ETSI. The IETF's IPR policy is discussed in RFC 2026 (BCP 9), originally from 1996. As IPR issues were vigorously discussed in the IETF in the last decade, this document was amended by RFC 3979 (BCP 79) and RFC 4897, which further defines and clarifies the IPR policy.

Some particularities of IETF's IPR policy are:

- There is a preference for creating standards with no essential IPR at all.[15]
- However, there is the freedom for groups to adopt technology with a commitment of fair and non-discriminatory terms, or even with no licensing commitment, if they feel that this technology is superior enough to alternatives with fewer IPR claims or free licensing to outweigh the potential cost of the licenses.[16]
- For the specific category of 'mandatory to implement security technologies'[17], the principle is that there are no IPR claims, or only royalty-free claims, unless there is a very good reason not to do so.
- Interaction claims – standards process, evaluating alternatives
- IETF itself claims that it believes that the requirement for two independent implementations relieves IPR problems (see above).
- Also a declaration that someone believes that a third party owns essential IPR is possible (and encouraged).[18]

The IETF also has special rules dealing with the fact that its participants are individuals, not firms or organisations as such. IETF stipulates that if a contributor represents an

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[13] IETF (1996).

[14] See IETF (1996), at Section 10.3.3: 'If the two unrelated implementations of the specification that are required to advance from Proposed Standard to Draft Standard have been produced by different organisations or individuals or if the "significant implementation and successful operational experience" required to advance from Draft Standard to Standard has been achieved the assumption is that the terms must be reasonable and to some degree, non-discriminatory.'

[15] It's IPR policy, defined in RFC 3979 (IETF, 2005, p. 12) states: "In general, IETF working groups prefer technologies with no known IPR claims or, for technologies with claims against them, an offer of royalty-free licensing."

[16] IETF, 2005, p. 12.

[17] This is to ensure that there will be at least one common security technology present in all implementations of such a specification.

[18] In fact, on the IETF list of IPR statements (available at https://datatracker.ietf.org/ipr/), there are also quite some (approx. 30) of such 'third party' statements.

organisation, or is sponsored by an organisation, the requested IPR disclosures he or she does are also on behalf of that organisation.

2.3 OMA

The Open Mobile Alliance was created in 2002 as the consolidation of the WAP forum and the Open Mobile Architecture initiative. Since then, six other (smaller) fora that also aimed at developing applications protocols merged into OMA, including the Location Interoperability Forum (LIF), the Wireless Village (focused on instant messaging and presence), the SyncML Initiative (focused on data synchronisation), the Mobile Games Interoperability Forum, and the Mobile Wireless Internet Forum. OMA clearly positions itself to be technology-agnostic: the protocols it develops should run on any type of network, such as GSM, UMTS and CDMA2000 (OMA, 2002). By also being independent of any specific Operating System (OS), OMA thrives for true interoperability.

Membership is for companies, and OMA defines four categories here: Mobile Operators, Information Technology Companies, Wireless Vendors, and Content Providers. With some 400 members, OMA attracts considerable attention. More importantly, it gathers a rather fair representation over the full value chain (including content providers, for instance), making it rather distinct from many other SDO's (Brenner et al, 2005). There are several membership levels (sponsor, full member, associate member, and supporter). The sponsor level secures a position in OMA's board, though this comes with a 140.000 US$ yearly fee.

The standards-making process

OMA deliverables have three important milestones:[19]

- phase 1: Candidate Enabler Release;
- phase 2: Approved Enabler Release;
- phase 3: OMA Interoperability Release.

A key difference between these different, sequential stages is the level of interoperability. Phase 1 is for use within a single service enabler; phase 2 is approved for a single service enabler but over different networks and different [user] devices, and phase 3 includes interoperability between multiple service providers. As an illustration, OMA MMS (versions 1.1 en 1.2) specifications are currently in phase 1, whereas OMA Device Management specifications are in phase 2. (Phase three definition work is still in progress.)

Regular interoperability test fests are organised to allow the Candidate releases to be tested (and eventually be elevated to Approved release). The OMA Interoperability (IOP) Working group identifies, specifies and maintains the process, policies and test program to ensure interoperability (OMA, 2004). (Certification is not (yet) offered by OMA.) This way, interoperability testing is an integral part of the whole standards track.

[19] See Brenner (2005), p. 63 for more details.

2.4 ETSI

Being the body that standardised the successful GSM standard, and being one of the three SDO's that are officially recognised by the European Commission, ETSI is probably the best-known ICT-related standards body in Europe. It was established in 1988. At that moment, the standardisation of GSM was in fact already well on its way within CEPT, the European body of telecommunications administrations, but it was regarded desirable to take the GSM development out of CEPT and bring it into a new-to-be-established body. This would allow for a balanced involvement of all stakeholders (industry, for instance, was formally not allowed to participate in CEPT) and could serve as a basis for future European ICT standardisation.

Nowadays, ETSI has approximately 700 ETSI member organisations, from some 60 countries world-wide. The institute focuses on *'[...] Information and Communications Technologies (ICT), including fixed, mobile, radio, converged, broadcast and internet technologies.'*[20]

The formal documents that define ETSI's way of working are brought together in one set of documents. It is known as the 'ETSI Directives'. If necessary, these documents are updated by the body that has the specific power to do so; at the time of writing, the most recent Directives were version 23, published in December 2007.

Table 2: Documents that comprise the ETSI directives[21]

Document	*Notes*
ETSI Statutes	The official description of ETSI: its purpose, legal status and overall structure.
ETSI Rules of Procedure	A top-level description of the administration and operation of the Institute
ETSI Guide on Intellectual Property Rights (IPR Guide)	Provides assistance in applying the ETSI IPR Policy that forms Annex 6 of the Rules of Procedure. Includes checklists and specimen forms for declaring IPR.
ETSI Guidelines for antitrust compliance (Antitrust Guidelines);	
ETSI Board Working Procedures	
Powers and Functions of the Board	
ETSI Financial Regulations	
Terms of Reference of the Operational Co-ordination Group (OCG)	
ETSI Technical Working Procedures (TWP)	A detailed and very practical complement to the Rules of Procedure, addressing virtually all aspects of ETSI's operations.
ETSI Drafting Rules (EDR)	

ETSI Structure

The basic ETSI structure is depicted in Figure 1. The General Assembly (GA) is the main body, representing the members. It meets at regular intervals. The Board acts on behalf of the GA between the GA meetings. Board members are nominated during the GA. Only representatives of full members can become board member. The board also brings matters of strategic importance to the attention of the GA. It does so, for instance, by having board

[20] Source: http://www.etsi.org/WebSite/AboutETSI/AboutEtsi.aspx.

[21] Taken from ETSI (2007) and http://www.etsi.org/WebSite/AboutETSI/HowWeWork/Directives.aspx.

members that are 'champion' in specific strategic areas, such as interoperability. It also maintains externals relations and monitors standardisation policy and performance.

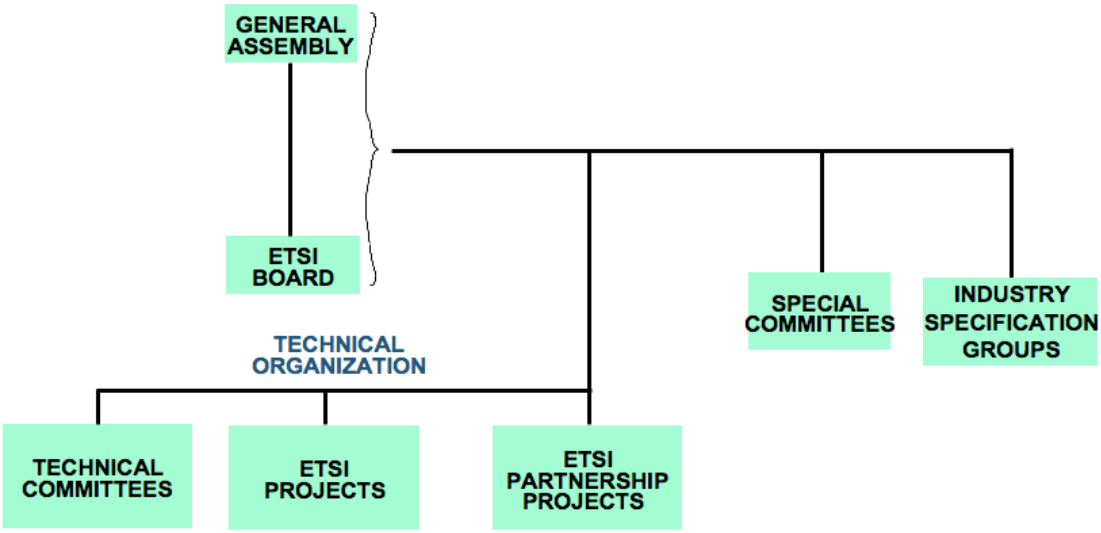

Figure 1: ETSI structure (taken from ETSI, s.a.)

The actual technical work is done in Technical Bodies (TB), of which there are three types. The most usual type is the Technical Committee (TC). Participants to such a body will typically meet between two and six times a year, in addition to electronic communications. This is a semi-permanent entity organised around a number of standardisation activities addressing a specific technology area. Acceleration to their work can be done by establishing a Specialist Task Force (STF) that performs strategically important work and reports back to the TC. Less usual is a so-called ETSI project (EP), which is market sector oriented. Currently, there is only one EP, on eHealth.[22] Finally, a special type of technical body within ETSI is the so-called ETSI Partnership Project (EPP). This is, in fact, a project in which standardisation is done together with other (usually regional) bodies. By far, the best known partnership project is 3GPP (Third-Generation Partnership Project), which standardises the third generation mobile telecommunications standards known as UMTS in Europe and W-CDMA in other regions. Note that a partnership project may have other (i.e. voting) rules. In fact, 3GPP has a one-company-one-vote model (i.e. without weighting), whereas regular in ETSI Technical Committees, a firm's vote has a weight that relates to the company's financial turnover (in telecom-related markets), and other factors.

[22] ETSI, (s.a.).

Decision-making

While ETSI as a principle strives for consensus[23], there are several voting procedures in place. In short, there are three major voting systems, all requiring 71% positive votes for a proposal to be approved:[24]

- *Voting by weighted national delegations*, applicable, for instance, for the elaboration, approval and implementation of European Norms (EN) and for changes in the statues and rules of procedure.
- *Weighted Individual Voting by full members*, used among other things for
    - taking decisions on matters concerning documents intended for regulatory and used by the European Union;
    - setting down standardisation policies intended to meet the needs of the European Union;
    - taking decisions on priorities in the work programme on matters that apply exclusively inside the European Union.
- *Weighted Individual Voting*, used in all cases in which the two other voting systems above do not apply. This is the most usual voting procedure. It is used, for instance, for decisions on the adoption of 'regular standards'.

