How to Perceive the (Future) Role of China in ICT Standardisation – A European Perspective

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***Abstract**: The paper argues that the Chinese standardisation system should not be perceived as a threat to international ICT standardisation, and that the rather more relaxed attitude of the EU is the best way forward. It claims that a co-operation based approach to the increasingly powerful relative newcomer is much more appropriate than one based on competition. These arguments are based on a discussion of the European and Chinese standardisation systems, on a subsequent SWOT analysis and on a brief case study.*

1 INTRODUCTION AND MOTIVATION

China started life as an economic power to be reckoned with as a manufacturer of products that were based on foreign designs. That is, until not so long ago the country was the classic commodity provider. In such a role competitiveness is based on scale and flexibility of manufacturing and on price which, in turn, requires the availability of the right (i.e. inexpensive) workforce. In this role, standards were primarily something to be implemented to improve economies of scale and to meet customers' needs. The latter, however, also implied that considerable royalties had to be paid to a level that reduced margins to almost zero.

By now, China is on route to transforming itself into a high-tech economy. Accordingly, the role of and the importance assigned to technical standards has changed. For one, the development of 'indigenous' standards (like TD-SCDMA and AVS) has become a priority[1]. They are supposed to serve as a tool to reduce royalty payments through cross-licensing but also to open up new markets (especially in developing countries).

Moreover, Chinese policy makers have realised that standards, most notably ICT[2] standards, are crucial for market success in that sector. Primarily from Germany they have learned that standards may be used in support of an industrial export policy, from the EU they could learn how to use standards to support a single market, and US standardisation showed them how companies can use standards to drive the development and direction of an industry sector – again, specifically of the ICT sector.

Europe has taken this step quite a while ago and by now has a well developed regional standardisation system with close links to the major international bodies. Nonetheless, the

[1] A popular Chinese saying states that third tier companies make products; second tier companies make technology; first tier companies make standards.

[2] Information and Communication Technologies.

system exhibits a number of flaws, especially with respect to the field of ICT standardisation. Recent initiatives and regulations in the field have been designed to overcome some of the most pressing issues identified. While some of the proposed remedies are debatable (see also e.g. [Jakobs & Blind, 2011]) the measures, once implemented, should indeed improve efficiency and effectiveness of the European Standardisation System (ESS).

The situation outlined above – a large but still relatively inexperienced newcomer (to ICT standardisation) and a long-standing major player in international standardisation – suggests a very clear distribution of influence. Yet, the situation is not quite so simple. For example, Seo [2012] argues that while in the foreseeable future no individual Asian country will have the power to lead international ICT standardisation (the way the EU and the US are leading today), an alliance of these countries (especially China, Japan and South Korea) might well assume a leading role. To this end, she argues, it will be necessary for these countries to avoid – and learn form – the mistakes made by the EU and the US.

Adopting a rather more economic point of view, Breznitz & Murphree [2013] observe that a 'low royalties' approach adopted for many Chinese standards. This, they claim, is done in support of the national manufacturing capacity. This approach, however, "… *may threaten the business model of companies that rely on the intrinsic value of their IP as a means of earning returns*". In fact, the 'threat' motive in conjunction with IPR appears frequently in this report.

Looking at the issue from a completely different angle, Hesser & de Vries [2011] argue that "*As a consequence of the developments of standardisation education in Asia, Europe will not only turn from a leader into a follower in standardisation affairs but will also lose its competitive edge in many advanced technology fields and high-growth markets*". Indeed, standards education is far more advanced and commonplace in Japan, South Korea and China than it is in the EU or the US which are still fairly slow at catching up.

The above arguments suggest that the prospect of a shift of power in international ICT standardisation is at least not that terribly far fetched. In the following I will, therefore, eventually discuss the EU's view of the role of China in international ICT standards setting. To this end, section 2 will offer an overview of the two standardisation systems with a focus on a number of important characteristics. This will be followed, in section 3, by a brief SWOT analysis of the two systems. Finally, section 4 will discuss European views on the Chinese system including a brief case study on the standardisation in the field of e-mobility to highlight the problems that occur when different approaches to standardisation clash in a potentially very large market.

2 THE STANDARDISATION SYSTEMS

2.1 The European Union

2.1.1 The European standardisation system

The European Standardisation System (ESS) comprises the three European Standards Organisations (ESOs; CEN, CENELEC, and ETSI) and plus 33 National Standards Organisations (NSOs). It is very much modelled on the international system. Accordingly, the co-operation between the ESOs and their respective international counterparts are guided by formal agreements[3]; see Fig. 1.

[3] This holds primarily fort he links CEN – ISO and CENELEC – IEC; not so much for ETSI and the ITU-T.

