Bargaining Norms Arguing Standards

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STT Netherlands
Study Centre for
Technology Trends

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The STT Netherlands Study Centre for Technology Trends was established in 1968 by the Royal Institution of Engineers in the Netherlands (KIVI). In 2001, STT merged with the Future Shape of Technology Foundation Beweton. STT carries out foresight on topics, which cross the border between technology and society. Within the foresight process, STT stimulates participants to think innovatively about the future. The most important aim for STT in doing foresight exercises is to encourage the exchange of participants' – each with their own specific academic background and working environment – ideas and experiences. This can also be referred to as 'knowledge fusion'. The foresight working method arises from the conviction that people themselves are the 'engine' to new developments. In this way, STT develops visions for the future. A publication is the tangible result of a foresight exercise, however, the results are also dispersed via the media and lectures. In addition, STT roots these ideas and results into the practical environment. After foresight on a topic has been completed, the results should be transferred and continued into other activities. The participants, who take part in this foresight process are the most important ambassadors for the forth-setting and dissemination of ideas.

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Arguing Standards

Negotiating Technical Standards

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Contents

Preface

This monograph unravels the process of negotiating standards. It offers perspectives on negotiations in transportation and telecommunication infrastructure from different disciplinary perspectives and from the different viewpoints of practitioners. For the STT foresight project, it is crucial to gain insight into these processes. This enables STT to advise Dutch parties involved, on which questions, strategies and policies they should focus on to position the Netherlands within international infrastructure networks. The articles give us unexpected glimpses behind the scenes, illustrating the preconditions required for attaining standards.

This multiform book results from a close cooperation between the STT Netherlands Study Centre for Technology Trends and researchers from the Universities of Maastricht and Utrecht. The productive collaboration originated from the shared interest in standardisation processes for trans-border infrastructure development. Standards play a crucial role in facilitating the international exchange of goods, people and information. This makes them both a fascinating topic of study for researchers and a key-element in future infrastructure development. These combined interests led to the organisation and financing of an international workshop in Utrecht to map crucial aspects of standardisation processes that often remain unnoticed: the processes of negotiating standards. The workshop received additional financial support from the Royal Netherlands Academy of Arts and Sciences (KNAW) and the Netherlands Graduate School of Science, Technology and Modern Culture (WTMC).

Based on the outstanding quality of the contributions, STT took the initiative to publish the papers and comments from the workshop. Usually we present STT studies as end products. However, in this bundle of essays we show you the results of the first step in the foresight process, which focused on identifying key-issues, preceding the next step of offering outlooks into the future. The conclusions offer a first impulse for a research agenda, strategy and policy, which at a later stage will be tested on their robustness for the future.

This book is part of the STT foresight project entitled: 'HubHolland.eu' which explores the future of infrastructure networks in Europe and the position of the Netherlands here in. Other workshops in this project, focused on the themes: safe-guarding public values; the attractiveness of the Netherlands as a hub; and on issues concerning governance for border-crossing infrastructure projects. All these preliminary workshops accumulated in a scenario-workshop and round-table discussions, in which the role of standards recurs. The topic of standardisation processes surpasses the national boundaries; we therefore encouraged the idea of broadening the topic beyond the Dutch frontier and developing an international scope. This allowed for an alliance with the European Research Area ForSociety.

We hope you enjoy reading and using this book.

Who would have thought home-baked cookies played such a central role in obtaining international standards?

Karla Peijs
Chair Steering Committee
HubHolland.eu

Wiebe Draijer
Chair STT

The Complexity of Negotiating Technical Standards

Anique Hommels[1], *Judith Schueler*[2], *Andreas Fickers*[3]

Forty years ago, in July 1966, the international efforts to agree on a common standard for colour television in Europe failed. After years of intense discussion between various actors on the technical, industrial and political scene, the study commission XI (television) of the CCIR (Comité Consultatif Internationale des Radiocommunications) — an advisory body on radio communication technologies of the International Telecommunication Union (ITU) — was unable to present a consistent recommendation for one European colour television standard to the Plenary Conference meeting in Oslo. While many television engineers and broadcasting officials all over Europe had hoped that the introduction of colour television would bring an end to the fragmented European landscape of black and white television standards, the advent of colour finally, added a new technical hurdle to the already complicated process of transnational programme exchange in Europe. As a result of competing industrial and technopolitical strategies and interests, the European television landscape became divided. The press caricatured the new division of Europe in Cold War rhetoric as 'colour television curtain', segregating the mainly Eastern European Secam camp from the Western European (with some prominent exceptions as France, Greece and Luxbourg) Pal camp.

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The colour television story is — at least to a certain degree — exemplary for the complexity of standardisation processes and for the ambivalent effects that standardisation can evoke [Fickers, 2007]. It demonstrates the interlacement of technical, economic and political interests when it comes to defining the technical standard both at the national and international level. In addition, it points to the crucial importance of the social and the symbolic capital involved in an apparently 'neutral thing' such as a technical standard.

Technical standards are a typical phenomenon of complex societies. They are a means to achieve control and to regulate or coordinate the production and uses of technology. Proportional to the increase of complexity, standards are a prerequisite for enabling the (international) interlinking of technical components and systems. As Timmermans and Berg [Timmermans et al., 2003a; 2003b: 8] argue: *"...standards emerged as one of the hallmarks of rationalization."* Technical standards act as control procedures and enable the interoperability of socio-technical systems: *"Standards specify how we work, how our societies interact; they hold our sociotechnical societies together."* (p. 8) When technical standards gained crucial importance during the industrial revolution, they were primarily aimed at improving the trade and production process (e.g. Taylorism as an early example of standardising the production process). Standardisation became one of the central pillars in the functional ideology of scientific and technological progress.

Over the past decades, the EU has made standardisation a top priority in order to support the stabilisation of a common market and the unification of Europe. The aims expressed repeatedly by the EU, in reports on infrastructure development focus on interlinking national infrastructures, cross-border exchange of people, freight, data or information, interoperability and safety. All these aims require standards. The European Committee for Standardisation (CEN) sees standards as an essential way to *"help building the 'soft infrastructure' of modern, innovative economies."* [4] Hence, the development of infrastructure networks cannot be understood without taking standards into account. Thinking about the future of transnational infrastructure development implies a better understanding of the process of standardisation.

In this book, researchers and practitioners argue that standardisation should be understood as technological as well as social and political. Although standardisation is sometimes seen as a boring, highly technical and a-political process, the contrary is true. Standards are socially constructed in complex and lengthy interaction and negotiation processes. They are inherently political. The high stakes involved in standardisation processes (political, economic, but also in terms of reputation and prestige) and their contested

4 See the benefits they describe: http://www.cen.eu/cenorm/aboutus/generalities/benefits/index.asp

nature, make standards and the processes interesting strategic research sites. Standardisation processes are complex and difficult to achieve. Paradoxically, standards developed to coordinate or control people or processes, turn out to be particularly difficult to control themselves [Ciborra, 2000; Hanseth et al., 1994; Timmermans, 2003a]. To negotiate norms and standards proves to be a technological as well as political tour de force. In formal standardisation processes, a variety of actors are involved: engineers, politicians, industrialists, international standardisation bodies etc. These negotiation processes often remain hidden to the general public and for scholars interested in studying these processes; it is often hard to find out what happened and why. This also defines the extent to which governmental and entrepreneurial policies can influence the processes of standardisation.

One way to get a better grasp of what is going on in standardisation processes is to focus on these micro-level processes of arguing and bargaining. Researchers from a variety of disciplinary backgrounds have been studying standardisation and the negotiation processes involved. Our aim here is to bring together perspectives from the history and sociology of technology, economics, business studies and political science. Their views on standardisation processes will be confronted with the views of experts who were actively involved in such processes. Key questions that will be addressed are:

- How do technical standards emerge?
- What is the role of negotiations in these processes?
- Who are the negotiators?
- Which problems do they face?
- What is the role of national and international (political) styles, informal networks, reputation and prestige?
- Finally, what does this mean for research and policy on standardisation?

This work combines two ambitions. In the first place, it feeds into a growing academic interest in standardisation processes. It offers the reader a mosaic of different research perspectives on bargaining and negotiating technical standards. In the second place, it helps to prepare the way for outlooks into transnational infrastructure development, as part of a foresight exercise performed by STT Netherlands Study Centre for Technology Trends. It wants to signal the importance of standardisation for infrastructure development and to analyse, where policies could potentially focus on to stimulate effective standardisation processes. We challenge the readers to translate the insights of the different case studies to implications for policy on both a national and European level.

The aims can be summarised as follows:

- Multidisciplinarity: We want to broaden the intellectual horizon by asking scholars from a diversity of scientific fields to reflect upon negotiating standards.
- Interdisciplinarity: We hope to integrate these view in a coherent perspective on negotiating standards.
- Transdisciplinarity: We want to learn from the interactions between expert practitioners and scholars.

Contents

In the first part, Tineke Egyedi and Henk de Vries make an attempt to map the diverse field of standardisation research from their own disciplinary perspective. They critically reflect upon the current trends in standardisation and standardisation research. Egyedi represents a social scientific perspective on standardisation, including research in the field of Science, Technology and Society studies. De Vries takes a business studies perspective on standardisation research.

In Part two, the focus moves to negotiation processes. As an expert on political negotiation theories Frank Pfetsch presents a number of negotiation models from the field of conflict studies. Furthermore, he discusses the role of political styles and national cultures in negotiation processes.

In Part three, the historical investigations on the QWERTY-case (by Andreas Reinstaller) and the ITU frequency allocation (by Christian Henrich-Franke) emphasize the importance of social networks and 'soft factors' in standardisation processes and — in a more general sense — in innovation as such. Both reinforce the necessity to historicise the analysis of past standardisation processes, in order to gain useful insights into the complex practices of negotiating standards. Thereby, contributing to a empirical enrichment of sometimes, too abstract standardisation theories, especially in the field of economics.

In Part four, two historians of technology, Nina Wormbs and Marine Moguen-Toursel, present empirical studies on the development of telecommunication and transport standards. Wormbs discusses standardisation as a form of regulation. She analyses the case of early radio broadcasting in Europe (1920s) and the negotiations on, for instance, the formula for allocating wavelengths. Moguen-Toursel reveals the tough negotiations on the European Commission level for standard weights and dimensions of commercial vehicles (like trucks) (1949-the mid 1970s).

In Part five, two interviews with 'practitioners' discuss the experience of the negotiation processes that they were involved in. Hans Borgonjen, head of the R&D department of the ICT organisation for the Dutch Police, was involved in the negotiations around the Tetra standard: a formal technical communication standard for services in the 'command and control' sector (like emergency services). Willem Wakker is director of ACE Consulting. He has been active in the world of standardisation since 1988 and was involved in various international standardisation committees.

Finally, a brief conclusion sums up the outcomes of the different articles and sketches the implications for future research and policy.

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Standardisation: A Business Science Perspective

Henk J. de Vries[1]

The fitting of light bulbs into sockets, ISO 9000 requirements for quality management systems, McDonald's product and service specifications and the specifications of the GSM mobile phone system all have in common that they are used repeatedly by a large number of people and therefore, have been laid down in standards. A distinction can be made between standards and the process of developing them. A number of examples illustrate this: In 1922 a German national standard was set for different paper sizes, known as the A series. This was prepared and approved by a committee of the German national standards body. The ISO 9000 standards come from ISO: the International Organization for Standardization. Their predecessors were military standards from the NATO. The GSM specifications were developed by a consortium of companies and have been laid down in standards of the European Telecommunication Standards Institute (ETSI). Standards shape products, processes, services and systems and have a major business impact.

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This paper provides an introduction to the standards and standardisation phenomenon. First, the main concepts are defined. Next, a basic model of standardisation is presented. The subsequent sections in this paper are based on the main elements of this model: the development and approval of standards, making standards available and gaining acceptance, the implementation and impact of standards. A description of trends and a short discussion concludes this paper.

Standards

Definition

On an international level, the definition of a standard has been standardised (ISO/IEC, 2004): a document, established by consensus and approved by a recognized body that provides — for common and repeated use — rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context. However, not all standards are consensus-based or approved by a recognized body and standards may have different formats to that of a document e.g. software, in the case of Windows. Generally, a standard is an approved specification of a limited set of solutions to actual or potential matching problems. It is prepared for the benefits of the party or parties involved, balancing their needs and intended and expected to be used repeatedly or continuously, during a certain period, by a substantial number of the parties for whom it is meant [De Vries, 1997].

Standards categories

A distinction can be made between basic standards, requiring standards and measurement standards. Basic standards include terminology standards, standards providing reference models and 'standards for standards'. Requiring standards can be distinguished by performance standards and standards that describe solutions. Another, possible subdivision within requiring standards is the distinction between interference standards, compatibility standards and quality standards. Compatibility standards are always descriptive; interference and quality standards can be performance standards as well as solution-describing standards. Measurement standards are a particular kind of requiring standards; namely, standards that describe a solution for measuring.[2] Most standards concern technical topics; other topics include services and management systems.[3] In many standards, preference ranges are laid down.[4]

2 De Vries [De Vries, 1998; De Vries, 2006b] offers a more systematic and complete approach on the topic of standards categories.

3 Many academic studies on standards concentrate on one technical topic (e.g., 'standardisation of gas chromatographic analysis of essential oils', see [Van den Dool, 1974]). Technical and biotechnical sciences like mechanical engineering, civil engineering, architecture, informatics, agriculture and biotechnology may study the role of standards in designing, developing, building, using and maintaining technical artifacts and in growing crops and breeding animals. Examples in the area of mechanical engineering include Henzold [Henzold, 1995], Hesser [Hesser, 1981] and Tenchea et al. [Tenchea, Arghiriade and Lipp, 1987]. Medicine, dentistry and veterinary medicine may study the role of standards for areas including products, materials and medical information interchange. Taking the example of dentistry, scientific literature often pays attention to standards, especially to Round Robin tests. Mostly, standardisation is just one of the topics addressed (e.g., [Lane, Watts and Wilson, 1998; Schmalz and Browne, 1995; Watts and McCabe, 1999]). Standards for management systems and their application are studied by management or business science (e.g., [Kanji, 1998 and Seghezzi, 2000] or social science [Zwetsloot, 2000]). Effenberger [Effenberger, 1995], Galinski [Galinski, 1992] and Interrante and Heymann [Interrante and Heymann, 1982] provide underpinning for terminology standards.

4 Bongers [Bongers, 1980] and Ailleret [Ailleret, 1985] have provided mathematical studies on this topic.

Standards and intellectual property rights

Aggarwal and Walden [Aggarwal and Walden, 2005] conceptualize IT standards as bundles of patents. Though this is exaggerated, it is a fact that many standards lay down requirements for which patents apply [Clarke, 2004].
A licensed standard is created when a company (or group of companies or agencies) establishes a new design, gains patent or copyright protection for it and then explicitly sets out to persuade other companies to use the same one [Crawford, 1991, p. 44]. Standards and patents both generally speaking describe a technical solution. A standard, however, is intended to be used by all parties for which it is meant. A patent is only used by the patent-holder and via licenses, by third parties chosen by him; who usually have to pay for this use.

Standardisation steps

In general, standardisation includes the following steps.

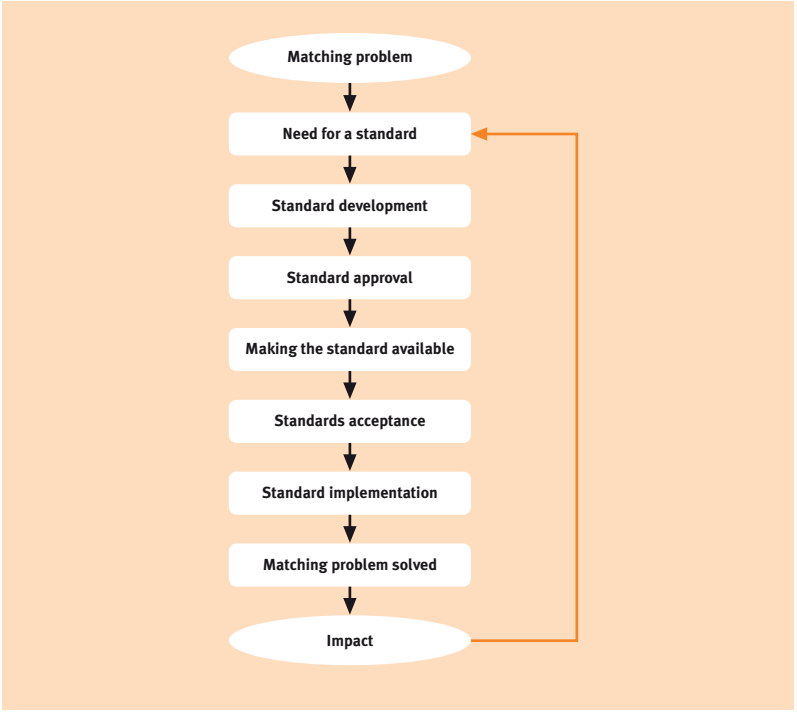


Figure 1
Steps in standardisation.

These steps may apply to company level or to an intra-organisational level; where two or more organisations develop common standards. Figure 1 suggests a strict sequence with one feedback loop, but in practice the steps can be intertwined and more feedback loops may apply. The sequence of steps shown here provides the structure for the following sections. These sections

focus on: the development and approval of standards, making standards available and gaining acceptance, implementation and the impact of standards.

Development and approval

Company standardisation

Most standards are developed by one organisation for their own needs. These 'internal' standards are called company standards [Düsterbeck et al., 1995, p. 107]. By the end of 2003, the People's Republic of China had 20,226 national standards (including adopted international standards), more than 32,000 professional standards, in access of 11,000 local standards and more than 860,000 company standards [Wen, 2004]. Most other countries do not have a central registration for company standards, but it is to be expected that in other parts of the world, the number of company standards strongly outweighs the number of other standards. Company standardisation includes two aspects: developing standards for use within the company and developing standards to be used in the company's relations with its direct business partners [De Vries, 1999, p. 231]. 'Developing' does not mean that each company standard has to be designed from scratch. A company standard may have the form of:

- a reference to one or more external standards officially adopted by the company;
- a company modification of an external standard;
- a subset of an external standard (for instance, a description of the company's choice of competing possibilities offered in an external standard, or a subset of the topics covered in the external standard);
- a standard reproduced from (parts of) other external documents, for instance, suppliers' documents;
- a self-written standard.

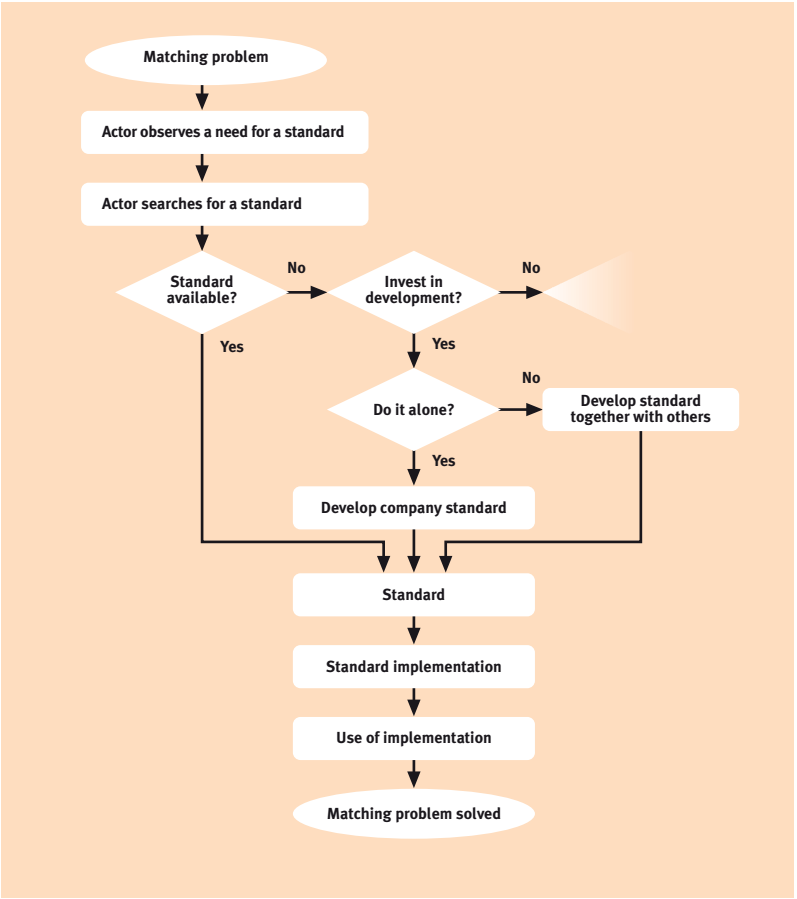
Companies may prefer external standards, for example, international standards, but these do not always meet all their needs. Therefore, they complement these with all forms of company standards mentioned above. In most companies, the number of company standards exceeds the number of external standards.[5]

Choice between company standardisation and co-operation

In the case that a company needs a standard that is not yet available, it has the choice between developing their own company standard and cooperating with others to draft a common standard, see Figure 2.

5 Adolphi (1997) is the most complete academic study on company standardisation.

Figure 2
Choice between company standardisation and co-operation.



Joint standards development

The main stakeholders in most standardisation projects are manufacturers of products and services, the professionals that support the development of these products and services, and the customers that buy them. Other stakeholders include: the organisations that represent these stakeholders (e.g. branch of business organisations, professional societies and consumer organisations), governmental agencies, organisations for testing and certification, consultancy firms, research institutes, universities, and special interest groups, such as trade unions and environmental pressure groups. Very often, the manufacturers dominate standardisation.[6]

Standards development combines a design process with a decision making process [Maillard, 2000]. Because of the similarity with product development, insights from product development theory can be applied to standardisation [Schacht, 1991; Susanto, 1987]. Studies that address the decision making processes include Hawkins [Hawkins, 1995], Riganati [Riganati, 1986] and Sandusky and Gasser [Sandusky and Gasser, 2005]. Li [Li, 2006] analyzed the

6 Studies on standard development include De Vries [De Vries, 1999] and Egyedi [Egyedi, 2001; Egyedi, 2003]. Some studies address the issue of access to the standardisation arena of (delegates of) less powerful parties, such as developing countries [The World Bank/ISO, 1993]; consumers [Coles, 1949]; small and medium-sized enterprises [AFNOR, 1995] and their possible influence on the process.

negotiations and power battles during standards development. Studies of technology and society (STS) offer theoretical concepts that may be of help in analyzing standards making [Schoechle, 1999, p. 89]. For example, social constructivism indicates that standards do not suddenly leap into existence as the result of a momentous act by a heroic inventor; rather they are gradually constructed or deconstructed in the social interactions of social groups (e.g., [Egyedi, 1996]).

Providing and accepting standards

Once standards have been developed, they have to be made available; on paper or in electronic formats. Many standardisation organisations provide the standards for free on the internet. Several other standards are not available at all e.g. the criteria Michelin uses to assess the quality of top restaurants, the Coca Cola recipe and the technical specifications developed by some of the industrial consortia.[7]

In a market economy, most standards are voluntary. It is up to the companies and other organisations whether they choose to use the standards. However, in some cases standards can be compulsory. For example, many countries prescribe the food safety management standard HACCP. Generally speaking — although there is always an exception to the rule — in a central economy, the central administration compel the use of certain standards.

A third possibility next to 'markets' and 'hierarchy' is that a group of companies or other organisations agree to the use of certain standards. For instance:

- a branch of business organisations may agree that in order to be allowed to be or become a member, the companies have to meet certain (quality) standards. For example, in the Netherlands the members of the association for catering companies — with a common market share of 90% — agreed to implement a set of hygiene and quality standards, in order to demonstrate that they are 'good' in comparison to other companies that are not members of this association [Simons and De Vries, 2002, p. 48].
- parties in a supply chain may agree to common standards. For example, supermarkets and their suppliers in the Netherlands have agreed to introduce standard crates for fresh food products [Koehorst, De Vries and Wubben, 1999].
- partners in a consortium may agree to the use of a set of standards. One example is a group of American process industries and contractors who have agreed to the use of certain standards for their installations [Simpkins, 2001].

7 Publication and distribution of standards, using possibilities of information and communication technology, may be studied by information science (e.g., [Kuiper, 1975]).

In the 'market' situation two issues are of importance: the art of finding the right standards in the collection of thousands available standards [De Vries, 2006a, Section 4.2] and the 'battles' between competing standards. In the case that several standards are available to solve the same matching problem, the question is which one will 'win' in the market. Scientists, especially economists, have described and analyzed several examples of such battles. Examples include: standards for cellular telephone services [West, 1999], microcomputers [Hergert, 1987], interactive videotex [Schmidt and Werle, 1998] and high definition television [McKnight, Baily and Jacobson, 1996].[8] Having just one standard has obvious advantages, such as economies of scale, transparency and avoiding the costs of converting to an alternative standard. However, in many cases several standards are developed that provide solutions for the same matching problem; resulting in a battle for acceptance between these standards.[9]

Standards implementation

Once an organisation has decided to implement a standard, the next question is: how? For most standards, this is an issue for technical experts, who have to use the technical requirements laid down in the design. However, it is not self-evident that these experts actually do this. For instance, it is more an exception than a rule that software designers use the international standard ISO 8601 [ISO, 2004] for the format of dates and time in their software. This standard states that years should be written using four digits; two digits are permitted only in cases where no misunderstanding can be expected. The shift from 1999 to 2000 cost millions of dollars to inspect, modify and test software. This exercise would have been unnecessary if the software developers had implemented ISO 8601.
In the case of standards that prescribe human behaviour e.g. procedures or instructions, actual implementation of these standards is even less evident. The most complicated are the standards that impact the entire organisation (or a large part of it). This applies to standards for management systems, such as quality management systems, environmental management systems or occupational health and safety systems.[10]

Which version of a standard is implemented, is something to be aware of. The international standard for the resistance of copper, IEC 28 has remained unchanged since 1925 and its technical contents since the first edition in 1914 [IEC, 1925]. On the contrary, the International Financial Reporting Standards are predisposed to frequent change, which causes problems in comparing the financial figures from different years [Hoogendoorn, 2004].

8 Shapiro and Varian [Shapiro and Varian, 1999] provide various short examples.

9 An overview of factors that contribute to standards dominance is provided by Van de Kaa et al. [Van de Kaa et al., 2007].

10 Cochoy, Garel and De Terssac [Cochoy, Garel and De Terssac, 1998] wrote about the implementation of the ISO 9000 standards for quality management from a sociological perspective.

Impact of standards

Many standards remain 'hidden' for the general public. Standards may cause restrictions to the variety of products, processes or services which may provide the advantage of economics of scale. However, using standard building blocks, quite an amount of variety may be offered, at an acceptable price. For instance, without such standardisation, a car would be far too expensive. Standards also facilitate communication; they contribute to the functioning of the whole economy. Standards contribute to safety, health and protection of life and other consumer and community interests. Standards have, to a certain degree, eliminated trade barriers (after [Sanders, 1972]).

In most standardisation activities, companies have the lead. Standards are especially important for companies when they are linked to their products. Standards enable companies to:

- demonstrate the quality of products and services (using test methods laid down in standards);
- give clients confidence: the product (and or the production method) meets accepted requirements;
- be allowed to bring products onto the market because conformity to standards may be a means to demonstrate conformity to legal requirements;
- be successful with products, because they meet customers' wishes and are compatible with other products.

The impact of standards on society in general and business life in particular is increasing due to a combination of developments:

- Companies, in general, can no longer be considered as isolated organisations; not only regarding trade transactions but also technical operations. In the area of information and communication technology (ICT), companies are primarily connected to other companies. This is also the case in other areas. Technical specifications chosen by the company have to fit in with the company's environment. For example, the chemical composition of petrol should not differ per country and for efficient cross-order exchange of medical data; standards are needed for data definitions and communication protocols.
- The tendency to concentrate on core business and to contract out other activities makes agreement with suppliers necessary on: product specifications, product data, communication protocols and the quality of the production and delivery processes. Because the company usually has several suppliers, each with several customers, the most profitable way to solve these matching problems is by using widely accepted standards.
- There is a tendency to pay more attention to quality and environmental

issues in a systematic way. This has increased the need for management systems standards, such as the ISO 9000 for quality management and the ISO 14000 series for environmental management. This has also had a knock-on effect on other standards; as management systems cause companies to perform activities in a structured way, standards for products, production means and information systems need to adapt to adhere to this required structure.

- Globalisation of trade increases the need for international standardisation.
- Within the European Union and the European Free Trade Association, the choice for one single market without barriers to trade has caused the replacement of different national standards by European ones. This makes export to several countries easier. There is no longer a need to produce different variants of products to meet different standards in different countries. However, companies that mainly serve national markets have been confronted with a substantial increase in the number of standards that are used.
- There is an increasing need to provide confidence to customers and other stakeholders, which can be somewhat achieved through conformity assessment i.e. certification. In general, requirements for conformity assessment are laid down in standards.
- Both at the European and the national level there is a tendency to link standards to legislation; in a way that standards provide detailed requirements that correspond to global requirements laid down in laws. This causes an increase in the number of standards and an increase in obligations to use them.