[23] At ETSI, consensus is interpreted the same way as in ISO/IEC (and, in fact, many more organisations): *"[Consensus is a] general agreement, characterised by the absence of sustained opposition to substantial issues by any important part of the concerned interests and by a process that involves seeking to take into account the views of all parties concerned and to reconcile any conflicting arguments.'*. ETSI (s.a.).

[24] Based on Statutes of the European Telecommunications Standards Institute, Version approved by General Assembly #47 (SCM) on 29 March 2006, as part of ETSI (2007).

3 Analysis and findings

In this chapter, we discuss the findings from our interviews, complemented with evidence from the literature. This chapter is topic-based, where the selection of topics was prompted by the issues that were deemed most relevant during the interviews.

The topics we will discuss are:

- Overall assessment of performance, quality and relevance of output (Section 3.1)
- Membership, admission, and joining decision by actors (Section 3.2)
- Role of interoperability (testing) (Section 3.3)
- Initiating new work (Section 3.4)
- Third party specifications as input to the standard process (Section 3.5)
- Organisation and secretarial support (Section 3.6)
- Decision-making structure and sensitivity to 'gaming' or abusing the system (Section 3.7)
- IPR policies (Section 3.8)
- Services provided to consortia and fora and collaboration with other SDO's (Section 3.9).

3.1 Overall assessment of performance, quality and relevance of output

Performance is a multi-facetted construct, and there are many different dimensions in which performance of one body may be compared to another one. Also, performance might not only be related to factors that are endogenous (internal) to the SDO, but also may be affected by exogenous (external) factors such as features of the application area the body is focusing at. Finally, it must be noted that the assessment by any member may be strongly influenced by the type of actor (operator, supplier, public body) and by the individual positioning of that actor in the field.

Nevertheless, we did look both in literature and the interviews for the way the four bodies are assessed by users.

Relevance of the work of the standards body

All the bodies we studied have, at least at one point in time, been of very high relevance to the telecommunications community (in fact, this was an implicit element in their selection for this study). It is interesting, however, whether this relevance is currently changing. Overall, our interviewees stressed the current high relevance of IEEE and OMA. They are developing the standards and technologies that are of high importance in the next few years. More negative signals were given about the relevance of IETF. Although no one denied the importance of its TCP/IP protocol stack, it was generally believed that not many new, important things were happening there. This is possibly the result of many incumbent players – especially the 'bellheads' – feeling uncomfortable with this body and their influence in it, and therefore bringing their activities elsewhere. Whatever the reason, IETF was regarded as becoming less important, even by the more 'nethead' firms we talked to.

'Other bodies are producing more relevant things that complement the existing IETF standards'.

ETSI is a somehow special case here. Although all the people we talked to are strongly involved in ETSI, their view on the current relevance of ETSI is highly critical. One large operator, in the course of planning a NGN network, even commented that ETSI has become a tier-2 SDO for them. Also others argued that, looking at their current need for standards, ETSI was not regarded as particularly relevant and its pipeline did not seem particularly important to the market either. 3GPP is still relevant, but not so many ETSI activities are of focal interest to members/stakeholders. The perception of losing importance is a worrying sign.

Academic input in the standardisation process

Academic input in the standardisation process can be valuable, and is generally considered a plus. IEEE is generally seen as *the* example for this, whereas ITU and ETSI are recently taking action to improve academic output.

However, the role of academic input should not be over-estimated. It is often overlooked that participation by academics is also often problematic. They often embrace academic arguments, which may result in solutions that are elegant from an academic viewpoint, but are not necessarily pragmatic or cost-effective. Also, academics often do not care about speed of development, and often favour their own design or ideas at all costs, and come with totally new designs or ideas, also in situations where it is more rational to build on or integrate into existing things (even if they are not as optimal as something designed from scratch). The knowledge of academics (and often, for that matter, also of the research labs of suppliers) is pretty far away from the practical technical issues that are at stake when developing standards. It has also been stressed that the very strong academic role of IEEE as a conference organiser and a journal publisher does not necessarily mean that the academic contribution to the standardisation activities of IEEE is equally high.

Of course, there are exceptions. Our interviewees mentioned positive examples of individuals such as Scott Bradner (professor at Harvard, and very active in IETF), and the university of Texas, which has conducted valuable work in the IEEE context on the behaviour of radio LAN systems at the edge of radio coverage.

The more critical view of the interviewees on academic input is in line with recent studies on the link between academic research and standardisation. The FP6 INTEREST study has shown that academic input is valuable in some specific situations, but generally hard to realise due to several incompatibilities (see Bekkers et al., 2006).

Speed of process

It is an often-heard claim that formal SDO's are slow in delivering. That is – at least for a part – the explanation why firms go to other types of standardisation organisations, such as fora and consortia. Although our interviewees considered speed (or better: good timing) very important, the often-heard claims of the 'old', formal SDO's being slower in developing standards than consortia and other newer type of organisations were considered several times a myth. A good example is the Session Initiation Protocol (SIP); its development in IETF took longer than many comparable standards in formal SDO's. Particularly for IETF, it has been commented that it is '[...] claimed to suffer from low speed when either (1) the number of volunteers is too low and (2) when there are too

many volunteers, with too many different opinions.'[25] One interviewee explained: 'Consortia allow you to make speed, which is very important: the timing of the SSO's output is key to the business success. However, this does not mean that consortia are always made of like-minded organisations. Also in consortia, you have many different types of actors, representing different interests. However, the risk is considerably lower that there are participants who deliberately try to delay or block the standardisation effort. There is really less gaming (instead, groups already divide before and join different consortia).' Others attribute differences of speed not to being a formal SDO or not, but instead to cultural aspects: 'Americans just run harder'.

Interestingly, IEEE's qualities in this respect were highly regarded by our interviewees. IEEE makes technically solid standards. Its expert model attracts high-level knowledge, and by focusing on component standards more than system standards, IEEE had great successes. A lot of high-level, academic knowledge flows into IEEE, and the IEEE is very technically oriented, both resulting in high-quality, solid technical output.

Still, some mention that IEEE it is limited to rather specific application areas. Also, IEEE is not always the most appreciate place. In the case of wireless standards in the 60 GHz band, ECMA (with its TC32-TG20 task group) seems to get momentum at the expense of IEEE that was working on a similar technique.

3.2 Membership, admission, and joining decision by actors

SDO's exist by the grace of its stakeholders, usually – but not always – its members. For this reason, membership levels and distribution (balance between various categories), member admission rules, and decisions of actors to become member or not, are of high relevance. In this section, we will discuss four aspects:

I) Membership type (corporate membership, individual membership, and no membership)
II) Membership balance
III) Membership restrictions (particularly: distinction between geographic origin)
IV) Membership costs and contribution model

Note that this section will not discuss the level of influence (and possible abuse) of individual firms; these are discussed in Section 3.7.

I) Membership type: corporate membership, individual membership, and no membership

As discussed in Chapter 2, the studied SDO's differ in membership structure. ETSI and OMA offer membership to firms (and organisations), IEEE to individuals (while introducing an additional company membership recently) whereas IETF does not have the concept of members at all.

Individual membership, on the positive side, results in more discussions not so much in black and white terms, judging what is good and not only from a particular firm's perspective. Instead, the discussion is more nuanced, less contentious. Particularly when

[25] http://en.wikipedia.org/wiki/IETF

dealing with a new technology, this is favourable. Individual membership stimulates high-quality, expert contributions.

At the same moment IEEE, a body based on individual membership, can be observed to have serious struggles with this. As Carl Cargill (a famous standardisation scholar and now Director of Standards at Sun Microsystems) puts it:' [...] in IEEE, virtually every individual is paid by a company and is sent there to serve specific company interests.'[26] IEEE's individual membership model is seriously counteracted because of firms increasingly trying to manipulate this body. An example is the way in which Qualcomm (and Kyocera) were accused to game the system with their Wimax-competing proposal. In this example, an entire standards activity was revamped and re-started (for more details, see Luna, 2007). The new IEEE Corporate Membership model tries to deal with this challenge, but it remains to be seen how successful it will be in doing that. Corporate membership is also more appropriate in dealing with bigger 'system standards', as there is a large set of interests that need to be aligned, between firms but also within firms, and it is more a long-term issue.

A particular case, of course, is the IETF with no membership at all (see 2.2). Interviewees are rather critical about this, as will be discussed in more detail below when we address decision processes.

II) Membership balance

Within almost every standard and almost every standardisation body, there is a wide array of stakeholders. In ICT we can think of infrastructure equipment suppliers, end user equipment suppliers (handsets, but increasingly all sort of devices that communicate), operators and service providers, public bodies, test houses, intermediate users / integrators and, not the least, end users). Some of them are typically represented in the standardisation process, others not. In this subsection, we discuss membership balance, and (presumed) unbalance between different stakeholder groups.

Clearly, all interviewees applauded OMA's broad membership. *'The positive sides of OMA are the industry-wide backing and a merge of multiple standard-setting bodies, partly overlapping SDO's. This reduced fragmentation.'* OMA has a very broad membership, broader than other organisations in this industry. In fact, the members represent the widest possible range in the value chain (e.g. also IT companies, content providers, tool vendors, etc.; Sheshryar Qutub & Weerasekera, 2005). It has been noted, however, that there is some tension because of the different cultural backgrounds (telecom vs. IT).

ETSI has reasonably wide membership footage, too. This is positive, though in some cases, firms do not want such a wide representation (and therefore go somewhere else). Also, ETSI has been commented to have many 'passive members' (e.g. Microsoft, Intel). They sit at ETSI, but do not really do anything and bring their resources and projects somewhere else. As such, ETSI's 'real' membership may be more limited than what the numbers seem to show.

Telecom firms made rather critical remarks about the membership balance of IETF. Although many (individuals from) telecom firms participate in IETF, they feel that they are not actually heard and their interest is marginalised. In addition, there is not only the issue of telecom vs. IT-focused companies, but also the issue of vendors vs. operators. Vendors

[26] Luna (2007).

(with probably around four times as many representatives as from operators) dominate IETF. Operators and their requirements are not very valued there. As one the technologies developed in IETF started to be more and more key to the business of operators, they tried to increase its involvement, but with little success. *'IETF does not sufficiently take operator's requirements such as fault management into consideration. It also intentionally does not include standards for interfaces between operators, charging mechanisms, real-time performance information for effective network management and QoS maintenance. These things are key to operators.'* (Dickerson, 2004, p. 295-296; below, in Section 3.7, we will discuss more about IETF's decision procedures in this context.)