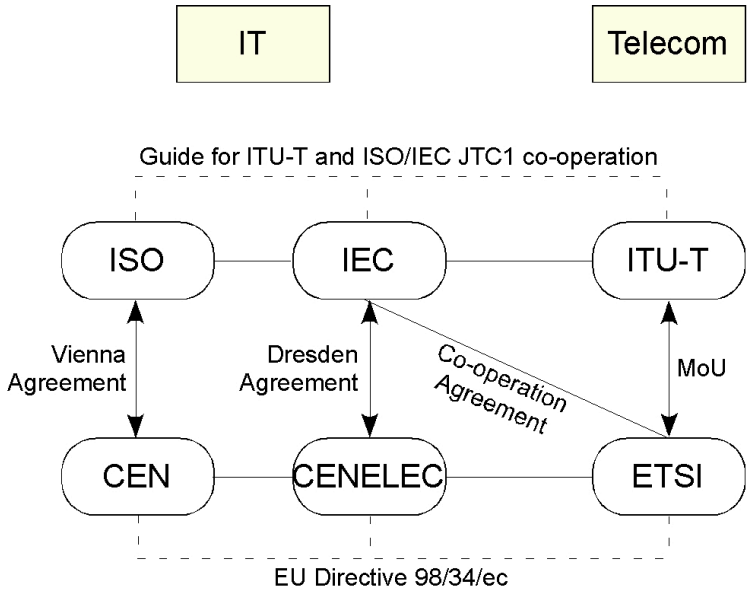


Figure 1: The ESOs, their international counterparts and the links between them

[EU, 1998] also establishes the rules for the co-operation between the individual ESOs on the one hand, and between ESOs and national bodies on the other. As a result, neither are European standards in conflict with each other, nor are national standards in conflict with European ones.

Thus far, European and international standards, while still strictly voluntary in nature, clearly enjoyed priority in Europe: "… *the authorities are obliged to recognise that products manufactured in conformity with harmonised standards are presumed to conform to the essential requirements established by the Directive*", specifically in public procurement. *"If the producer does not manufacture in conformity with these* [harmonised European] *standards, he has an obligation to prove that his products conform to the essential requirements."* [EU, 1985]. Obviously, companies that wished to do business in EU countries did not necessarily consider the application of European standards one hundred per cent voluntary in practice. New regulations in place since 2013 [EU, 2012] should change this situation but still need to be implemented

The ESOs produce different types of deliverables the most important of which are European Norms (ENs). The European Commission may request the ESOs to develop ENs supporting EU Directives and Regulations through 'standardisation mandates'. ENs developed in response to such mandates are called 'Harmonised Standards'. Other deliverables include Technical Specifications (TS), Technical Reports (TR), Guides and Workshop Agreements (CWA). They differ with respect to their methods of development and level of consensus required and are supposed to meet different market needs. Also, CEN frequently adopts ISO standards without any technical modifications. Today more than 2,500 European Standards are identical to ISO documents.

2.1.2 The European standardisation strategy

The EU does not have an overarching standardisation strategy as such, really. That is, no single, concise such document exists. Rather, a number of documents, put together, might perhaps be said to represent such a strategy.

A recent document by the European Commission [EC, 2011] and the associated Regulation [EU, 2012] define a number of measures to be taken to improve efficiency, effectiveness and inclusiveness of the European Standardisation System (ESS). Most notably, the Regulation

[EU, 2012] provides for referencing of consortium standards in legal documents and in public procurement. These standards and the underlying processes will need to meet the quality criteria defined by the World Trade Organisation. The ESOs will be asked to improve their processes for the transposition of consortium standards into European ones. Moreover, the regulation postulates that all stakeholder groups shall be adequately represented, either directly or through representative organisations.

These provisions refer primarily to the internal structure and working of the ESS. The specific topics that need to be addressed by the ESOs are covered in the '2010 – 2013 ICT Standardisation Work Programme for industrial innovation' [EC, 2012]. This living document describes in which fields ICT standardisation will be required to support EU policies. These fields include, for example, e-Health, Intelligent Transport, ICT for sustainable growth, the Internet of Things and e-Government.

Finally, very generic 'Strategic objectives for the European standardization system' have been published as a draft for public consultation [ESOs, 2013]. The document sets out, at a very high level, a number of objectives the ESS shall have met by 2020.

Taken together, the documents mentioned above, plus a few others (e.g. [EU, 2004], [EC, 2004a]) represent something akin to a European standardisation strategy

2.2 China

2.2.1 The Chinese standardisation system

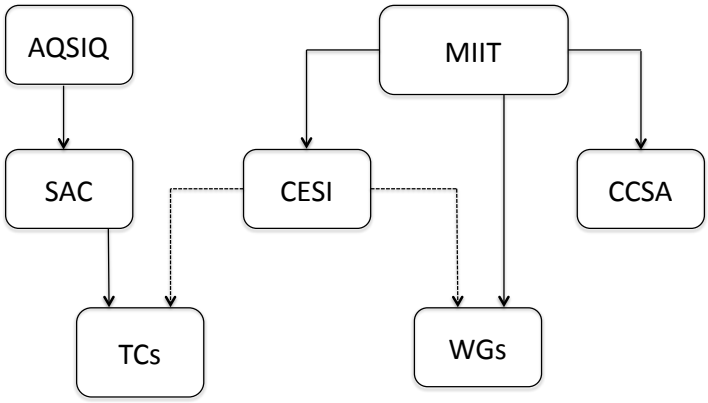
The standards system in China is administered by the General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ). AQSIQ is a ministerial level administration directly under the supervision of the State Council. AQSIQ administers both the Certification and Accreditation Administration of China (CNCA) and the Standardization Administration of China (SAC). CNCA supervises all certification and accreditation activities throughout China, while SAC is in charge of National Standards. In addition to SAC, a number of other entities are also involved in ICT standardisation.