Conclusions and discussion

Standardisation includes the development and approval of standards, the process of making these standards available, the acceptance and subsequent implementation of standards and the impact of them. The standardisation phenomenon is primarily part of the functioning of companies, including their mutual relations and the relations with other parties, such as customers and governments, but its impact is not limited to companies; standards impact society as a whole.

For a combination of reasons, the importance of standardisation is increasing for the functioning of different elements of the societal system. Therefore, there is a shift from developing standards at a company level to the inter-organisational level and increasingly at an international scale. On this international scale, the balance of power is shifting from North America and Europe

to Asia. Alongside traditional standardisation organisations on a national and global level, industrial consortia have emerged as an alternative setting for standards development. In between the national and the global level, the regional level is becoming more important for political reasons. This applies in particular to Europe, but increasingly to other parts of the world as well. China can be seen as a region in itself, which increasingly sets and implements its own standards instead of referring to international ones.

The way standards are developed is changing as well. Relatively new is standards development in informal communities by using the possibilities of the internet. Also, existing standardisation organisations have introduced new forms of stakeholder involvement. The fragmentation in different ways to develop standards leads to a disarray of available standards and thus a difficulty for stakeholders to choose the right ones e.g. in the case of standards for home electronic systems or for corporate social responsibility. Therefore, there is a market need for coordination and authority.

These developments constitute an interesting area of research. A multidisciplinary approach is needed because of the variety of aspects [De Vries, 2002]. Existing theories can be used to study standardisation, for instance, negotiation theory, transaction cost theory and actor network theory. The question is, to which extent does standardisation research need its own theories? It can be argued that standardisation is not a real discipline, but it might develop as a specialisation within business science [De Vries, 1999, Section 1.1.3]. Nevertheless, to get a better understanding of standardisation we need complementary approaches from different disciplines.

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A Research Autobiography from an STS Perspective

Tineke M Egyedi[1]

"To the question, what is the meaning of life, everyone answers with his or her autobiography." [VPRO, 1989, p. 27]. The same applies to a standardisation researcher when asked to give an overview of the trends in standardisation theory during the last decade. Therefore, before you lies a research autobiography. To start with, it discusses the most important changes in standardisation research over the last 15 years; ending with a number of interesting recent works. Afterwards, 'classic' theory on the negotiation of technical standards is presented. This is elaborated on and illustrated with the case of container standardisation. The essay concludes with a set of recommendations for research and policy.

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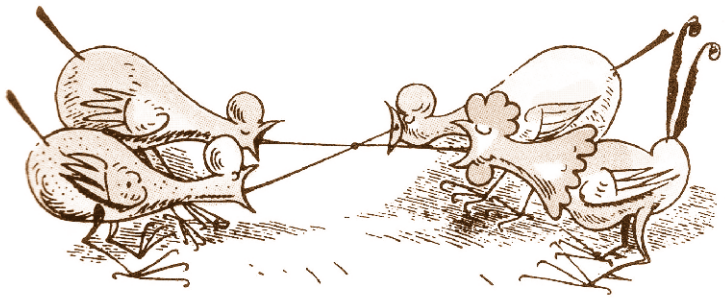
Developments in standardisation theory

As far as I am aware, the choice of theory discussed below is restricted in two ways. Firstly, my overall focus on IT means that I am foremost familiar with compatibility standards. Although I occasionally shift focus to e.g. container, gas and process industry standards, I am bound to overlook a lot of interesting standard-focused developments in other fields, for which I apologise beforehand. Secondly, while writing 'Shaping Standardisation' [Egyedi, 1996] I was aware of certain strains of research (e.g. that leading up to [Schmidt and Werle, 1998]), but sadly not of others (e.g. [Hanseth et al., 1996; Timmermans and Berg, 1997]). Therefore, the literature which I now describe as inspiring may have much earlier roots.

Roots of theory

Figure 1
Negotiation in standardisation.



With hindsight, the emergence of a field of standards research was first detectable in economics in the late 1980s.[2] One of the first and most charming examples was Paul David's case study on why the QWERTY keyboard became the de facto standard, whilst seemingly objective criteria of usability favoured the alternative keyboard design [David, 1985]. Indeed, this focus on de facto standards, i.e. dominant proprietary designs, products and technologies, was shared by many economic scholars of the time. Typical research questions were: When will a company switch from one (de facto) standard to another [Farrell, 1990]? In what manner do companies use standards to play the market [Cargill, 1989; Weiss and Sirbu, 1990; Bonino and Spring, 1991]? Do standards limit innovation [Blankart and Knieps, 1993]? Is coordination by committees more effective than by the market [Farrell and Saloner, 1988]? For an overview of early economic research on standardisation I refer to David and Greenstein [David and Greenstein, 1990]. Blind [Blind, 2006] provides an overview of more recent economic research.

A lot of what has become basic standards terminology stems from the 1980s

2 Be careful: the easier accessibility of Anglo-Saxon discounts possible relevant earlier work in other languages.

and 1990s. For example, every student of standardisation soon knows the relevance of network externalities, installed base, the bandwagon mechanism, transaction costs and game theory for understanding aspects of standardisation. On the shoulders of these giants a second recognizable and significant body of standardisation theory emerged. It was inspired by theories and perspectives from technology studies; formerly called technology dynamics or Technology Assessment. Overall, these scholars, myself included, had a background in social sciences such as sociology, political science, social psychology, management studies etc. (e.g. [Mansell and Hawkins, 1992; Schmidt and Werle, 1998]) or engineering [Hanseth et al., 1996]. They readily applied, mixed and extended theory from social sciences[3] and technology studies.[4] This led:

- in the case of Egyedi to ESCOT, an elaboration of the SCOT approach [Bijker, 1987] with elements from e.g. new institutionalism, technological paradigm theory, social psychology and actor network theory [Egyedi, 1996, p. 53]; ESCOT formed the basis for theoretical framework on shaping standardisation (p. 72); and
- in the case of Schmidt and Werle to actor-centred institutionalism, *"a social-shaping perspective on standardisation and the coordination of technology"* [Schmidt and Werle, 1998, p. 11], also includes elements from sociology and governance theory, in particular.

Clearly, their sources of inspiration strongly overlap, as do some of their research questions (e.g. which factors determine the content of committee

Table 1
Main elements in the social constructivist approach to standardisation [Egyedi, 1996, p. 72).

Social actor	Committee		Standards body	Actor network
attribute	interests	technical paradigms	standards ideology	interests
bearer of attribute	interest groups	practitioner communities	institutional provisions	corporate actors and organised interest groups
social construction of	standards		standards process	role of standardisation
social construction by	negotiation of problems and solutions		regulation of negotiation	negotiation of meaning / problem definition of standardisation
role standards body	internally oriented (institutional context)		mediates standards ideology via institutional provisions	externally oriented (as actor)

3 E.g. new institutionalism [March and Olsen, 1989; Powell and DiMaggio, 1991].

4 E.g. technological paradigm [Dosi, 1982], actor network theory [Callon, 1986], Social Construction of Technology: SCOT [Bijker, 1987].

standards?). My feeling is nevertheless that both works are very different and have a theoretical value of their own. However, being an involved party, I must leave the comparison to others.

Trends

In answer to the question: have there been any changes over the past ten years in focus or approach in standardisation research? There seem to be several developments:

- Where earlier research largely focused on proprietary de facto standards (1980s), the emphasis shifted to committee standards and in particular to the committee standards of the formal standards bodies (1990s; e.g. [Schmidt and Werle, 1998]) and consortia and other fora (late 1990s and early 2000s; e.g. [Cargill, 1999; Hawkins, 1999]).[5]
- Over the years the emphasis has shifted from a prime interest in standards development to an interest in the implementation of standards and the use of standard-compliant products, testing and certification (e.g. Timmermans and Berg, 2003; Jakobs, 2005a; Wapakabulo, 2005]). This shift can also be observed in the activities of some of the standards bodies (e.g. Internet Engineering Taskforce Force (IETF) reference implementations; European Telecommunications Standards Institute (ETSI) testing centre).
- Whereas in earlier days the standard was usually seen as the end of the process (static view on standards), currently researchers are increasingly attentive to what happens to the standard afterwards (dynamics of standards [Egyedi, 2006a; Egyedi, 2006b; Egyedi and Blind, forthcoming]). At stake is a standard's life-cycle, which includes implementation feedback and standard maintenance (e.g., revision and withdrawal).
- Overall, a shift has taken place in what is being standardised by the standards bodies, namely the shift from product to process and to quality management standards. For example, the ISO 9000 (Management), ISO 14000 (Environment) and presently ISO 23000 (Corporate Social Responsibility). This has also brought about a shift in research focus.
- Moreover, along with the wider interest that standards are raising, the almost exclusive emphasis on compatibility and interface standards, by scholars mainly coming from the ICT field, is shifting to include reference standards (e.g. Maximum Acceptable Concentration, MAC; Maximum Residue Limits; MRL) such as standards for testing the risk of asbestos [Bal, 1999] and soil pollution [Souren, 2006].

What has not changed is our interest in trade-, competition-, and science-related standardisation scandals, the skirmishes, the battles and the wars (e.g. [Shapiro and Varian, 1999]). These, and the consequences they can have

5 Since the 1980s, a time when USA-based scholars dominated the research field, more European scholars have entered the field. Please note that de facto standards are particularly addressed by US scholars (e.g. [West, 2003]) and that the increased involvement of Europeans may explain current higher interest in committee standardisation.

[Bowker and Star, 1999; Lessig, 2006], keep us focused on why standardisation is both an important and interesting topic.

The field of standardisation studies seems to be in an early phase of professionalization. When I first attended the workshop of the European Academy for Standardisation (EURAS; Helsinki, 1996), the president and host were both economists (Prof Manfred Holler and Dr Esko Niskanen). Coming from quite a different background, I managed to survive several presentations about the 'Nash equilibrium'[6] (from Holler's PhD students, in particular). Since, the constituency of the EURAS workshop participant list has undergone a profound change. Economists still attend, but the type of participants and range of disciplinary backgrounds has diversified from historians to engineers, from experts in environment to management standards, from IT practitioners to standards developers. Because of this, the need to professionalise and create a common ground is becoming stronger.
Two standardisation scholars who have actively tried to build a theoretical foundation in this area are Henk de Vries and Ken Krechmer [Krechmer, 2000a; Krechmer, 2000b; Krechmer, 2006]. I explicitly want to draw attention to de Vries' work on defining standards, standardisation as a discipline, and the role of education [De Vries, 2005; De Vries, 2006; De Vries and Egyedi, 2007] in professionalizing the field of standardisation.

Negotiation theory

This paper focuses on the negotiation of standards, that is, on the standards process. It is a key area in standardisation. Before addressing why, let me first position it in relation to the developments sketched earlier.
First, because standard negotiations primarily occur in committees (of formal standard bodies, consortia, government agencies, etc.), the focus limits us to coordination by committees — and not markets, in the way Farrell and Soloner (1988) use the term. That is, it excludes the emergence of proprietary de facto standards (e.g. Qwerty keyboard)[7] and wars between standards, exceptions aside. Secondly, the anticipation of its impact determines negotiations and should therefore be included in negotiation theory (e.g. compare [Van Lente, 1993]).
The negotiation process is highly important because it determines what interests, values and norms will be institutionalised in the standard. By adopting the standard and implementing it, these interests, values and norms materialize in technical artefacts. These artefacts, in turn, shape to a large extent our use of these artefacts and our behaviour in general.[8]

6 Game theory where the Nash equilibrium is a kind of solution concept of a game involving two or more players, where no player has anything to gain by changing his or her own strategy unilaterally. (see e.g. [Holler, 1990]).

7 I.e. except where formalisation of de facto standards by a standards body is concerned.

8 NB: A too deterministic view should be avoided, for technology is often used in unexpected ways making users a recognized source of innovation; and standards use is usually voluntary. Nevertheless, values incorporated in standardised matter are usually forceful and durable — they may well outlive their creators.

For example, in response to the need for consistent and reliable building material, CEN has issued a European standard in the area of 'Cement and Building Limes' [EN 459, 2001; Zacharopoulou, 2007]. From 1995 onwards, although still a pre-standard, it gradually replaced the national standards of the European member-states. The standard — which was largely based on a German one and reflects the German geological and production context — includes methods for testing cement.

The German building methods and economic interests have little in common with, for example, those of Greece. Greece still has the know-how and the natural and economic circumstances, which are compatible for traditional lime production (i.e. 'air-hardening lime putty'). This traditional method is of importance for the conservation of monuments and historical buildings, but also, the quality of 'air-hardening lime putty' more than matches the quality of 'air-hardening dry hydrate'; which the EN 459 testing method favours [Zacharopoulou, 2007].

Regardless of whether the European standard is voluntary or not[9], because this issue was not recognised as an issue of concern during the CEN committee process, Western-European lime production interests now co-shape the future of the traditional Greek lime producers and of the conservation of Greek cultural heritage.

The following two sections address committee negotiation from the social constructivist angle. Three of what I regard as the core-elements in negotiation are discussed: the role of technical paradigms, actor interests and the institutional setting of committees (see Table 1, column 2 and 3). The third section takes a complementary angle on negotiation processes and uses the concepts of standardised gateways and POT domains.

Political-economic and scientific-technical discourses

Standards practitioner literature notes that a shift has taken place from a technical style of standardisation in former times — mainly based on technological considerations — to a process with strong political and economic overtones (e.g. [Irmer, 1990; Van Rooij, 1991]).[10] The shift is one from a process mainly driven by technological knowledge, technical practices, common expectations, etc. (i.e. technological paradigms; [Dosi, 1982]) to a process mainly characterised by the negotiation of economic and political interests (actor interests; e.g. [Callon, 1986]).

In both cases, standardisation is perceived as a transient activity, where participant's roots and loyalties lie elsewhere. Either a committee participant's primary point of identification is the 'interest group' (e.g. industry versus environmental group) or it is the technological practitioners' community (e.g. architects versus civil engineers). In both cases, the negotiation process

9 Formally, one need not adopt a standard, not even if it is referred to in European regulation if one can prove that the own specification at least equals the formal spec — but the process is cumbersome and not transparent to outsiders.

10 Is this really a historical development, Nina Wormbs (Royal Institute of Technology, Stockholm), my discussant during the workshop asked me: or should we rather be viewing this as a shift in perspective — scientific or otherwise — on standards processes? Below I will pursue the view that such 'facts' — i.e. observations and feelings of practitioners —, whether they have been affirmed by science or not, should in the true social-constructivist research tradition be accepted and analysed as facts. Let me add, however, first, that a shift in scientific perspective on standards processes is an interesting hypothesis, but one that might prove difficult to test because the number of studies of standardisation that date from before 1985 is very small (i.e. the problem of comparison). Second, we may safely assume that a mix of various interests, motives and knowledge has always simultaneously affected standards processes. Even so, standards bodies institutionally privilege the technical perspective to the disadvantage of all others [Schmidt and Werle, 1998, p. 38]. This means in effect that all perspectives are translated into technical wordings. To understand the issues that underlie the 'technical' differences, the scientist will need to fall back on the views ('facts') as described by the practitioners that were involved.

centres on negotiating what the main problems are and how to define them [Bijker, 1987] and see Table 1, column 2.

Whether standardisation is knowledge-driven or interest-driven is significant. They imply different kinds of standards processes. In this respect, drawing a comparison between experts and politicians is clarifying [March and Olsen, 1989]. Where experts reduce subjectivity, politicians organize subjectivity. Whereas experts seek data, politicians seek allies. Where experts engage in research, politicians engage in logrolling. The classic outcome of confrontation of contending ideas among experts is the confirmation of one and the rejection of others. Where political ideas are concerned; the outcome is the building of a coalition that makes compromises among some in order to exclude others.

The shift from a technical to an interest-driven process has occurred in all areas of standardisation. In some areas this has direct and possibly dangerous consequences for our health and safety. An example is the historical shift from biological standardisation — including food standards — to standardisation of risk in the 1990s [Mazumdar, 2007a]. A central role in defining food safety standards is played by the 'Codex alimentarius' and the Codex alimentarius commission and advisory committees of the World Health Organisation (WHO) and Food and Agriculture Organisation (FAO) of the United Nations. In principle, risk is defined based on science.

"The First Statement of Principle concerning the Role of Science in the Codex decision-making process, and the extent to which other relevant factors are taken into account: …Food standards, guidelines and other recommendations of the Codex alimentarius shall be based on the principle of sound scientific analysis …" [WHO/FAO, 2005].

However, there is an example that shows otherwise [Mazumdar, 2007a, p. 142]. In two situations, which both involved setting Maximum Residue Limits (MRL), the scientific 'evidence' should have led to the same negotiated outcome — but it did not do so. At stake were:

- MRLs for five growth hormones in beef cattle (advice adopted in particular through the support of beef-producing countries); and
- MRLs for bovine somatotrophins, hormones used to increase milk production (advice initially blocked, but later adopted after an appeal to the World Trade Organisation).[11]

"(…) the committees claim primacy for science, but their decisions are political. They are negotiated by vote, and determined by legal argument and by trading interests." [Mazumdar, 2007a, p. 143]. She asks herself: *"What is the role of science in negotiated standards, where science is only one element in the*

11 2006 WTO Decision: the 'precautionary principle' to which the European Commission wanted to adhere in both cases violated Arts. 2.2 and 5.1 of WTO/Sanitary & Phytosanitary Agreement [Mazumdar, 2007a].

force-field of negotiations?" [Mazumdar, 2007b]. An interesting question, indeed.

Rules of the game

Moving a decision process from one arena to another — with different structural features — changes its outcome [March and Olsen, 1989, p. 29]. As the rules of a game affect its outcome, standards procedures affect standards. Applied to standardisation, the institutional setting of a standards committee affects the standards process. Committees are bound by procedures. They regulate the standards process. For example, the procedures of formal standards bodies reflect the desirability of consensus-driven decision making, a balance of interests and an impartial process (i.e. a 'democratic ideology'; [Egyedi, 1996]) and see Table 1, column 3).[12]
So far the theory. Of course praxis partly differs. For example, one salient mismatch is that between the 'balance of interests' aimed for and the actual participation of 'minority' groups such as Small and Medium-sized Enterprises (SMEs) and consumer-citizens [Jakobs, 2000]. Overall, these minorities are absent in standards committees, whilst in some areas their stake is increasing. The following quote, an article from the World Summit on the Information Society, illustrates this stake.

"Standardisation is one of the essential building blocks of the Information Society. (...) The development and use of open, interoperable, non-discriminatory and demand-driven standards that take into account needs of users and consumers is a basic element for the development and greater diffusion of ICTs and more affordable access to them, particularly in developing countries. International standards aim to create an environment where consumers can access services worldwide regardless of underlying technology." [WSIS, 2003, article 44].

Staying with the example of ICT, ICT producers usually dominate the standards process. They dominate in number of representatives and influence on standard's content in the committees of formal standards bodies as well as consortia. This, whereas, as Jakobs puts it: *"users (...) are the ultimate sponsors of standardisation (the costs of which are included in product prices). (...) Moreover, users will suffer most from inadequate standards that will leave them struggling with incompatibilities"* [Jakobs, 2005b, p. 5].

12 In some respects, the procedures of standards consortia are not that different. See e.g. [Egyedi, 2006c].

Negotiating standardised gateways: the ISO Container

In further specifying the previous, distinct angles can sometimes be identified in the mix of commercial, public and other interests, expert opinions, values and beliefs etc., which affect committee negotiations. They coincide with identifiable actor groups. For example, specific actor-categories participated in standardising freight container dimensions in the 1960s. At the negotiation table, different transport operators (shipping companies, railway operators, road transport hauliers, short sea shipping operators) and container owners were present, all with their own vested interests and sometimes represented or accompanied by technical experts. Moreover, many countries had a national champion in the transport sector and government representatives helped advance their interests. For instance, the Swiss transport policy favoured European container transport by rail, while Dutch policy was strongly orientated towards a road transport-based hinterland for containers arriving in the Rotterdam harbour.

Discussions in the ISO committee on containers addressed several domains: the Political, the Operational and the Technical domain (POT domains[13]; [Egyedi, 2000]):

- The dimensions of the standardised container had to comply with the regulations of different countries for each transport mode, and overcome incompatibilities in the political domain (i.e. different transport and environmental policies and other political and regulatory differences).
- Furthermore, the ISO container had to forge compatibility between different subsystems of transportation. This problem had firstly, an operational component. That is to say that because the subsystems operate differently, they face other problems, have other interests, priorities and customers and therefore have different requirements with regard to container standards. (For example, the safety hazards of container transport differ for each subsystem.) Secondly, compatibility between subsystems of transportation had a technical component. The inter-modal container had to interface with the vehicles used by the different transport modes.

In this manner the ISO container became a standardised gateway,[14] not only creating technical compatibility between the different transport modes, but also creating international compatibility between national policies and operator interests.

13 NB: for other cases a different set of domains may be better suited.

14 This line of research builds upon David and Bunn's concept of gateway technology. A gateway technology is *"(...) a means (a device or convention) for effectuating whatever technical connections between distinct production subsystems are required in order for them to be utilised in conjunction, within a larger integrated production system."* [David and Bunn, 1988, p. 170].

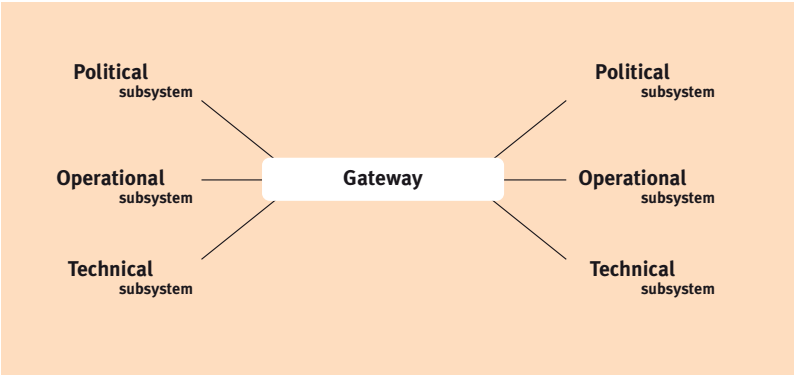


Figure 2
Standardised gateways and compatibility between the 'POT' domains in infrastructure systems.

Conclusion

Standardisation studies have many muses: inspiring standards practitioners as well as theoretical muses from various disciplines. Within the given limits, the previous research autobiography could only highlight a few of them. Given the importance of standards and the way they pass on social, cultural, and economic values, a good understanding of negotiation processes is of paramount importance. The implication for government policy makers is, firstly, to keep a close watch on standards, the values they embed and their (negative) consequences. Secondly, to advance the regulatory standard setting as an area which needs political legitimacy (i.e. give a voice to public values which have little chance of being heard). Finally, to exploit standards, as a means for technical and societal change. As the container case shows, standards have the potential to facilitate policy change (i.e. the shift towards more sustainable cargo transport).

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Reflection

Nina Wormbs[1]

De Vries' paper composes a fine introduction, which traces standardisation back in history. He then proceeds to discuss their importance and how to define them. The second part of the paper deals with the different steps in a typical standardisation process as seen from a company view.

In my opinion, De Vries' main point is that standards are growing in importance. The main argument for this appears to be the higher interconnectivity on different levels. Tasks that companies did 'in-house' are now being done by suppliers — perhaps on the other side of the world — and standardisation facilitates. Another reason is that people ask for certification. Trade and globalisation is another reason for this rise in importance; national standards are being replaced by regional or international ones. De Vries writes: "*There is no longer a need to produce different variants of products to meet different standards in different countries.***"**

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This statement made me recall, with affection how I travelled some twenty years ago and found different kinds of candy in each country. Now, wherever I go I get Mars or Kit Kat. Returning to De Vries' comment I wonder if this is really true; that there is no longer a need to produce different variants of products to meet different standards in different countries. On a general level as we of course know, it is not true. I might very well travel from Stockholm to Utrecht and plug my computer into the electric grid of Holland, but flying into Geneva is a whole different story. On a more meticulous level De Vries is of course right; this need has indeed decreased. The follow up question is: what are the consequences?

De Vries points to all of the benefits of standards. He also points to the impact of standards and relates this to the wide-ranging aims of standardisation i.e. *"contributing to safety, health and protection of life."* It is only in the last paragraph, before the conclusion that he hints to possible problems with standardisation, such as the limitation of freedom.

I come from a country [Sweden ed.] were we are obsessed with safety. We are standardising life in such a way as to eliminate every possible risk. I think that the dimension of freedom is an important one, but I would like to end by raising yet another aspect. We are in general using standardisation to decrease risk, but a high level of standardisation might instead increase risk.

In the biological sphere we know that diversity is the key to survival. In the organisational sphere Elinor Ostrom argues for diversity to cope with changes [Ostrom, 2002]. In the realm of technology, I think we can make a similar argument. Wide spread software is an example that comes to mind in parallel with viruses like Melissa.

I think we need to pay more attention to the consequences of standards. What are, to take a very different example, the consequences of standardising ethics or morals?

For someone who is new to the field, Egyedi's very brief and concise first three pages are educational and rewarding to read. She then moves on to what I want to focus on here. Egyedi points to a shift she sees in standardisation *"based on technical considerations to a process with strong political and economic overtones."* The first kind she calls knowledge-driven and the second kind interest-driven. The example taken here concerns risk standardisation in the food chain. The WHO has decided that science should form the basis of the decision-making process, when it comes to determining what should and should not be allowed. However, evidence-based standardisation does not

prevail as Egyedi shows when she refers to recent studies made by Mazumdar. Instead, certain economical interests, for example in trade, proved decisive. Science or knowledge was only one piece of the negotiation.

I wonder if this really is different from before; if we can say that evidence-based standardisation is less common today and that interests are more important? Might it not just be the other way around: that economic interest has always dominated, but that recently there has been a demand for evidence-based standards in decision-making? This is the idea I get from reading both Egyedi's and De Vries' description of standardisation from the company perspective.

Perhaps the term interest is the confusing one here. I think that standardisation processes always have been interest-driven. I would also argue that this is a core claim from STS (Science, Technology and Society) that negotiations — which standardisations are — are always about stating your interest and arguing for it.

We can argue that in this process science has over the last 100 years perhaps gained a more prominent role. Hence I would argue that we have always had interest-driven standardisation. The fact that science has been made an accomplice in a growing number of standardisation fields should not make us sleep better — on the contrary. We should examine what lies behind this veil of science.

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Bargaining and Arguing as Communicative Modes of Strategic Social, Economic and Political Interaction

Frank R. Pfetsch[1]

This paper deals with important elements that constitute negotiation processes. It deals firstly, with what negotiation means, by discussing definitions, typologies and distinctions between public and private negotiations, between political and economic issues, between cycles of conflict and negotiation and how they fit together. Furthermore it presents strategies of negotiation such as confrontational and integrative, and discusses the so-called negotiation dilemma involved in these two strategies. The role of trust and power complements the discussion about the so-called golden rules of principled negotiation. Finally, the role of culture in international negotiation is explored. How do national cultures and styles influence the negotiation process and its outcome? Is there a transnational culture which supersedes national or regional borders? Finally, as a practical advice to practitioners I resume my findings about what successful negotiation could be based upon.

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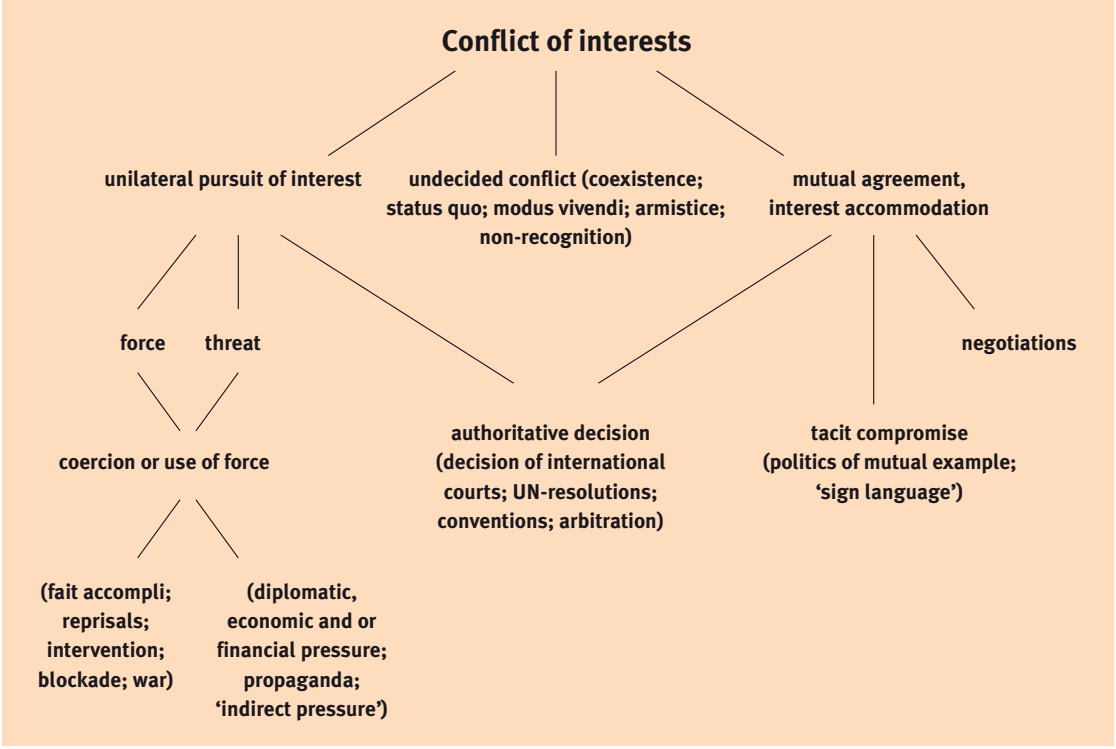
What is negotiation?