Finally, in terms of membership balance, IEEE is dominated by the US, as 50% of total funds for IEEE are from that country. On the other hand, one could probably make similar claims for other bodies.

III) Membership restrictions (particularly: distinction between geographic origin)

Key in all interviews was ETSI membership ruling in regard of geographic origin.[27] The common opinion was that it is understandable why the distinction between European and non-European members once has developed this way, and that the abolishment of such a distinction is not that easy (there may be risks towards ETSI's role in the EU and the support of the Commission). But, it is nevertheless considered necessary – and, to many, inevitable – that ETSI gives up such a distinction if it wants to retain its role as important SDO. We will reprint the reactions we received below.

> *"The European vs. global issue is not yet solved by ETSI. Currently, ETSI tries to be both, maybe resulting in the worst of two worlds. ETSI indeed has a global membership, but especially when it concerns the non-European members, it's a passive global membership. ETSI is still seen as a place that predominantly serves European interests and therefore unsuitable for other projects. With 3GPP, an ad-hoc solution was found by establishing a partnership which was truly international in its functioning. It bought ETSI time, but did not result in the necessary changes to ETSI itself."*
>
> *"The current distinction within ETSI between full members and associate members is hard to defend. Though it is understandable that there needs to be some distinction in the context of the Europe-specific Public Enquiry Process (ETSI may lose this competence if it did not meet the necessary requirements), it is harder to understand why board positions are reserved for full members only. Even an associate member of the largest membership category (45 units) is currently not allowed to have its representatives voted for board member. This shows that ETSI does the splits when it comes to balancing its European and its global identity."*
>
> *"It is desirable that ETSI becomes truly global and abolishes the membership policy among other things – the difference between associate members and full members. Also, rules related to the constitution of the board, would need to be changed. There should be a simpler structure. However, it is not sure that current members will agree with such a change. Moreover, it seems that such changes will put the EU recognition of ETSI as an ESO at risk (if this recognition is lost, ETSI would not*

[27] In ETSI's current rules, full members '[must be] established in a country falling within the geographical area of CEPT'. See http://www.etsi.org/WebSite/Membership/eligibility.aspx.

be able to produce standards that have a formal status in Europe any more, and would also no longer receive mandates for studies from the EU).”

“One possible future way for ETSI is to extend its 3GPP partnership to other areas. By doing this, it overcomes the problems related to the dual European/global identity of ETSI, and the disadvantages of weighted voting (Note that, unlike ETSI itself, 3GPP uses a one-company-one-vote system). In fact, this extension already seems to take place, by broadening the scope to a common IMS (IP Multimedia Subsystem), next generation technologies (such as IMT-advanced), and an increasing interest in fixed transport technologies such as cable network (think of the cooperation with Cable Labs for the PacketCable technology). However, the relationship between ETSI and the other participating SDO’s in 3GPP is reportedly not so well any more as it once was. By contributing not only 70% of all 3GPP members but also hosting the 3GPP secretariat, the partners feel that ETSI dominates 3GPP.”

IV) Membership costs and contribution model

Even if a party is formally eligible for membership, the actual costs for joining (or joining while having a similar say as comparable organisations) may be a barrier. Here, specific criticism is vented on OMA. Although OMA is open, memberships fees – especially for the sponsor category – are very steep and result in de facto foreclosure of smaller players (White & Keith, s.a.).

ETSI uses a system in which membership contribution is based on so-called ‘units of contribution’, which in turn are based on ‘telecom-related turnover relating to ETSI standards’.[28] According to some interviewees, the ETSI membership contribution model is getting obsolete and will cause more and more problems over time. The most pressing problem is that it is increasingly difficult for a member to determine what (and what not) has to be seen as telecom-related turnover relating to ETSI standards. While this question might have been relatively easy to answer for most ETSI members a decade ago, the grey area is becoming larger and larger. For instance, what about a PDA with communications capabilities? And the camera or music player in phones? And network management activities? And do ADSL products qualify? As we move towards a more integrated world, where communications services truly converge with each other and with other capabilities, the ETSI definition is becoming more and more problematic. Since this is self-declared, members will have the incentive to report higher relevant turnover in good times (increasing their influence and being prepared to pay for that). In times of misfortune, however, they will have incentives to report low turnovers. Whereas membership contribution fees have until now only resulted in incidental problems, they are expected to become a structural problem in the future.

[28] For more information, the reader is referred to ETSI’s ‘Members' contribution assessment’ and ‘Electronic Communications Related Turnover – Definition’, available from http://www.etsi.org/WebSite/Membership/memberContributionAssessment.aspx and http://www.etsi.org/WebSite/Membership/ECRTDefinition.aspx respectively.

3.3 Role of interoperability (testing)

All the bodies studied here focus at the development of so-called interoperability standards (in contrast to measurement standards, performance standards, or safety standards, for instance). Interoperability standards aim to make devices successfully work together, usually by defining interfaces between system elements. However, just having a standard does not guarantee such interoperability. Broadly speaking, if devices to not work properly together, this can be the consequence of different problems:

1. The standard is incomplete (suppliers may – knowingly or unknowingly – make choices for specific implementations that are incompatible).
2. The standard is ambiguous (designers of devices on both end of the interface may believe they have implemented it in accordance with the standard but they still do not work together).
3. The standard is fine, but devices may not implement the standard correctly.

Situation 1 and 2 are not blame to the ones that draft the standard. It is close to impossible to draft a perfect standard, with nothing missing, with no ambiguities at all, while still only describing an interface and refraining from prescribing specific implementations. Testing of implementations, against a reference system or against one another, is necessary for both (1) feeding back possible problems or omissions to the standard and (2) ensuring that end user devices work. Note that these are two distinctive aims that may require different actions: whereas early interoperability testing may help to improve the standard (when the standard in question is not frozen yet), activities such as certification might ensure the end user or intermediate user that the device will work (assuming the parts on the other side of the interface, like the network infrastructure, also successfully past certification). Early-phase testing might also help manufacturers in the design process, or to identify and address flaws in their designs (which are usually prototypes, not commercial products). In some standards, such as WiFi and WiMax, product certification also assures that products implement a compatible set of options (important for standards that leave options open that might impede compatibility). Certification is also linked to brand awareness and marketing.

On the basis of the above, one can distinguish between a quite wide array of activities that, for the sake of convenience, we all lump together using the term 'interoperability (testing)'. One can think of reference test systems, test suites, "plugfests" (or "plug tests"), proofs of concepts, certification, 'verification houses', and so on. To a varying degree, SDO's do integrate such activities into their work.

Interviewees commented very favourable on the way in which IETF has integrated interoperability / implementation testing in their standardisation procedures (for more details on this, see Section 2.2). Below, we include quotes about their assessment of IETF in this respect.

> *"IETF Implementation requirements are interesting and positive. It integrates interoperability testing into the standardisation process. Other bodies might learn from this, though one has to realise that it is not always easy to do a similar thing in another standards environment. It requires, among other things, that all specifications are already written out in a consistent manner before interoperability testing can start, and this is expensive and time-consuming"*
>
> *"The integration of interoperability in IETF is a great thing. In fact, it is a bit alike the rules in some consortia, where the demonstration of working prototypes is a*

requirement to arrive at the 0.9 version number. Interoperability, certification, test tools (and the specification for these) and logo/labelling are very important. Although it is not easy to say whether something exactly similar to the IETF implementation requirement would work in ETSI, it would be a good thing to study what can be learned from it and how it could be integrated (maybe in a somewhat different way)."

"The IETF implementation requirement is clearly an advantage. One has to bear in mind, however, that IETF nowadays merely extends its existing standards and does not develop new, innovative standards. Nevertheless, one can certainly think about standards for which the implementation requirement would also be possible in ETSI, for instance for test standards for radio LAN."

"Both in a formal and in an informal sense, IETF is doing very well in the area of interoperability. In particular, at so-called "bakeoffs", interoperation between multiple vendors is tested and demonstrated, before the specifications are standardised. This is a great plus. This allows for recognising errors, uncertainties, omissions, and contradictions in the specifications at an early phase. In fact, it has been suggested that other SDO's can learn from this practice (IAB, 1993, at Section 2). However, a drawback of this procedure at the IETF is that this interoperability testing phase is not very transparent and that implementations are not tested against a single, well-defined reference implementation. The result is that not everyone is equally able to learn from it."

Similarly, interviewees were very positive about the way OMA integrated interoperability testing in its standards development activities (which are discussed in more detail in Section 2.3). By making interoperability tests an integral part of the process, the quality and attractiveness of the standards is higher.

On ETSI, the views were more critical. *"In ETSI, interoperability testing may be considered as a deficiency. There are, of course, some interoperability activities but these are not linked to the standardisation process; they do not provide feedback to improve the standard. Also, these activities most often concern to standards not developed by ETSI. ETSI would greatly benefit from a 'design for interoperability'."* Other interviewees note that ETSI's weakness is that profiling and interoperability are not integrated. Among other things, these can lead to ambiguity in the produced documents.

Finally, interviewees commented that strong marketing/certification entities, such as the WiFi Alliance and the Wimax forum, further strengthen the standardisation process and are complementary. To some degree, the GSM Association (GSMA) plays this role for GSM and UMTS.

3.4 Initiating new work

During the interviews, the degree to which SDO's managed to initiate new, relevant work was regarded as one of the key issues, if not the most important single issue. Here, several aspects are relevant:

- the way new work is (supposed to be) identified and accepted as a new work item, including rules and procedures for this;
- the actors with principal responsibility to bring up new work items (members? SDO management? Board? Secretariat?);

- the role of (commitments for) resources;
- the philosophy behind work identification (identify user requirements and translate these into technical solutions, or develop technical solution and see whether they meet user needs);
- potential agreements with other organisations.

In this space, the potential resistance of members or other stakeholders to start new work can be of relevance too.

Some note that one of the reasons for the proliferation of consortia is that SDO's are disinterested in emerging technologies (Mitchell, 2004, p. 26). SDO's are usually dominated by large players. These are not necessarily the ones that will bring in the good new initiatives. Patrick Gannon, president and CEO of OASIS, notes: "It's not uncommon for large players to join a standards effort late [...] It's only when there's a clear indication from the market that they come on board" (Mitchell, op. cit.).

Right now, it happens that members are not interested in good new proposals, and turn it down or do not make resources available. After a few years, they find out that it is actually desirable, but by then other fora/consortia already claimed the project. (As an example, the case of Intelligent Transport Systems– ITS in ETSI was mentioned).