SAC is the Chinese NSO and represents China in ISO and IEC. It was established by the State Council in 2001. Chinese National Standards are owned by SAC, whilst all other standards are supervised by SAC and ideally also registered with them.

China Electronics Standardization Institute (CESI) is a professional institute for standardisation in the field of electronics and ICT. It is administered by the Ministry of Industry and Information Technology (MIIT). Among other activities, CESI manages 51 national technical mirrors to IEC TC/SCs and ISO/IEC JTC1/SCs.

China Communication Standards Association (CCSA) is the Chinese member of the Global Standards Collaboration, the association of national/regional standards bodies active in the field of telecommunications. Like CESI, it is administered by MIIT.

Figure 2 depicts the relations between the individual bodies discussed above.



AQSIQ: General Administration of Quality Supervision, Inspection and Quarantine
MIIT: Ministry of Industry and Information Technology
SAC: Standardization Administrative of China
CESI: China Electronics Standardization Institute
CCSA: China Communications Standards Association

Figure 2: Relations between Chinese standards bodies

The Chinese standardisation system produces both voluntary and compulsory standards. Also, four levels of standards are distinguished, all of which should be registered with SAC. These levels are

- 'National'
  They include, among others, mandatory standards for processes and products, accounting, hygiene and safety, and environmental protection. Moreover, transposed international standards fall into this category.
- 'Professional' (or 'Industry')
  Relevant government bodies under the State Council are typically responsible for standardisation at this level.
- 'Local'
  Local standards are developed when neither National Standards nor Professional Standards are available. Local standards are to be superseded by national and industry standards once they are available.
- 'Enterprise'.
  Enterprise Standards may be developed and/or used by an individual company if no other standards are available. Development of enterprises standards is encouraged given that they are more stringent than the national or trade standards [PRC, 1990].

2.2.2 The (draft) Chinese standardisation strategy

In 2012 the Chinese Ministry of Science & Technology released a Draft 12th Five-Year Special Plan on Technical Standards for comments [MST, 2012]. The document observes that "*Technical standards are the technical basis of social and economic activities, a strategic resource for national development and a core element for international competitiveness*". The strategy identifies how technical standards are to be used and considered in planning, R&D, Advanced Development, Testing and Certification, Intellectual Property, and a host of other areas.

Research and Development in support of standardisation is a major focus of the strategy. This holds specifically for the creation of stronger links between R&D and standardisation, in both directions. 'Next Generation Information Technology Industry' is the second of the identified 13 major areas where science and technology shall support the development of new technical

standards. Dedicated R&D efforts shall also help to promote (superior) national standards in the international arena. This also holds for the development of industry and 'alliance' standards and their subsequent elevation to national standards.

'Capacity building' is another major aspect of the strategy. This refers to an improved education on standards-related matters, including both technical and non-technical (e.g. procedural) aspects and also to an improved information flow between the different parties involved in standards setting and implementation.

Overall, the strategy addresses all aspects relevant to the development and use of standards. A particularly strong emphasis is put on the integration of education, R&D and standards development.

2.2.3 China's position on the 'standardisation ladder'

Over the past number of years China has become increasingly active in the international standardisation arena. This holds particularly for the ITU-T. Here, the ITU has identified an 8-step 'standardisation ladder' (see Fig. 3). According to Levin [2010], China has reached the 8th level at ITU-T by making proposals on future study questions and on the ITU-T's future work programme at the World Telecommunication Standardization Assembly. Moreover, China supplies ten Study Groups / TSAG Vice Chairmen and one Chairman[4] as well as numerous Rapporteurs and Editors.

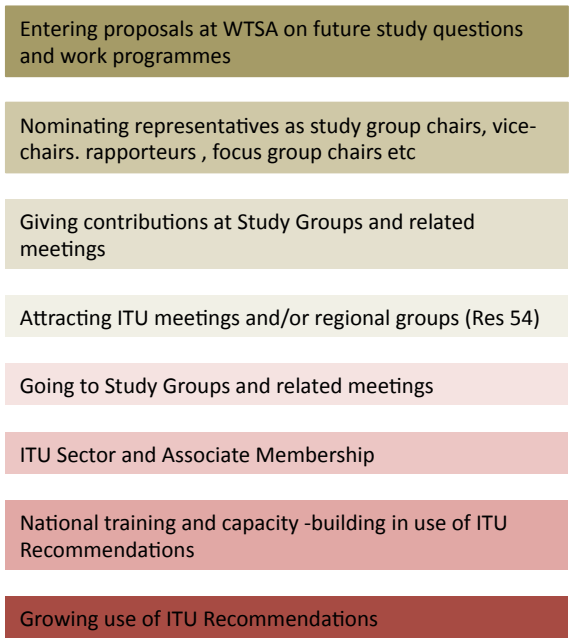


Figure 3: The Standardisation Ladder (adapted from Levin [2010]).