Bargaining and arguing are basic elements in any negotiation process. Political negotiations are involved — also when supposedly non-political matters such as technical norms and standards, weights of vehicles, telecommunication settings etc. — have to be decided. Whenever a conflict of interest has to be solved and therefore, a choice has to be made between alternatives, public and private discourses and battles are always involved.
Negotiations are a way of finding solutions to conflicts of antagonistic interests, without the use of violence. In a democratic society, a non-violent resolution is the appropriate form of dispute management. The significance of political negotiations has become increasingly apparent. Examples such as increasing interdependence in the exchange of goods, information and persons in a world of globalisation, the trend towards the expansion of democracy, the tendency of peaceful interaction between Western governments highlight this process. All these developments, together with longstanding practices within and between states, point to the growing importance of negotiation as a political and economic tool. Democratic culture and negotiation culture go hand in hand, determining the interactions within international and transnational regimes and organisations, as well as between the governments of the OECD-area.

Figure 1
Modalities of conflict management. Source [Grewe, 1964].



Negotiations are based on divergent interests and serve to satisfy them. These interests usually relate to one and the same issue and are in conflict with one another — if the interests were compatible there would be nothing to argue about. The negotiation process is guided by the search to reach a consensus. Opposing interests therefore, form both the structural element and the determinant in the process of negotiation. There are certainly other means of satisfying interests, such as the unilateral enforcement of interests or a legal decision that might settle a dispute.

Modalities of conflict management

Figure 1 illustrates the different modalities of conflict management. These comprise firstly the unilateral pursuit of interests through coercion, threats or by force. Secondly, undecided openness by way of coexistence, ceasefire, non-recognition and perpetuation of the status quo. Thirdly, the mutual coming to terms, through tacit compromise or negotiation. Distinctions need to be made between negotiations on private and public goods and between political and commercial goods.

Public and private negotiations

Negotiation takes place in two settings, one in which people privately negotiate about a commercial commodity (for example the quantity, quality, conditions or the price of a product) and the other in which political bodies negotiate (e.g. about the affiliation of a territory). In the former case, the negotiators are unconstrained individual persons committed only to their personal interests and abilities. In the latter, the negotiators are bound to explicit or implicit instructions. A politician usually bears his clientele in mind (his constituency, party, government etc.) and must show consideration for their interests. Private negotiations also take place under certain restrictions, but are dependent on personal endowments. For example, the amount of money he has at his disposal in order to make a purchase. The political negotiator is thus more restricted and enjoys less freedom than a private person; he has to respect the interests of his clientele, otherwise he will be unable to guarantee the negotiated obligations.

Political and economic issues

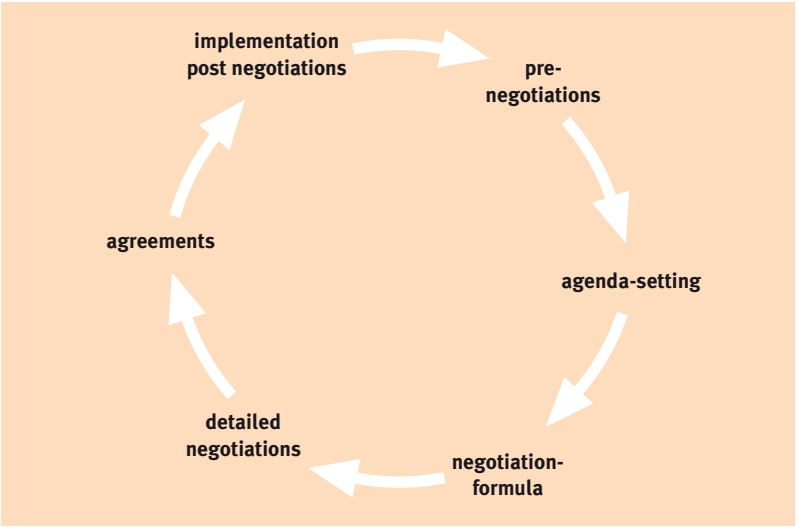
There is a significant difference between political and economic issues. International negotiations on economic issues refer mostly to conflicts of interest, with regard to divisible economic goods. Negotiations on political issues often refer to conflicts of values (e.g. national identity). Economic negotiations are usually conducted with ‘soft power’ i.e. with diplomatic or structural instruments or instruments that lead to a consensus by way of bargaining. Political issues can be tackled with ‘hard power’ i.e. among others

with coercive means. Empirical research proves that value-related issues, such as territorial integrity or sovereignty (borders, territorial affiliation, population, government) are more difficult to bargain over than disputes over economic goods [Pfetsch and Rohloff, 2000, p. 129]. Value-loaded issues, which are related to components of national identity, are as a result of this, more difficult to deal with than economic issues. Issues of resources such as oil, water or minerals can be divided and differentiated according to their quality and quantity, price and time of delivery etc. Compromises can be reached through a multitude of bargaining techniques such as re-grouping issues, establishing new links among formerly unrelated objectives — in short, by creating promising win-win constellations among the disputants instead of win-lose and zero-sum constellations. Complex political conflicts have as a result the tendency to lead to partial agreements; those centering on economic goods tend to lead to more comprehensive and (possibly) durable results.

The negotiation-conflict cycle

Negotiations cannot be separated from conflict development and can thus be broken down into different phases. Just as conflict can be divided into phases with different intensities (latent conflict, manifest conflict that are predominantly non-violent conflicts, crises, severe crises and war), so can the negotiation process be viewed in terms of the pre-, main- and post-negotiation phases (see Figure 2). These classifications are obviously analytical in nature; in real-life a clear distinction is rarely possible. The relation between the phases of conflict and those of negotiation is complex and requires clarification. It is in all probability, impossible to construct explicit patterns in the relation between the two processes. However, it is possible to relate the phases of conflict intensity to particular means. Given that the appropriate utilization of means is partly determined by the intensity of conflict. A latent conflict, for example, demands means such as prevention or early warning (diplomacy and other means). High intensity conflicts require 'hard' methods. For predominantly non-violent conflicts, the appropriate conflict measures are defined in chapter VI of the UN Charter, which states that the parties should *"seek solutions by negotiation, enquiry, mediation, conciliation, arbitration, judicial settlement, resort to regional agencies or arrangements or other peaceful means of their choice."* A violent conflict must be countered through war prevention and the termination of war demands the peace enforcement measures mentioned in chapter VII of the UN Charter. The Bosnian war of the 1990s could not be stopped through mediation attempts by UN, EU and OSCE, but by NATO military interventions. Finally, the post-war period requires peace consolidation measures, which means the building-up of stable, preferably democratic institutions, the organisation of elections and their observation and the creation of facilities for economic reconstruction. All these phases

Figure 2
The negotiation cycle.



of conflict development can be accompanied by negotiations but enjoy varying degrees of success. As a rule, success is related to the symmetric use of means, to the appropriate implementation of measures according to the intensity of conflicts.

It is frequently observed how conflicts can break out over and over again, but also can remain dormant for a while. This fluctuation is evident in the contexts of the Northern Irish, Basque and Kurdish conflicts. The cycle-model permits the location of the different instruments of conflict management as mentioned by Boutros Boutros Ghali in his 'Agenda for Peace' (1992), which mentions preventive diplomacy (peace prevention), peace keeping, peace enforcement and peace consolidation. In particular, the determination of the phase, in which conflict negotiations has the best chance of success. Early warning measures may therefore prevent a latent conflict from escalating into a crisis. Management techniques may prevent a crisis from escalating into a severe crisis, deterrence may hinder parties from going to war etc. The conflict cycle ends with peace consolidating measures and the building up of a legitimate government.

Negotiation strategies: Confrontational versus integrative negotiation

A distinction can be made between 'hard' or confrontational negotiation and 'soft' or integrative negotiation. As a tendency, bargaining is the more confrontational mode of communication and arguing the more integrative mode of communication.

Confrontational negotiations

'Hard' negotiation aims to achieve unilateral advantage. The unilateral pursuit of interests can be observed in the tradition of classical cabinet politics. The French diplomat François de Callières has specified the rules of 'hard' negotiations as: taking advantage of the weakness of the other side, hiding emotions, not putting all your cards on the table, using the art of flattery and not showing that you are a smart manipulator. In addition to these rules of confrontational diplomacy, De Callières also mentions elements that could be regarded as 'soft' rules, such as avoiding false promises, not practicing deception or unfaithfulness, negotiating with discretion and perseverance [De Callières, 2002].

Integrative negotiation

'Soft' negotiation aims at concessions and compromise, attempting to involve the negotiating partner and reach a solution with him and not against him. All the instruments used in negotiations, which concern actors, issues, processes and circumstances and aim to achieve a solution through mutual agreement, constitute soft negotiation techniques. Another author of 18th century French diplomacy, Fortuné Barthélmy de Félice, specifies this by including openness and honesty, moral oriented policy, awareness that interests are intermingled with passions, control of passions (love, hate, friendship, revenge, jealousy, pleasure, and avarice) and avoiding confrontations. He also emphasises that without power negotiation is a blunt sword, without negotiations power is too hard an instrument [De Félice, 1778].[2]

The negotiation dilemma

Whether 'hard' or 'soft' negotiation is employed, in both cases the negotiator can find himself confronted with a practically unsolvable dilemma: should he negotiate 'hard' and achieve favourable results, but take the risk of not reaching an agreement at all or should he negotiate 'soft' and increase the chances of achieving a settlement, but miss the opportunity of gaining a favourable result? The following strategies exist:

- In asymmetrical relations, a party should and will act tough if it is strong, and soft if it is weak.
- In an asymmetrical negotiation relation, a party should and will act soft if it is strong, and tough if it is weak.
- In an asymmetrical negotiation, a party should and will act soft if the other acts tough, and tough if the other party acts soft, whereas in a symmetrical negotiation, a party should and will act tough if the other acts tough, and soft if the other acts soft.

It seems this dilemma is difficult to solve. The choice of one strategy over the other depends on an assessment of the counterpart and his power relations.

2 Other rules are for example: act as if your opponent were on your side; look behind your opponent's façade; practice the art of speech and writing, knowledge of issues and persons; do not confuse negotiations with intrigue; develop friendly relations with your negotiation partner; be patient and wait for the favourable moment.

In order to avoid the negotiation dilemma, William Zartman proposes a combined strategy of 'soft' and 'hard' depending on the issue: a party should play 'hard' in cases where vital interests are involved and when minor issues can be compensated with 'soft' means. An exchange of differently valued issues could be the solution to the dilemma, as could all other means, which bring about positive-sum games, such as establishing linkages between interdependent economic sectors or policy fields.

Principled negotiation (Harvard Negotiation Project)

With the well-known 'getting to yes' model of principled negotiation, a new conceptual approach in the person-to-person relationship has been presented by Roger Fisher, William Ury and Bruce Patton [Fisher e.a., 2003]. Five golden rules of behaviour determine successful negotiations in the private, as well as in the public sphere:

- Personal and positional bargaining should be separated; otherwise arguing over positions produces unwise agreements, endangers an ongoing relationship and is inefficient.
- Negotiations should focus on interests and not on positions such as rigid ideologies or fixed values.
- All parties should benefit from the options chosen and should receive mutual gains.
- Objective criteria i.e. market value, scientific and or professional judgements, fair standards and procedures should be introduced.
- In the event that negotiation is not possible, the best alternative should be developed.

This concept is immediately clear and has been tried out in many experiments. I see its limits in its somewhat idealistic approach, which means that it is not necessarily the right approach for every political context.
If the decision-making process runs the risk of ending up in deadlock, of not attaining the desired outcome or if the climate of the negotiations is charged, an adjournment or a source-out into committees could take place as a way of gaining time, providing and processing more information and or cooling down the atmosphere etc. One way of offsetting inconsistent interests can be through referring to a more detailed law, which is quite often the case in constitutional negotiations. However, reporting the details as being regulated by law can express, in some cases, a lack of ability or will to make decisions.

The role of trust

Trust is the basis of human understanding and in politics it lays the foundation for cooperative relationships. Without trust, negotiations can never lead to durable agreements. Trustworthiness and reliability form the basis of mutual

understanding and cooperation. For example, by establishing trust between Eastern and Western Europe through 'trust building measures' — during the so-called Helsinki process — the social-liberal coalition government of the Federal Republic of Germany paved, among others, the way for peaceful unification later on. In the tense atmosphere of the Cold War, such conciliatory policy would never have happened. As a general rule, one can say that trust is enhanced if a negotiator demonstrates the capacity to understand the other side's problem etc. [Zartman and Bermann, 1982].
This can serve as guidelines for cooperative negotiations and they largely depend on the personal relationships between the negotiating parties. However, personal relations are not the only elements of successful outcomes in politics. In the political arena, negotiators are bound to the existing power relations.

The role of power

Power is present in all political negotiations. Power determines the relationship between the negotiating parties. There are at least three dimensions of power, which can be expressed in the following statements: power is a possession, power is a relationship and power is relational. Thus: one that results from resources, the other from social and political relations and the third from the position a negotiator occupies compared to the others. All three dimensions exist on the basis of the perceptions of politicians and interpretations by scholars. During the process, power relations can be changed by skilful negotiations. By various means the supposedly weaker side can transform the power relations to his advantage (see [Pfetsch, 2007, pp. 89-111]).

The role of national and international cultures and styles

In international assemblies and conferences, decision-makers belong to different national or regional cultures, which can influence the path to decisions and contribute to the determination of the agenda. Despite international and or professional training and influence, it is improbable that individuals can completely rise above their culture and always act in a 'cosmopolitan' way [Salacuse, 1993, p. 208]. It is therefore, important to shed some light on the cultural framework of negotiations. The culture and style of the negotiator can have a positive or negative effect on the outcome of the negotiation process. The role of culture in international negotiations is treated as controversial in the negotiation literature. On the one hand it is argued that cultural factors have an important influence on the negotiation process and explain, among other things, the outcome of negotiations. On the other hand there is the argument that national cultures do not matter very much at all, because a

professional international negotiation culture exists that dominates and makes differences between national cultures obsolete.

National cultures

Different cultural patterns can be identified under the broad headings of Anglo-Saxon, Japanese, Arab, Latin/Roman, Slavic, Christian-Orthodox, Teutonic etc. In addition to this, Huntington's well-known distinction between civilizations recognizes a Western, Confucian, Japanese, Islamic, Slavic-Orthodox, Latin American, African and a Hindu civilization.

What is understood by the term culture? The French writer and politician Edouard Herriot has defined culture *"as that which remains when everything else has been forgotten."* The paradox inherent in this statement grasps an important characteristic of culture, namely the fact that it is not a material entity, but rather a way of thinking and acting that stems from the unconscious. Culture can be defined as *"a set of shared and enduring meanings, values, and beliefs that characterize national, ethnic, or other groups and orient their behaviour"* [Faure and Rubin, 1993].

Intercultural negotiations are determined to a certain degree by the cultural context of the negotiating parties. In politics, mutual understanding or misunderstanding depends to a large extent on the knowledge about the ways of thinking and forms of expression of the opposing party or, as Jönsson has claimed *"shared meaning, which is a prerequisite for effective communication, presupposes some common cultural code or at least sensitivity to cultural divergences"* [Jönsson, 1990, p. 47]. Language is one important medium of communication, a *"system of signs"* [Hitz, 1977, 41]. The misunderstanding or misinterpretation of the intentions of the other party can have far-reaching consequences. The Vienna conference with Kennedy and Khrushchev in 1961 is an example of misinterpretation as a result of the different political cultures in each country. This led to incorrect conclusions about the intentions of both sides. The Anglo-Saxon understatement displayed by Kennedy was interpreted as weakness by the impulsive and direct Khrushchev and finally, led to the Cuban Missile Crisis of 1962.

Negotiators are, in behaviour and expression, captives of their culture and mentality. National stereotypes, such as those of a German, can be identified.

The nomination of the president of the ECB

The discussion over the nomination of the President of the European Central Bank (ECB) provides clear evidence of the different cultural patterns outlined above. The debate not only took the form of a personal duel between the German Chancellor and the French President, but also demonstrated the deeply-rooted differences in the political cultures of the two countries. The choice of President was between Helmut Kohl's candidate, the Dutch banker Wim

Figure 3
Portrait of a German negotiator. Source [Smyser, 2003].

A German negotiator is someone who

- employs a deductive negotiation style
- prefers systematic and structured dealings
- attempts to convince his opponent through argument
- attempts to see opposing positions rather as compatible than incompatible
- orients his efforts towards compromise and keeps the whole context and the goal in mind
- employs a clear-headed style without much emotion
- is often considered as pedantic and a know-it-all
- focuses on trust and reliability
- tries to make use of economic negotiating power
- orients his behavior towards alliances and coalitions
- rejects military options as far as possible.

Duisenberg and Jacques Chirac's favourite, the Frenchman Jean-Claude Trichet. The result, according to the official announcements that followed the consultations of the 5th of May 1998, is the following: Duisenberg was more or less forced to announce that he did not intend to remain in office for the full term, but that he would leave office earlier for health reasons. He would be replaced by Trichet, who would then remain in office for the full term of eight years. How can this 'compromise' be explained? As already mentioned, on the one hand the nation and its political elites — and therefore, personal representation — are very important to France. The nation, 'une et indivisible', stands in the tradition of monarchic and or republican sovereignty and is a symbol of self-identity. On the other hand, as a consequence of historical experience, Germany focuses on currency stability, which it attempts to achieve with the help of clearly defined competences, rules and procedures for the European Central Bank. To achieve this, autonomy and independence are indispensable prerequisites.

Besides these different appraisals of institutions and persons, there are also differences in priorities. While in French politics people have priority over institutions; the German political culture gives a higher priority to institutional arrangements. Institutions stay, people change — to sum up the German concept. Additionally, both countries pursue different aims in their economic policies. While the Germans act on the assumption that the ECB, like the Bundesbank in Frankfurt, should be autonomous and independent. The French consider monetary policy to be an integral part of a comprehensive economic policy. For this reason they made the suggestion of supplementing the ECB with an economic cabinet. This case therefore, demonstrates that differences in political culture — with, for example, respect to different appraisals and

priorities of institutions and persons — can explain a recruiting decision like the one of the ECB president. As seen both approaches are not mutually exclusive and can be overcome by compromise.

Trans-national cultures, professional cultures

The complexity of the issue or issues under negotiation increases the significance of experts in negotiations. Unlike career diplomats, these specialists are seldom evident in the field of a global negotiation culture. Therefore, the tendency towards specialisation can be interpreted as a process, which strengthens 'group cultures' and not necessarily national cultures [Lang, 1993, pp. 44-45].

This does not necessarily entail a communication barrier. The individual negotiator has had a specific professional education, which influences his perception of the problem, his approach and the way he comes across. Professionalism and a shared (or at least similar) self-image mean that negotiations between members of a given professional group (e.g. lawyers, engineers, politicians etc.) from different countries are more successful than those between compatriots who have different professional backgrounds [Hofstede, 1989].

In many areas of social or political life, 'subcultures' do exist. Such hyphen-cultures are for example: the corporate culture, the judicial culture, the negotiation culture, the administration culture, the language culture etc. each possessing their own interpretations, codes of conduct and symbols (see Table 1). These pertain to the different way of doing things. An example can be taken from the corporate or administration culture. Three groups from Germany, France and Britain were confronted with the same problem. They were each asked to solve a conflict between two departments within one company. The French passed the decision to the top of the hierarchy, the Germans suggested specifying the competences of each department in a document and the British saw the solution in improved communication between the two heads of departments. The three methods are characteristic of the national administrative cultures: hierarchy, horizontal separation and process.

It should be noted however, that the question which community (e.g. civilization according to Huntington, trans-national region, nation, sub/national unit etc.) is a reasonable referent for 'culture' has not been easy to answer [Zartman, 1993, p. 19]. In fact, research has so far concentrated on national negotiation styles. However, subcultures below the national level are important. These comprise ethnic minorities as well as the already mentioned organisation-bound professional or corporate cultures [Lang, 1993; Faure, 1999].

Finally, negotiators are bound by certain directives that are closely connected to national political and economic interests. The governmental system of a country, the influence of interest groups, the 'political season' (e.g. election campaigns) and the importance according to public opinion all come to

bear on this aspect. Whereas the extent to which some leeway is left to the negotiators and exploited by them is related to cultural and personal factors. The negotiation process as a whole — as well as the strategy of the parties — remains under the influence of political interest and those opportunities for action, which have been availed. This is why Lang [Lang, 1993, p. 43] warns against interpreting any behaviour from the opposite side that does not make sense at first glance, simply as 'culturally determined'.

Which culture prevails in the last instance; the professional or the political? As with scientific consultation in politics, expert advice by professionals only serves in most cases as an alibi for politicians. If the advice fits the political purpose, then and only then, will the advice be accepted. The case study by Andreas Fickers [Fickers, 2007] on the introduction of the German Pal and the French Secam system in Europe shows that the introduction of the two

Table 1
Profiles of some professional cultures. Source [Lang, 1993, p. 42].

Indices	Engineers	Lawyers	Economists	Politicians
Cultural values				
Believe in	The laws of Physics	Statutory laws	The laws of Economics	The law of survival
Have respect for	Technology, computations, materials, designs	Authority, precedent, 'sanctity of contract', rules in general	Theories and statistical data	Patrons, parties, and partisan loyalty
Cultural perspective				
See themselves as	Builders and problem solvers	Defenders of justice, partisan advocates	Planners and policy advisers	Defenders of public interest, mediators, ultimate decision makers
Express themselves through	Numbers and works	Technical words and documents	Money	Approval and directives
Suspicious of	Timely project implementation and worker performance	Parties' good intentions and pledges	Socio-political variables	Rival bureaucrats and ambitious subordinates
Negotiating style				
Team role(s)	Leader or technical specialist	Leader, spokes-person, technical adviser, or excluded	Leader or financial adviser	Leader
Negotiating focus	Technical specifications	Parties' rights and duties	Costs, prices, payments	Satisfying superiors, avoiding criticism
Future concerns	Project implementation	Conflict resolutions	Cash-flow risks	Project completion
Communication style	Precise and quantitative	Precise and logical, but perhaps argumentative	Technical and conservative	Cautious and self-protective

competing colour television systems — of approximately equal quality — was dominated by national political and not (only) technical considerations. Nevertheless, national technical cultures played a role in the way the two systems were developed.

Advice to practitioners

What can a practitioner learn from the above about negotiation strategies? The former Dutch minister of Foreign Affairs and former representative of his country to the European Union, Bernard Bot [Bot, 2004, p. xi-xiii], states ten rules for successful negotiations.[3] To summarise, I propose the following seven rules for successful negotiations (see Figure 4).

Figure 4
Rules for successful negotiations.

1. Try to find out how willing the other side is to negotiate; where are the limits to the participation of parties in negotiations?
2. Identify the most important parties that are directly or indirectly involved in the conflict. Try to understand the power structures or relations and concentrate on the most important ones.
3. Identify the issues involved and their importance; assess the priorities of both yourself and the other side.
4. Keep an eye out for compatible and non-compatible issues as well as possibilities for exchange (package deals, log rolling etc.).
5. Assess the trustworthiness and reliability of your opponent and evaluate his limitations; make sure he can and or will uphold his commitments.
6. Take into consideration the circumstances regarding time and space that may influence decisions and evaluate their significance.
7. Develop strategies in case these rules cannot be observed.

3 Be credible to those you represent. Make it clear that you respect the positions of the other side. Know the dossiers well. Maintain good a network. Be aware of power relations. Make sure that the other side doesn't lose face. Learn to play on various playgrounds. Be firm and have endurance. Make concessions at the right moment in order to achieve something in return. Be yourself and keep to your negotiation style.

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A Theoretical View from Political Sciences

Reflection

Jelte Dijkstra[1]

The politics of standardisation

When the editors of this book invited me to comment on Frank Pfetsch's article, from the point of view of a standardiser, I felt honoured. Standardisation is seldom the object of scientific study and rarely, if ever, do scholars focus their analytical minds on this subject.

The various contributions to this book, which reflect the shared historical viewpoint on standardisation from different angles, show how rich and complex in nature standardisation is and how diverse the lessons are that can be learnt from it. The organisers of the workshop 'Bargaining Norms, Arguing Standards'[2] have realised, unlike many others that there is more to standardisation than technology and economics. Indeed, considering the success of the experiment, I would not hesitate to recommend similar studies by sociologists, cultural anthropologists and political scientists.

One could argue that this paper belongs to the latter category. Although it is illustrated with cases from history, it has a clear political-economic bias, which is no surprise considering Pfetsch's long and impressive career as a political scientist.

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When I explain to people that formal standardisation is generally organised through country representation, they often conceive standardisation as something political. The country model originates from a time when national values, customs and economic interests were commonly the stakes of international standardisation; times when the turnover of large companies did not normally exceed the BNP of small countries, as it may do now. Nowadays, formal standardisation — albeit still relying on the country model for efficient organisation — is increasingly geared towards facilitating the combination and marketing of products and services, to the assessment and control of quality and to adding value and creating opportunities in general.

To me, therefore, the relationship between politics and standardisation is not so obvious, even if they share similar aspects such as negotiation, lobbying and consensus. Still, Pfetsch makes the relationship explicit, when he writes "*Political negotiations are involved* — also when supposedly non-political matters such as technical norms and standards, weights of vehicles, telecommunication settings etc. — have to be decided." I cannot argue with that, but does the fact that political negotiations are involved in standardisation automatically turn standardisers into political negotiators? If so, they could learn valuable lessons from this paper and from political science in general.

Who are these 'standardisers', these political negotiators discussing supposedly non-political matters? If anywhere, one would expect to find them at the core of the standardisation process: the technical discussion. Usually a formal standard is, at any stage of its development and adoption, discussed in a technical committee in which representatives from stakeholders discuss its scope and content. From taking part in many meetings of such committees, I cannot do anything else than conclude that these representatives are not normally selected for their diplomatic skills. Standardisation is generally considered to be a technical exercise for technicians, even if stakeholders with more generic topics — consumer organisations, policy makers, trade unions — are politely invited.[3]

The publicised and therefore, supposedly — but not explicitly — agreed goal of most standardisation processes is to harmonise on the best technical solution. In reality, standardisation is all about finding a balance between technical excellence and acceptability. Sooner or later the process changes from a technical debate into a strategic — one might even say political — discussion. This change is marked by a strong decrease in detailed technical discussions and a miraculous outburst of accusations of spurious argumentation.

3 CEN Technical Committee 331 deals with the standardisation of methodology for assessing the quality of postal services. In one of its earlier meetings, the representative of Bundespost protested against the participation by the European consumer organisation because, as he argued *"consumers know nothing about the way we run our business."*

So how do so many standardisation projects survive this change of climate? Could standardisation processes be improved or sped up by substituting diplomats for engineers? Could stakeholders increase their influence on the outcome of those processes by sending professional lobbyists to the negotiating table? The paper does not really address these questions.

Pfetsch points out that, although cultural differences influence the outcome of a negotiation process, *"...in political negotiations, national cultures do not matter very much at all, because a professional international negotiation culture exists that dominates and makes differences between national cultures obsolete."* I recognise this, but in standardisation processes, I also recognise a similar, more important phenomenon; that of the professional international technological culture. In technical debates, national cultures do not matter very much, because a professional international technological culture exists that dominates and makes differences between national cultures obsolete. Add to this, the fact that most conflicts in standardisation processes are not conflicts between national interests, but between the interests of — multinational — stakeholder groups (e.g. manufacturers vs. consumers, installed base a vs. installed base b) and one could argue that the professional international political negotiator would probably have very little to contribute to a standardisation process.

Technical experts will probably always be dominant in standardisation processes and in the political negotiations involved. For them, this paper may be surprisingly instructive.