In ETSI, new work (and new work items) typically results from current work. As a consequence, few really new areas are tapped. A shared feeling among the interviewees is that perhaps the biggest problem in ETSI is that the pipeline is slowly drying up. Filling it again with standards projects that are valuable, once they are finalised, requires the ability to identify the right opportunities. Further developing this ability should be one of the key strategic issues for ETSI. Right now, this is basically left to the technicians participating in the TC (usually very knowledgeable about their own field but not about other fields), and to corporate representatives attending events such as the GA (not necessarily with a broad orientation themselves). It may be argued that these are not the best people to identify new projects. There have been several cases where ETSI 'missed the boat'. It may be inevitable that this happens sometimes (certainly not something to be ashamed of), but if the pipeline really dries up, one should think how that came about. To transfer from what was once almost a 'one-issue club' into a body that aspires a long-lasting position in the market, the process of deciding on new projects is essential. One may see this as an identity crisis ETSI is going through.

In the interviews, some ideas were brought forward:

1. To start a more pro-active process, involving others than the usual representatives of the members, or possibly even parties that are not a member (yet). *'It's the process before the fact that matters most.'* Some interviewees have suggested that one might try to gather CTO's or, in some cases, even CEO's to come with the long-term roadmap. Other commented, however, that ATIS already did a similar thing but was not as successful as one might hope for.
2. To allow for the development of competing technologies within their body and between bodies, as long as the participants are willing to invest effort in these. This increases variety, while later on it will show which proposals are more viable than others. Usually, this will be sorted out long before any products come to the marketplace. (Even though this might still happen occasionally - as it did with Blu-Ray and HD-DVD – this price is more than acceptable if one thinks of the advantages).

3. Move away from developing big, vertical, all-encompassing systems (only). These systems are often very ambitious and might suffer from competition with component standards that are very successful at one specific layer or part of the network. Others comment that bodies that do *not* focus on vertically, integrated systems are both at an advantage and at a disadvantage. On the one hand, implementers need coherence in a larger system, where all components are well tuned to one another. A body that does not focus on a full system cannot have an overall vision on a system. On the other hand, history has shown that also SDO's that develop one single component of a full system can be very successful. In fact, some scholars have claimed that component standards are becoming increasingly successful (Waclawsky, 2005)
4. Give the SDO management or secretariat a more central role in identifying and using new opportunities. In IEEE, for instance, an expert committee has the interesting role to identify new, emerging areas. Others, however, commented here that the ETSI secretariat sometimes did attempt to get work started in new areas, but they are eventually dependent on the effort that members are prepared to invest in such work. This may also explain why some new work that is taken up by ETSI progresses slowly while external efforts develop fast. An example is IPTV: while TISPAN was working on this, the IPTV Forum (which includes some key ETSI members) also got momentum.[29]
5. Lower the requirement for new work items. It was commented that within IEEE, it is relatively easy to set up a new working group, and these groups are semi-autonomous, making their life easier.

A recurring theme in the interviews is that members resist the take-up of new projects. This might be because:

- They feel that there is an unbalance and that the interest of their membership category is not well served (this is how commercial operators feel about IETF);
- They have stakes in another technology or standards that could – fully or partly – serve the same application area.
- The existing, traditional members dominate the scene, and there is a strong "not invented here" sentiment. All of this creates a lock-in situation. This is an aspect of SDO culture and hinders the adoption of really new initiatives.
- Influential members deliberately keep new work items out of SDO's and bring it elsewhere because of the SDO's regional focus: it was argued that this happens in ETSI because these members regard ETSI as 'too European'.

Some interviewees even went so far to claim that without 3GPP, ETSI is little more than a local standards club without much impact. "Its rules of procedure were originally crafted to protect the vested interests of major players like Administrations and large vendors, assuming shared interests. Such shared interests, however, are usually only found in the maintenance of existing standards and not in new areas in which ICT standardisation is needed."

[29] It must be noted that this may be partially due to the decision in IPTV Forum to take the IMS as their starting point, whereas TISPAN aimed to develop a system that would work on in IMS and non-IMS environments. Thereby, the latter set itself a considerably more challenging goal.

Perhaps there is not much more to achieve for ETSI than currently is the case: the best what you can do is a good infrastructure, a well-oiled secretariat, a good competence centre – and ETSI already has all of this.

Views differed when it came to the question whether technical work should be preceded by (or be the result of) a good analysis of user requirements (like in ETSI) or whether good technical work should just be taken up and time will tell whether this technology eventually serves a user need (which is closer to how IETF works).

3.5 Third party specifications as input to the standard process

A standard that is standardised by SDO's is not necessarily fully developed from scratch by that SDO. It is not unusual at all that an SDO builds upon work already performed by others and fed into the standardisation process at a specific point. In fact, this process, which is also known as ex-post standardisation, is one of the oldest modes of standardisation. There may be a variety of reasons for firms or organisations to submit specifications in order to get them standardised:

- a formal standard may be more favourable from the legal point of view;
- a formal standard is well disseminated and accessible to any interested party (think of specifications that many would like to consult, such as the Compact Disc (CD) standard);
- a formal standard is conceived as a 'quality stamp';
- a formal standard signals a stable, 'frozen' version of the specifications, that are a solid basis for product development;
- eventual ambiguities, omissions and errors may be found and corrected;
- a formal standard is usually well maintained.

Depending on the SDO, there are different modes in which existing technical solutions may flow into a standardisation process. In fact, some bodies always work on the basis of submitted, complete specifications. If they meet certain criteria (related to the product, but also to the process followed), they are eligible to receive the status of standard.[30]

Several bodies accept third party specifications as input to the standards process (here, third party can refer to specifications developed by a specific firm, but also specifications developed by another SDO, forum, consortium or any other setting). ECMA, in particular, seems to be popular to 'bring standards'. This is possibly so because its rules are not very restrictive when it comes to endorsing third party specifications; also, in ECMA there does not seem to be a lot of resistance of other members.[31] IETF is even completely built upon this concept: any standards track starts with someone submitting a proposed, complete set

[30] In fact, it in such cases it would be better to talk of Standard Setting Organisations – SSO instead of Standard Developing Organisations (SDO's), but this more academic distinction is somewhat outside the scope of this report.

[31] ECMA, in turn, often submits its own standards to formal SDO's such as ISO. In its own words, *'ECMA is the inventor and main practitioner of the concept of "fast tracking" of specifications drafted in international standards format through the process in Global Standards Bodies like the ISO. Since 1986, when fast tracking was introduced to ISO, over 75% of fast-tracked standards have been fast-tracked through ECMA.'.* (ECMA 2008). It also has a Co-operation Agreement with ETSI that allows it to bring its own standards into ETSI. While this was supposed to be restricted to the area of business communications, the feeling has developed that ECMA was using it in a broader sense than what was considered desirable within ETSI and this route is in the process of being changed.

of specifications. In ETSI, it is possible to submit ready-made specifications using the so-called PAS procedure (PAS: Publicly Available Specifications).

There are also several key questions, both from the point of view of the submitter as the point of view of the SDO or its members:

- can the SDO alter any aspect of the specification? If so, this might be a problem for a de facto standard that is already widely deployed;
- does the standard-to-be compete in any way with existing standards of the SDO, or standards or interests by (some of the) members of that SDO?
- Does the submitted standard receive the same status as 'normal' standards produced by that SDO?

There have been very successful cases where specifications developed by external fora were brought into a formal SDO for publication. In particular, the area of broadcasting shows several of such examples, such as DVB (brought into ETSI[32]), Digital Audio Broadcast Plus (DAB+, brought into ETSI), Digital Radio Mondial (DRM, brought into IEC), Terrestrial Digital Multimedia Broadcasting (T-DMB, brought into ETSI), and TV Anytime (brought into ETSI).[33] However, in these cases, the specification that was offered to the SDO was rather distincive of the work of the SDO itself and did not pose much of a threat to the existing standardisation activities (and usually not a threat to the most dominant actors). Arguebly, this explains the relative ease at which these specifications got published, approved or otherwise brougt into the formal SDO's.

Interviewees mentioned many cases of SDO's having problems dealing with third party specifications. IEEE, for instance, allows third party specifications as input, but struggles with that (Luna, 2007). In ETSI, one of the first (and most) famous PAS submissions, that of TetraPol, was a very contentious one: the proposed standard competed head to head with an ETSI standard that was under development called TETRA, and under strong pressure of members, the Tetrapol PAS request was rejected. Altough the above-mentioned examples of DVB, DAB+ and T-DMB are exaples of more recent, succesful PAS submissions in ETSI, it is noted by interviewees that PAS only seem to works well for 'friendly proposals': those proposals that support among ETSI members anyways. 'Unfriendly proposals' meet considerable more resistance.

A similar situation exists for the procedure in ETSI where existing specifications can be proposed as work items in order to have them accepted as Harmonised Standards (so-called EN's).[34] Several of such proposals have met great resistance, including cdma450 and MediaFLO. Most often, this resistance stems from (other) ETSI member having interests in competing standards. Note here that although ETSI standards such as DVB have been successfully accepted as American TIA standards, whereas TIA standards in exactly the same area have been refused to be accepted as ETSI standards.

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[32] The DVB standards are published by a Joint Technical Committee (JTC) of European Telecommunications Standards Institute (ETSI), European Committee for Electrotechnical Standardisation (CENELEC) and European Broadcasting Union (EBU).

[33] See the presentation of Philip Laven of the European Broadcasting Union on the recent EU conference on standardisation (Laven, 2008).

[34] These EN's are very valuable: radio communications products based on such a EN are automatically assumed to meet the relevant European requirements (set out in the R&TTE directive). In contrast, a manufacturer that brings products into the market which such an EN does not exist has to prove for each products that it meets the necessary requirements by having it tested in a test lab.

All interviewees were in strong favour of promoting the use of external specifications. This view is also reflected in the literature: 'Formal standards bodies should take up consortium specifications in a more systematic and transparent way' (Dickerson 2004, p. 300). Below, we include some quotes from the interviews:

> *'A more intense use of the Publicly Available Specifications (PAS) would be desirable. Actors have legitimate reasons to choose for a consortium to develop a new standard. After the development work is done, however, it remains important that the standard is widely accessible, is maintained and that there is a good version management. Consortia are not good in this; after the standard is ready, the interest of the partners declines. Formal SDO's, such as ETSI, are much better at this, also because of their continuous character. It is clear that there is a substantial demand for 'rubberstamping' the output of consortia standards: it was done for the CD and CD-ROM standards (within ECMA and ISO), for open office formats, and computer languages (e.g. ECMAScript/JavaScript), among other standards.'*
>
> *'Everyone would benefit from a good and well-used PAS procedure, with clear rules on the condition for work to be submitted. These conditions should not be unnecessary restrictive; for instance, work should not be rejected because other SDO activities address similar or the same application area. Each submission should be judged on fair, identical criteria.'*
>
> *'Note that this should not be confused with using the PAS route to provide consortium standards with specific types of (European) recognition (attractive for complying with procurement rules, for instance). This is another discussion, which should take place in a different arena, and is not the key goal of the proposed ('re-introduction') of PAS in ETSI.'*

Opinions differed, however, on whether or not a third party submitter should accept that the relevant Technical Committee (TC) of the SDO performs maintenance tasks on the standard and, if appropriate, makes changes to the standard. For existing standards that are widely adopted, such as the CD, Sun's Java or, for the sake of the example, Adobe's PDF format, this could be seen as problematic.