Somewhat surprisingly, the situation is rather different for ISO, where the US provide the vast majority of secretariats and also supply the majority of Chairpersons. Here, China is not represented at all. Similarly, China's representation in some of the major standards consortia is limited, with no representation at management level of the Open Mobile Alliance (OMA), the Object Management Group (OMA) and the IEEE-Standards Association. Three IETF WG Chairs (out of over 200) are from China, as are one OASIS director and one W3C Advisory Board member. It looks as if the ITU-T and appealed to China.

[4] By comparison, three Vice Chairmen come from Germany; the US supply five Vice Chairmen and two Chairmen.

2.3 Some Important Characteristics

2.3.1 Links to government

Both the European and the Chinese standardisation systems are fairly centralised[5]. Also, both systems are under the influence of policy makers, albeit to varying degrees. The EC's influence over the ESOs may primarily be attributed to the fact that they provide a significant percentage of the ESOs' funding. Moreover, Under the 'New Approach' to standardisation *"… legislative harmonisation is limited to essential safety requirements (or other requirements in the general interest) with which products put on the market must conform …"* [EU, 1998]. These "essential requirements" are defined in 'Directives'; the ESOs are then charged with developing the Harmonised European Standards that specify how to meet them. But also beyond that the EC pro-actively influences standardisation "*The Commission takes a role both in initiating and facilitating the development of standards ….*" [EU, 2008]. According to [EC, 2011] "*The Commission will make funding of the ESOs conditional on their fulfilment of performance criteria and their meeting defined objectives ….*". This is a clear indication that the Commission aims to extend their influence over the ESOs.

China's SAC is officially a non-governmental body. However, the Standardization Law of the People's Republic of China [PRC, 1988] speaks of "*The department of standardization administration under the state Council …*" and stipulates that "*Competent administrative authorities under the State Council shall, in line with their respective functions, be in charge of standardization in their respective departments and trades*". The Chinese government not only funds standardisation but aims to "*Provide sustained support for international standards development …*" and also to fund R&D in support of, or leading to, technical standards [MST, 2012]. All in all, "*What makes standardization special in China is the leadership of the state*" (quoted in [Breznitz & Murphree, 2013]). And according to the Seconded European Standardization Expert for China, "*In China, standards are considered a tool from the government to support an industry. This puts the responsibility for standardization squarely in the hands of the ministry that oversees the respective industry*"[6].

2.3.2 The standards setting processes

There is not very much to say here. In Europe, CEN's and CENELEC's processes are virtually identical to those adopted by ISO and IEC[7]. ETSI's process[8] is slightly different but follows the same basic principles.

In China, SAC has adopted a process for National Standards also very similar to that of ISO.

The 'traditional' processes adopted by CEN/CENELEC and SAC have long been criticised as being too slow, too unresponsive to urgent market needs and unnecessarily bureaucratic. However, for a debate on the issue of speed see e.g. [Sherif, 2003].

2.3.3 Stakeholders

The European NSOs are the only members of CEN and CENELEC. Membership in an NSO, in turn, is open to all interested parties. However, participation by government agencies, users and consumer representatives is typically comparably low. CEN and CENELEC stipulate that representatives act in purely personal capacity (i.e. neither as corporate nor national

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[5] In contrast to e.g. the US where there are over 270 ANSI-accredited national SDOs (the OASIS consortium being a very recent addition Suttmeier, R.P.; Xiangkui, Y. (2004).

[6] http://quality-partnerships.cn/standards-in-china/eu-china-similarities-and-differences-in-standardization/.

[7] Outlined on http://www.iso.org/iso/home/standards_development/resources-for-technical-work/stages_of_the_development_of_international_standards.htm; CEN does not have a Fast Track procedure, though.

[8] See e.g. http://www.etsi.org/standards/standards-creation-process/standards-making-process.

delegates). In contrast, ETSI's membership base is primarily made up of companies (with a relative majority of manufacturers), government entities, research organisations, and users. In ETSI, members are supposed to act as company representatives. Recently, both the European Commission and the European Parliament reinforced the importance of adequate participation of all stakeholders in standardisation (see [EU, 2012], [EC, 2011]).

According to [PRC, 1990], "*Trade associations, research institutions for science and technology, and academic organizations should be given a role to play in formulating standards*". In fact, Rongping & Zhuoliang note that researchers from universities and public research institutes dominate the standards work in China, whereas trade associations and enterprises are comparably unimportant [Rongping & Zhuoliang, 2005]. The members of the WGs participate as individuals and do not have to represent any position other than that of their own expertise. According to [Cao, 2008], tens of thousands of government employees are working on the development of standards.

2.3.4 Integration of standards consortia

A vast number of important ICT standards have been developed by industry consortia. These consortia do not have to follow the open, consensus-based process of the SDOs (although many, especially all larger and more important ones, do). Views of the work and the output of these consortia differ.