Economic Analysis of Technological Standards and Standard Setting

Andreas Reinstaller[1]

Insights and pathways towards a historical economics

In the past twenty years, economists have developed a profound understanding of the implications that technological and compatibility standards — as well as network effects — have on production, consumption and the efficiency of resource allocation in general. However, as I will argue, economists generally consider standards as a means to some economic end and therefore fail to recognise and properly analyse the role social contingencies, institutional factors and historical processes play in their definition and implementation. While this does not diminish the value of the economic analysis of standards, their omission is certainly the source of misunderstandings and misinterpretations of developments in social and economic history. This will be shown in the second part of this paper. Here the most prominent historical case study in the debate around technological standards — Paul David's famous discussion of the historical lock-in to the QWERTY typewriter keyboard — is re-examined from a process oriented, historical perspective (see [David, 1985; David, 1986]).

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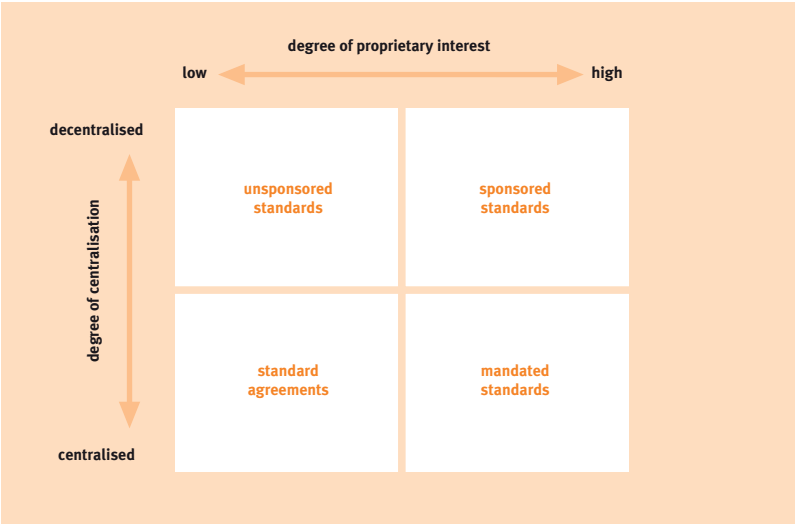
The analysis of standards in economics: an overview

David and Greenstein [David and Greenstein, 1990, p. 4], define standards as a "set of technical specifications adhered to by a producer, either tacitly or as a result of formal agreement." They also distinguish between reference, minimum quality and interface- or compatibility standards. While reference and minimum quality standards are important devices to signal a specific quality or characteristic of a product to potential users, interface and compatibility standards are necessary to incorporate technological components into a larger technological system. Whereas reference and minimum quality standards are important for the study of consumer choice and the diffusion of alternative products (see e.g. [Reinstaller, 2005]), interface and compatibility standards have attracted more attention by the economic profession and are considered to be important for two main reasons.

Firstly, if products are compatible, then they can be operated together; in the sense that other products can use the output of one product. This has an impact on how firms develop and adopt technologies, as well as on the organisation of firms and more in general production. Secondly, if the value in use consumers draw from products depends on the number of other consumers purchasing the same brand economists say that consumption exhibits so-called network externalities. These have an effect on the number, the characteristics and also on the diffusion of products. Standards in production and consumption are therefore important because they are the source of positive feedbacks; they are the basis for self-reinforcing processes that ensure that 'virtuous cycles' emerge, but also that 'catastrophic demises' happen. This will be discussed in greater detail in the next section.

Figure 1 summarises how David and Greenstein [David and Greenstein, 1990] have classified the literature on compatibility standards in economics. This taxonomy, despite its early date of publication is still very valuable. It classifies contributions on standards according to two criteria. The first is the degree of centralisation of the process of standardisation. If standardisation happens in a decentralised fashion economists generally consider this to happen through the interaction of individual agents on the market, i.e. without the intervention of some authority or official agency. In the latter case, economists would consider the process to be coordinated centrally. The second dimension along which contributions in economics may be classified is the extent to which the process of standardisation is the outcome of the proprietary interest of an economic agent i.e. whether he or she expects a personal economic advantage from it.

Figure 1
Classification of the emergence of standards.



If there is a strong proprietary interest, an economic agent proposes and tries to establish a standard to gain some economic or political benefit. In the decentralised scenario this can be a single firm, trying to obtain some strategic advantage on the market. In this case, a firm proposes a network and tries to persuade others to join in. The firm then sponsors this network with the aim to achieve some privileged position in the market. For instance, the computer software producer Adobe gives away the Acrobat Reader for free. This is a programme to view and print electronic documents in the Portable Document Format (or PDF). In this way Adobe supports the diffusion of this format in order to sell other software with which it is possible to edit documents written in the PDF-format. This strategy has been successful and PDF is nowadays the most widely diffused format for electronic documents.

In the centralised scenario, standards can be mandated by some government body with the aim, for instance, to push specific technologies, in which home industries could gain a competitive advantage or to achieve some political goal (see for instance the discussion in [Shapiro and Varian, 1999, p. 311]). A good case to illustrate this is the fast adoption of the Global System of Mobile Communication Standard or GSM. The European Telecommunication Standards Institute (ETSI) established it at the beginning of the 1990s in order to set up a large unified European standard for mobile communication. This helped to promote the European mobile communications industry by establishing a large market and increase the value in use of mobile communication to the European consumers.

If proprietary interests in a standard are low, we can distinguish between 'unsponsored' standards and 'standard agreements' depending on the degree

of centralisation of the process leading to their establishment. In the latter, standard-setting bodies set standards primarily with the aim to prevent potential problems of technological integrity across products and reduce transaction costs for firms. These standard setting-bodies coordinate for instance the assignment of telephone numbers, the protection against interference and data protocols for electronic devices and so forth and thereby support the adoption and diffusion of technologies. Finally, un-sponsored standards emerge merely because of technological and historical contingencies, as well as learning processes of firms and consumers acting in the market. The famous cases of the QWERTY keyboard [David, 1985; David, 1986] or the technological trajectories taken in nuclear power reactor technology [Cowan, 1990] are very prominent cases of this type of standardisation.

In this paper I will focus on this last type of standardisation in order to discuss how social processes affect the emergence and adoption of standards. Whereas at a first superficial glance, the case of un-sponsored standards seem to be the least interesting from a political or social science point of view because strategic behaviour and political processes appear not to play any role. I will show in the third section of this paper, that 'un-sponsored' standardisation — at least the famous QWERTY case — can only be properly understood if the social and historical contingencies in which these processes happen, are taken into account. Before I start this discussion, in the next section I will give a brief overview on how standards are analysed by economists.

The economics of QWERTY: The economic analysis of the emergence of un-sponsored standards

One short paper by Paul David [David, 1985] has made the economic analysis of standards prominent in the profession. In this essay David used a model developed by Arthur, Ermoliev and Kaniovski [Arthur et al, 1985] to explain why, despite better alternatives we still use the QWERTY keyboard on our computers and typewriters. He told the story of how — in the 1860s when the QWERTY key arrangement had been developed — the aim was not to find a design that would allow typing to be done as quickly as possible, but to avoid that the types would entangle when writing too quickly; it was developed to slow down the typing speed. However, as the problem of entangling types was solved and keyboard layouts became available that indeed were optimised for typing speed, such as the DVORAK keyboard, typists kept on using QWERTY. For economists, this was insofar a revealing tale, as the standard economic model assumes that economic agents that are fully informed about technological alternatives and act rationally will always opt for the 'best' i.e. the most

profitable one. David however, argued that sometimes, if choices are made in a sequential way and later adopters learn from early adopters, people may get locked into sub-optimal solutions. In this section of the paper, I will re-examine the QWERTY case and try to highlight the strengths and weaknesses of the economic analysis of un-sponsored standards.

The essential analytics of technological standards in economics

Coordination

Economists characterise the emergence of standards as a coordination problem. We can only talk about a standard if everybody in a population of potential adopters uses one single technology or a very limited number of technological alternatives. This implies that there must be some kind of implicit or explicit coordination of choices across adopters. The central incentive for each agent to act in this way is that adopting the standard technology is economically more rewarding than acting otherwise. The canonical decision problem related to standards is shown in Table 1. If a firm and a typist coordinate on the typing standard QWERTY, they will respectively get pay-offs *a* and *b*. On the other hand, they will get pay-offs *b* and *a* if they both opt for the standard DVORAK.

In case they don't coordinate and the firm buys only QWERTY typewriters and typists only train on DVORAK keyboards, the firm will get pay-off *c* and the typist will get *d*. In the reverse case, where the typist has trained on QWERTY and the firm has DVORAK typewriters, the pay-off to the typist is *c* and the pay-off to the firm is *d*. The conditions for the emergence of a standard are straightforward: Typing will be standardised if the pay-offs to both — the typist and the firm — are larger than when each one uses an alternative. That is, if the pay-

Table 1
The QWERTY versus DVORAK standardisation game.

		typist: QWERTY	typist: DVORAK
firm	QWERTY	*a*, b	*c*, d
	DVORAK	*d*, c	*b*, a

offs *a* and *b* are (each) larger than both *c* and *d*, then the technology will settle on QWERTY or DVORAK keyboards. If on the contrary both *c* and *d* are larger than *a* and *b* then the two keyboard designs will coexist.[2]

As the discussion of the canonical coordination problem shows, standardisation is a process of maximising the joint pay-offs of the agents involved in the standardisation game. One dominant standard will only emerge, if all the agents using it are better off. This implies that under some circumstances it will pay for 'selfish' agents to coordinate their actions. Such situations are frequent when the products exhibit network externalities, i.e., when the pay-off and hence the value in use of a product depends on the number of previous adopters of that product. This is typically, but not exclusively, the case for network technologies. The value in use of a telephone network depends on how many users one can reach. If all telephone networks were using different standards then there would hardly be any value to a potential adopter.

However, the problem of choosing standards is more complicated. If the firm and the typist both knew from the start that DVORAK is better, they would immediately choose DVORAK, as shown in Table 1. However, what if they don't know? What if the assumption of perfect knowledge about the pay-offs of the two alternative keyboard designs is relaxed and we assume more realistically a) that typists are uncertain about the preferences of firms and b) that pay-offs change dynamically over time depending on the number of previous adopters. For instance, neither the firm nor the typist may know whether learning and improving typing skills is easier on DVORAK than on QWERTY. In this case, the expectations and behaviour of early adopters may play a crucial role for the establishment of a standard. As the work of Katz and Shapiro [Katz and Shapiro, 1985; Katz and Shapiro, 1986] and Farrell and Saloner [Farrell and Saloner, 1985; Farrell and Saloner, 1986] has shown, this can lead to strategic behaviour of early adopters. For instance, firms may try to set up a so-called 'installed base' in the early stages of the diffusion process by sponsoring a specific technology and therefore, pre-empting users from choosing a technology of a later entrant. Looking again at the QWERTY case, one could argue that the promoters of the Remington typewriter — the first one to use QWERTY back in the 1860s — tried to bind customers to their product by setting up an installed base of typists that were able to use the touch typing method on that keyboard. Indeed, Remington trained and rented out typewriters with trained typists. This made its own product more productive to potential adopters than that of its competitors. A large pool of trained touch typists therefore, could have been an incentive for adopters of typewriters to choose the Remington. In this way, the promoters of Remington set up a positive feedback mechanism that could have pre-empted later adopters from

2 More formally, the condition for standardisation is $a,b > \max(c,d)$, and the condition for the coexistence of standards is $c,d > \max(a,b)$. More complicated is the case where $a > c$ but $b < d$. If the game is repeated many times, then there is just no dynamic equilibrium, as one of the two agents will always have an incentive to deviate. The technologies will switch continuously.

choosing an alternative typewriter design. However, historical evidence shows that this was not the case. These attempts were made, when there was still no clearly defined market for typewriters. This implies that an installed base strategy is only valuable if a well specified market for the product also exists. I will discuss this issue later in-depth.

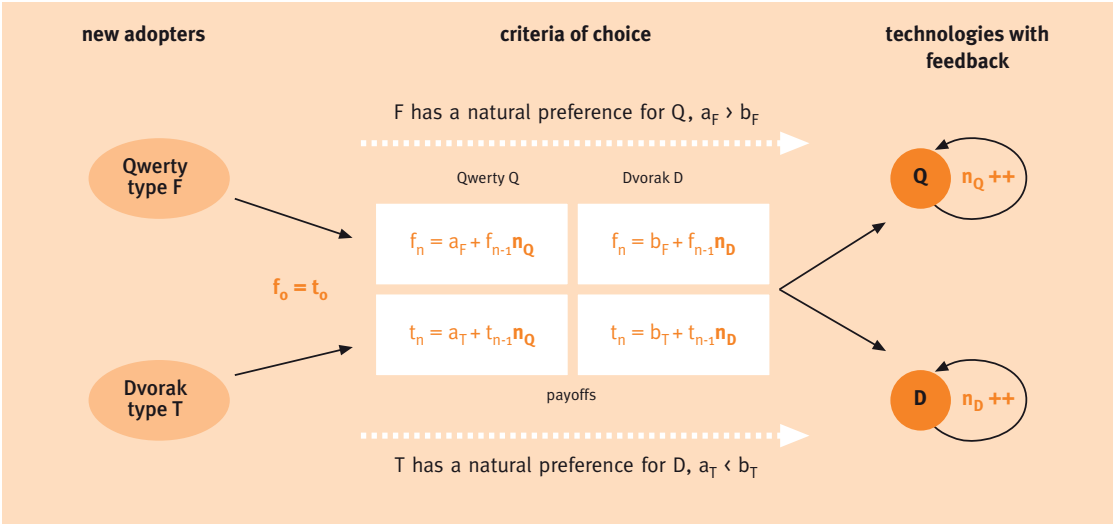
Network effects and positive feedbacks

As Shapiro and Varian [Shapiro and Varian, 1999, p. 175] put it "*positive feedbacks makes the strong get stronger and the weak get weaker...*" Hence, two technologies starting from the same market share and with approximately the same initial performance may experience very different development paths in the presence of network externalities. How can this happen? Many explanations have been developed, but Figure 2 sketches the famous model by Arthur [Arthur, 1989] that gives an appealing answer.

In Arthur's model, dynamically increasing returns are the source of the positive feedback effect. They may be attributable to experience-based learning. For example, the more typists use a certain keyboard the more skilled they get in using it. This implies that the returns from using a specific keyboard in terms of saved labour time increase dynamically.

Instead of differentiating between firms and typists, we could speak about adopter types that have a-priori preference for one or the other design.
In Figure 2 we assume that there are agents (whom we name *F)*, who have an a-priori preference for QWERTY and agents *T* who have an a-priori preference for DVORAK. This is captured by the pay-offs: each F-agent gets a pay-off a_F if she adopts QWERTY and a pay-off b_F if she adopts DVORAK; where the pay-off

Figure 2
The Arthur model [Arthur, 1989].



for QWERTY is higher. On the other hand, a *T-agent* gets a pay-off a_T for QWERTY and b_T for DVORAK, where b_T is now larger than a_T. What happens now, if adoptions are made sequentially? We toss a coin, which allows the first agent to choose. Let's say we have selected an *F-agent* and it selects QWERTY first. The pay-off *F* gets is f_1, equivalent to the first cell in the pay-off matrix shown in Figure 2. She gets a idiosyncratic pay-off a_T and in addition she also gets a pay-off that depends on the network effect i.e. it increases in the number of adopters $f_{n-1}*n$. Hence, the first agent who chooses QWERTY gets a_F, the second gets a_F+f_1*2, the third gets a_F+f_2*3, and so forth. The more people adopt QWERTY the higher the pay-off gets for later adopters. This shows how the mechanics of dynamically increasing returns work.

Assume now that by chance, the first two agents who selected the typewriter keyboard were QWERTY types and the third potential adopter in the row has a preference for DVORAK expressed by $b_T > a_T$. He will compare the pay-offs of the two keyboard designs. However, due to the prior adoptions of QWERTY it may turn out that despite his personal preference for DVORAK, QWERTY is now more profitable. DVORAK pays him $t_1=b_T$, whereas QWERTY pays $t_1=a_T+f_2*3$. As easily calculated he will adopt QWERTY, despite his preference for DVORAK if $f_2*_3 > b_T - a_T$. As the pay-off of any keyboard increases with the number of previous adopters, the likelihood of a DVORAK type adopting QWERTY despite his preference will therefore depend on the number of previous adopters of QWERTY. Hence, the initial choices of the first two agents influence the decision of later adopters. This feedback mechanism is symbolised by the loops on the right hand side of the figure.

If this sequence of choice is repeated for an infinite number of times, Arthur, Ermoliev and Kaniovski [Arthur et al, 1985] and Arthur [Arthur, 1989] show that the system will experience a so-called 'lock-in' i.e. "*an absorbing state (in technology) from which it is hard or impossible to escape.*" [Arthur et al, 1985]. In our example, the small accident was symbolised by the early toss of a coin. Our imaginary world would have looked differently had the first adopters been typists with a preference for DVORAK. Therefore, early accidents during the initial phases of the diffusion of a new technology can have long-lasting and even irreversible effects. This implies, that a QWERTY lock-in may have happened even if DVORAK was better from the start. Economists call this decentralised selection of an initially inferior technology 'market failure'. Dynamically increasing returns are therefore a potential source of inferior and suboptimal allocations of goods (see also [Cowan, 1991]). Nevertheless, as I will argue, one needs to explain why the population of adopters grows over time, or in other words, how a market for such products comes into being, as increasing returns are a necessary but not a sufficient condition for lock-in.

The evolution of standards and its social contingencies: The neglected dimension in the economic analysis of standard setting

In the previous sections I have seen that economists have analysed compatibility standards essentially as a source for positive feedbacks that lead to path dependencies. Consequently, in the presence of network externalities market failure is likely. Another important insight from the economics literature on unsponsored standards is that temporally remote events have a long lasting influence on technological development i.e. small events and the sequence, in which choices are made by economic agents matter for economic outcomes. This has led some economists to claim that 'history matters'.

However, most of the existing literature in economics has neglected two important dimensions of standards: firstly, there is hardly any attempt to explain why standards are developed in the first place. It is generally assumed that agents have a choice between a given set of standards, but little is said about their origin and their development. As I will argue, the development of standards is deeply enshrined in human reasoning and human problem solving. Therefore, problems of all kinds may affect the development of a standard and not only the economic or technological aspects. Secondly, even though some authors underline the importance of historical economics (see e.g. [David, 2001]) they take a rather mechanistic view on positive feedbacks in so far as they (implicitly) believe that their existence is in itself a necessary and sufficient condition for path dependent economic outcomes. There is no attempt to explain why anybody would be interested in adopting any particular standard at a particular moment in time. Again, there is a focus on the act of choice and as a consequence, these authors neglect the historical and social conditions that make a standard a source of value and thus economically meaningful. For instance, the Arthur model expounded above will converge towards a lock-in equilibrium, only if the number of adopters heads towards infinity. The number of users has to increase continuously. However, for this assumption to be valid one has to identify historical contingencies and processes that actually lead to such an increase in the population of potential adopters otherwise the assumption is not valid.

In this section, I will present some recent contributions that have re-examined the QWERTY case. These papers study the social and historical causes for the emergence of standards and whether small chance events would indeed have been sufficient to explain the long lasting impact this interface has had on business processes. They highlight how the interaction of human problem solving on the one hand and technological, social, institutional as well as economic constraints on the other, quite naturally involve the development of standards. Standards from the view of this research are therefore part of a

technological development that aims to break constraints imposed by a complex landscape of interdependent social, technical and institutional relations (see [Reinstaller, 2007; Reinstaller and Hölzl, 2008]).

As is shown in these papers, the organisation of production and related technological standards are closely linked not only to technical problems, but also to issues of governance and social control. Generally speaking, it is my view that in many instances, the development of standards cannot be disentangled from one or another dimension of issues of social development and social conflict. Reinstaller and Hölzl [Reinstaller and Hölzl, 2008], for instance, show that the rise of Taylorism adopted as a management method to cope with governance problems, also led to the development of many new interface standards in production and to a standardisation of production routines themselves. One of these standards was the QWERTY standard for typing.

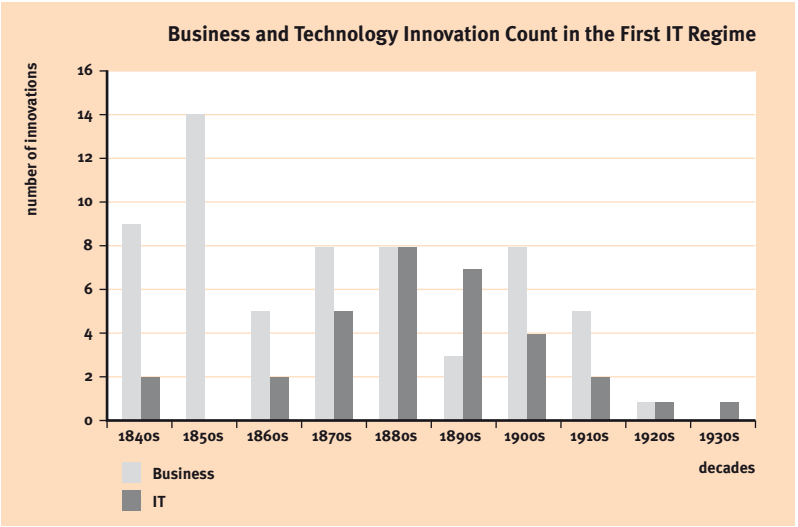
QWERTY: small and large events

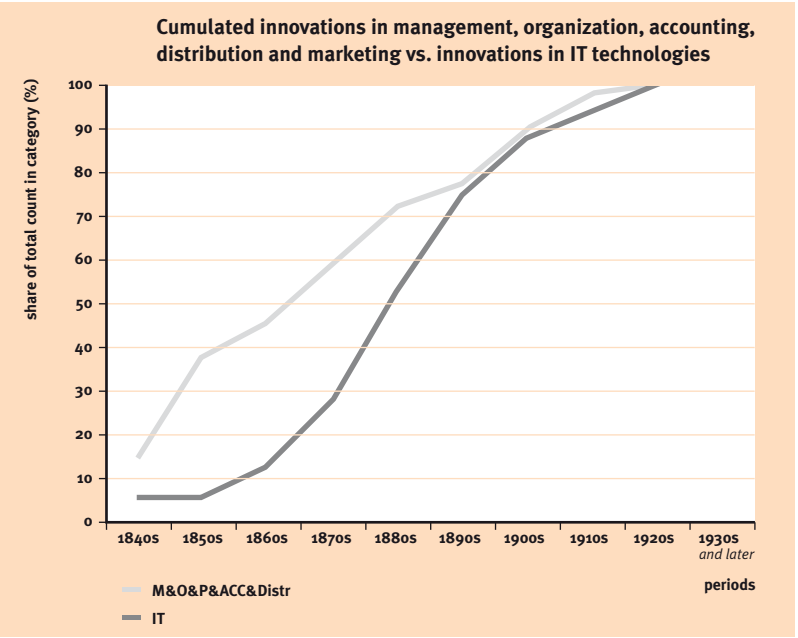
Reinstaller and Hölzl [Reinstaller and Hölzl, 2004; Reinstaller and Hölzl, 2008] have interpreted the adoption and diffusion of QWERTY and the path dependence in business processes this has created from the perspective outlined above (the interested reader is referred to these sources for more details). In these papers I argue that QWERTY was an important interface standard needed to apply and successfully implement Tayloristic methods in the realm of business administration in the US. For this purpose, we have to look at the details of the historical process leading up to the development of Taylorism.

Figure 3 shows counts for innovations in information processing technologies and in business practices and organisation of production in the US for the period from 1840 to the 1930s. In the period between 1850 and 1880, the US system of production experienced a conversion from small-scale shop based production system to mass production. The figure shows that this development preceded the wave of innovations in information processing technologies. If we bear in mind that the first typewriters were developed in the late 1860s and became a commercial success in the 1890s, we see that its diffusion was part of a larger process, which eventually led to the establishment of large enterprises with large business administrations.

Reinstaller and Hölzl [Reinstaller and Hölzl, 2004] interpret this evidence as two subsequent waves of innovations that were triggered by two systemic constraints in the organisation of US production in the mid 19th century that inhibited the transition to a mass-production system, which had become necessary because of demographic and geographic factors. The first constraint was represented by the interdependence of the process generating

Figure 3
Innovations in information technology and complementary innovations in management practices, organisation, accounting, and marketing. Source: [Reinstaller and Hölzl, 2004].





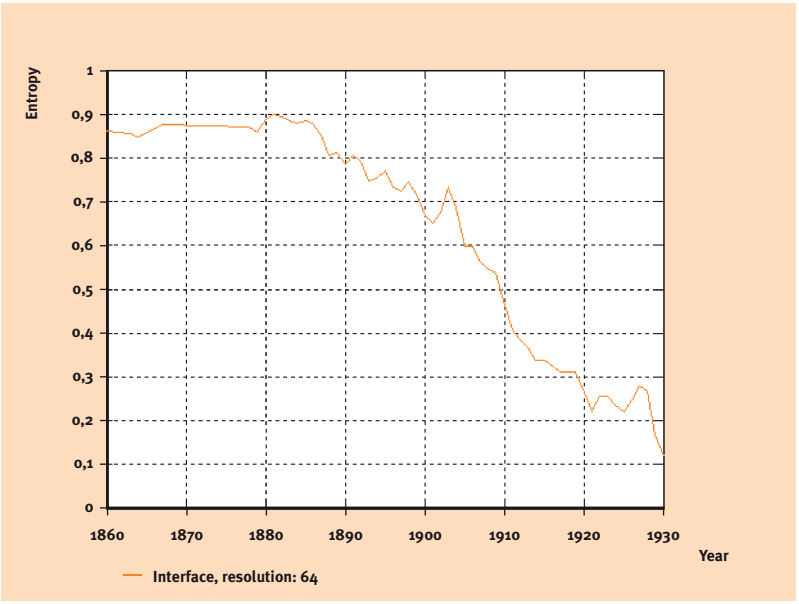
cost information (accounting) and the process generating business decisions (management). The decentralised organisation of production and the simple accounting system in use during the period of the ante-bellum American System of Manufactures was consistent with the management needs and the scale of production of the time. The system became inconsistent as operations were scaled up. The change in management practice then triggered changes in accounting practice, with the aim to control the production process better. However, once business administrations were set up, they produced information on a much larger scale. The problem of efficient processing of the infor-

mation emerged. This interdependency between production activities on the one hand and information-processing as well as management needs on the other led to a second constraint: More information could only be processed with more clerical workers or if the productivity of clerical work was drastically scaled up. However, as historical evidence suggests the pool of people potentially eligible for clerical work was quasi-fixed because the number of qualified high school graduates could not be quickly increased. As a result, information-processing activities were reorganised in line with Tayloristic methods and new office machines developed and adopted. This increased the productivity of office work by two orders of magnitude (see Table 6.2 in [Reinstaller and Hölzl, 2004]).

Although not having been developed for this purpose, from the start the QWERTY keyboard jointly with the touch-typing method turned into a means to the end of introducing Tayloristic methods in the office. Typing schools for the QWERTY touch typing method were set up under the influence of large business firms. This lined up the interest of firms to have productive typists with that of potential clerks, to get a relatively well paid job. This network effect between a typist capable of the touch-typing method and firms using QWERTY typewriters would certainly have been a source for irreversibility. However, it would not have been a sufficient condition for path dependence and lock-in [Reinstaller and Hölzl, 2008]. This is because the number of users and adopters started to grow as a consequence of the process of adopting Tayloristic methods in office work. Eventually this became the process that triggered the growth of the market for QWERTY typewriters and QWERTY typists — and from this the lock-in to the QWERTY design followed. The path-dependence of the QWERTY keyboard is therefore, only possible to understand if we look at the larger historical process that led to the problems of information processing, which the emerging large firms in the US faced in the 1890s.

Figure 4 lends some support to the view expressed in this paper. It shows how the variety of the keyboard designs in the market changed over time using an entropy measure bounded between zero and one. If it is close to zero, just one design dominates. If it is close to one, variety is highest and many different designs co-exist. David [David, 1985, p. 334] claimed that the “faithful 1890s” were the period, in which the lock-in to the QWERTY keyboard happened. According to his account, it was the accidental development of touch-typing for the QWERTY keyboard in the early 1880s and indeed Figure 4 suggests that the touch-typing method must have had some influence on the lock-in — as the entropy value starts declining from 1888 when touch-typing had been developed and had started to diffuse. However, the process leading to the

Figure 4
Entropy of the typewriter keyboards offered on the market. Source: [Reinstaller and Hölzl, 2008].



lock-in was slow before 1900 and only accelerated afterwards. Reinstaller and Hölzl [Reinstaller and Hölzl, 2008] argue this had to do with the introduction of the Underwood 5 typewriter in 1901 that led to technological closure in the development of typewriter designs. The Underwood typewriter was superior to all other existing typewriters; it combined a QWERTY key-board, with a front-strike design of the type levers. Types now struck the cylinder head-on, which made it possible to immediately read the written text. This improved the value in use of the typewriter considerably. Before the introduction of the Underwood, the market for typewriters was not clearly defined and touch-typing was just one amongst many ways of how producers tried to define a market. With the entering of the Underwood this changed. Typing became an activity that could be used to solve business needs. The Underwood typewriter was the right tool for this need and the QWERTY touch typing method the right practice. Indeed, the analysis of office management manuals published during this period shows that the combination of Underwood 5 type typewriters with touch-typing trained typists became a major ingredient of Tayloristic office management. Due to urgent problems in information processing the Underwood-QWERTY-touch-typing technology diffused very quickly into business administrations. By the end of the 1930s, Tayloristic methods had penetrated many large business firms in the US and the standardisation of the interface was almost completed; as measured by an entropy value close to zero. This may explain why entropy declined much faster after 1900.