Also, it is a contentious issue whether proposed third party specifications should also be accepted when they compete in one way or another with standards the SDO itself is developing (or has developed). Most SDO's seem to have rules to not develop competing standards at the same time[35], but it is not always clear how these rules relate to third party specifications. Here, however, most interviewees were in favour of doing so: competition keeps everyone sharp and increases the chances to have high-quality and relevant standards, and standards that meet real-live users needs. Finally, it also leads to better IPR licensing conditions. This is the same for competition within a standards body as

[35] At first glance, it might seem that IEEE allows for competing standards to be developed simultaneously. This is not really true, however. IEEE has the principle of unicity. At the Project Authorisation Request (PAR), there is a criterion that the proposed work does not compete with an existing standard. In the case of the development of WiMax (IEEE 802.16), which appears to compete with other IEEE mobile radio technologies (such as IEEE 802.20, that was at that time still under development), the original application area of WiMax was for fixed installations. Thus, when standardisation started, it was not believed to compete with the mobile standards in development within IEEE. It was only later that it became clear that WiMax could possibly serve mobile applications as well. An older case was that of Ethernet vs. Token Ring networks. Although it later appeared as competing technologies, it was originally believed that because of their different technical nature, they were essentially distinct technologies, serving different application areas.

competition between standards bodies. In some cases, it may lead to two incompatible standards arriving at the marketplace (Blu-Ray and DVD-HD, for instance). But such cases are rare, and the overall advantages of competition tend to offset the costs (in terms of accidental user confusion).

3.6 Organisation and secretarial support

On the whole, interviewees were rather content with the organisation of SDO's as such. Especially ETSI was highly appreciated. *'ETSI is an efficient platform to work in.'* It functions much better than ITU, for instance, that is seen as inefficient and very politicised.[36] IETF was criticised for having a relatively poor version management. This is partly due to the fact that many standards never reach the ultimate level of "internet standards" but still are deployed widely. In that case, other organisations must 'provide stability' by referring to specific versions of an IETF standard for a specific application (e.g. 3GPP that refers to specific versions of the SIP protocol).

A particular problem that was mentioned is that of the size of the board of several SDO's. In particular at OMA, the board is much, much too large. Being so large, it is inefficient. In fact, members buy votes. Optimum board size is probably in the range of 11 or 12 persons. This is enough to get the work done, but not too much to make it sluggish and inefficient. ETSI is also commented to have too many board members (currently 27). Though less than OMA this is still a lot.

One interesting point raised in the interviews is that in some bodies, executive functions and committees comprise industry members. Most notably, this is the case in IEEE. These people bring in valuable market insights.

3.7 Decision-making structure and sensitivity to 'gaming' or abusing the system

A very key issue is how decisions are made in SDO's. Even when virtually all bodies would claim that 'consensus' is the leading principle, it may be implemented very differently. Closely linked to the decision-making structure is the degree to which members feel they have a 'fair say' in the process and to what extent (other) member may 'game' the system.

IETF and its non-voting system

IETF is a special case here. As noted before, this body does not have the concept of membership. IETF uses an interesting mechanism in which no formal ballots/voting exist, and the SSO itself can take decisions to move a standard along the standards route. There is a principle of 'rough consensus', which implies that unanimity is not strictly necessary. There is an important – and influential – role for working group chairs and for IAB and IESG chairs, which have to determine when rough consensus is reached.

Several interviewees proved to be very critical on this. IETF is a highly closed organisation; anyone has the right to get involved, but actual influence is a privilege for a very small group of insiders. Even though 'officially' all communications are via the mail list, actual

[36] For instance, ITU missed the opportunity to move all the NGN activities into one, efficient group, because of political involvement – every country wanted to provide the chairman.

communications is often direct, for instance when these selective groups of insiders meet in hotel rooms. Decisions (such as the decision when sufficient consensus is achieved to move a project along the standards track) are at the discretion of the Working Group chair and the Area Director. If someone is not part of that 'in-crowd' (e.g. has a good relationship with this chairman or area director), he may not be heard. Although there are public meetings, the attendance is huge and participants hardly have the chance to bring something up (especially when one is not considered an 'authority' in the specific technical area by the insiders).[37]

It may be surprising that IETF, because of this, has not faced major conflicts here. The answer may be in the nature of the standards they focus on: single protocols rather than on tightly interlocked systems. These single protocols are arguably less prone to large conflicts of interest.

IEEE and its individual membership model

In the problematic Qualcomm/Kyocera case (see Section 3.2, and the more detailed discussion in see Luna, 2007), it became once more clear how individual membership models make an SDO more prone to abuse. By sponsoring large numbers of engineers (own staff, but also others) one can systematically buy support at the voting stage. These problems have prompted the introduction of a corporate membership model at IEEE.

Weighted vs. non-weighted voting

Many bodies have opted for a weighted voting system, so parties with a larger role in the market also have a larger say in the decisions. Most interviewees, however, were not proponents of weighted voting, somewhat to our surprise, as all interviewees are representing large firms. One issue with weighted voting is that the views of smaller firms – that are possibly more innovative or future-looking – are suppressed. There is a risk in ETSI that parties 'buy influence'. There is quite an amount of freedom in claims about the actual turnover, and by just declaring it high (or low) you can determine the amount of influence. This fits in certain 'guerrilla-techniques' that some parties are pursuing in such bodies. Note that ETSI uses weighted voting, but 3GPP does not – something that was appreciated by our interviewees.

It should be noted that bodies with non-weighted voting but individual membership might share these problems. In IEEE, abuse usually takes places when the stakes are high, and parties send in huge delegations.

'Gaming' the system

In principle, there is no way to organise an SDO that safeguards it against any type of abuse. Any standards-producing organisation – whether it is an accredited SSO or consortium – is potential subject to be gamed (Updegrove, 2003). As a result, the question we ask ourselves here is not whether an SDO can be abused, but how prone it is to abuse. Furthermore, it is important to recognise that what is clearly abuse according to one actor, is a legitimate defence of its interest by the other. Also, what is called 'abuse' in legal

[37] One interviewee noted: '*The no-voting process is a problem in a way. You can compare it with voting by humming: who hums hardest will determine the outcome'.*

terms (particularly abuse of a dominant position) is not necessarily so for members of an SDO.

The most pressing cases of 'abuse' are usually related to behaviour with IPRs (which we will discuss in the section below), because IPRs and the temporary monopoly they grant their owner may be used in SDO-settings. Other type of abuse is more unusual, as most SDO rules will require a consensus decision to do something, thus requiring considerable support of other members.

One particular concern, both in literature as in the interviews, is that of the "passive negative votes". These votes come from people that sit in at meetings for as much as two years without saying a single word and, in the end, unexpectedly cast a negative vote. (Luna, p. 51*ff*). The active participants perceive this as 'unreasonable' blocking.

Blocking and stalling votes

A particularly difficult situation arises when interests and opinions strongly differ between members, and it is hard to get to a consensus decision.

In ETSI, we have seen such problems when the decision was to be taken on the basic technology for its third-generation mobile telecommunications system, UMTS (see Bekkers, 2001, for an extensive discussion on this). A special meeting was convened to get to a decision, and behind the curtains, a huge amount of lobbying was taking place).

ETSI is not alone here, though. Also in other bodies we find well-documented cases where the stalling of votes delays or even annuls a complete standards development. An illustrative example is that of IEEE and its Ultra Wideband (UWB) standard. The IEEE study group for the UWB specification for wireless communications remains deadlocked after two years. Neither of two competing camps, led by Intel and Freescale Semiconductor[38] had the votes needed to move forward. "The engineers are not listening to each other anymore," laments Martin Rofheart, director of UWB operations at Freescale. "Today, because there is the perception that [UWB] could be a major business opportunity and major vendors are involved, it makes it very difficult to compromise," says the IEEE Standards Association's Carlo (Mitchell, 2004, see also Waclawsky, 2005, p.42). It is disquieting that no consensus can be reached at all and processes need to be stopped even if there is apparent demand for the standard. Attempts in ETSI in the area of UWB had a similar fate (although in ETSI, this discussion concerned the creation of a System Reference Document (SRD), a document that plays an important role in frequency planning by CEPT).

An interesting observation is that both IEEE and ETSI failed to finalise a UWB standard. In both cases, it was a stalemate between two rivalling groups that resulted in a halt. Both bodies have shown not to be able to cope with such a situation. Though interviewees differ in opinion whether UWB is really a promising technology or merely a hype, the observation is interesting, and not an isolated case.[39]

One way out of stalling votes is to leave some options open en let the market decide: this was used, for instance, in the IEEE 802.11 series. Here, the proponents of Frequency Hopping (FH) technologies and those that preferred Direct Sequence (DS) could not get to

[38] Originally part of Motorola, divested in 2004.

[39] Another example is HyperAccess, where two industrial parties do not want to give an inch. (Not to be confused with HyperLAN.)

an agreement, and both techniques ended up as options in the standard. The issue of potential consumer confusion was, in this case, sold by the establishment of an organisation, the WiFi Alliance, which promoted one particular (set of) option(s), ensuring that products bearing a particular name or logo would indeed be compatible. Most of the time, the 'tipping' market characteristics will ensure that one implementation (or: set of options) increasingly gains support, and the other vanishes. For a while, this might lead to consumer confusion; which could be successfully addressed by certification organisations such as the WiFi alliance. There might be a price (in terms of market confusion and later take-up) but such eventual events are usually offset by the advantages of competition.

Another option is allowing for a higher degree of competition between standards within and between SDO's. Groups will be formed around different proposals, positively working to a good solution, instead of dedicating all energy to trying to prevent other technologies to be chosen, or coming to half-baked compromises. Also here, there may eventually be a price to be paid for the market, but again this is likely to be more than countervailed by the advantages of competition.