Europe has only very recently formally recognised the importance of these consortia and of their output. Specifically for the field of ICT, [EU, 2012] allows referencing of technical specifications that are neither European nor international standards. The caveat is that the processes of the originating entities (i.e. e.g. private standards consortia) meet the relevant WTO requirements. [EC, 2011] requires the ESOS to incorporate "widely accepted" such specifications into the ESS. It remains to be seen how this new approach towards standards consortia will be implemented in practice and which effect it will have.

China still seems to adopt the 'old' European stance according to which "*It is considered doubtful whether, in the light of the speed of development and the limited participation of experts, the fundamental principles for accountability of standardisation such as openness, consensus and transparency are followed in a robust fashion* [by industrial fora and consortia]" [EC, 2004b]. According to [Suttmeier et al., 2006], "*China seems to show a preference for working through established, institutionalized standards organizations, more in keeping with European and Japanese practices*". This is further corroborated by Ernst [2011], who notes that "*However, there is a widespread perception in these countries* [emerging economies] *that the existing international standards system, and especially the non-formal standards development organizations and consortia, primarily reflect the interests of large global industry leaders from the United States, the European Union, and Japan*".

Yet, Wang et al. [2010] state that "… *China should give full play to the industrial consortia and alliances, through institutional and managerial innovation*".

2.3.5 Links between R&D and standardisation

The link between R&D and standardisation is weak in Europe (see e.g., [Interest, 2005a], [Interest, 2005b]). However, up-to-date input especially from the research community would be crucially important for standards setting in the ICT sector. Specifically, the link between research and standardisation may be considered as an indicator of the timeliness of ongoing standardisation efforts, and for standardisation's ability to address emerging issues.

However, thus far "*The political support includes indirect support to pre-standardisation …*" [EU, 2008]. In addition, dedicated projects looking at the link between R&D and

standardisation have been funded by the EC. More recently, [EC, 2011] observes "*potential synergies between research, innovation and standardisation*" but fails to offer any specific suggestion on how these synergies should be exploited, or how exactly R&D findings shall be fed into the standardisation process.

As far as China is concerned, Stuttmeier's & Xiargkui's [2004] observation that "*In 2001 and 2002 China thus began to reform its standards regime with an eye toward building standard setting into its national research and development programs as a priority objective. This has now resulted in a system in which policy purposes for the standards regime – expressed through laws, administrative directives, and policy statements – are increasingly integrated with a research and development (R&D) network*". Today, the draft standardisation strategy [MST, 2012] puts a very strong emphasis on the link between R&D and standardisation. What's more, it makes concrete recommendations how this link shall be established and strengthened, respectively

2.3.6 Education about standardisation

Not unlike the link between R&D and standardisation the level of education about standardisation is very low in Europe. Individual initiatives at universities are few and far between, and an overarching formal framework is missing. During the past couple of years the topic has received increasing attention by standards bodies, including among others IEEE[9] and ISO[10]. The ESOs have established a 'Joint Working Group on Education about Standardization'. They have defined a (fairly generic) 'Policy on Education about Standardization'[11], developed model curriculum for both higher education[12] and vocational training, and set up a 'Repository of materials'[13]. These activities were not least triggered by a White Paper [Hesser & de Vries, 2011] published by the European Academy for Standardization. However, the meat still needs to be added to the bone.

The situation is different in Asia in general and in China in particular. Here, about 30 universities provide courses on standardisation (most notably, perhaps, China Jiliang University). Moreover, [MST, 2012] also realises the importance of education in the field.

3 A SWOT ANALYSIS

The above can be used as the basis for a SWOT analysis for both the European and the Chinese (ICT) standardisation environment.

In Table 1 below, the requested changes to the ESS introduced through [EC, 2011] and [EU, 2012] are taken into account, despite the fact that these changes still need to be implemented. The same holds for the measures put forward in [MST, 2012]. In this respect, the analysis is rather future-oriented. It also refers to the 'best case'; the proposed new measures would lead to significant improvement of the respective standardisation systems. It remains to be seen how realistic tis approach is, though.

[9] http://www.ieee.org/education_careers/education/standards/index.html.

[10] http://www.iso.org/iso/home/standards/standards-in-education.htm.

[11] ftp://ftp.cencenelec.eu/CEN/Services/Education/Education/PolicyonEducationaboutStandardization.pdf.

[12] ftp://ftp.cencenelec.eu/CEN/Services/Education/Education/ModelCurriculumForEaS.pdf.

[13] http://www.cencenelec.eu/standards/Education/Pages/repository.aspx.