The evidence presented here, suggests that larger historical processes, human problem solving and the adoption and enforcement of standards are closely

related. One cannot properly understand the emergence of (un-sponsored) standards and lock-ins through small events in history without adequately understanding the historical contingencies, in which this development is embedded. It is very likely that QWERTY would not have emerged as such a strong standard, if the right typewriter and the right typing method had not been developed in a time when the whole way of how business firms were administered and therefore, the need to process and diffuse information quickly were drastically changing. It was this development that led to a dramatic increase of the demand for the typing technology and as a consequence to the growing population of adopters whose decisions network effects increasingly influenced. Hence, large events that create a favourable environment are the precondition for small events to unfold their long-lasting effect.

Conclusions

In this paper, I have argued that the economic literature on economic standards has provided a wealth of insights into the process of technology adoption, strategic behaviour of firms and the long-lasting effect of small historical events on economic and social outcomes. However, I have also shown that much of the literature — despite its usefulness — remains somewhat footloose as it falls short in providing satisfactory accounts on the reasons why standards exist and become economically meaningful parameters. The genuinely, economic perspective that focuses on the act of choice among a set of existing alternatives needs therefore to be complemented by a historical and social analysis that explains how these alternatives came into being.

I have argued that standards emerge quite naturally as a consequence of human problem solving, in sofar as they allow for the simplifying of complex systems and thus for the development of problem solutions. However, problems in the economy are rarely of a purely technical nature. Power, agency, but also the inherited baggage of norms and traditions, constrain the process of economic and social evolution. Technologies, of which standards are a part, reflect solutions to technological and larger social problems. The development and the diffusion of standards and technologies in general can only be accurately understood, if we are able to work out how historical and institutional contingencies affect human choice. I have illustrated these ideas on the basis of the famous QWERTY example.

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Cookies for ITU

Christian Henrich-Franke[1]

The role of social networks in standardisation processes

"To work successfully in this field both professional knowledge and multiple personal contacts are necessary. The latter, however, depends on many years of active participation and experience. Therefore it is important to consider these aspects when staff for international matters will be transferred." [Bornemann, 1966].

On the 26th of October 1966, in a letter to the technical department of the German ptt administration, the ptt Ministry's Secretary of State, Bornemann, signals the importance of social networks for the international regulation of radio services. Implicitly, Bornemann points out that membership in a transnational 'engineer network' is a prerequisite to successfully negotiating radio standards.

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The network mentioned by Bornemann is the empirical basis upon which the question is based: how can social networks be valued for 'bargaining norms and arguing standards' in standardisation processes. Focus was placed on regulative standardisation [Werle, 2001] of radio, by the International Telecommunication Union (ITU) between the 1950s and the 1980s.
This paper commences with a description of the ITU's institutional structure as this forms the background from which the engineer network emerged. Then the constituting elements, the origin and the effects of the network will be presented. Amateur radio will in this context be taken up as an example for opportunistic behaviour. Moreover, this paper attempts to answer the question mentioned above. Finally, it will critically reflect on the value of sociological theories for the work of historians. Along with this some remarks on the suitability of rational choice as a theoretical concept to analyse human behaviour in negotiations on standards will be provided. However, before turning to the empirical data, some general thoughts on standardising radio will be outlined.

Some thoughts on standardising radio

In the case of radio — with frequencies crossing political borderlines — regulative standards are of great importance, because radio has the characteristics of a common good; this means non-excludability from consumption and rivalry of consumption. Consequently, the risk for negative externalities[2] is extremely high. Even unconnected (national) radio networks require a minimum definition of technical or operational parameters, which makes participation in international spectrum management compulsory.
Some characteristics distinguish the radio spectrum from other common goods.[3] Firstly, radio frequencies cannot be depleted. Sustainable spectrum management is therefore, not necessary. Secondly, negative externalities become noticeable without delay. Thirdly, the radio spectrum is not purely a global common good. Due to propagation characteristics the problematic issues of common goods are, in some parts of the spectrum, rather regional or national.
When asking for human behaviour in negotiating radio standards, it is important to consider that the perception of an efficient internalisation of negative externalities is very normative. There are three ideal types of efficiency[4].
Technical efficiency: Standards have to create a situation, in which the availability of individual frequencies is maximized according to present technical capabilities.
Economic efficiency: Standards have to create a situation, in which the profits derived from radio operations are maximized. Standards have to decrease the

2 For a detailed discussion on the concept of externalities see [Liebowitz, 1994].

3 For good differentiations of common goods see [Kasper e.a., 1999; Ostrom, 2002].

4 For a clearly laid out analysis of the term efficiency see [Cordato, 1994].

costs of radio infrastructure and increase the (user's) welfare.
Distributional efficiency: Standards have to create a situation, in which the distribution between different groups (states, radio services etc.) is fair and equitable. Different normative criteria (national sovereignty, number of inhabitants, dimensions of territory, economic activity etc.) can be taken as a basis.

In the period under consideration, regulative standardisation had been an integral element of a two-stage process of distributing radio waves. This process aimed to internalise negative externalities by transforming the non-excludability from consumption into excludability. The first step was splitting the whole frequency spectrum up into different frequency bands. The bands were allocated to radio services like broadcasting, air navigation and amateur radio. However, no individual user got direct permission to transmit anything on a particular frequency. It was more the case that other radio services were excluded from usage. In the second step, individual frequencies, within the several bands were assigned to nation states, either on the basis of a frequency plan or on the basis of 'first come, first served'.[5] In both steps, regulative standards were fixed. Finally, it must be emphasized that ITU never used pricing for spectrum management.

The engineer network in standardising radio

In 1906, the Berlin radio conference laid down, for the first time, radio standards within the International Radiotelegraph Convention; today this is known as the Radio Regulations (RR) [Tegge, 1994]. From then on, the RR has been revised and expanded at administrative radio conferences. The RR gained the normative character of an inter-governmental agreement. Since 1932, standardisation of radio has been carried out under the auspices of ITU.
Each administrative radio conference followed the same organisational pattern of horizontal and vertical division of work, which was designed to make a maximum use of technical knowledge. The General Assembly was placed at the top of the conference. It was endowed with the power to decide on all aspects of the RR. Here, the national delegations' leaders assured a kind of public control of standardising radio. Most of the work was done in a large number of committees and sub-committees, where ptt-administrations' engineers negotiated all individual elements of spectrum management, including technical standards. Depending on the method for assignment, propagation characteristics, the density of radio transmissions etc. these standards were fixed in a more or less detailed way. For the matter at hand, it is important to emphasize that no minutes were taken on the negotiations in the sub-committees and that voting power was 'one country, one vote'.

5 For an analysis of frequency distribution from a perspective of property rights theory see [Henrich-Franke, 2006a].

It is remarkable that ITU made standardisation of radio a rather open process. Organisations like the European Broadcasting Union (EBU), the International Association for Marine Electronics Companies (CIRM) or the International Amateur Radio Union (IARU) actively participated in standard-setting; though only in an observer capacity. They were invited to send in proposals and reports to administrative radio conferences. The ITU relied on these specialised organisations because of their expertise.

Administrative radio conferences marked the end of a decision-making process, which was considerably extended during the time under consideration. The German ptt administration for example, set up a special working group to prepare the 1979 World Administrative Radio Conference (WARC), as early as spring 1974. The European Conference of Postal and Telecommunications Administrations (CEPT) did the same in April, 1974. On the national and international level, a broad range of organisations, authorities and interest groups took part in the preparations. One central forum for the preparation of radio conferences was, of course, ITU's Consultative Committee for International Radio (CCIR).

Actually CCIR was responsible for negotiating coordinative standards. Its task was to continuously study the technical and operational development of radio. CCIR was a mixed public-private standardisation forum, though with exclusive public voting power. It regularly brought together engineers to discuss radio matters in a purely professional atmosphere. For the matter at hand it is important that CCIR was advised to clearly prioritise technical efficiency. Concerning the above mentioned WARC 1979, CCIR even arranged a Special Preparatory Meeting (SPM), where more than 750 radio engineers worked out a report with detailed technical information on all aspects of the WARC's agenda.

The engineers' network's constituting elements, origin and effects

The precondition for the emergence of the engineer network was an intense contact between the engineers involved. The several radio conferences, their intensive preparation and the permanent work of CCIR offered the opportunities for these contacts. Engineers from ptt administrations and spectrum authorities met within official meetings as well as within a variety of informal umbrella events; like parties or trips to local sights. These encounters allowed them to become better acquainted with each other. The Swedish delegate at WARC 1951, Övergaard, almost surprisedly described engineers of the Soviet delegation as "*very congenial*" [Sveriges Riksarchiv, 1951a]. Many personal friendships developed, regardless of national backgrounds or dividing political

ideologies. On the informal level, engineers from Eastern Europe could come into contact with Western European ones. Sometimes, the engineers were accompanied by family members, who also made friends among engineers and their families. Gradually, they began to talk about family situations or other private matters. In one case, the wife of a Soviet and a Western German delegate, prepared cookies and coffee together for their husbands who were sitting in a difficult night session of one administrative conference. According to their husbands, these 'Cookies for ITU' were an important factor for successful negotiations [Unpublished, 2003a]. Progressively, the engineers became connected by a dense trans-national personal network.[6]

The engineer network was held together by a kind of 'engineer habitus' [Bourdieu, 1997]. The engineers shared the perception of spectrum management as being first of all a technical matter that should foster technical progress and efficiency. Non-technical impact of radio standardisation was valued as second-class. According to that view, frequencies were wasted, when they were assigned to do tasks, which could be done in other ways. For example, via cable. Rudolf Binz, long-time head of the German radio frequency department, made the primacy of techniques most obvious by expressing that "*if I discover, that I am unable to use a certain radio station, then I have to coordinate, regardless of any costs*." [Unpublished, 2003a]. Of course, engineers did not omit national economic or political objectives. However, they more easily refrained from promoting inferior national techniques or reduced national frequency demands. In their own opinion, they considered themselves as being more open-minded for compromise solutions.

A sharing of the described dispositions served as a ticket to the engineer network even for representatives of international interests groups or the industry. The network provided an opportunity to negotiate standards unaffected by non-technical actors and their differing interest. Then again a non-sharing of the network's dispositions resulted in a clear exclusion. The engineers had a distinctive reaction to non-technicians and preferred to discuss radio matters among like-minded engineers. Even engineers who did not consequently share the network's values had no chance of entering or were disqualified by the network. Expertise was a necessary, but not sufficient requirement.

The 'engineer habitus' originated in response to the outlined institutional design of ITU and the contemporary political environment. In the first place, the structure of radio conferences and of the CCIR fostered the engineers' delimitation. Equally important, were bloc confrontations between East and West, which challenged standardisation activities. Rhetorically well trained politicians and militaries disputed non-technical matters like participation of particular countries and voting powers.[7] The Western bloc took advantage of its majority of votes in distributional issues. Many of the early radio conferences ended without putting a revised version of the RRs into effect.

6 For a more detailed discussion see [Henrich-Franke, 2006b].

7 Good descriptions of these confrontations are given by [Codding, 1952; Råberg, 1997].

Consequently, negative externalities threatened to increase. Especially the radio conferences' General Assembly hosted numerous ideologically charged discussions driven forward by non-engineer actors. Nevertheless, at the same time the engineers negotiated radio standards within sub-committees or in informal settings. At WARC 1951 for example, Soviet and Swedish engineers successfully negotiated radio beacons for the Baltic Sea at the ITU's entrance hall [Sveriges Riksarchiv, 1951b]. Though these standards — without a common signing of a revised version of the RR — formally did not come into effect, they were complied within the following. Apart from a limited number of radio services e.g. broadcasting, international radio traffic did not suffer from exceptional interferences at that time.

The engineers found themselves in a strange situation. Although the official rhetoric was confrontative, they were able to successfully negotiate radio standards. On top of that engineers on both sides of the iron curtain shared the same perception of spectrum management. This had a confidence-building effect and accelerated the establishment of a trans-national social network. Engineers began to trust in their counterpart's behaviour and no longer calculated with mutual rule-breaking.[8] On the contrary, the engineers' behaviour in negotiations became predictable. As a consequence, they began to make use of their network within the preparations of, and the negotiations at the conferences.[9] To get the RR signed by all delegations, the engineers purposefully predefined the General Assembly's decisions by using information asymmetries on the technical impacts of radio. They simply left no room for additional adjustments and justified their proceeding with technical arguments. The General Assembly was in many respects transformed into a debating club; meanwhile, the engineers in the sub-committees de facto decided. Controversial discussions within the General Assembly were accepted as a ritual act, because "*politicians had to do their business and we accepted that.*" [Unpublished, 2003a]. Remarkably, the RR was signed by all delegations at WARC 1959; for the first time after WWII. The general trust in the ITU's capacity to successfully regulate the spectrum returned, which had partially vanished after the first post-war conferences.[10] Many technicians judged this as an engineers' success.

Nonetheless, non-members of the network did not confine themselves to give a nod to the engineers' results. Instead they had to be persuaded. That job was assigned to a special type of engineer, who was placed at the interface of the technical and political sphere. Such delegates needed to combine technical expertise with a politically neutral reputation. Very often, these delegates came from the Nordic countries.

To sum up, the engineer network decreased the transaction costs of spectrum management. Negotiations were shortened and regulative standards were commonly agreed upon. Trust — and this meant social capital [Westlund,

8 On the phenomenon of trust see [Funder, 1999; Notteboom, 2002].

9 For a general discussion on strategies within networks see [Sydow, 1995].

10 For a good discussion on trust in rules see [Siegenthaler, 1993].

2006; Rothstein, 2005] — was created both in ITU's institutional structure and in the behaviour of other engineers. Most of all the RR was signed by all delegations so that regulative standards were legally protected.

The other side of the story: engineers' opportunistic behaviour

A specific part of the engineer network was formed by engineers and leading ITU officials, sharing the hobby of being a radio amateur. The amateur bands offered an opportunity to cultivate friendships in daily life. The contacts between radio amateurs could therefore be closer than within the 'normal' engineer network. Radio amateurs had a particular group identity with a clear technical character. At each radio conference a list was put up at the entrance where all radio amateurs signed in. They met several times during conferences on informal occasions to discuss their hobby. Incidentally, they also discussed standards. The German delegate, Hans Pressler, underlined the closeness of cooperation among radio amateurs, where, *"even the east-west confrontation was reconciled."* [Pressler, 1951]. Radio amateurs, in their capacity as national delegation's members, chaired a huge number of the most important committees and working groups at all ITU conferences in the second half of the 20th century. Amateur radio in some way was the only radio service with direct voting power and influence on the key positions of the decision-making process. Even Richard Baldwin, head of the IARU observer delegation at WARC 1979 admits that *"of course, having access to conference meetings (which are closed to the general public) also provide an opportunity for informal discussions with delegates, and in particular to provide information and assistance to our friends on national delegations."* [Baldwin, 1980]. Already before the opening of WARC 1979, the amateur radio journal, QST, promisingly announced that *"these amateurs can attend closed delegations meetings and speak up for our interests."* [Sumner, 1979].

Many IARU's observers at radio conferences were retired engineers from national authorities. They had already regularly participated in a large number of radio conferences and were reputable 'members' of the engineer network. Sometimes they were better informed on the formal and informal decision-making procedures than the committee chairmen. They simply knew how to behave to achieve their goals. To give just a few examples from the IARU observer delegation at WARC 1979: Tom Clarkson was one of the few who had already participated in the 1947 Atlantic City conference, as delegate for New Zealand and had served as vice president of the CCIR's plenary assembly in 1951. Shigatake Morioto had attended all CCIR plenary meetings after WWII and received the CCIR's 'Diploma of Honour' in 1978. Eric Godsmark had retired just a few weeks before the conference from a leading position at the

UK Radio Regulatory Department.

Amateur radio had played an important part in the early technical development of wireless communication. Already in the infancy of spectrum management a good number of frequency bands were distributed to amateur radio, especially in the short waves. However, in times of an increasing demand for radio waves, the traditional amateur bands were increasingly looked upon as a primary candidate for reallocation. The economic importance of amateur radio was as slight as its political one and thus no major societal group spoke in favour of it. No wonder that politicians and broadcasters from developing countries and the Soviet Union at WARC 1959 vigorously pressed for a reallocation of the short wave amateur bands for broadcasting, not least for additional propaganda programs.

When the redistribution was put for discussion the 'amateur engineers' reacted promptly. On informal occasions and by making use of amateurs who chaired important committees, like the Dane Gunnar Pedersen or the Czech Miroslav Joachim, they tried to emphasize the importance of amateur radio for technical progress. In addition, amateur radio's usefulness in cases of emergency was underlined. Nevertheless, a good number of politicians refused to follow these arguments. In that situation amateur engineers — even those from the Soviet Union — changed their tactics and approached the military. In many countries they simply ignored political directives from delegation leaders or lay aside original national objectives. The amateurs were well aware of the superior voting power of the military in many delegations. They argued that the amateur bands were the only ones, which could be put at the military's disposal, without delay in case of war. The militaries were easily pursued and spoke up for amateur radio. Actually, it is not possible to exactly reproduce what happened. The sources give no strong hint of that. However, the supporters of reallocation fell silent.

At the end of WARC 1959 the amateur bands remained relatively unchanged in the RR. Similar developments can be observed at the WARC 1979, where radio amateurs were able to extend their frequency bands; though the scarcity was much higher and the conflict much more intense compared to 1959. The German frequency manager and professed amateur, Eberhard George, admits (without mentioning just one detail) that *"amateur radio would never have shaped up so well, if it had not been supported in that way."* [Unpublished, 2004]. It is important to underline that the engineers saw no need to justify their behaviour, though they clearly ignored decision-making powers. Or as Krister Björnsjö put it: *"Within ITU the amateurs' work is held in very high esteem. They are technically experienced and therefore deserve their good frequency bands."* [Unpublished, 2003b].

To sum up, amateur radio is a good example of the engineer network — or at least a part of it — which clearly only focuses on personal gain and advantage.

Conclusion

When trying to answer the question about the value of social networks for standardisation processes on the empirical basis presented, two important points have to be kept in mind. Firstly, this paper solely dealt with regulative standardisation. Secondly, the case study is chosen from a time when the 'neoliberal turn' had not yet changed the 'world of standards' [Iversen, 2006]. The 1990s witnessed the emergence of a variety of new standardisation organisations, which reflected the growing significance of regional markets in an era of liberalisation. National ptts were privatised and ITU went through a major restructuring [Allison, 1993].

In the case considered here, it was shown that social networks were an important factor in negotiation processes. Social networks can affect standardisation both in a positive and a negative way. Or put in other words, social networks can increase as well as decrease transaction costs. A quantification of these transaction costs, however, seems to be impossible. How many costs were saved because of successful negotiations on radio frequencies during the Cold War? Other questions arise from this paper's focus on social networks. Is the compliance with the unsigned RR simply a result of shared perceptions and dispositions within the engineer network? Or is compliance a consequence of the common pool problematic inherent in radio?

Being confronted with such fundamental questions makes it impossible to soundly assess the importance of social networks. On the one hand, they can create trust among negotiators and thus shorten negotiation processes. As shown in the example of the engineer network it was possible to bypass controversial political decisions and turn standardisation into a success; although no formal agreement was signed. In that example, the engineer network has proved that it can solve complex problems inherent in collective action. On the other hand, social networks make agency problems intrinsic in standardisation processes more hazardous. Members of such a network can mutually reinforce opportunistic behaviour and turn opportunism into a routine procedure. In this respect, the question of legitimacy becomes an urgent one. For example, as shown in the case where study engineers voted against orders from democratically legitimised ministers. Here members of a network were clearly working to and for their own advantage. To emphasize it once again: social networks can be important factors of 'bargaining norms and arguing standards', but a general judgement regarding their influence cannot be made; at least not on the basis of one case study. It seems worthwhile to systematically explore the question: whether the importance of social networks differs when negotiating on different kinds of standards?

This paper has shown that sociological theories and concepts can be applied to the work of historians. They draw the historian's attention to specific 'soft

factors' like culture, trust, affection etc. and can help to make correlations between these factors visible, which could otherwise easily be overlooked. For a historian, sociological theories and concepts offer help to select and separate important factors from unimportant ones. However, a reconstruction of 'soft factors' is a difficult and often time-consuming issue. Sources to base the argumentation upon are not easy to find. Often archives provide no strong hint on soft factors. They usually offer written information on the contents of the standardisation process like protocols or reports. 'Soft factors' like trust, interpersonal relations, a specific habitus, social networks, opportunism are hardly ever mentioned. To sum up, sociological concepts offer interesting perspectives on standardisation processes, but their application on history is often difficult.

Coming to the end, some remarks still have to be made on the suitability of rational choice as a theoretical concept to analyse human behaviour in negotiations on standards. One of the major findings of this paper is the importance of 'soft factors' for the outcome of negotiations. At first glance, these factors appear to come into conflict with a 'rational choice' behaviour. When a limited number of radio amateurs is able to carry through specific radio standards, which are economically unbeneficial then the rationality underlying that behaviour can be questioned. Even more, such 'soft factors' are individual-related aspects of human behaviour. They can hardly be generalised or incorporated into the rational choice concept. Especially a prediction of the outcome of negotiations, which requires generalised assumptions on human behaviour, is made more difficult due to 'soft factors'. Alternative concepts of human behaviour are apparently more suitable to analyse human behaviour in negotiating standards. However, when focusing on a specific group like the engineer network or the radio amateurs it becomes obvious that within their institutional arrangements — the formal and informal rules of behaviour — individual actors definitely chose a rational behaviour. Of course, the amateurs' opportunism was beneficial for the limited number of group members. In conclusion, the rational choice concept is judged as suitable to analyse human behaviour in negotiating standards, under the precondition that the particular institutional arrangements are taken into account. Probably a link from standardisation research to new institutional economics can be fruitful in that context [Williamson, 1999; Furubotn et al, 1997].

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Reflection

Pascal Griset[1]

Standards as economic and social practices

The two papers in this section address the way standards are developed and how they can stimulate or on the contrary interrupt the adoption of efficient innovation. They also try to enlighten the dynamics between some theoretical models and the facts proposed by history.

Henrich-Franke's paper presents the role of social networks in standardisation processes regarding radio. The general context of this activity is specifically presented in the first paragraph. Obviously, radio waves are not the only form of technology, which needs standardisation. Frequencies are a common good, with a high risk of negative externalities, if coordination between operators is not appropriately and swiftly fixed. The author distinguishes between three kinds of 'efficiency' that are supposed to drive the standardisation process: technical efficiency, economic efficiency and distributional efficiency. This last category is the most challenging. Henrich-Franke describes its internal structure as a 'two stages' process, where frequencies are firstly allocated to services and then within these frequency bands, assigned to nation states. These nation states will eventually distribute the frequencies for users operating on their territory.

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ITU was at the centre of this system. The way this institution developed its organisation is described thoroughly in the paper. The fact that ITU made standardisation of radio a rather open success is underlined. Entering the heart of his argumentation Henrich-Franke wants to present the central importance of engineer's networks in the elaboration of standards. In order to demonstrate his argument on a solid basis, he presents the origin and internal logic of these kind of networking activities. Engineers get to know each other through different events - where family members were also sometimes associated. Personal friendships occurred regardless of national or political backgrounds. This informal society became stronger year after year; consolidated through a kind of 'engineer habitus'. The values shared within this community were based on the supremacy of technical elements in the building of the decision making. Henrich-Franke is convinced that this technical culture is a 'ticket', which is necessary, but not sufficient to be integrated into the community. Nevertheless, this network is non-homogeneous. Some engineers have a specific role of interface between their community and the political sphere. They have to combine technical expertise with a politically neutral reputation. Henrich-Franke's remark that these 'mediators' often originate from Nordic countries is an interesting observation and would merit a deeper study.

This approach, which focuses on the 'soft factors' in negotiating standards is precious. Lénoard Laborie in his work on the European cooperation, in the field of telecommunications since the 19th century to the 1950's has already demonstrated the crucial role of personnel networks in the history of the ITU. Nevertheless, the historical analysis would be of more substance if the influence of the culturally based attitude was compared with politically and nationally based strategies. This would allow for a more precise periodisation. Actually, the author admits that the proposed model no longer fits with the reality of a Union, more and more influenced by liberalisation and privatisation in the second half of the 20th century. He underlines the impact of 'deregulation' forces, which changed the mood of international negotiations drastically after 1980. We have nevertheless, the feeling that this evolution occurred earlier in the century. The decolonisation, the struggle concerning the New World Information and Communication Order (NWICO or NWIO) in the 1970's was a major source of tension in the ITU conferences. Consequently, the 'engineer habitus' was already destabilised before the liberal challenge occurred. A three part periodisation could provide a more accurate and comprehensive structure to this precious and stimulating approach of international negotiations of technical standards.

Reinstaller's paper addresses Paul David's discussion of the historical lock-in to the QWERTY typewriter keyboard. His approach is largely process oriented

and based on a large and rich literature background. Reinstaller presents his vision of the different kinds of standards and the way standards appeared in an historical process following different logics. The different points are well grounded in a precise bibliography. The discussion on the process of adoption is brilliant and mobilizes different relevant tools. The author uses an expanse of literature sources and is able to have a look at QWERTY through complementary approaches. The general argument of the paper, which is aimed at grounding the theoretical reflections into a larger historical contextualisation is shown less convincingly by this article. To strengthen this claim, its clear and structured historical narrative would have to include an historical base, with references to original sources or historical literature. Otherwise, it misses a certain historical vividness and sometimes tends to be too theoretical and artificial.

Criticism appointed to these papers should not take away from their quality. They are precious tributes for a better understanding of the evolutionary character (life cycle) of standards and show that multidisciplinary methods by some unavoidable contingencies are frustrating, but are also the only way to address, with some expectable progress, complex phenomena.

Community Bargaining in the Field of Vehicle Safety

Marine Moguen-Toursel[1]

The case-study of negotiations for weights and dimensions of commercial vehicles

This paper follows the path of pioneering historical studies on technical standards, which showed how standards are irreversible and not always the most efficient on industrial grounds [David, 1985]. The case study we are dealing with reaches the same conclusions. This irreversibility explains that the stakes are particularly important for economic actors and can induce industrial battles.

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Since the 1960s, we have noticed a process of harmonisation of national standards between Member States of the European Economic Community. European Institutions are increasingly concerned with safety issues. They want to define new standards for cars and trucks in order to allow them to circulate on all European roads and to be safer. However, improvements are rather slow because various and sometimes opposing, interests are at stake. Nevertheless, an agreement is needed. In case no such agreement can be reached, it is necessary to identify 'Community roads'. These roads would be the only ones where all trucks allowed to circulate in Europe could operate, including the heaviest ones. A very difficult negotiation involving engineers of vehicle specifications and of road infrastructures would have to take place because numerous European roads are not able to sustain heavy trucks.
The Convention on road traffic established in Geneva[2] was the starting point for international attempts to draw a uniform rule for weights and dimensions for commercial vehicles. The rather general conclusion of the Convention became rapidly inoperative. The issue then became part of the Community statutory framework. A resolution was adopted by the European Conference of the Ministers of Transport in October 1960. Therefore, at the beginning of the 1960s, several documents were dealing with this issue. However, their prescriptions were notably different and none of them have been kept as a source of reference by all European countries. Later on, despite real attempts by the European Commission to see these negotiations reach an end, discussions were very difficult. Such slow improvements in the EU negotiation process called for further studies. For instance, what were the real stakes of these discussions? Why did the agreement between market players take so long to emerge?

Negotiation vehicle standard on the Community level: an overview of 1965 — 1992

In March 1962, the Council introduced an examination procedure and in advance of this, a consultancy by Member States concerning transport. The European Commission took these issues and discussed them within the framework of Community Institutions. Two groups of people were opposed: those in favour of 10 tons[3] by simple axle and those of 13 tons[4] by simple axle. Industrial battles were acute in the Council. The Council only foresaw a procedure of bilateral agreements between Member States for the circulation of vehicles in Europe. At its session on the 22nd of June 1965, the Commission impressed the need on the Council to speed up bilateral negotiations on solutions, which would make it (temporarily) possible to maintain the two systems in force for maximum axle load in international transport between Member States [European Commission, 1966]. Oppositions were so acute that later on

2 The Convention on road traffic was established in the framework of the Economic Commission for Europe of the United Nations (Working Party 29) on the 19th of September 1949.