3.8 IPR policies

Whether one likes it or not, IPR is without the single most contentious issue in standards-making. Nowadays, IP vendors participate vigorously in the standards process in order to ensure that the final specification includes technologies covered by their patents. Especially with the advent of technology-only firms (companies that have a business model that is fully or largely based on licensing income, not from producing standard-compliant products), the interests of the various stakeholders become even more diverse and make it even more difficult to come to an outcome that is acceptable by all. IPR issues are getting a lot of attention in SDO settings, and the challenging dilemmas placed by combining the mechanisms of standardisation and IPRs have resulted in a solid body of academic literature.[40]

The price of IPR is becoming a serious consideration when developing and adopting standards. In the words of Jim Carlo, president of the IEEE Standards Association: *"You now have compromises that are not just mathematical or technical compromises but have major marketing compromises behind them"* (Mitchell, 2004). There is some evidence that standards from different SDO's start to compete on the basis of the costs of the associated IPRs. Mitchell (2005) reports a case in which two Digital Rights Management (DRM) technologies are being developed in SDO's. One of these is ISO MPEG REL, where there is a single IPR owner. The other one is developed at OMA (Open Digital Rights Language, part of OMA DRM 1.0). The latter has multiple IPR holders, however. When an independent licensing agent, serving these IPR holders, announced a licensing programme for 1 US dollar per cell phone, the wireless industry balked. This example seems to indicate that competing standardisation efforts might contribute to lower (cumulative) license fees.

IPR rules are also a very important consideration for firms whether or not to join standards bodies. In a recent small-scale survey of large firms active in standardisation, all respondents indicated they carefully studied the IPR policy before joining any SSO (and some of them were member to more than 150 SSO's). Some will also review their membership if changes to the IPR policy are made (Updegrove, 2003 p. 212). One of our

[40] It is beyond the scope of this report to provide an extensive overview hereof. For more references, see Bekkers & West (2006), Bekkers et. al. (2006), and Bekkers (2001).

interviewees indeed stated that *"… an obligatory royalty-free licensing policy is a show-stopper for us. That is why we do not participate in W3C."*

Table 3: IPR policies at the studied SDO's, plus W3C

SDO	*Main characterisation IPR policy*
IEEE	Voluntary ex-ante disclosure of licensing terms since early 2008, including a (F)RAND option
IETF	- Preference for IPR-free standards - Otherwise RAND, though decisions may be made to divert from this - Implementation requirement is believed to relieve IPR problems - Declarations from parties other than the IPR holder itself are allowed (and encouraged)
OMA	"Standard" (F)RAND policy
ETSI	"Standard" (F)RAND policy, now also 'passively' allowing voluntary ex-ante disclosure of licensing terms
W3C (not under study here)	Royalty-free (RC) obligation

As shown in Table 3, in the standardisation world, an SDO policy requesting all IPR holders declare it is prepared to license its essential IPR at (F)RAND conditions[41] is quite common. RAND-policies, when used in the current patent-intensive strategies of SDO participants, show several shortcomings:

I. No sensible cost/benefit analysis is possible in order to decide on the inclusion of a certain technology in the standard, or when choices have to be made between alternatives.

II. Commitments to license essential patent claims on RAND terms are inherently vague; this can lead to litigation processes delaying the introduction of standardised products.

III. Patent holders may demand higher licensing fees than they could have profitably demanded before the standard was set, and such higher royalty payments could result in higher prices for consumers.

IV. Any implementer has to negotiate individually to a large number of IPR holders resulting in significant coordination costs and delays.

V. Although licenses or individual patents have to meet the criterion of 'reasonable' fees, this is not necessarily the case for the full set of all patents. There are no mechanisms that prevent 'over-inclusion' of IPR in a given standard.[42] This may result in a problematically high cumulative royalty fee or "royalty-stacking".[43]

VI. There are many known cases of both over-claiming and under-claiming, both creating distortion in the market. Over-claiming (claiming non-essential IPRs as essential) can be either a deliberate strategy (trying to engage parties in licenses) or a precaution (minimising the risk that the firm is found guilty of not disclosing essential IPRs). Under-claiming, as well, can be either a deliberate strategy or reluctance.

[41] (F)RAND stands for Fair, Reasonable and Non-Discriminatory.

[42] This is different from the issue that typical devices such as mobile phones have more and more features, such as camera's, music players, agenda's etc. that usually require many licenses from third parties as well.

[43] See Lemley & Shapiro (2007).

Also, there are members that just send blanket claims, not providing information on the actual patents.

VII. There is the risk that a third party owns a blocking patent. This party is not bound to RAND policies and might, in the most extreme case, develop into a patent troll, take parties in hostage, etc.

It should be stressed that there is no single SDO IPR policy that does successfully address all (or even most) of these points. For instance, third party IPR problems simply cannot be effectively addressed in an SDO policy. However, the perceived problems with RAND did lead to may heated discussions in the last few years. Among other things, ETSI studied whether it should revise its policy (but in the end did not make much changes) and IEEE introduced a brand new IPR policy (see Section 2.1).

Below, we will discuss three themes related to intellectual property rights in standards: emerging new IPR policies, royalty-free licensing policies, and EITF's patent approach.

Emerging new IPR policies: voluntary ex-ante disclosure of licensing terms

Without doubt, one of the most interesting recent developments is the adoption of a voluntary ex-ante licensing policy in IEEE (this was already extensively discussed in Section 2.1). All interviewees regarded this as a very interesting move, and their view is best described as moderately positive. Voluntary ex-ante licensing schemes can reduce uncertainty, one of the central current problems. It could facilitate a sensible cost/benefit analysis in order to decide on the inclusion of a certain technology in the standard, or when choices have to be made between alternatives. It is well thinkable that a main technology sponsor, in order to get its technology selected as the basis for a standard, does voluntarily choose to announce future licensing terms. Patent holders may compete to offer the most attractive combination of technology and licensing terms and thus make such commitments leading. Some interviewees, however, feel that they would not opt to declare licensing conditions beforehand. *'It is like asking a chess-player, at the start of the match, to denounce what his 20th move will be.'* Within a *voluntary* scheme, of course, it is not a problem if not each member wants to disclose its future license terms.

Certainly, such a policy may also give rise to questions in the sphere of competition regulation / antitrust rules, as it may potentially lead to anti-competitive conduct (e.g. group boycott conduct or buyer cartel behaviour). In this context it is very valuable that the Department of Justice (DoJ) issued a positive review of IEEE's business letter, thereby making clear what is deemed allowed and what not.

Although IEEE is widely known (and by many praised) for its bold and very visible introduction of its voluntary ex-ante licensing policy, it would be unfair not to recognise that ETSI also made a move in that direction. Late 2006, the final report of ETSI's *IPR Review ad hoc group* recommended that voluntary public disclosures of licensing terms should not be precluded (ETSI, 2006, Recommendation 2 and 6 in particular). This recommendation was adopted by the General Assembly and the ability to voluntary public disclosure licensing terms is confirmed in recent public ETSI documents (see ETSI 2008a, for instance). This documents also mentions new ETSI antitrust guidelines.[44]

[44] Which seems to be a weird term, as the term *antitrust* generally refers to the US, whereas in Europe we refer to *competition rules*. Although these two regimes have similar sets of goals, they are definitely different from one another,

Although ETSI now also allows for voluntary ex-ante disclosure of licensing terms, we may still observe some important differences with IEEE's policy. These differences are outlined in Table 4.

Table 4: Differences between IEEE's and ETSI's voluntary ex ante licensing schemes

IEEE	*ETSI*
Voluntary ex-ante disclosure of licensing terms is clearly encouraged. There is a clear IPR policy, setting the policy out in detail.	Voluntary ex-ante disclosure of licensing terms is best described as 'passively allowed'. It is better characterised as *'parties are free to communicate ex-ante what their licensing fees will be if they wish to do so'* than an integrated, ex-ante licensing policy.
The DoJ's positive reply to IEEE's Business Review Letter makes clear what conduct is and what is not allowed in the SDO setting. In particular, it argues that the policy should facilitate a sensible cost/benefit analysis in order to decide on the inclusion of a certain technology in the standard, or when choices have to be made between alternatives.	It remains unclear to what degree licensing matters may be discussed in the SDO setting. Although ETSI states that ex-ante licensing 'enables competition on the basis of technology *and price* before the standard is approved' (ETSI 2008, emphasis added) it also maintains that there may be 'No discussion/negotiation of specific licensing terms within ETSI' (ibid.) Also ETSI (2007) states that: 'IPR Guide Section 4.1 is still appropriate and should not be changed with respect to the fact that discussion of commercial issues within ETSI TB shall not take place.' Without the disclosed licensing terms taken explicitly into consideration during the technical inclusion process there is little protect of having a sensible cost/benefit analysis.
Statements of future licensing terms are collected and made available by the SDO (in the same way (F)RAND statements and other statements relating to IPR are), making them available in a consistent way to all those that are interested. This scheme ensures that the licensing conditions are signalled to all stakeholders, not a selective club.	Statements of future licensing terms are the business of the firms in question; ETSI will at most include an URL to such information.

The European Commission now seems somewhat favourable to ex-ante licensing (even to *obligatory* ex-ante licensing; see EC 2007, page 36-38) but the exact conditions are still not clear. The Commission indicates that *'Adopting an IPR policy within standards bodies whereby price and other licensing terms are disclosed ex ante can therefore yield pro-competitive benefits, provided that such IPR policies include appropriate safeguards to prevent collective price fixing which would be illegal.'* (EC 2007, page 38). The Commission continues with *'The role of the competition authorities in these is not to impose a specific IPR policy on standards bodies, but to indicate which elements may or may not be problematic.'*. To the knowledge of the authors, however, the indication of these elements has not yet been made (publicly) available.

Given the current IPR problems, it is clear that SDO's will need to experiment with new approaches and learn from it. This experiment is promising, and its risks are rather limited (as it is a voluntary scheme). From the experiment we can learn important things such as (1) the degree to which IPR holders actually are willing to disclose future licensing terms, (2) the degree to which there will be actual competition between technologies on the basis of announced future licensing terms, (3) what way parties will behave during the SDO processes and to what safeguards are necessary to satisfy the competition authorities.

Royalty-free licensing policies

W3C insists on a patent-free IP policy (RF: Royalty-Free); however, as a result, firms have managed to move projects that were potentially fitting in W3C towards consortia that do not stipulate royalty-free licensing conditions, such as OASIS (Mitchell, 2005). Also in our interviews, the judgement of RF policies was rather negative. One has to bear in mind, however, that we mainly talked to representatives of larger firms, usually having an extensive IPR portfolio; other parties might feel different about this issue.

Nevertheless, the resistance towards RF policies is in line with the strong objection of European and world-wide industry against the apparent desire of the European Commission to stipulate royalty-free standards e-government standards in its European Interoperability Framework.