Table 1: SWOT analysis of the European and the Chinese standardisation system

Europe	China
Strengths • A contradiction-free standards system. • Well-established, consistent system with close links to European policy makers. • Close and long-standing co-operation with international counterparts and major NSOs (CEN, CENELEC). • Well respected internationally (thanks to the development of several hugely important standards; primarily ETSI). • Pioneers in innovative approaches towards standardisation (e.g. 3GPP; ETSI). • Flexible approach to standardisation through 'new deliverables'. • Improved incorporation of consortium standards. • (Increased) representation SMEs and consumers in standards setting.	**Strengths** • Good alignment with national policy making. • An over-arching standardisation strategy to guide future development of the system. • Improved links between R&D and standardisation. • Recognition of the importance of standards education. • Clear vision of 'internationalisation' of domestic standards.
Weaknesses • (Financially) dependent on policy makers. • Slow-moving process, not 100% suitable for fast-moving technologies (CEN, CENELEC). • Overly European focus (CEN, CENELEC). • Sub-optimal type of representation (through national delegations; CEN, CENELEC). • 'New Deliverables' lack necessary level of consensus. • Limited links between R&D and standardisation. • Limited emphasis put on standards education. • Some very debatable proposed modifications in the new Regulation.	**Weaknesses** • Supervision by a government entity may limit flexibility. • The non-existence of 'new deliverables' also limits flexibility. • A rather complex system of different and possibly contradicting standards at various (geographic) levels. • Still limited experiences with international SSOs. • Limited number of leading functions in many international SSOs. • Integration of consortium standards is not addressed at all.
Opportunities • Reduced market fragmentation due to contradiction-free standards will help sustain the single market. • Good links to international bodies and to major NSOs can be used to strengthen the EU position in the global arena.	**Opportunities** • A large internal market gives economic clout. • R&D in support of standards setting should yield superior standards with better chances of international market adoption.

• High reputation can attract both European and international know-how, contributions, and members. • Flexibility will be helpful when newly emerging topics will have to be addressed. • Higher democratic legitimacy may increase relevance associated with European standards.	• Well-educated standards setters will strengthen China's position internationally. • Clear focus on internationalisation of good domestic standards will help open up new markets.
Threats • Financial dependency, slow processes, national representation and overly European focus may lead to reduced international importance. • Lack of an adequate level of consensus for the 'New Deliverables' may render them irrelevant. • Inadequate links between R&D and standards setting hinders exploitation of state-of-the-art technical knowledge, may render European standards inadequate, and may keep ESOs from addressing crucial future topics. • Newly requested improvements will not be adequately implemented, leaving Europe stranded with possibly irrelevant European standards. • Increased market fragmentation through inadequate incorporation of consortium standards into the ESS. • Failure to re-consider some of the proposed modifications to the ESS may render the ESS less efficient.	**Threats** • Government-driven system may result in standards that do not meet current industry needs. • The system may not be flexible enough to adequately address the needs of the fast-moving ICT sector. • Classes of standards not owned by SAC may lead to contradicting standards and market fragmentation. • Low visibility in international standardisation will reduce chances of national standards to succeed internationally. • Ignoring consortium standards may leave China stranded with irrelevant (inter)national formal standards.

The analysis above pretty much confirms what was to be expected. Both strengths and weaknesses (as well as the resulting opportunities and threats) of the ESS result form a well established, long-standing system. On the one hand, good relations with policy makers, major peers and their international counterparts together with time-honoured (and bureaucratic) processes have made CEN and CENELEC major players in their respective fields and entities to be reckoned with. However, this may not be quite enough for fast moving sectors like ICT. Here, ETSI and its different underlying model may be considered a success story (not least reflected in the huge successes of e.g. DECT and, most notably, GSM). Yet, more is needed to adequately address the challenges of successful ICT standardisation. The various 'New Deliverables' with lower levels of necessary consensus had been a first step, ETSI's hugely successful 'Partnership Projects' may be seen as another. So the ESS may be considered as being on the right track here. In addition, being contradiction-free is a major asset (that should be treasured and maintained).

On the other hand, such systems tend to become self-complacent. Until very recently, the ESS ignored the role and importance of private standards consortia. The initial suggestions on how

to incorporate their output into the ESS were severely flawed (see e.g. [Jakobs & Blind, 2011]). The recent Regulation [EU, 2012] certainly points in the right direction, but it remains to be seen how things will develop in practice. Likewise, is remains an open issue how the contradiction-free system is to be maintained in the face of the likely wealth of consortium standards used and referenced.

Unfortunately, some of the perhaps less obvious issues with potentially considerable long-term ramification keep to be largely ignored. These include primarily the link between research and standards setting and the education about standardisation. A weak link to research may imply that important findings never make it into the standardisation process and that, accordingly, standards will be developed that do not take into account the state-of-the-art. As a result, such standards will either not be taken up by the market or be very soon superseded by others (most likely developed by a consortium). Inadequate (or rather, virtually non-existing) education about standardisation will, in the medium to long term, lead to (at least initially) poorly equipped European standardisers. Of course, this has been the situation for decades. The difference in the future will be the fact that they will need to deal with their well trained peers from Asia. It may well be anticipated that the latter will have a distinctive advantage and that they will be in a position to push even technically inferior standards.