3 This was the case for the Federal Republic of Germany and the Netherlands. When they became Members States of the European Communities, it was also the position defended by the United Kingdom, Denmark and Ireland.

4 This was in particular the axle load defended by France. Originally this limit was instituted because the most common carrying capacity was 10 tons. In order to carry these 10 tons, it was necessary to have a dead weight of 9 tons. The total weight reached 19 tons, which gave a weight on the front axle of 6 tons and a weight on the back axle of 13 tons. It was the most common truck in France. This standard was maintained on semi-trailers inherited from the United States after the Second World War, whereas other European countries preferred trailers. French truck producers, like Berliet, Saviem or Unic, specialized in the production of semi-trailers of 13 tons by simple axle (see [Grevet, 2005]).

no discussions were held on this issue in the Council between 1965 and 1970. During the 1970s, several new elements forced the European Commission to reopen the debate: the development of containers, the improvement of road building techniques and the AASHO tests.[5] The Six EEC Government's members suddenly wanted to agree on a position of principle by the end of 1971. The German position obtained support because the UK and Denmark joined the EEC in 1973. On the contrary, French negotiators, whom remained in favour of 13 tons, were isolated. In 1972, limited change did occur as Belgium and Spain chose to abandon their previous standard.

Considering the impossibility to reach an agreement on one of the two limit-values, the European Commission proposed 11.5 tons. The delegations from Belgium, Italy and Luxemburg were ready to agree on this compromise, but the German and Dutch delegations maintained their position in favour of a maximum weight of 10 tons. French negotiators in Brussels remained the only ones asking for an axle weight of 13 tons. A compromise was reached in 1972 between the six Member States: 11 tons by simple axle and 40 tons of total carrying capacity for trucks. Due to strong opposition from the three new members in 1973, in particular the British one, the compromise had to be put aside. The Council did not even agree on a posterior date to discuss this issue [Berliet Foundation, 1972]. Finally, the directive of the 24th of July 1986 introduced — from the 1st of January 1992 — the limit of 11.5 tons for driving axles, except for the UK and Ireland who temporarily maintained 10.5 tons.

This persistent uncertainty concerning truck specifications was problematic for haulage contractors as well as for car producers. Consequently, haulage contractors used vehicles that did not meet their needs and therefore, postponed the renewal of their cars; using for a while obsolete materials. Car producers' production expenses rose; induced by the modifications necessary for exported vehicles — depending on national legislations — as well as those induced by the non-existence of large series of production.

Technical, industrial and commercial stakes invoked in the negotiation process

Technical stakes

The main stake of the issue was to allow transport by road, following the general trend of an increase in the carrying capacity, which we notice in all modes of transport and which is necessary to reduce prices of production (through the development of large series). The European harmonization of weights and dimensions of commercial vehicles aims at reducing — and then suppressing — all obstacles to trade. Improvement of productivity and enlargement of export markets for the European automobile industry are closely linked to the

5 Americans were the first, at the beginning of the 1950s, to realize tests on the influence of axle loads on roads. The main conclusion is that the aggressiveness of axles rises exponentially (at the forth power) according to their weight. The European Commission establishes its policy on elements resulting from the AASHO tests. Nevertheless, principles and conclusions of this work are contested by some car producers. Paul Berliet indicates that they can not be transposed to the French case. He notices that they were built on a bad foundation voluntarily under-dimensioned in order to analyze destruction phenomena essentially due to pumping phenomenon (roads which are not treated against the frost). He refers to the Lahr tests produced in Germany, which show that on the contrary, the aggressiveness on roads has more to do with the frequency of circulation of axles than to their unity weights. MAN, well-known German truck builder, is opposed according to the same arguments to the use of AASHO tests in Europe.

elaboration of a common single market. It is particularly important for car producers who are selling 75% of their output in the framework of the EEC.
This harmonization also reduces the distortions of competition, since car makers who wish to export no longer have to adapt their output to national norms.

Industrial stakes

Freight prices partially depend on the weight and dimensions of trucks because cost by unity is noticeably reduced as the vehicle capacity increases. Therefore, the cost will be higher for haulage carriers in countries where more restrictive conditions in this field are imposed.
The differentiation between national standards limits the exchanges of cars and therefore can have an impact equivalent to that of a proper restriction. If, until the beginning of the 1960s these differences did not provoke real restrictions to trade, it is because national administrations adopted an open attitude towards this point. However, certain countries clearly expressed their intention to modify their attitude.
Car makers are able to produce vehicles of a total laden weight by far superior to the proposed limits (10 tons by simple axle and 16 tons by double one).
It is also technically possible to build roads able to support these trucks.
Moreover, improvements have been made in the suspension of vehicles, the conception of tyres and disposal of axles (axles said as 'non aggressive'), which tend to substantially reduce the deterioration of roads by heavy trucks.
In particular, the French preference for 13 tons was sustained by some good innovations by the French tyre industry. This industry had a comparative advantage over its competitors; it allowed an axle load of 13 tons on vehicles of small dimensions. Improvements were achieved during the 1950s through the generalisation of radial tyres. They represented a decisive step in the process of reducing rolling resistance for tyres. Tests made by Renault Véhicules Industriels in the late 1970s allowed them to evaluate the rolling resistance per ton per vehicle of 6 kg, which was remarkably low compared to the level twice as high for private cars [Bonnetain, 1980]. The Michelin Company expressed itself in favour of an axle load of 13 tons. Both Michelin and Dunlop became part of the ADPVI;[6] an association created in 1959 by Paul Berliet in favour of a European harmonization on 13 tons by simple axle. In addition to Berliet, Pegaso, Michelin, Marrel, Kléber-Colombes, Dunlop and Unic were members. This association was very active in establishing contacts with members of the European Commission, of the Economic and Social Committee and of the European Parliament. It also circulated pamphlets where it explained its argumentation. It engaged in every action for obtaining the non-acceptation of AASHO tests as the basis of European working groups.
The appraisal and development of container techniques, considered as the transport of the future and subjected to precise standards, bring together the

6 Association for the Development of the Productivity of Commercial Vehicles.

definition for heavier standards of commercial vehicles and the new needs induced by these techniques. The European Commission tried to draw up a first study of this issue, which in addition to its influence on weight and dimensions of vehicles, had repercussions on the building of bridges, infrastructures, communication roads and so on.

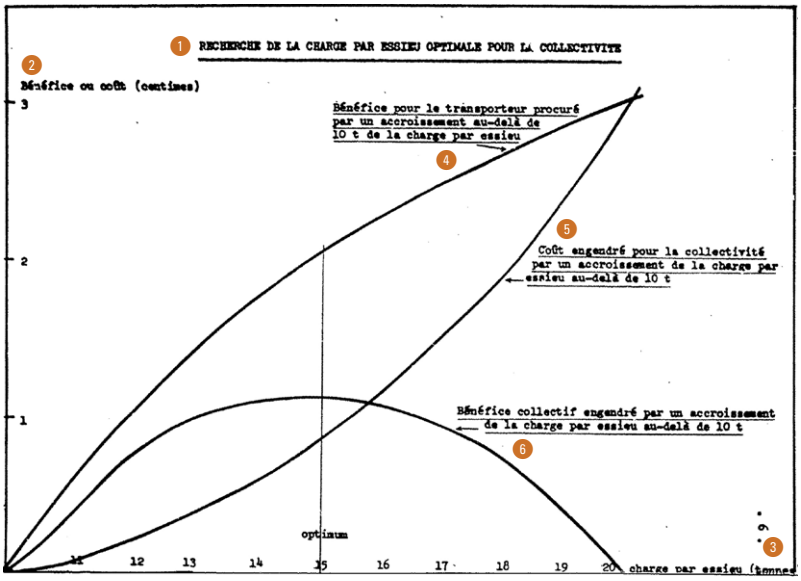

Figure 1
Harmonisation of weights and dimensions of commercial vehicles in the framework of the EEC, issued by the Liaison Committee of the automobile construction, October 11, 1969.
1 *Study of optimal axle load for the collectivity*
2 *Benefit or cost (cents)*
3 *Axle load (tons)*
4 *Benefit for the haulage contractor due to (or induced by) a rise of axle load above 10 tons*
5 *Cost for the collectivity due to (or induced by) a rise of axle load above 10 tons*
6 *Benefit for the collectivity due to (or induced by) a rise of axle load above 10 tons*

Commercial stakes

The balance of the forces in Europe was increasingly orientated towards a lighter axle load. Two conceptions were opposed: the French and the Italian granted particular attention to the profitability of road transport; meanwhile other Member States refused to raise infrastructure costs — which could be a consequence of the adoption of a heavier axle load — and wished to maintain a real balance between road transport and rail transport [Moguen-Toursel, 2007]. Additionally, relations with the American standards have to be considered. Was the final choice of a lighter axle load for trucks operating in the European Communities also induced by the desire of national governments to get in line with American standards on this issue, [Grevet, 2007] in particular allowing sales of trucks between Europe and the United States without adaptation of initial productions? Therefore, the evolution of discussions towards a lighter axle load would illustrate a growing influence of American positions on this matter. On the contrary, the adoption of a much heavier axle load could have been a way of protecting the European market from being overwhelmed by American trucks. In this respect, the wish of French manufacturers to adopt 13 tons by simple axle on a European level could be understood as a technical protectionism against the American standard of 8 tons by simple axle.

The main arguments in favour of 13 tons by axle:

- More profitable for haulage contractors due to the improvement of freight costs (ton/km of carrying capacity).
- More profitable for the collectivity: better trade exchange (better fluidity of traffic) and less pollution.
- Deteriorations on roads would be limited[7] and further reduced thanks to improvements made on the suspension of vehicles, conception of tyres and disposition of axle (axle qualified as 'non aggressive').
- The argument which limits the fears expressed by the partisans of 10 tons concerning the quicker deterioration of roads: 13 tons trucks are mainly used for long distance traffic, (just one type of traffic). Therefore, it noticeably reduces the percentage of use of these trucks compared to the whole trucks' traffic (for France: 5% in 1964).
- Better safety (better adherence of tyres, lower quantity of vehicles on roads, improvement of traffic conditions and reduction of risks of accidents).
- Less consumption of fuel.
- In case of withdrawal of trucks of 13 tons, there would be a commercial prejudice for car makers of this type of vehicles.
- Better competitiveness for transport by rail.
- Reduction of the number of axle for the same carrying capacity (volume of trade).

The main arguments in favour of 10 tons by axle are:

- More profitable for the collectivity: a heavier weight would be too aggressive for roads and bridges. There should be a strong raise of expenses dedicated to building, improvement and maintenance of roads, which might be unbearable for certain countries (Ireland, for instance) and would provoke too frequent reparations, which would constitute an obstacle to a growing exchange of trade.
- According to the AASHO tests, axle aggressiveness raises exponentially according to their weight. Road deterioration represents a very important element of the social marginal cost, foundation of the common system of rates fixation for use of infrastructures that the European Commission wanted to propose to the Council. There is no doubt that because of the tariff progressiveness induced by such a system, the economic advantages of 13 tons' trucks are loosing weight.[8]
- Reduction of risks of severe accidents.[9]
- Strategic reasons: because of the existence of a large consensus in favour of 10 or 11 tons, it is less difficult for the European Commission to reach a compromise on this base between European members.
- In case of withdrawal of 10 tons, it would be a commercial prejudice for car makers of these kinds of vehicles.

7 According to an enquiry made in the United States by the Board of Public Road, raising the axle weight from 8.2 to 10.9 tons, annual expenditures for the building of ordinary roads would raise from 0.7 to 1.2%, depending on the kind of roads and the density of the traffic, and the transports' costs would be reduced by about 25%.

8 The adoption of a heavier weight would provoke such a raise of taxes on vehicles that these latter, because of the imputation of infrastructures costs, would hardly be profitable.

9 The adoption of 13 tons, on the contrary, would provoke a deterioration of the traffic safety on roads while raising the number of accidents in which trucks are implicated as well as the gravity of these accidents.

Technical standards as tools for stimulating the European integration process

The wish of European Institutions to implement a common market on the Community level was a powerful factor of evolution; both in trying to abolish non tariff obstacles to trade between Member States (in particular through the harmonisation of national technical standards, the change of public markets' practices and the first attempts to liberalize industrial sectors) and to rely on a competition policy (through the reduction of State aids, a control of cartels in the European Union, and so on). The harmonisation of legislations is one of the fields conferred to European Institutions through the Treaty of Rome; as a tool for establishing the common market and allowing its well functioning. The Treaty of Rome stipulates that legislations have to be harmonised, but without precisely defining this harmonisation. We can easily imagine that this policy harmonisation has to answer to the needs of economic integration (elimination of obstacles to the free circulation of goods, services, capitals and people, as well as the establishment of a free competition followed by the creation of an adapted legal framework) whilst not ignoring the necessary attempts to reach such an integration [European Commission, 1971].
A technical world harmonisation is a key element of the reinforcement of the competition of the European automobile industry in the world. The European Union and its Member States have always been first rank in international attempts for reaching a harmonisation, while sustaining actively the studies realised in the framework of the Economic Commission for Europe of the United Nations (UNECE) agreement of 1958; focusing on an international technical harmonisation for road vehicles.
The judgement given on the 20th of February 1979 by the European Court of Justice on the Cassis de Dijon allows, in some cases, substituting mutual recognition of national legislations to their harmonisation. This latter, being strongly paralysed by the ruling unanimity in the European Council. Between 1981 and 1984, the European Commission defended a gradual improvement programme of the interior market, which produced the White Book in 1985 and the achievement of the European market in 1992. With the Single Act in 1987, the Commission obtains that Council decisions concerning the regulatory and technical European harmonisation must be decided by a majority ruling and no longer by a unanimity ruling. The obstacle represented by national technical standards is therefore, progressively put aside by improvements made by the European Commission [Defraigne, 2007].

This story is more about the construction of the European identity by the way of technical standardisation than a story of economic or technical conflict. Can we conclude that cars produced in the European Union correspond to common

standards; achieved by a technical harmonization between Member States, concerning issues such as weights and dimensions of commercial vehicles, vehicles safety, their energy consumption and their noise emissions? Have we produced a 'proper' European car, which is safer and cleaner? If this is the case, could it be proof of European integration or did national standards remain predominant?

For the production of vehicles, it is possible to speak of a harmonisation from one country to another. It is the same case for safety issues and for environmental issues. This could definitely be considered an improvement in European integration, since it is one angular stone in the achievement of a common market. Nevertheless, improvements have always been very slow and even chaotic. Adjustments of the Community decision process have been necessary for avoiding ignoring oppositions, especially national ones in the framework of the Council.

Conclusion: Constructing a European identity by means of technical standardisation?

As a conclusion, we can explain the progressive slip of Community negotiations (first centred on 13 tons then on 10 tons by axle) by the unwillingness to give commercial vehicles the dimensions, which could allow them to be too profitable, compared to transport by rail. It also can be put down to an authentic failure of the consideration of French interests on the European level. Other European countries were building vehicles, which generally fitted future European standards; this was far from being the case for French car makers. If the latter more or less succeeded in being heard up until 1973, the membership of new countries in favour of a lower weight by axle modified the situation. Two groups were opposed: the French and the Italians paid special attention to the profitability of roads. Meanwhile, other member countries refused the high costs of road systems and wished to maintain a real balance between transport by road and by rail.

Additionally, the relations to American standards must not be ignored. The prevalent personalities on this issue were German negotiators who for several years were opposed to the industrialists in their own country, while trying to impose standards closer to American ones. German ministers in charge of these safety and environment issues are characterized during the period studied, by a strong favour for the protection of the environment and a wish to introduce a new balance between rail and road (where rail was favoured). On a more general level, this process of harmonisation of national technical

standards for road transport was an important step towards the achievement of a real common market within the framework of the European Union.

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Standardising Early Broadcasting in Europe: A Form of Regulation

Nina Wormbs[1]

This paper focuses on arguing and bargaining as it looks at standardisation as a form of rule setting and regulation. The case focuses on the regulation of broadcasting in Europe. The paper is divided into two parts. The first part is a historical case and focuses on the so called Geneva plan — put into operation in 1926 — and the procedures leading up to the formulation and acceptance of the plan. The standard-based organisation Union Internationale de Radiophonie (UIR) is showed to be essential both to rule making and adherence. The second part points to some lessons learnt from participant observation at the Regional Radiocommunication Conference in Geneva 2006 and makes a methodological argument about looking at negotiation processes historically.

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Introduction

Genève, October 10, 1925

Dear Mr Lemoine,
Following the receipt of your telegram we telegraphed the Hungarian Dept. of Postes and Telegraphes asking them to lift the Budapest wavelength to at least 555 metres which will give that station 10 kilocycles separation from Sundsvall. [a city in mid Sweden, 62.5 degrees North.]
Owing to a harmonic from Geneva (which is working on 1,100 metres) it is practically impossible for me to tell exactly what is happening in the 550 zone, but I have a suspicion that the trouble may be coming from Milan and not from Hungary. Although my records show that Milan is due to work at 308 metres, I have heard that she is actually experimenting round about 545. If the Hungarians disclaim working on or near 545 I will telegraph to Milan. In any case I hope to be in that city today week as I am taking a week's holiday in Northern Italy.
Wishing you a pleasant journey home.
Yours sincerely,

A.R. Burrows[2]

Mr Burrows was head of the newly established Office International de Radiophonie (OIR) in Geneva. The Office functioned as a focal point for information exchange on the workings of the broadcasting transmitters in Europe in the 1920s. As seen from the above note to the Swedish engineer Siffer Lemoine (a suitable first name for one dealing with frequencies one might think — Siffer no doubt derived from the French 'chiffre' — figure), every transmitter did not operate according to agreement. Burrows writes: *"Although my records show that Milan is due to work at 308 metres, I have heard that she is actually experimenting round about 545. If the Hungarians disclaim working on or near 545 I will telegraph to Milan."* Clearly the Italians were up to some mischief, which had to be corrected if the Swedish transmitter was going to have the expected reach without interference. At the same time, Borrows' note shows us that he was not actually able to check what the Italians were doing, since his equipment was not sufficient to do so. This illustrates an interesting tension, which raises questions on the authority and legitimacy of agreed-upon rules. How did the European countries agree on the rules for broadcasting and how were these rules upheld?

The underlying understanding of standardisation in this paper is that standards are a form of regulation. This is a view behind much of the research on standards by Nils Brunsson, Bengt Jacobsson et al. *"To regulate is [...] to*

2 Letter from OIR [Office International de Radiophonie]. Burrows to STA [Swedish Telecom Administration]. Lemoine 10/10 1925. Radiobyrån, FVIIIa.II. STA Archives.

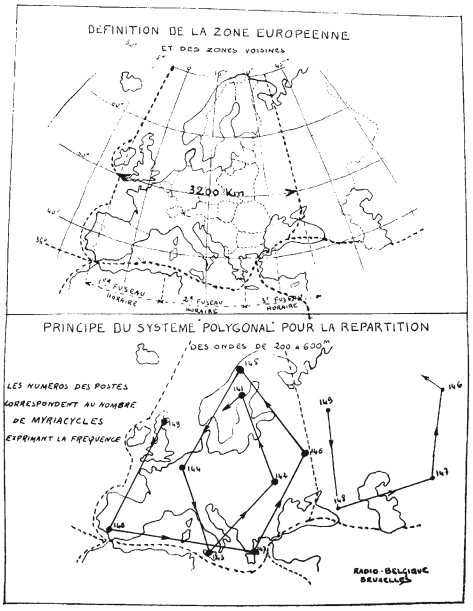

Figure 1
Definition of the European zone. Source: UIR Archive.

create and propagate rules", which is not a limited and simple business but rather to be viewed as "a form of organized governance." [Brunsson and Jacobsson, 2000, p. 10f]. Rules can have different forms and standards are just one form of rules.[3] This definition is not uncontested. However, as part of a discussion on negotiations, it proves functional.

This paper wants to explore the establishment of procedures and rules for broadcasting in Europe in the mid 1920s. Broadcasting was a hugely popular cultural technology; attributed with all sorts of promises, above all for a more peaceful world where everybody would understand each other. However, it almost immediately encountered severe problems as interference was concerned [Briggs, 1961]. Not only did radio communication between ships disturb broadcasting with their spark signals interfering with a broad band of the spectrum. Perhaps more importantly, national transmitters sending programmes primarily aimed at a specific area or country, would disturb each other and make listening less enjoyable, hard or at times even impossible due to high interference (this was especially true at night when middle-wave had a longer reach.). As more and more radio stations were established, the need to agree on the use of the radio spectrum became acute.

The forming of the International Broadcasting Union was a way of trying to solve the chaos in the European ether. By way of organisation, standardisation or rulemaking could be achieved [Ahrne et al, 2000]. The organisation of broadcasting was a prerequisite to forming rules. However, the adherence to rules was essentially important and thus, we need to find out how authority and legitimacy were established. The organisation and establishment of the Union is believed to be crucial in this respect. Moreover, the Union, the Office

3 Brunsson and Jacobsson also mention norms and directives as two other types of rules [Brunsson and Jacobsson, 2000, p. 12].

and its members must be seen in a wider context. Not only was the Union in no way omnipotent; to begin with, the agreements had to be ratified by the national Governments, which of course had other considerations to take into account. It also worked in a 'historically specific situation' with struggles for power persisting on the official political arena. Last but not least, the rules were made by people who can be expected to not only be driven by an altruistic idea of broadcasting, but also to have personal agendas, preferences and modus operandi.

Organizing for rule making and adherence

When broadcasting as a phenomenon reached Europe in the early 1920s, there was no international agreement on the use of the frequencies for the service, since it was new.[4] There were institutions pertaining to wireless — as was the term frequently used — such as the International Radiotelegraph Union, but the conventions were of limited bearing on broadcasting.[5] When broadcasters spread over the continents, they used the frequencies that seemed available and which served the interest of the broadcaster [International Union of Broadcasting Organisations, 1926, p. 8].

Very soon, interference was appreciated as being one of the biggest problems for broadcasting. At a meeting in Geneva in April 1925, the International Broadcasting Union was constituted, or Union Internationale de Radiophonie (UIR) as it more often was called [International Union of Broadcasting Organisations, 1926].

A Council of nine members meeting four times a year would direct the Union and the Assembly would meet at least once a year. Admiral Carpendale, from the BBC, was elected president of the Assembly with vice presidents from Germany and France. A permanent Office was established with a former BBC director of programmes as its new director.[6] The UIR would establish connections between European broadcasting companies — and in the future also those in other continents — and would defend the interests of these companies and work for the growth of broadcasting. However, the 'most urgent problem' was the allocation of wavelengths [International Union of Broadcasting Organisations, 1926, p. 15].

The Office summoned engineers from 14 European countries who met at the League of Nations in Geneva early July 1925.[7] Captain Eckersley, chief engineer at the BBC was appointed chair and proposed that only the wavelengths between 200 and 600 meters should be considered and that stations in operation for a long time should suffer the least from a new agreement. Following a discussion, work on a plan was referred to a sub-committee.[8]

Information from the delegates showed that no less than 126 stations of which

4 The technology was, however, not new, only the use of it. See further the convincing argument for the social construction of broadcasting in [Douglas, 1987].

5 See [Codding, 1952]. Codding is still the standard reference on what would in 1932 become the International Telecommunication Union (ITU).

6 See [International Union of Broadcasting Organisations, 1926, pp. 12-14]. Pamphlet UIR archives. The founding members were companies from Austria, Belgium, Czechoslovakia, France, Germany, Great Britain, the Netherlands, Norway, Spain and Switzerland. At the second assembly in March 1926 companies from the following countries formally entered: Denmark, Hungary, Italy, Sweden and Yugoslavia. See [International Union of Broadcasting Organisations, 1926, pp. 65-72]. The first non-European companies were allowed to enter in 1927.

7 Hence the League was not involved in the conference, even though it had an Organisation for Communications and Transit since 1920, the chairman of which however, stressed the importance of the work of the UIR in an opening address at the meeting. First sitting, UIR European Conference of Broadcasting Engineers. 6 July 1925 [hereafter 1st sitting July]. p. 1. STA Archives. Radiobyrån 1916-1967, F VIII a:II Internationella rundradioärenden 1925. For the workings of the Organisation for Communications and Transit, see Frank Schipper, Vincent Lagendijk and Irene Anastasiadou [Schipper et al, 2007].

8 1st sitting July. pp. 5-6.

38 were projected.[9] The sub-committee proposed that the new plan should be rehearsed and evaluated so that every country should have a calibrated wave meter and that one country should transmit calibrated signals in order to *"establish a standard measure for broadcasting."*.[10]

In the recommendation adopted by the conference, 'a set of rules' were suggested: action should be taken against transmitters, which produced harmonics deviating from the transmission wavelength, permits should not be granted to a station deviating more than 0.33 1/3 percent from its wavelength, stations with a power exceeding 2 kW should not be placed closer to other stations than 1500 km and 10 kHz, amateurs should not be allowed to transmit unless they could show *"thorough scientific knowledge and enough technical skill"* that they could operate their equipment and finally that no new spark or arc system would be taken into operation. Furthermore, a definition of transmission power was agreed upon.[11]

In September, the engineering conference convened again and work was referred to a technical commission, which had roughly the same composition as the preceding sub-committee.[12] The final agreement was that four factors should be considered in the new plan, namely: priority of length of existence, population of the country, area of the country and necessity of duplicating due to language difficulties.[13] The first three factors were straight forward and eventually considered. Based on these a formula was suggested by which every country's share of the spectrum could be calculated.[14]

In the case of Great Britain, the area was 229.800 km^2, the population was 43.57 million and the priority i.e. the number of stations in operation on the 1st July 1925 was 20. However, depending on how large Europe was made i.e. how many countries one should include, the index for each term could be calculated. If Europe consisted of Great Britain, France, Germany, Italy, Sweden, Norway, Finland, Belgium, Holland, Switzerland, Spain, Czechoslovakia, Austria, Hungary and Ireland the indices would be 6.08 + 16.12 + 23.53. This sum divided by 3 gave the percentage of the total number of stations that Great Britain was entitled to, namely 15.24. If, on the other hand Denmark, Latvia, Estonia, Lithuania, Poland and Romania were included, Great Britain would be entitled to 13.12 percent of the total number of stations.[15]

In the final formula adopted by the Council in December, priority was replaced with the 'economic development of the country', calculated as the telegraphic and telephonic traffic of the country, as shown in international statistics.[16] Furthermore, in order to get a more sustainable plan, the original idea of exclusive wavelengths was abandoned and the existing wavelengths were divided into exclusive and common wavelengths. A station with an exclusive wavelength had unconditional right to that wavelength, whereas several different stations would be allowed to broadcast on common wavelengths. If every country was given at least one exclusive wavelength, the expected growth of

9 4th sitting July. p. 1.

10 3rd sitting July. pp. 1-5. 4th sitting July. pp. 1-2. Cf Siffer Lemoine. Från radiokonferensen i Genève. Tekniska Meddelanden från Kungl. Telegrafstyrelsen [From the radio conference in Geneva, Technical Notice from the Royal Board of Telegraphy].1925. r. 7. p. 55.

11 4th sitting July. p. 2. Serien Nr 22. Resolutioner av den i Genève i juli 1925 hållna europeiska [...] [Resolutions from the European conference in Geneva — Swedish translation of a document originally in French and English]. Radiobyrån 1916-1967, F VIII a:II. Cf Lemoine. 1925. pp. 55-56. The recommendation was to be communicated to the member nations via the League of Nations' Organisation for Communication and Transit.

12 1st sitting September. pp. 2-7.

13 3rd sitting September.

14 P.M. concerning new distribution of broadcasting wavelengths in Europe, F VIII a: II.

15 Tables In Geneva represented countries. July 1925 'and' All countries in Europe, F VIII a:II. A hand note reveals that leaving Denmark out the first time was a slip of the hand. The first figure was the percentage of the area of Great Britain to the Europe in consideration, the second figure the percentage of the population of Great Britain to the Europe considered and the third figure the percentage of the stations of priority to the number of European stations of priority.