EITF's patent approach

In some way, IETF is the odd one out in standardisation land. More specifically, it (1) expresses a explicit preference for IPR free standards[45], (2) otherwise uses RAND, though decisions may be made to divert from this, (3) it has an implementation requirement which is believed to relieve IPR problems and (4) allows – and encourages – declarations from parties other than the IPR holder itself. Altogether, IETF seems to be less a victim of IPR problems than other bodies, but possibly this is also due to the nature of the work they do: the standards they focus on are by themselves less prone to IPR problems.

Interviewees are especially enthusiastic about the third aspect. As has been described, the implementation requirement means that *"at least two independent and interoperable implementations from different code bases have been developed, and for which sufficient successful operational experience has been obtained. [...] If patented or otherwise controlled technology is required for implementation, the separate implementations must also have resulted from separate exercise of the licensing process".*[46] IETF itself also states that when the implementation requirements are met, *'… the assumption is that the terms must be reasonable and to some degree, non-discriminatory.'*[47] This assumption may be challenged during the so-called Last-Call period, where every participant is free to comment on the proposed standard.

Altogether, this effect of the implementation requirement is judged positively by our interviewees.

On a more negative note, it has been commented that IETF obliges IPR-owning firms to specify their licensing terms, however, no one seems to do so and according to Lemley (2002, note 352) *'… since the IETF has never sanctioned anyone for non-compliance, there is little incentive to specify terms in the future.'*

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[45] In fact, parties involved in IETF exerted pressure to go from patent-free standards towards standards that do cover IPRs – but IETF still has a 'preference for non-IPR'.

[46] IETF (1996).

[47] See IETF (1996), at Section 10.3.3: 'If the two unrelated implementations of the specification that are required to advance from Proposed Standard to Draft Standard have been produced by different organisations or individuals or if the "significant implementation and successful operational experience" required to advance from Draft Standard to Standard has been achieved the assumption is that the terms must be reasonable and to some degree, non-discriminatory.'

Trapped in the IPR system?

One line of argument is that SDO's and members got trapped in a situation in which the (seemingly rational) behaviour of each individual actor has created a world they all suffer from. When it became clear in the 1990s that essential IPRs are the most important and strategic assets one could own, many participants in standardisation created great efforts in securing such patents. Having an IPR in a standard has become a goal in itself, instead of the question whether having that piece of technology included in the standard actually is worth the price. The latter includes questions like how much value the technology does add to the quality of the standard (e.g. in terms of performance, functionality, price-reduction of manufacturing)? Are there other free or less costly solutions with the same value?

The tricky part that might have created this situation is that firms have an incentive to allow other firms to add a trivial IPR to the standard, if these other firms allow them to do the same. There is strong evidence that points to the existence of such mechanisms; the timing diagrams in the UMTS study of Bekkers & West (2006) shows that firms that are 'sitting on the table' mostly have IPRs that were applied for at the time the standard itself was being developed, while relative outsiders usually own patents that were already granted before the standardisation process begun (Figure 2 and Figure 3).

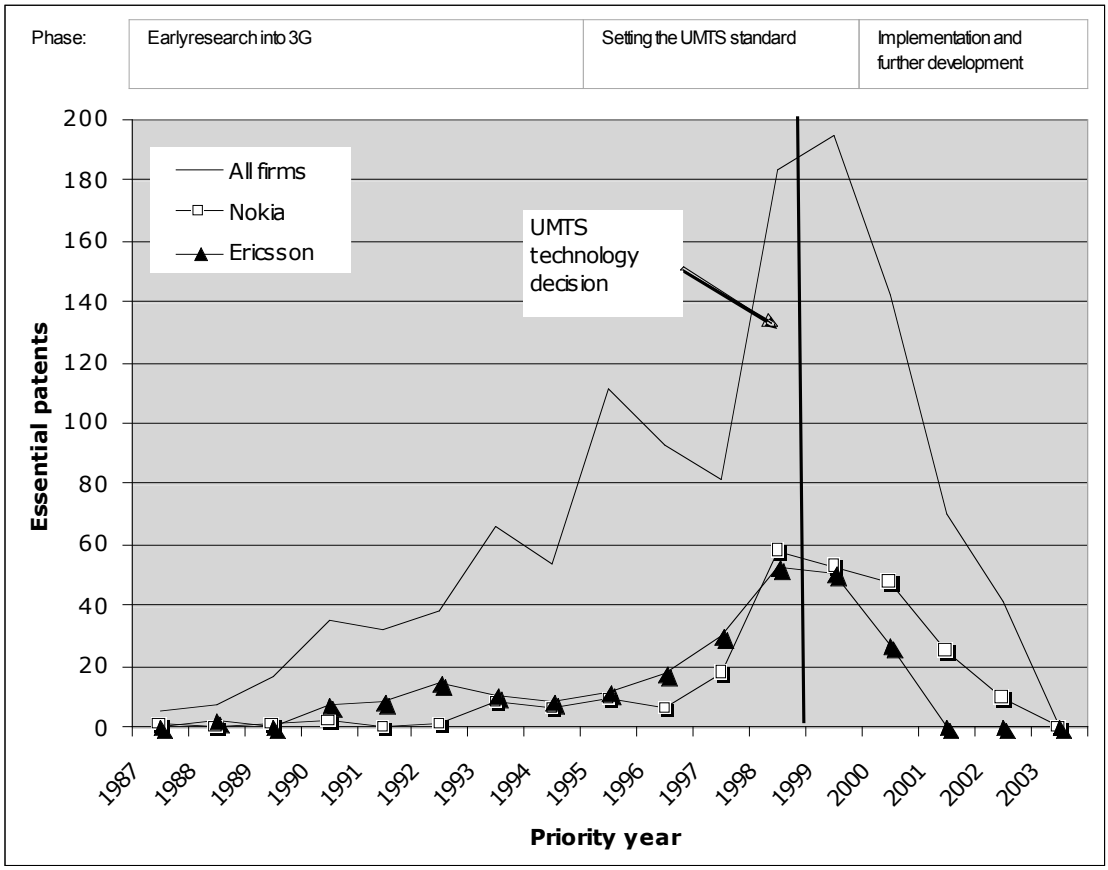

Figure 2: Timing of essential UMTS patents by leading essential IPR holders for that standard (Bekkers & West, 2006).

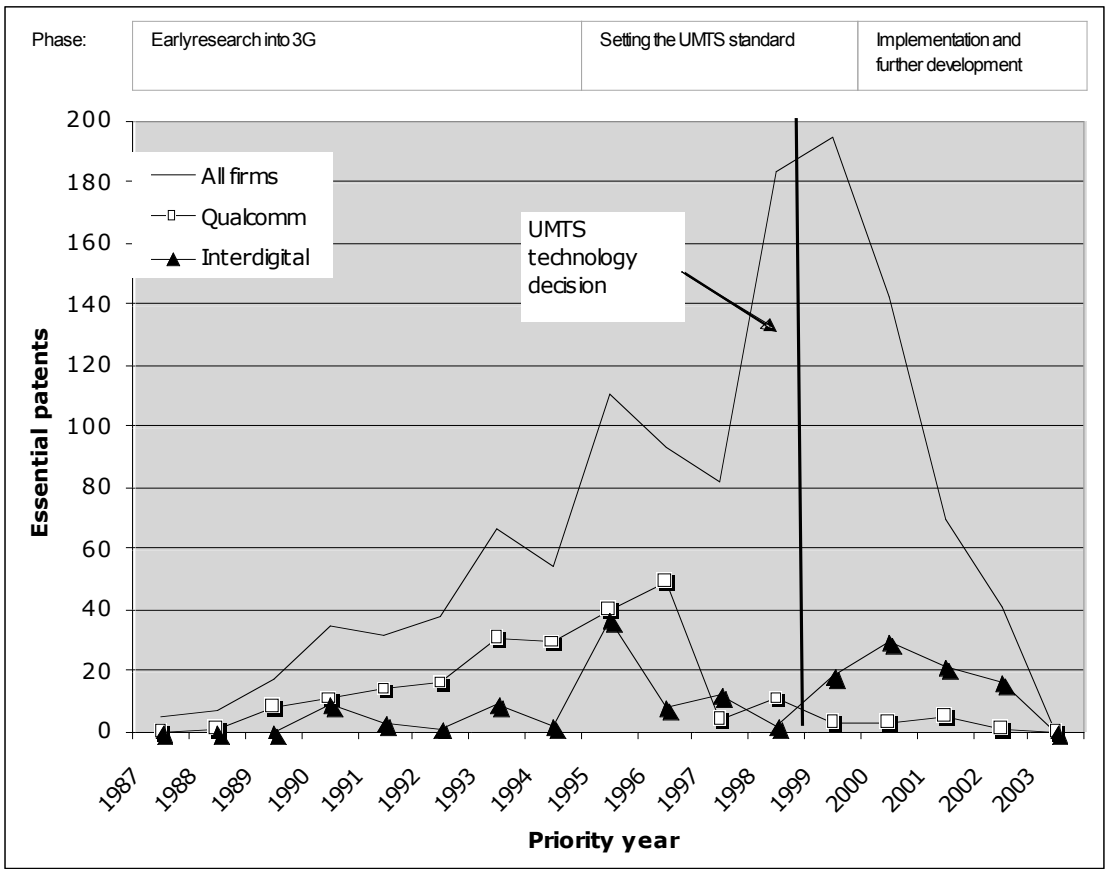

Figure 3: Timing of essential UMTS patents by leading essential IPR holders for that standard (Bekkers & West, 2006).

In patent citations analysis, the patents held by these outsiders also show up to be much more valuable than the patents of the insiders. This was studied by analysing the number of so-called forward patent citations.[48] The 332 studied EPO patents with priority dates from 1982 to 1997 had on average 2.91 times as many citations as the industry average, while the 165 patents in 1998 had 1.07 times the industry average. Further analysis shows that the quality decrease is not gradual, but marks an abrupt drop in 1998 — matching the abrupt increase in patent filings. These figures point at possibly quite worrying situations regarding the value and necessity of essential patents.

For UMTS, more than 6,000 essential patents are claimed by their respective owners (representing approximately 1,200 unique technologies that are often patented in more than one jurisdiction). Although it can well be accepted that a new standard will draw on some existing, proprietary technology, and this will likely cover a number of patents that protect key technology to realise a well performing standard, it is hard to believe that it is necessary that such a standard needs to rely on more than 1,200 patents.

This phenomenon draws close parallels to what is known among economists as the *tragedy of the anticommons:* a situation where rational individuals (acting separately) collectively waste a given resource by under-utilizing it. This is possible in situations where there are overlapping property rights, as is the case in standards with multiple essential patents.