For China, the situation is quite different. The country is a relative newcomer to international standardisation. Their national standardisation law dates back to 1988 (which, as one result, completely ignores e.g. IPR issues) and their national body was founded only in 2001. The identified strengths and weaknesses very much reflect this relative youth. On the bright side, the Chinese government seems to be well aware of the importance of standards and standardisation, and to be prepared to act accordingly. This is, for instance, exemplified by the new draft standardisation strategy [MST, 2012]. This document very much focuses on what has been identified above as weaknesses of the ESS – the link to R&D and the importance of education. Especially the latter had been realised quite a while ago and adequate remedies have been made available in the form of, for instance, university degree courses on standardisation. More generally, the very existence of such a strategy document is an advantage not to be underestimated (assuming that it will actually be implemented). More generally, the government is able, and prepared, to spend significant amounts of money on a limited number of prestige projects [Meyer, 2013]. Through it's leading role it can also minimize the duplication of efforts, albeit only to a limited degree.

On the 'darker' side it seems that China has not really learned as many lessons from others as it could have. For one, it's national standards system with four levels of standards ('National', 'Professional', 'Local', 'Enterprise') is a potential source of problems. According to [Hou, 2011], "*almost all provinces have developed local standardization strategies*". Moreover, the government itself suggests to develop 'Enterprise' level standards even if National ones are available if they are "*stricter than the corresponding national, trade or local standards*" [PRC, 1990]. Kennedy et al. [2008] observe that "*by 2006 there were more than 1.26 million company standards registered in China*". Here, it might be worthwhile to look at Europe and consider the establishment of a contradiction-free standards system (which is probably easier said than done).

The same holds for the adherence to the development of only full-fledged standards. That is, no lightweight deliverables that would introduce an additional level of flexibility are developed. The same holds for the non-consideration of standards consortia and their output. Here as well the recent move by the European Commission might serve as a role model.

4 EUROPE AND THE CHINESE SYSTEM

The descriptions and discussions above have – hopefully – demonstrated that the Chinese standardisation system is nothing to be worried about or even feared. Obviously, the sheer size of the Chinese market is close to being mind-boggling. Yet, this does not hold for its standardisation system, which has its strengths and weaknesses just like every other standardisation system. On the other hand, said market size arouses desires. The next section will, therefore, provide a brief case study on the standardisation in the field of e-mobility to highlight the problems that occur when different approaches to standardisation clash in a potentially very large market.

4.1 An Aside – Approaches to e-Mobility Standardisation in China and the EU

The major challenge associated with the standardisation of e-mobility is rooted in the fact that this is a highly multi-disciplinary topic. Stakeholders include governmental organisations, SSBs, automotive manufacturers, the electric/electronics industry as well as battery designers and power companies. Adequate standardisation is one of the central pre-requisites for market acceptance of electric vehicles (EVs). In both regions, the question is to which extent the stakeholders involved will be able and willing to co-operate in standardisation. German/ European and Chinese administrations are well aware of this issue. Accordingly, they sponsor a number of initiatives and special co-operation projects to foster EV standardisation. One of the main issues here is the fact that EV standardisation strategies differ vastly between Europe and China. Without a general understanding of these strategies it is difficult to understand how the two systems impact the standardisation efforts of European car manufacturers [Gerst & Gao, 2012].

4.1.1 Different standardisation strategies

Germany has been very active in Electromobility standardisation and has launched a national e-mobility program [NEP, 2012] that is in line with the European strategy on clean and efficient vehicles. It provides a public policy framework to support the development of alternative technologies in the automotive sector. The main objectives here are to support the competitiveness of the European automobile industry and to promote sustainable mobility. Thus, it contributes to the European debate on measures to promote decarbonisation of transport, but also takes into consideration the changing consumers preferences. The Strategy follows a two-tier approach, comprising

- the promotion of fuel efficient vehicles to be put on the market in the near future, with a focus on the combustion engine (2020 perspective), increased use of sustainable bio-fuels and gaseous fuels;
- the European roadmap and the action plan for promoting the proliferation of breakthrough technologies, mainly focusing on EVs (plug-in hybrids and fully electric) and Hydrogen-powered vehicles.

In contrast, and in line with the 12th 5-Year Plan, the Chinese standardisation strategy aims to establish a scientific, systematic, open, orderly and adjustable EV standards system that will meet industrialisation, commercialisation and management requirements and that will become an important technical cornerstone for the Chinese e-mobility industry. The emphasis of the standards development will be on the co-ordination of national standards with sector-specific and company-specific standards [Gerst & Gao, 2013]. The idea is to transform recent technological achievements into (national) standards and use them to influence international standardisation activities. That is, China aims to transform itself from a follower to a leader in EV standardisation.

In total, 57 standards have been published since the 9th 5-Year Plan (12 standards for Electric Vehicles, 8 for Hybrid Electrical Vehicles, 7 for Full Cell Electrical Vehicles, 6 for e-motorcycles, 8 for energy storage, 5 for Electric motor and 11 for infrastructure). Currently, 7 standards are waiting for approval, 19 new standards are under development and preliminary research is conducted for another 45 ones. Compared to the European approach to use and develop standards in an international regulatory and standardisation framework, China develops its own national EV standards. This has a direct impact on the standardisation efforts of European car manufacturers [Gerst & Gao, 2013].