16 Note on the proposed plan for the allocation of Wavelengths between the European Broadcasting Stations working on Waves between 200 m. and 600 m. 12/12 1925, UIR Archives, box 94.

stations would be handled with the common wavelengths.
The plan was proposed to the Council in March 1926, was accepted by the Council at a meeting in Paris in July 1926 and put into operation in November.[17]

Discussion of the historical case

An initial question for a discussion on rules for frequency allocations might be: why? In this case, it is clear that enough people perceived that there was a great need for rules; as the present situation did not function well. Those setting out to form these rules were those engaged in broadcasting and hence well informed with what needed to be done.[18]

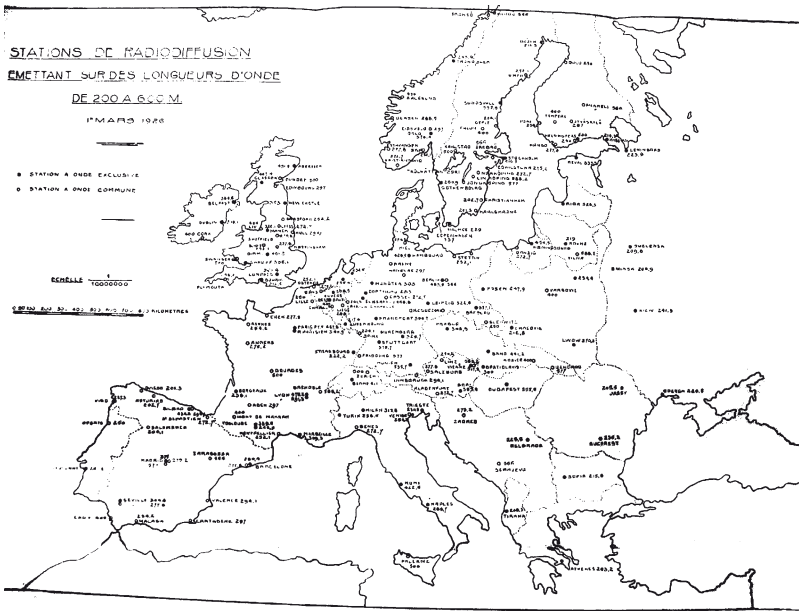

Figure 2
Plan for radio diffusion stations in Europe in march 1926. Source: UIR Archive.

An organisation formed in order to formulate and propagate rules, within the organisation can be regarded as a 'standard-based organisation' according to the terminology of Ahrne, Brunsson and Garsten [Ahrne et al, 2000, pp. 50-51]. This is clearly the case with UIR. By forming an organisation, standards voluntary for anybody would be made mandatory for the members. Since the recommendations were adopted by Council members they were also expected to follow them. The idea of a standard-based organisation is also that it can control or at least facilitate adoption and adherence to standards. However, as we have seen, facilities for control were lacking and poor adherence might have been caused by poor technology. In any case, organisation facilitated

17 Lemoine. 1926. p. 78.

18 It should be noted that these were not the same people as those responsible for radio in general. The relation between the new organisation and the existing one has not been explored here, but it seems as though this division worked sufficiently well.

communication between the members, in this case through the Office.
It is also clear that negotiation of the rules was essential. The Norwegian delegation stressed that an agreement, which not everyone would feel inclined to follow, would be of little use. In some matters, rules were easily agreed upon, such as how to define transmitting power or that wavelengths must be calibrated. Others demanded extensive negotiation, like the formula for allocating exclusive wavelengths.
In conclusion, the organisation of UIR not only made it possible to agree on mutual rules for broadcasting, but due to easier communication, the possibilities open for propagating and keeping the rules were increased. However, there is yet another dimension to this rulemaking — largely overlooked by the framework of the social scientists Ahrne, Brunsson and Garsten — and that is historical specificity.
The hypothesis of a larger study on regulating broadcasting is that the political situation in Europe affected the use and regulation of the spectrum.[19] In the above case, Great Britain had a large influence, being viewed as a forerunner or perhaps even an imperial power in broadcasting issues. A number of delegates paid their tribute to the BBC at the first meetings. Furthermore, the appointment of Carpendale as first president of the Council and Eckersley as chairman of the engineering conferences supports this. In the late 1940s and early 1950s, the role of Great Britain was not as salient, when discussions on regulating broadcasting on the VHF-band were at hand. Additionally, as we know, the geopolitical power of Great Britain had also changed at this point. The argument here is that we need to take this context into account when we are studying what might be believed to be 'mere' technical matters.

A contemporary case and methodological remark

During the 20th century, the successor to UIR convened on a number of times to regulate spectrum use for broadcasting. In 2006, the International Telecommunications Union met for the Regional Radiocommunication Conference. Here the aim was to make a plan for digital terrestrial TV and to limit the use and protection of analogue transmissions in time. These two conferences were separated by 80 years and the world looks different. Let us look at one example from the plenary meeting on the 6th of June.
At this plenary meeting all delegations are present and the status of the meeting is high. Interpreters are available and the chairman of the conference is the chairman of the meeting. We enter when some committee work is being reported and some documents are to be approved. In between two documents the delegate of the Syrian Arab Republic asks what the status is of the analogue television assignments for Palestine. The representative of the Radio

19 To some extent this is already known, for example through transmitters for jamming during the war or for propaganda during and after the war. The east-west divide following WWII also had a great effect on UIR as the eastern block formed a new organisation. UIR eventually had to re-organise itself into the European Broadcasting Union. See further [Wallenborn, 1978].

Bureau says that they had not been taken into account, since the Palestinian assignments did not fit into any of the categories, which were to be dealt with at the conference. The Syrian delegate did not accept this interpretation. Two years ago, it had been decided that the Palestinian assignment should be considered. The Chairman of the conference proposed that the Legal Adviser should be asked for his opinion and the representative of the Bureau agreed. A bit later the delegate from France is appointed to head a coordinating group consisting of Cyprus, Egypt, Israel, Jordan, the Syrian Arab Republic, Turkey and Palestine. The delegate from Syria did not think this was acceptable. The Chairman of the conference says that it was his idea to try and resolve problems with those countries who did not have satisfactory results. He says that he thought that his proposal would be welcomed and that it should not be rejected. The chairman states that he, himself, will assist in mediating in the group. Lastly, the French delegate points out that he has not offered his help, but is willing to assist if need be.[20]

Being present I had the possibility of comparing the minutes with my own memory and notes. It was clear that not only were the statements edited, but a lot of other information was emitted. The Syrian delegate, for example, not only rejected the interpretation, he clearly stated that the frequencies needed protection and he said very distinctly *"They are there. They belong to the people of Palestine."* The minutes do of course not show the posture or the intonation of the Syrian delegate.

As a participant observer, one realises how much information gets 'lost' when meetings are turned into proceedings or agreements; when experiences of encounters and negotiations are turned into reports and memories [Thedvall, 2006].

Conclusion

Like both Tineke Egyedi and Henk de Vries have stated in their papers, I believe that negotiation and standardisation processes should be studied by different disciplines that can learn from each other. As an historian, I find my own discipline to have a given place in standardisation processes since historic specificity is of essential importance. However, I also propose that historians may look towards sociologists and anthropologists, who with their methods and study material can point to things we might miss. Our material and methods (as historians) leave us with unanswered questions. To end with here are just a few examples: How does one understand the fast spread of the rumour that one of the iterations had run old figures for two nations, which everyone seemed to have heard, despite it being posted nowhere? Or what should one make of the fact that the same delegate makes statements in

20 Minutes of the Thirteenth plenary meeting, 6/6 2006. RRC-06, Document 159-E, ITU.

different languages in the same session? This is not shown in the minutes, but it should be assumed that it has a meaning. Or finally, what role does the football game have that is played at lunch at the UN on Tuesdays?

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A View from the History of Technology

Reflection

Kai Jakobs[1]

Bargaining norms — Arguing standards: historical cases

A word of warning from the commentator: for someone with an engineering/computer science background, professional contact with historians may be a bit unsettling. This is probably because the views and perceptions underlying our respective research work and the resulting goals are rather different. But let's see.

One of the most interesting — and challenging — aspects of research into standards and standardisation is its inherent multi-disciplinary character. For whatever reason, prior to the workshop 'Bargaining Norms — Arguing Standards' my (professional) exposure to historians had been fairly limited, to put it mildly. So, in some respect the workshop was an eye-opener; yes, there are quite a few historians out there with at least some interest in standards (setting) and yes, they can contribute very interesting studies to the field. I was especially pleased with the fact that studies of the standardisation of ICT systems (my own area of expertise) were particularly well represented (and very interesting).

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In the fast moving world of telecommunication, the 1960s is almost pre-history (they certainly are pre-internet, which very much amounts to the same thing for the average computer scientist) let alone the 1920s. Yet, the two papers, whose topics are mainly set in these periods, are addressing aspects that remain highly relevant till this day — the role and importance of the individual in standardisation, and the process' legitimacy. After all, standards are still developed by individuals, who may or may not feel inclined to represent their respective sponsor, employer or home country in the process; and who may or may not have their own agenda. What is more, with the increasing importance of ICT in our daily lives, the aspect of a standard's 'legitimacy' is probably even more important today than it was in the 1920s. Specifically, the emerging 'Internet of Things' with the resulting virtual ubiquity of ICT will add a whole new dimension to this aspect.

The pace of development in the transport sector is not as breath-taking as it is in the ICT sector. Thus, the fact that variations on problems that were discussed in the 1950s are still relevant today, may be less of a surprise here. Nonetheless, I was quite astonished to realise that the issue of axle-weight that caused so many problems for many decades during the last century is re-emerging in the context of the discussion on the pros and cons of allowing road trains (or Gigaliners, as they are called in Germany) on the European public road network.

In my opinion, all historical papers are most timely. Moreover, they show that it is clearly not correct to think that in (high) technology there are no lessons to be learned from history.[2]

This is precisely the point where my worries start. The historical papers as well as most other workshop papers, do have lessons to teach today's engineers, standards developers and policy makers. I don't know if they listened (and do have some doubts here), but in my humble opinion the really frustrating thing is that those who know, don't seem to be interested in teaching them. That is to say, the papers offer a wealth of information, but they stay clear of any conclusions and even suggestions or proposals on how lessons from the past could be put to good use today. I very much appreciate that it may be, at least, dangerous — if not outright foolish — to try and directly transpose (possible) solutions from the past onto the present. The respective boundary conditions are too different, as are the value systems, the belief systems and indeed the language (and probably many other aspects as well). Blame my engineering background (which tends to lead to tunnel vision), but despite these insights I believe that research findings should at least be potentially useful for today's world. Thus, I would like to urge authors to take a step into this direction by not largely limiting themselves to providing an account of what happened, but to also address the question 'why did it happen in this way?' To sum up: historians contribute their knowledge, insights and analyses of past events and

2 I recently attended a workshop where a panellist said something along the lines of "If we want to shape the future we must forget the past." I believe he was serious ...

standards developers, policy makers and (social) scientists extract potential lessons for future policies and actions. This provides a whole new and exciting field for co-operation.

To conclude, I would like to get back to the papers and list some questions that occurred to me; where I feel the answers could have ramifications for the future. They might be addressed by combining insights from the historical case studies presented and those from other disciplines:

- How did the BBC — then a private company — manage to obtain the legitimacy (and authority) to move in a position where they could lead the allocation of frequency bands (which are more or less public goods)? Why could small countries, like Norway and Sweden make their voices heard the way they did (i.e. punch well above their weight)?
- Was the informal 'engineer network' good or bad for ITU's activities (and for frequency allocation)? What can policy makers and standards bodies do to respectively support or prevent the emergence of such networks?
- What could be done to align environmental concerns and economic considerations in seemingly purely technical questions? Which form of 'mediation' (e.g. through science, public opinion, etc) could help (if any, that is)?

Interview with Hans Borgonjen, vts Police, Odijk

Fighting for one European Standard

Judith Schueler[1, 2]

Hans Borgonjen worked for years on the realisation of two goals for international communications between the police, the ambulance services and the fire service.
In 1985, the ministers of the Schengen countries agreed that a long term solution for cross border communication had to be created; laid down in Article 44 of the Schengen Agreement. Various national authorities and companies started negotiations in order to elaborate on the agreements. There were two objectives: a harmonised frequency band and a European standard for trans-national digital radio communications. Borgonjen participated in these consultations as a representative for the Dutch Public Safety; as head of the knowledge and innovation centre; a sub-division of ISC (now called vts Police Netherlands). In the Netherlands, these agreements have led to the development of the 'C2000 system' and in Belgium, for instance, to 'Astrid.' Recently, Germany also decided to adopt the standard and other countries outside the European Union also appear to be interested in its development.

1 STT, The Hague, the Netherlands.

2 This interview was held to allow the interviewee to express his experiences and ideas.

In the eyes of his colleagues, Borgonjen is more or less a property developer: *"A property developer starts with nothing — maybe with a rough plan — and then starts to organise things in order to put the plan into effect; in the later stage the construction is delegated to someone else."* When asked to describe himself, he uses the words idealist and realist. He aspired to achieve the best that was possible by keeping a clear focal point in mind; an ideal image. Developing the Terrestrial Trunked Radio (Tetra) standard brought the ideal of a better European cooperation for public order and safety by way of radio communications nearer. He still believes that the common good of harmonised frequencies is underestimated, but does feel that the importance of this has become more obvious. Eventually, the harmonised frequency of 380-400 MHz for Public Safety in Europe was accepted; the Tetra standard could never have been built without this frequency. This band is now also in use for Public Safety outside of Europe.

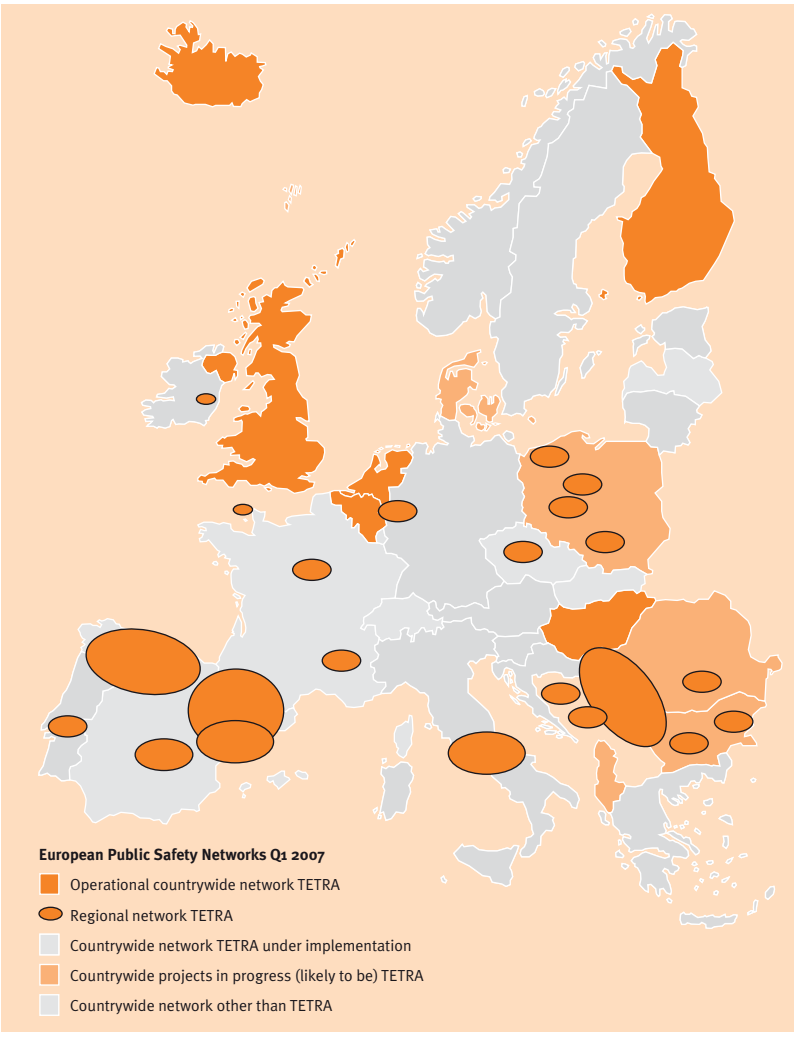

Figure 1
European Public Safety Networks Q1 2007.

Interests and trust

Formal and informal steps succeeded each other. The formal steps consisted of, for example, the discussion and processing of official documents; the stock-taking of user parties' needs and requirements; assessment by the industry and presence at meetings. The informal steps took many different forms; both before and during the meetings. A talk at the bar in the evening or during lunch served to smooth out small bottlenecks or aided the parties in being able to make decisions, which would stimulate progress within the formal meetings. In addition, sometimes this setting allowed alliances to be forged prior to the formal meetings. *"Sometimes one might almost call it conspiring."* During these informal meetings, they discussed the various positions and strategies. For example, deals were made with one another so that parties knew on which support they could mutually count on *"When you contribute this point and your minister writes such a letter, we will take the other point and our minister will write that letter."* Therefore, some user parties presented themselves as a united front during the meetings. government parties expressed solidarity, because they had exactly the same interests. *"Police and Public Order in Finland or England does not differ that much from that in the Netherlands."*

This resulted in users having the power to impose certain wishes and requirements. This was very important, because they were the ones who were going to use the services. The industrial parties tried [in this way] to keep their ears to the ground. The government national representatives were both the future users and the future buyers. *"One does not easily treat these with contempt, which helped."* Another overriding factor in the negotiations was the Schengen Agreement. Forthcoming from this agreement was the demand or desire to harmonise the various national services. Therefore, it became politically necessary to come to a mutual solution. *"These backgrounds and relations made a vast difference."* *"Should we have sat there as mere political policy officials and they had thought: 'All right, but when this party is over, we are going to do business with other people,' then things would not have run so smoothly. We now played a double role which was ideal."*

All major suppliers contributed their input, such as Nokia, Motorola, Ericsson, Rohde & Schwarz and Marconi. They each developed their own plans and by doing so left their mark on the process and outcome. Some companies already had a product, which appeared to fit the model; this was then proposed. *"In the early days, when Nokia proposed something, Motorola was against it, because this would have meant that Nokia had a lead and vice versa."* In conclusion, they were all there to enhance their own interests. In addition, they all

wanted to give the impression that the client was of paramount importance, so that they often bowed to the proposals during the meetings and decided on something else later on.

The interests of governments and companies sometimes clashed, which caused stagnation. In particular, the French government officials strongly favoured their own industry. Before the negotiations on a European standard started, France had its own system; the French government and industry had already invested in it. This explains why the French stimulated the Tetrapol Technique as a standard for Europe. *"These conflicts of interests were so apparent that everybody was aware of them and that made it less problematic."*

The German representative also made a case for the interest of the German company Bosch, the 'home' supplier of communication equipment for the Public Safety services in Germany. This led Germany to plead for the Tetra 6 Standard, whereas the majority of the government parties advocated for the Tetra 25 -called after the 25 kHz band of the frequency. The confidence in the Germans took a blow in the period of the Tetra 6 versus the Tetra 25 debate. When the German representative went into retirement, the situation changed. According to Borgonjen, this shows how these types of activities are interwoven with personal, national and industrial interests. It was a battle between one technology solution and another. Sometimes, the parties involved wrongfully suspected a conflict of interests. For example, someone once expressed the suspicion that Borgonjen preferred the Tetra Standard to Tetrapol, because the Dutch company Philips allegedly would profit from it — even though Philips was not even involved *"I then thought: 'So, that is how they see this.'"*

The government parties had strong confidence in one another; in particular, the relations between the Belgians, the English and the Dutch were good. This mutual trust turned out to be an essential aspect throughout the process. The best strategy was to show in a friendly but consistent way that four or five countries had the same wish. This was then substantiated by, for example, a formal letter from the ministry. The representatives could influence the process at the right moment by having the authorities underscore the importance of a speedy solution. As a coalition of governmental parties, they mutually agreed on how to play the game. It was interesting that the industrial parties also asked for these kinds of letters, because they could be used as legitimisation towards their superiors. The same applied to the supporters of the project from the European Commission, who had to prove that the project had the support of the national governments in order to push through decisions at a European level.

Support

The excellent mutual relations among Dutch representatives was shown during the General Assembly on the French Tetrapol proposal. Tetrapol was not an open standard; the French wanted to get this 'label' as an official recognition and to be on the same level as Tetra. The European Telecommunications and Standardisation Institute (ETSI) had a procedure, which made it possible for 'supplier solutions' to be adopted as a standard: the PAS (Public Available Specification) procedure. Tetrapol started this procedure so that it could still qualify as such. If their application would be adopted then there would be two standards in Europe. During this meeting there was a lot at stake for the Tetra Association that was striving for one standard in Europe — the Tetra Standard. The agenda had to be well planned and timed because everybody had something to say. *"The evening beforehand, we had made a scheme of the speakers. Before I was due to make my contribution, a Frenchman was going to present untruths about Tetrapol and Tetra. I then faced the choice of telling the story, which we had agreed upon or to reply to the Frenchman."* Borgonjen chose the latter, when his speaking time was up, but his argument not yet finished, the Dutch representative of Telecom rose and said he would give up his allotted speaking time in favour of Borgonjen finishing his argument. *"That was great."* The Tetrapol proposal perished during that meeting.

The Dutch position's big advantage was that the regulations are close to that of the Dutch Home Office (Ministerie van Binnenlandse Zaken). ISC, in name of the Home Office is administrator of the Public Safety radio frequencies, just like the armed forces. This means that they are also members of the National Frequency Committee and therefore, know the Ministry of Telecom well. In most other countries, the situation is different; there is a gap between the Public Safety organisation and the government as legislator. In all the years, the cooperation between the Dutch parties has been harmonious. The policy officers at the Home Office supported the course — determined by the content — with the technical standard as the main issue. *"It was also the case that I only had to raise the alarm and the necessary action was taken."* At the same time, Borgonjen was prepared to provide information, when the Minister had to report to the Lower House of Parliament; a mutual productive cooperation.

Perseverance

Another important factor was the stable nature of the individuals within the group. Borgonjen considers it a great advantage that his organisation allowed him to continue to work on the standard, even when his function had changed. It was difficult to introduce new people to the process. They had an information arrears and no commitment (as yet) to the process. *"It was not yet their baby."* Contrary to Germany, where new people entered the ring all

the time, the stable factors remained the English, the Belgians and the Dutch representatives. This continuity was essential. *"One also needs a passionate 'fool', like me, who is able and willing to persevere for years."* Some of his colleagues did not understand why he clung to the standard and what was in it for him. In particular, because it took so long before concrete results were achieved. Perseverance and confidence in the final result were necessary character traits.

Looking back, Borgonjen thinks that the process could have been completed earlier, if they had not needed to fight against Tetrapol. At the same time, that may have been the secret behind the success of the Tetra Standard. The 'mutual enemy' led to an alliance of forces within the Tetra community. *"I sometimes wonder, looking back, if the results might have been worse if Tetrapol had not existed."* The mutual subtle differences in the community became of minor importance compared to the common aim of preventing the existence of two standards in this relatively small niche market.

Except for France, the Czech Republic and part of Spain, all countries from the European Union have adopted the Tetra Standard. All these countries, including the Tetrapol countries, use the same frequency. The two objectives have therefore, been obtained. *"We strove for a European standard and we wanted a harmonised frequency band; the latter has been 100% successful — actually more than 100%, because it has also become a de facto standard outside of Europe. The Tetra Standard in Europe has — with a few exceptions — also been accomplished."* Although it has taken a relatively long time, it can be seen as a successful project, according to Borgonjen.

A disadvantage of the lengthy process is that telecommunications techniques develop very quickly. When the negotiations on Tetra started, GSM hardly existed. TNO had done research, as well as institutes in other countries. It was expected that the commercial market would grow and that the Tetra market would remain a niche. This is why it was so important to achieve one standard; nobody would benefit from a fragmented niche market. The use of the GSM standard was not an option for the parties involved in public order and safety. At first, they had a head start because they demanded from the beginning that data as well as voice could be sent. At the time this was not possible with GSM but, has quickly grown. So quickly in fact, that Tetra is now lagging behind the commercial world regarding data. With a new Tetra 2 for higher data speeds, the countries are now trying to work together on an additional standard. For mission critical voice (group) communication Tetra is still by far the best solution.

Transfer of knowledge

Borgonjen likes to relay his experience with these kinds of projects to others who are involved in similar ones. Sociological and historical studies of these themes make history come alive for the parties directly involved. No process can be copied, but general lessons can be learnt. There are many aspects, which are often taken for granted but, that may be of interest to others.

An important point that he would like to give is to pay attention from the beginning to relations with one's peers in other countries. If one really tries to cooperate and listen to one another, many misunderstandings can be overcome. Once the cards have been dealt, it is difficult to take leave of them and find a common course, because most people have the tendency to follow their first approach. It is also necessary that everyone makes compromises. The collective, higher goal has to be upheld at all costs, otherwise everybody ends up with nothing; especially in these kinds of niche markets.

Language is also important. Most of the parties involved felt at home using telecommunications jargon and all of them had a fair command of English. However, this is not always the case, as shown by the Schengen group. Here policy officers were present whom were less knowledgeable concerning technology and interpreters who had little knowledge of and experience with the jargon. Minor translation faults can lead to major misunderstandings, such as in the case of one of the meetings when German participants became angry for no apparent reason; Borgonjen therefore, switched his headphone to German. It turned out that the interpreter had mistranslated a word, which subsequently created commotion. When Borgonjen explained this, the air was quickly cleared. As a result, Borgonjen organised a successful crash course radio communication for the translators which clearly improved the situation.

Interview with Willem Wakker, ACE, Amsterdam

An Experienced Author of Standards

Judith Schueler[1, 2]

Willem Wakker works at Associated Computer Experts (ACE). The company consists of 25 employees and produces compilers (translation programmes) for computer software. The international development of standards for these translation programmes is an essential part of the company's activities. Devoting himself to these standards, Wakker is a member of both the Dutch Normalisation Institute (NEN) and the internationally operating International Organisation for Standardisation (ISO).

Wakker puts his heart and soul into being a standards writer and has over the course of time engaged himself in related activities. Initially, he was interested in a specific standard and subsequently, became involved in a committee, where he occupied himself with other standards that were discussed in that committee. The longer he was involved in standardisation processes, the more background knowledge he developed of the process. *"At that time I also became involved in the more important issues."* By now he has sufficient knowledge of the procedures to know how the various standardisation institutes function. The challenge that he presently still faces remains that of producing a useful specification, which enables others to advance their programming activities and thus solve their problems. Furthermore, he sees it as his task to keep a broader view on issues, to ensure that everything is running smoothly and that the procedures are correctly implemented.

1 STT, The Hague, the Netherlands.

2 This interview was held to allow the interviewee to express his experiences and ideas.

Working groups and 'national bodies'

The working groups that develop the standards — in which Wakker has participated — were primarily aiming for consensus. A working group developing a specific programming language falls within a broader ISO group. Sometimes these working groups disappear once the work has been completed; in principle, they remain as long as the standard exists. For instance, the first version of the standard — for the programming language C — dates from 1988; this working group (of which Wakker is a member) still exists to define the extensions for new systems and situations. *"This is a living entity."* Once every few years, a new version of the C standard is created, which is worked out by the same group.

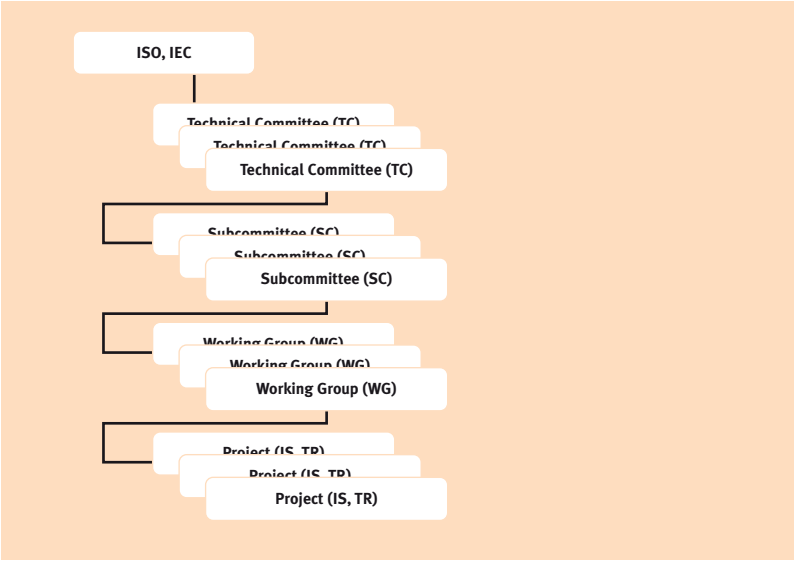

Figure 1
Working groups and national bodies.

During the development of a standard, it was important that the members of the group all had trust in the course they had jointly decided to take. If everyone agreed in the groundwork, such as the technical direction, the right content and the right context, the process ran without too many negotiations being necessary. The technical nature of the process means that all working group members need to be as specific as possible. Of course there is always room for discussion, but this rarely takes the nature of heavy negotiating. The members try to solve technical issues as a team in order to arrive at an adequate standard. *"There are often technical subjects, which you can philosophise about to great length, but at some stage you just need to put something on paper."* The person writing the position paper firstly draws up a draft and by doing so, partly steers the process. On the basis of this document, the other members can put forward their arguments. A conclusion is reached by means of convincing one another on the basis of technical arguments.