[48] Forward citations are citations to a patent made in subsequent patents indicate that the invention or information in the cited patent contributed to the development of later inventions. Forward citations are commonly used in empirical analysis as indicators of the technological importance of patents.

3.9 Services provided to consortia and fora, and collaboration with other SDO's

The rise of consortia and fora has not gone by unnoticed by the large, normal SDO's. After a period of ignoring this trend, SDO's now have started to take them more seriously, realising that they serve a legitimate market need and that they are here to stay. As a result, SDO's have started to cooperate with such organisations (e.g. by signing MoU's), take the results of (some of) such organisations as input for standards (e.g. DVB, also see Section 3.5), and, finally, also to offer services to them.

As several other SDO's did, ETSI has developed activities directed towards fora (in this case: 'ForaPolis'). Amongst others, ETSI now hosts OMA after winning a custom-made bid in response to OMA's tender. Some interviewees showed to be positive about Forapolis, while according to others, as yet, success still seems to be limited (it is believed that two larger and two smaller organisations used these services), and one of the key goals – a real bridge to what happens in consortia – is not realised. True interaction does not materialise. There is the serious risk that such services start to become a goal in itself, that they increasingly require the development of new services and require investments to meet customer's demand, and that these efforts start to cannibalise on the work that needs to be done for the SDO's core activity. Although this is a nice way to generate substantial revenue and to keep the staff and secretariat busy, it is at the risk of creating dependency. Finally, if the SDO starts competing in this area with commercial providers of such services, it could be questioned that this is a good development.

Another ETSI activity is the Industry Specifications Group (ISG). According to our interview partner, ISG services are in itself a good thing. Setting up a well running forum requires a lot of work to be done (bylaws, IPR policy, administration, establishing a secretariat, arranging facilities such as meeting rooms). Offering such services off the shelf to prospective consortia and fora makes sense. Unfortunately, however, ISG services have not been very successful yet. There are signals that this is related to one of the (few) requirements for such groups: that any ETSI member is entitled to participate. Possibly, this requirement restricts the use of ISG's, but it is a difficult discussion whether it would be good to lift this restriction. Another interviewee commented that *'… also ISG fill a niche in the standardisation landscape, but it all becomes rather complex.'*

Collaboration with other SDO's

Collaboration with other SDO's was seen key by the interviewees. *'These days, firms are looking for truly global standards. Unlike in the past, ETSI is not an 'obligatory passage point' any more for mobile telecommunications standards. If ETSI wants to maintain its position, it is key to establish cooperation with other bodies. Not merely Memoranda of Understanding (MoU's) or the like, but true collaborations, where bodies are working on equal footing on important standards for the future*.' It was also suggested that ETSI would intensify its collaboration with IEEE, for instance by organising European meetings for that body. One person also would like to see such collaboration with IETF.

4 Overall conclusions and recommendations

The aims of this study are to gain insight in the differences and similarities between the used methods at four important standardisation bodies, and how these methods are judged upon by (potential) participants.

Again, we emphasise this is a quick scan that draws heavily on e relatively little number of interviews. We do not intend to be representative or authoritative, but to gain useful insights, especially in the context of improving ETSI. Although we attempted to include a variety of different types of stakeholders for the interviews, the views expressed here will certainly not include all views. We also asked our interviewees to talk frankly, not as representatives of their firms, but to present a genuine view on how SDO's work and how they could be improved.

First, we would like to make a few observations:

- There is quite some variety in procedures and ways of working. Each of the bodies under study here has its own qualities, and to some degree is optimised to the market it is serving – in terms of application areas, technologies, geographical setting, and membership. The strengths of one body cannot always be easily copied to another.
- There is an overall need for diversity, not a 'one size fits all'. In some situations, wide membership is essential, in others, firms rather standardise something in a more homogeneous group.

4.1 Main conclusions

Taking our central question in mind, our study brings us to the following ***main conclusions***:

- The degree to which SDO's managed to **initiate new, relevant work** is one of the key challenges for SDO's, if not the most important single challenge. In recent times, with a wide availability of places to standardise, it is not as evident as it once was that an SDO actually gets those projects that it believes to be best positioned for. The typical current mechanism, where a new work item is started after a certain minimal number of members propose an activity, might not be sufficient anymore in the future. This report suggests a number of alternative and/or complementary mechanisms, but also recognises that none of these is without its own problems or difficulties.
- Concerning **interoperability**, we have seen several very interesting practices by integrating that phase in one way or another into the standardisation process. In OMA, proven interoperability is a requisite to get to the ultimate status of a standard. Also in IETF, proven interoperability is requisite to ever become a standard (though this system is organised differently from that in OMA). Given the increasing importance of interoperability, and the recent surge in policy attention, SDO's should be strongly advised to make interoperability more than an additional

should be strongly advised to make interoperability more than an additional activity, but rather something that is fully integrated into the process.

- Using **third party specifications** as input for standards is another contentious but important area. There are huge advantages, as SDO's are much better in maintaining standards and making them widely accessible. DVB and CD are great examples here. Although this is a touchy subject, where dominant members prefer their status quo over new development, SDO's are vehicles to promote this route and remove barriers (possibly abolishing the condition that such third party specifications may not be aimed at the same application market as existing standards).
- Meanwhile, **IPR problems** remain among the most contentious problems that the standards world is facing. It is an illusion that other IPR policies at standards bodies will fully mitigate this problem. It is important to react to a changing world and changing IPR strategies of firms. One concern here is that there is an unnecessary, massive 'over-inclusion' of protected technologies: patented technologies are not included on the basis of their merits (how much value do they add in terms of performance, functionality, price-reduction of manufacturing, and what do they cost), but they are added because firms have incentives to allow other SDO members to move in patents as long as they are allowed to do the same.
- Now that RAND policies have been working – with varying degrees of success – for a number of years, new type of policies have emerged. Particularly the new IEEE voluntary ex-ante licensing policy is interesting, as it might help to fight over-inclusion of proprietary technology. Such innovative approaches and experimentation is likely to be necessary to respond to changing environments.
- **Collaboration with other SDO's** is seen as key. For ETSI, such collaboration with selected bodies (such as IEEE) should go much, much further than the current one.

Other conclusions are:

- The **performance and quality** of the produced standards of all bodies is considered to be good. In terms of relevance, however, there are substantial differences. Overall, our interviewees stressed the current high relevance of IEEE and OMA, whereas over the last years the relevance of IETF and ETSI has decreased.
- Whereas **academic input** can prove to be valuable, this seems to be true in rather specific situations only. There are many obstacles, and the key to success is to identify the specific situations in which SDO's can benefit from academia. This is an issue that should be taken seriously, but should not be over-estimated.
- Bodies with **individual membership** structures have been struggling with this in the recent past. For this reason, IEEE has introduced a Corporate Membership model.
- Most bodies have a quite **broad membership**, but there are often problems of balance. OMA is applauded for the best membership balance. IETF is seen as an impregnable fortress by firms from a telecommunications background; despite the consensus system they believe their voice is not heard at all. IEEE is regarded to be well balanced, although it inclines towards US organisations. ETSI, to the contrary, is believed to lean heavily against the European side. Though ETSI's membership base is truly worldwide, it non-European members are often passive members: they actually prefer to bring their key standardisation work elsewhere.

- Concerning **ETSI's membership structure**, it was clearly seen as inevitable that the de facto distinction between members from CEPT countries and others needs to be abolished if ETSI wants to be a real world player. There is really no good reason why only European companies are allowed to provide board members, for instance. Although 3GPP was a temporary solution to this problem, a more structural change should take place, according our interviewees.
- Also the **membership fee model** in ETSI will need changes as it is not future-proof. It will be increasingly difficult to apply the current criteria, even for a "good citizen", while the system is also prone to strategic behaviour.
- The **organisational structure** and the secretarial support of the studied SDO's were, in general, regarded as being of high quality. Especially ETSI was highly praised. The concern was, however, that some bodies had too large boards to make them effective; OMA was given as the example here.
- By definition, any SDO can be victim of **abuse**. However, certain rules and procedures make the standards body less prone to abuse than others. SDO's with individual membership (IEEE) and no membership (IETF) were criticised. Both literature and interviewees mention examples of abuse in the recent past.
- Stalling votes and other **decision-making problems** are inherent to the consensus model that is – rightly - adhered to by most SDO's.
    - Some bodies addressed this by leaving key technology options open in a standard. Most of the time, the 'tipping' market characteristics will ensure that one implementation (or: set of options) increasingly gains support, whereas the other vanishes. For a while, this may lead to consumer confusion; which could be successfully addressed by certification organisations such as the WiFi alliance. There might be a price (in terms of market confusion and later take-up) but such eventual events tedn to be offset by the advantages of competition.
    - Another option is allowing for a higher degree of competition between standards within and between SDO's. Groups will be formed around different proposals, positively working towards a good solution, instead of dedicating all energy to trying to prevent other technologies to be chosen, or coming to half-baked compromises. Also here, there may eventually be a price to be paid for the market, but again this is likely to be more than countervailed by the advantages of competition.

4.2 The possible contribution of the Dutch government

In the policy field, the subject of standardisation does not always arouse great interest – even though this might be gradually changing, with increasing recognition at the EU level (cf the recent discussion following the DLA Piper report[49]) and the growing understanding among governments that interoperability is key for their own public services, amongst others.

It is hard to underestimate the importance of standardisation, also in a wider context than just public services. A recent study by Fraunhofer Gesellschaft has shown standards

[49] see DLA Piper et al (2007).

account for 13% of the growth in labour productivity in the UK 1948-2002 (Blind, 2004; see also Blind, & Jungmittag, 2008).

Standardisation in telecommunications, in particular for mobile telephony, has been an important catalyser for European success in products and services (think of GSM, UMTS and DECT). It is in the public interest to repeat such successes. For that, the (European) standards infrastructure needs to adapt itself to rapidly changing environment.

Although standardisation is (and should) be primarily a case for businesses, public bodies can contribute significantly to its success. There have been numerous historical examples for this (see Bekkers, 2001, for instance).[50] To retain their relevance and success, formal SDO's (including ETSI) should go through a series of reforms. Since these reforms do not necessarily come automatically out of the behaviour of the dominant members (that usually have more interest in consolidating their position than in an successful SDO), governments could help SDO's to prepare them selves for the future.

The Dutch government has proven to be a particularly active participant in ETSI, and we sincerely hope that its continuous involvement will hep to address some of the issues that are highlighted in this report.

[50] Though also a number of cases where involvements of governments has hindered success, which emphasize that it has to be bone in the right way.

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