4.1.2 Standardisation management from a European industry perspective

European stakeholders in Electromobility in China are confronted with the national approach to EV standardisation. The individual reactions differ. The big corporations have issued their standardisation departments with special mandates for China to understand the rules and regulations and to ensure full co-operation with the national and relevant local governments. Smaller companies often do not have the means to do so and frequently team up with the large players. European stakeholders also form alliances and jointly draft position papers targeting relevant governmental entities to express e.g. common standardisation strategies and concepts for future implementation. Moreover, they organise cross-company workshops to inform local suppliers and other interested parties about international standards. A very dense cross-company network has also been established; the EV representatives of different companies exchange information on a regular basis and maintain good personal relationships [Gerst, Jakobs & Gao, 2012].

International corporations prefer international standards to save R&D cost, to enable large scale production and, most notably, to save market access time. A number of such standards are available in the automotive and electrical engineering sectors. However, in China the tendency to set national standards with a view to getting a competitive edge in the national market may be observed. That is, national and international standardisation concepts are in competition here. Although the development of national standards tends to be quick in China, these standards are considered inadequate for global markets by international companies. Due to the different interests involved, collaboration and co-ordination of all stakeholders is a time-consuming and costly exercise.

A fast market penetration of EV is high on the agenda of both European car manufacturers and the European Commission. However, in both regions the success of this new technology will depend on a variety of complex and intertwined factors. Amongst others, these factors include the ability and willingness of industry and governments to agree on a globally harmonised approach towards standardisation, common interfaces, vehicle topologies and architectures and certification processes. That is, compromises between the systems are inevitable.

4.2 Putting It all Together

Traditionally, Europe has rather good relations with China. In 1979, DIN provided the PRC with the full set of German standards, and thus contributed quite considerably to the shaping of the Chinese standardisation system (which is, like DIN, modelled on the international system). More recently (in 2006), the European Commission, EFTA and the ESOs launched the 'Seconded European Standardization Expert for China' (SESEC) project. The aim of the project is to "*enhance visibility of European standardization and contribute to the integration of China into the WTO trade system. Moreover, it helps European industry to maintain and*

increase its competitiveness in the global marketplace"[14]. The 'Europe-China Standardization Information Platform' (CESIP[15]) is another very tangible example of Chinese-European co-operation. The Platform is a web site where Chinese and/or European stakeholders (specifically SMEs) will find information in English and Chinese about applicable and upcoming standards with relevance for the export to China or Europe of certain product categories.

In general, it seems that the European view of the Chinese standardisation system is much more geared towards co-operation rather than competition (which would closer to the US view, not least demonstrated by the various 'threats' China is said to pose to the US in [Breznitz & Murphree, 2013)]. This is further corroborated in [Meyer, 2012], who argues that the EU system is one of co-regulation in which industry and government co-operate closely. The state acts as a facilitator of co-operation, also in standard setting, a role the European Commission has slowly grown into. More generally, he argues that the EU's standardisation system(s) is still marked by its comparatively high degree of co-operation; this ingrained view may well also extend to China. In the field of electro mobility, for example, one of the 10 general recommendations made in the 'German Standardization Roadmap for Electromobility' [NEP, 2012] is that "*Cooperation with China needs to be intensified and China must be urged to participate in ISO and IEC work*".

Adopting a slightly different view, a policy brief by the China EU Information Technology Standards Research Partnership [China-EU Standards, 2011] argues that the view from Europe is generally that standards and standardisation processes in China are barriers to market entry. This is said to be due to, among others, the complex system of mandatory and voluntary standards with different regional validity, some standardisations processes being shaped or even controlled by public policy and strong links between government and Chinese firms. Funnily, these views are largely mirrored by the Chinese views on the European system. One might suspect that this is not least due a mutual lack of information an knowledge, something the EC and the ESOs try to overcome.

Another issue to be considered is the alleged competition between the standardisation systems of the US and the EU. More recently, a third 'competitor' is frequently said to have joined the struggle – China (see e.g. [Bach, 2005]). Yet, for one, the three systems are quite different (despite strong similarities between the Chinese and the EU one), with different strengths and weaknesses. Moreover, mutual membership is more and more commonplace. ETSI, for example, has several Chinese members, as has IEEE. And through joint ventures or subsidiaries US and European firms are members of SAC. Meyer [2013] rightly notes that "*As competition between companies across borders increases, no company with international ambitions can afford not exploit the opportunities provided by the different systems. Competitive pressures force them to participate in multiple standardization systems. This arbitrage by private companies further reinforces the divergence and comparative advantages of the various standardization systems*".

All in all, it would seem that a more relaxed attitude towards China's role in ICT standardisation has been adopted by the EU and the Member Countries. Given the above, I would argue that this is the best way forward. Obviously, there will be problems (most of which are likely to related to IPR issues). But at the end of the day China will settle in the international ICT standardisation arena and the other players will get used to it. Power relations will shift, but since the standardisation environment has never been static (just think of the advert of private consortia that caused a severe shake-up) this will only be a rather

[14] http://quality-partnerships.cn/standards-in-china/sesec-project/.

[15] http://eu-china-standards.eu/Index.aspx.

temporary upheaval. An equilibrium will be reached – until the event of the next future standards super power …….

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