At a higher level, the discussion is less technical and more obscure. Here, national bodies have a role to play, such as the Dutch NEN and similar institutes from other countries. Many of these standardisation institutes are based on national representation from these institutes, in which national interests also play a part. Wakker argues that these national institutes are not necessarily interested in creating standards; other interests are involved. Now that many of these organisations have been privatised, they have to support themselves financially, and this means that issues become important, which have little to do with the actual standardisation work.

Of course the actual work is still done at the working group level, where the standards are written. *"That is what it should be about."* The members of the working groups have hardly any knowledge of the procedures. Each working group has its own chairman who must know something about the procedures, because he holds a higher level position in the committee. He must know the correct sequence of the procedures and know on which stages a document has to be completed. The procedures that the standardisation institutes develop, should ideally allow for a smooth writing process so that the writers of standards have the room to do their work. In fact, the working groups should not be affected by any interests that exist at the higher levels and should be able to withdraw themselves from the political debate. Wakker sometimes has the feeling that this concern is not considered a priority, which can jeopardise the efficient writing process of the specification.

The political debate — which takes place on a higher level — delays the technical process in the working groups and why this happens is often unknown. The interests clash: The participants in the working group may work towards a specification that can be obtained free of charge. This is inconsistent with a high-level decision that stipulates that the specification is to be paid for. *"In this case it is not about the technique, but how to earn money with the sale of standards."*
Conflict of interests also plays a role within the working groups. At the end of the day, the members participate in the working group on behalf of their employers or clients and these people — just as any other — have a specific purpose in mind. For example, they may wish to influence the direction of (or be fully aware of) new developments and with this in mind they take their seat at the negotiating table. This may not be explicit to the other group members, but by inquiring after the underlying arguments, the motives often become clear. In particular, because describing the standard requires such precision, the members continue to ask questions. *"Almost every word counts. And if a specific word is not used it means something."* This creates a situation where everyone is alert and asks about the why and wherefore.

The members of the C standard working group do not form a fixed group; new people come on board whilst others leave. Wakker has been a member since the 1990s, but was only present once in a while. Since 2000 this has changed and he has been present more often. Newcomers sometimes have difficulty understanding why certain things are arranged in the way they are. A rationale — a published document that gives an introduction to the C standard and reflects the history of its origin — helps to explain this complex standard. This aids in preventing the basic debate being held over and over again and helps members to understand what is being discussed. It is a dynamic document to which the members regularly add new developments and insights.

Language

Language plays a double role. The working groups develop a programming language and they all use the English language during their meetings and in documents. The programming language itself is comparable to legal texts. It is a distinct language, in which words are given meanings and which has its own structure and set rules. The members have many years of working experience with this language. *"If you work for a C committee, then you should know C."* To participate in a programming language working group is a very awkward way of learning that programming language. Most of the time, knowledge of the programming language itself is therefore not an issue.

Many working group members come from America or England, because there is a lot happening there in this field. Japanese or Koreans sometimes have more trouble with the English language and the cultural differences can make it more complicated. Formulating specific questions about the standard language is difficult as it is, let alone if you need to do it in a foreign language. The group members take care of this together; sometimes participants that do not master the English language are given the explicit opportunity to ask questions or make a remark. The chairman often repeats or provides feedback in order to know for certain that what has been said is correctly understood. Everybody is treated with respect, because every member represents their national body. If they go back to their countries with unanswered questions, there is a risk that their national body will vote against the standard. *"You therefore need to stay friends with them."*

According to Wakker, differences in debating style cannot be attributed to national differences, but rather to personal style. They are all professionals around the table; it is immediately notable if this is not the case. Wakker recounts that he was once sitting at a European standardisation group, where someone had been sent by his boss to collect all the documents. *"The only thing that he was contributing was 'guys, it's time for coffee', or 'I miss docu-*

ment 16, does anybody know where it is?' This person had little to contribute technically, such a person is tolerated; however, he is not taken seriously within the group."

Improvements

Wakker hopes that the national and international institutes will support to the work of the working groups more in the future. He is aware that this calls for a different mentality; namely that these institutes need to focus more on the 'standard' and less on themselves. He is not pleased with the fact that his company has to pay the institutes in order for them to participate, while at the same time, they put in many man hours per year for Wakker's commitment. The institutes should focus on properly supporting the authors of standards and not see them as a source of income. *"I am not saying that they should pay for everything, but the way it works at the moment is annoying."* The travel and accommodation expenses are also paid for by ACE. This resulted, for example, in Wakker's decision not to attend the meeting of a sub-committee in Singapore. The consequence of this was that nobody represented the Netherlands in this sub-committee. *"I thought it was ludicrous that ACE should have to pay for my trip and time, whilst I was representing the Netherlands."* Previously, a travel budget for trips like these existed and according to Wakker that was a good thing. This helped people and companies and encouraged them to cooperate in creating standards. Nowadays this support no longer exists.

National standardisation institutes have been forced to work commercially because the government has distanced them. According to Wakker, this gives the wrong signal; by doing so the government ignores the importance of standards as a cornerstone for the future of the Netherlands. If the government sees the importance of it, it has a responsibility to ensure that these processes run smoothly.

For example, education would increase the interest in standardisation. This can be realised by familiarising students with the phenomenon of standardisation. In particular, in academic training and research the wheel is often reinvented. If they had spent more time researching, they may well have come up with a specification that would have largely met their wishes. Moreover, the world of standards represents knowledge, which is embedded in the standards. In education, teachers could or even should make use of it. The question, however, is whether a change of mentality can be realised in this way. In management training programmes, people should learn something about the importance of standards, not so much about the technique, but about standards in general. The big question is how a reversal in the Netherlands can be

made. How can the process be supported more efficiently and how can the knowledge about the product be obtained? *"We need to do something about it."*

Reflection

Ragna Zeiss[1]

Living Standards — Two Practitioners and a Social Scientist

Standards are alive and kicking! That is what Borgonjen and Wakker have reminded me of. The world is increasingly organised around and by standards — 'enter a modern home and you are surrounded by standards and categories spanning the colour of paint on the walls and in the fabric of the furniture' [Bowker and Star, 2000, p. 1]. However, the increasing importance of standards for organising the world has received relatively little attention from social scientists.

Often, a standard has the connotation of something static and technical — this may not appeal to the majority of social scientists. Therefore, I am pleased that Borgonjen and Wakker demonstrate that the process of setting a standard is everything but, static and purely technical. They illustrate that although standards influence local practices and even enter into our homes, they are negotiated in international settings and shift between local, national, European and world footings. Furthermore, the interviews do not solely focus on individual standards — rather, they concentrate on standards and standard-setting in their social, political and organisational environments.

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Borgonjen points to factors that contributed to the setting of — in his eyes — a successful standard. Firstly, formal and informal conversations were both equally important. Secondly, trust between governments and taking action at the right time were crucial. Although government representatives sometimes became caught up in national interests, the political need to create a common solution was an important factor in the successful creation of the standard. Finally, Wakker also recognises the role of social, political and organisational factors in the standard-setting process. This does not only take place on a higher organisational and political level, but also at the working group level. Members of these groups often have different interests depending on the employers they represent. Yet, in order to prevent them voting against the standard, everyone is treated with respect and is given the freedom to talk. Contrary to Borgonjen's case, Wakker stresses that the 'technical' should have a more prominent place in the standard-setting process; the 'real' standardisation work is done within the working groups. Whereas national institutes are not necessarily interested in the making of standards, the working group focuses on consensus and attempts to solve technical issues in order to arrive at a good standard.

Notwithstanding the fact that the social, political and organisational factors maybe frustrating at times for practitioners — who just wish to create standards — the discussion surrounding who should be involved in creating what standards for what purpose, forms interesting material for social scientists. Social scientists may take a step back and study the 'boundary work' between different professional groups and organisations, which demarcate their activities, products and standards from and coordinate them with other groups and organisations [Halffman, 2003]. The notion of boundary work assumes that there is not a priory distinction between activities defined as technical or political, but states that these are created while carrying out the activities. The dispute about where the 'real' standardisation work is done, may reveal different ideas about what a standard is/should be and what purpose it serves. Whereas constructing a 'good standard' may mean solving technical issues and making it freely available for working groups members, a standardisation institute may define a 'good standard' as one with which one can make a profit. Which definition wins under which circumstances, remains a topic for further research: when do issues such as trust, political agreement, travel funds, and technology play a role?

Standards are classifications that order the world in a specific way. Both practitioners and (social) scientists classify them in particular ways e.g. design, terminological, performance, procedural, regulative and coordinative standards [Zeiss, 2004]. How standards are defined under what circumstances and what the consequences of these classifications are is an important question. Classifying a standard in a certain way often has consequences for the prac-

tices, in which the standard is put to work. Different people are likely to be involved in the development of a 'technical standard' versus a 'social standard'. Yet, in practice, the boundaries can also be blurred: recommendations can attain a quasi-mandatory status and regulative standards may not be complied with.

As mentioned before, Borgonjen and Wakker demonstrated that standards are not static and purely technical. These insights may encourage more social scientists to take an interest in the study of standards. Dynamic standards and those influenced by social, political, and organisational factors appear, after all, a much more interesting and rewarding research topic.

A standard is a 'living' entity or a 'living' document' (Wakker in the interview). Wakker states that after a standard has been formulated, the working group remains 'alive', in order to cope with new systems and circumstances. In Borgonjen's case, telecommunication has developed so fast that the standard now lags behind the commercial world and a new standard needs to be developed. It is important that the social scientists also remain alive and kicking; that they do not exclusively study the standard-setting process, but also the (social) life of the standard after it has been constructed.

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Implications for Research and Policy

Andreas Fickers[1], *Anique Hommels*[2], *Judith Schueler*[3]

The workshop 'Bargaining Norms — Arguing Standards: Negotiating Technical Standards' aimed at investigating a crucial phase in every standardisation process: the moments of negotiations between the various actors involved in a standard setting procedure. Starting with the observation that these concrete historical moments of interpersonal and often intercultural communication remain a 'black box' within the mainstream of standardisation theories and studies, the organisers invited scholars from various disciplines to reflect on the importance of 'bargaining' and 'arguing' as central communicative modes in negotiation processes, which focus on technical standards. In creating an interdisciplinary and international platform for a critical analysis of such negotiations, from theoretical, historical and practical perspectives, the workshop succeeded — at least in the eyes of the organisers — in stimulating a productive discussion on the theoretical and methodological challenges, disciplinary traditions, actual shortcomings and practical limitations of a multi-, inter- and transdisciplinary approach to the role and importance of negotiation in technical standardisation processes.

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In the first panel entitled 'mapping the field', Henk de Vries and Tineke Egyedi sketched the field of standardisation research from two different perspectives, which complemented one another in numerous ways. While De Vries presented a survey of the field of standardisation research in business science, with a clear economic and organisational domination, Egyedi offered with her 'research autobiography' an insight into her scholarly preoccupation with standardisation problems. Influenced by sociological approaches like the SCOT-model (social construction of technology) or the actor-oriented institutionalism, Egyedi demonstrated the complex interplay between different actors (firms, institutions or persons) and levels of interaction (described as political, operational or technical subsystems) in a regulatory process. Exemplified on the ISO committee on containers, she introduced the concept of 'gateway' to describe the importance of technical, organisational and political standards in enabling the compatibility of different transport infrastructures. The idea of describing or analysing standards as 'gateways' has been well received by technology historian Paul Edwards, who transferred the concept across to infrastructures.[4] Whereas Egyedi's model could be described as a synchronous analytical cut through a multilayered network of mutual dependencies; De Vries presented a chronological, process oriented model of consecutive steps in a standardisation process. These range from the initial detection for a need for a standard to the development, its approval, acceptance and finally its implementation, which corresponds to the original problem. Although, De Vries acknowledged the possibility of intertwining and feedback loops, this model suggested a very 'rational' process of problem solving and — to a certain degree — a rather deterministic understanding of standard development as 'path dependent'.

After these complimentary surveys on standardisation models and theories, political scientist Frank Pfetsch focused on the core thematic of the workshop: negotiation as a communicative mode of problem solving. Based on a rich fund of historical negotiation situations in politics, Pfetsch expanded on a classification of different conflict situations, representing specific styles of negotiations and thereby reflecting strategies of confrontational or integrative conflict management. In addition to the general benefit of such classification for the analysis of standardisation processes as specific conflict situations, Pfetsch emphasised the importance of both hard (political power) and soft factors (trust building actions) in the negotiation process, depending on the different stages of negotiation (pre-, main-, and post-negotiation phase) of the conflict cycle. In each phase of the conflict, the negotiating parties may change their communicative strategies, re-acting or pro-acting in a flexible way depending on changing contextual conditions. Finally, Pfetsch also addressed the interesting question of whether specific negotiation cultures

4 See the proceedings of the workshop 'Understanding Infrastructure: Dynamics, Tensions, and Design'. January, 2007, published online at: http://deepblue.lib.umich.edu/bitstream/2027.42/49353/3/UnderstandingInfrastructure2007.pdf

— either national or professional ones — may be considered as influential factors in international negotiation processes. Although it is not possible to measure exactly the influence of different cultural frameworks of negotiation, he nevertheless argued that the various 'subcultures', playing a role during a negotiation process (different national, corporate, judicial, administrative, diplomatic, communication (rules of language) cultures), each impose their own codes of conduct and frames on the interpretation.

The theoretical insights presented by Pfetsch correspond with a surprising accuracy with the historical findings displayed in the case studies by Andreas Reinstaller and Christian Henrich-Franke. In historicising the search for a standardised typewriter keyboard in the late 19th century, Reinstaller convincingly demonstrated the shortcomings of economic standardisation models that have so far dominated the interpretation of the famous QWERTY-case. Without embedding the QWERTY-case into the larger historical context of the late 19th century characterised by the emergence of mass production systems and large business administrations, Reinstaller argued, we would not be able to fully explain or understand the 'lock-in' of this specific innovation at that moment in time and at that place (USA). In addition, the development and the marketing of a specific technology, 'soft factors' like the training of — mainly female — typists played an important role in the promotion of Taylorism production ideology and thereby, reinforced the need for skilled information processing personnel using a standardised technology. Focusing on the ITU negotiations on radio frequencies as an example for regulative standardisation, Henrich-Franke shed light on the social dimension of the engineer network as central actors in the negotiation process. He described the ITU engineers as a group of experts with shared practices and knowledge, embodying a specific 'habitus' (Bourdieu) and characterised by a distinctive group identity (engineers versus non engineers). His account of personal relation- and friendships between engineers of the Eastern and Western 'bloc', even during the high tides of the Cold War, revealed an important and often neglected side of standardisation processes as social and cultural practices. Despite the fact that all the engineers act as representatives of affiliated institutions, the negotiating 'bodies' are human beings and despite their strategy agenda's, they are influenced by feelings of empathy, incorporated role models and behavioural norms and values. While it's hard to 'measure' the impact of such social and cultural factors on the course of a negotiation process, it would be ignorant and short-sighted to exclude such 'soft factors' from theoretical modelling of standardisation processes. In contrast, Henrich-Franke provided historical evidence for the influence of 'soft factors' on the 'negotiation climate' as argued by Pfetsch.

The historical perspective on standardisation was further developed in the two case studies on telecommunication (Nina Wormbs) and transport (Marine Moguen-Toursel). Both case studies demonstrated the complexity of committee standardisation negotiations in an international setting. While Wormbs retraced the international debate for frequency allocations in the early days of radio broadcasting and emphasized the crucial role of the Union Internationale de Radiophonie (UIR) as both facilitator and propagator of organisational and technical standards for the international regulation of radio broadcasting, Moguen-Toursel showed how complicated, tough and long-lasting negotiations can be on a European standard for weights and dimensions of commercial vehicles; when two central players in the field (Germany and France) adhered rigidly to their national production traditions in truck building. However, despite all nationalistic and industrial interests involved, Moguen-Toursel interpreted the discussions about technical standards in Europe as an indicator for a slowly and 'hidden integration' of Europe.[5] In addition to the historical reconstruction of such standardisation debates, based on the study of archival sources, Wormbs presented us with an eye-witness account of a Regional Radio communication Conference of the International Telecommunication Union (ITU) in 2006, with the aim of making a plan for the digital terrestrial television. As participant observer, she was able to compare the minutes of the plenary discussions with her own memories and notes and noticed an interesting difference between the 'official' and 'unofficial' minutes. The loss of contextual information (the 'climate' of negotiations, body language, sublime remarks etc.) in the published documents posed a serious challenge for historians who — in most cases — depend on the written sources for their narrative reconstructions of the past.

In trying to summarise the essential findings of the presentations and discussions made during this venue, several lessons can be learned.

Humanizing the 'homo oeconomicus'

Both the papers and the discussions during the workshop have emphasised the necessity to expand the theoretical frame of mainstream standardisation studies. Especially when focusing on negotiations in a standardisation process, theoretical insights of disciplines like political science, communications studies and cultural anthropology seem to provide useful models or frames of interpretation for an interdisciplinary analysis of negotiation processes, beyond the paradigm of 'rational choice' so dominant in economic, organisational and business sciences. To 'humanise' the actors involved in technical discussions, legal considerations and strategic management of a standardisa-

5 For the discussion on technology and the 'hidden integration of Europe' see [Misa and Schot, 2005, pp. 1-19].

tion question would, on the one hand, certainly have the effect of limiting the predictability-value of economic or business oriented standardisation theories, but on the other hand, reduce the gulf between abstract and idealised forms of theorisation and the practical reality of standardisation processes. Rationality is without doubt, a strong and important driving force behind the behaviour and motivation of actors involved in negotiations about technical standards, but it would be short-sighted to ignore the 'subversion of rationality' [Elster, 1996]. Max Weber already identified rational action as just one of four ideal types of human behaviour. Besides, functional rationality, human action can be influenced by traditional, value-oriented or affective motivations [Weber, 1922]. Standardisation studies could therefore profit from recent studies in diplomatic history and international affairs, where the traditional political agenda has been challenged by questions and reflections originating from cultural and communication studies.[6]

Standardisation as social and cultural practice

Analysing technical standardisation processes as social and cultural practices, might help to go beyond the utilitarian and functionalist models of explanation. This does not mean to dismiss the importance of economic, monetary, corporate or industrial rationalities in the standardisation process, but to identify cultural, social, psychological or cognitive factors as integral part of human rationality.[7] The eye-witness accounts of both Wormbs and the practitioners invited to the workshop have shown that important agreements between negotiating parties were often reached outside of the official institutional settings. During coffee breaks, at lunchtime or in the pub — important breakthroughs in a negotiation process were often reached in the corridors, not in the official arena of the meeting room. The undeniable problematic of how to integrate such 'soft factors' into 'standardised' theories about standardisation should not allow scholars to ignore or neglect these factors.

The workshop and the contributions in this volume have made clear that the study of standardisation practices can benefit from an interdisciplinary perspective. This workshop has shown that business science, Science, Technology and Society studies (STS), history of technology, negotiation studies all offer perspectives that can be integrated to produce a comprehensive analysis. In the future, the actual integration of conceptual tools or methodologies from these (and other disciplines) may be further developed and refined. Another, perhaps even more interesting observation from this workshop, is that the combination of scholarly perspectives and the perspectives from practitioners in the field of standardisation has been so constructive. It is interesting that

6 See for example [Lehmkuhl, 2000, pp. 187-207] and [Fickers, 2007, pp. 358-368].

7 For a neurobiological and cognitive analysis of the emotionality of rationality see [Damasio, 2000].

the practitioners generally recognised themselves in the detailed accounts, which the scholars gave of standardisation processes, but that they also warned these scholars for their, at times, too naïve views. Future research on standardisation might therefore, benefit from a close transdisciplinary collaboration with standardisation practitioners.

The value and limits of historicisation

A satisfying outcome of the workshop was the general approval that there was potential for historicisation for both theory building and methodological reflection. All invited practitioners, voluntarily admitted that their daily business rarely leaves them any time for a critical reconstruction of past standardisation procedures. The clearly prospective orientation of their work asks for strategic anticipation rather than critical retrospection. Nevertheless, they all admitted to recognising the interesting potential of a meticulous reconstruction of past standardisation processes. It can offer new or suppressed perspectives on their own past behaviour as well as on hidden strategic manoeuvres of their predecessors.

Focus on negotiation practices

One of the eye-openers of this workshop was the immediate value provided by perspectives from negotiation studies and political science for the study of standardisation processes. In the field of STS technology development has since long been conceptualised as a process of negotiation between social groups.[8] The interactions between these groups shape the characteristics and development of a technological artifact. However, in this literature, negotiation is not viewed as an explicit, conscious or intentional activity (with actors sitting around the table). Thus, political science literature on standardisation has, so far, not been considered as particularly relevant to these kinds of processes analysed in the STS literature on shaping technologies. However, the difference with the standardisation processes discussed in this book is that here negotiation does take the shape of an active and intentional process and is even institutionalised in organisations such as ETSI or ITU. This makes the perspective of political science on standardisation processes very relevant and promising for future studies on standardisation.

8 See e.g. Bijker, Hughes and Pinch [Bijker et al., 1987] and Bijker and Law [Bijker and Law, 1992].

Outlooks into the future

In addition to the challenges for future standardisation research as outlined here, this volume set out to identify crucial standardisation issues for infrastructure policy. This endeavour yielded a range of case studies that illustrated the varying provisions for the productive development of international transport and telecommunication standards. In fact, we mapped the 'soft' factors of standardisation that support the working of physical 'hard' infrastructure. Instead of focusing on what kind of standards could be valuable for future networks, the question should be how do these standards come to exist. This volume helped map the institutional complexities and interrelations, as well as the major issues at stake in international standardisation processes. In his commentary, Kai Jakobs asked us to learn from the analysis of past and present for the future. This is not an easy task, yet we want to take up the challenge by formulating critical questions combining some of the conclusions outlined above.

The diversity of arguments outlined in this book adds up to some tentative general conclusions. When translating the findings into policy direction, this book encourages us to keep the 'human' element in focus. The articles in this book, point to the importance of individuals and to capricious and coincidental factors that play a role in standardisation processes. Yet, they also show the importance of encouraging institutional settings. The conclusions we draw and questions we pose, try to honour these outcomes. They are intended to stir the mind, rather than to provide advice and directives.

Humanizing the 'homo oeconomicus' of the future

What does it mean for future policy, when we conclude that negotiation processes in standardisation go beyond 'rational choice', when aiming for the best possible standard?

It suggests the importance to recognise, stimulate and nurture talents and capacities of 'standardisers' beyond their technical skills and knowledge. Sensitivity to hidden agenda's, strategic behaviour and institutional relationships are a prerequisite for a successful process. In each of the discussed cases, insight into the process (and not only the product) proves to be crucial.

Thinking along these lines, it seems that education for engineers and technologists, who involve themselves in the standardisation process could play a key role. Teaching both the importance of standards and the socio-technical complexity of standardisation processes, as De Vries argued in the workshop, raises the awareness of engineering students that working on standards is an exiting practice to be involved in. Aside from educating students, exchanging knowledge about the process among practitioners could also be a valuable

tool to build-up skills and knowledge. Even though each process is different, the expertise built-up during years of working on standards offers a rich source of knowledge about the unwritten rules of the process and the institutions involved. During the workshop the discussions between practitioners and scholars showed a lot can also be learned through case studies analysed by scholars, who study and reflect on the standardisation processes in detail. Hence, this type of academic research can function as a way to preserve and recall lessons learned. The transdisciplinary workshop stirred the discussion and exemplified the importance of continuous exchange and teaching.

Questions that provoke the mind for future policy are:

- How to get substantial information on which practitioners' skills and talents are required for effective bargaining and negotiating standards and norms?
- How to cultivate these talents and skills?
- How to assure the dissemination of valuable knowledge about standards and about the process?

The future biotope of the practitioner

Notwithstanding the importance of national and international standardisation institutes, the negotiation process also takes place outside of the official meeting places. To be able to play this informal game correctly, long-term personal investment appears to be an important asset. The articles' analyses show that it is particularly important to allow the process to 'breathe'. Achieving a standard is often a long-winded process that does not always yield immediate success. It takes time to create a productive environment, in which effective discussion can take place and aims, technical requirements and points of departure can be agreed upon. This is only possible, when the individual practitioner receives support from his or her institution to take the time and necessary steps to achieve an atmosphere of trust and to secure an influential position.

Moreover, the institutional backing needs to include access to the network, on which the individual practitioner can rely. Individuals around the table represent the interest of their country, company, government or group (or sometimes several interests at the same time). The power represented by the network can play a crucial role to speed-up or slow down the process. The more unequivocal the parties are, the stronger their position can be. Forging coalitions takes place outside of the official meeting room and requires a strong and available network 'at the home base'.

Questions that provoke the mind for future policy are:

- How to acquire insight into the (historical and future) roles of national and international standardisation bodies?

– How can the long-winded process be supported institutionally?
– How can academic research about the process contribute to sketching the soft aspects of the practitioners' biotope?

Standards as a normative policy tool

Social aspects of infrastructure-related standards and norms unavoidably come into view, when discussing standardisation. Achieving and implementing international standards can be regarded a normative act, as standards reflect and strengthen the values of a particular society in a particular timeframe. Standards are used as powerful tools to buttress social goals, such as safety, sustainability or a strong European market. For governments, standard setting can be a way to safeguard public values and interest. Therefore, Egyedi argued that the values embedded in the standards should be seriously guarded and judged on their potentially positive and negative consequences for society. Whereas, the European Union often presents standards as a necessity for a smooth international exchange of goods, information, data or passengers between its Member States, standards exclude other States at the same time. Furthermore, the choice not to develop an international standard can also prove profitable. Think of Moguen-Toursel's case study about the weight of trucks. The discussion remained unsolved for many years and the different national industries could thus continue to build their trucks, without having to adapt to the new standard. Moreover, some argue that standards prohibit competition between systems, which might lead to a reduced innovation potential.

Thus, defining a 'successful' standardisation process depends largely on the aims and the perspective of a specific social group. One can strive for a standard agreed upon by the majority of the participating parties or a standard that supports the personal, business or national interests. As Wormbs argued in her commentary, standards can also increase the vulnerability of systems. For example, a virus in a computer system can rapidly spread. It also tends to make things equal, whereas diversity can be both profitable and fun; finding different products in different countries. In a negative sense, success could even entail to not reach a common standard; this can also be a policy strategy to safe-guard public values, such as securing diversity for safety reasons or protecting national industry.

In line with the arguments above about standards as a reflection of social values, standards can be seen as an expression of collective identity. In this respect, the Galileo project can be seen as the development of a European standard in opposition to the American GPS standard. Standards can thus, be used as (political and cultural) statements.

In the workshop, we merely focused on public infrastructures, which meant that we refrained from a discussion about standardisation as a potentially profitable for market forces. We instead focused on the social aspects because many of the discussed infrastructures are public utilities. This also implies that we address governments, rather than businesses with the implications we mentioned here.

Questions that provoke the mind for future policy are:

- How to use standards as effective policy tools, without reducing the potential for diversity, change and innovation too much?
- How to initiate a discussion about the advantages and disadvantages of standards for society?
- How to explicate hidden and invisible normative aspects embedded in standards?

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Judith Schueler

Judith Schueler manages together with Rosemarijke Otten, the foresight project on the future of infrastructure networks in Europe for the STT Study Centre for Technology Trends in The Hague. She graduated from Maastricht University in Arts and Culture (specialisation Technological Culture) with her thesis on a new form of housing for the elderly in Rotterdam. She received her MA degree in Society, Science and Technology in Europe from Maastricht University and the Federal Institute of Technology in Lausanne, Switzerland in 1998. In 2001, she started her research, which focuses on technology and national identity at Eindhoven University of Technology. She continued her research at the Deutsches Museum in Munich. In January 2006, she started the STT foresight, stretching her interest in technology and society from the past to the future.

Project Cooperation

The project was organised in cooperation with the Consultative Committee of Sector Councils for research and development (COS) of which STT is a member.
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Technical standards are a typical phenomenon of complex societies. They are a means to achieve control and to regulate or coordinate the production and uses of technology. Proportional to the increase of complexity, standards are a prerequisite for enabling the (international) interlinking of technical components and systems. In this book, researchers and practitioners argue that standardisation should be understood as technological as well as social and political activity. Standards are socially constructed in complex and lengthy interaction and negotiation processes. One way to get a better grasp of what is going on in standardisation processes is to focus on these micro-level processes of arguing and bargaining.

This work combines two ambitions. In the first place, it feeds into a growing academic interest in standardisation processes. The book brings together perspectives from the history and sociology of technology, economics, business studies and political science. Their views on standardisation processes will be confronted with the views of experts who were actively involved in such processes. In the second place, it helps to prepare the way for outlooks into transnational infrastructure development, as part of a foresight exercise performed by STT Netherlands Study Centre for Technology Trends.

Key questions that will be addressed in this book are: How do technical standards emerge? What is the role of negotiations in these processes? Who are the negotiators? Which problems do they face? What is the role of national and international (political) styles, informal networks, reputation and prestige? Finally, what does this mean for research and policy on standardisation?

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