Title: Standardisation, innovation and IPR

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Abstract
Patents and other industrial IPRs have the potential to undermine the collective pursuit of a technical standard that might serve the common interests of the sector or industry. This tension between the individual and the collective, between the development of technology and its diffusion, is by no means new; it is an inherent feature of standard development as an institution of innovation. The premise for this article is that the scope for conflict has increased over time. The increasing prevalence of the conflict raises a set of challenges for policymakers, patent offices, standards development organizations, and businesses. The article contributes to increasing awareness in these environments.

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Introduction

In an unprecedented move, a standards body recently (November 2003) petitioned the United States Patent and Trademark Office (USPTO) to re-examine a patent, which it claims, should not have been granted. One of the complaints the standards body made is that the patent office was wrong to issue the ('906) patent[1] because the extension of exclusive right to the technology in question could hamper the future development and use of HTML, the main language used on the web.[2] The implication is that by granting exclusive rights on the particular technology, the patent office can inadvertently undermine wider innovation on the web.

The W3C's complaint is one of several current cases that illustrates that tension continues to mount between standards bodies and IPR regimes. It illustrates the scope for conflict between these two institutions and suggests that the underlying tension is intimately associated with the innovation of network technologies. This article reviews how the underlying tension between IPRs and SDOs has increasingly led to conflict. It looks to the touchstone of the conflict (in the late 1980s during the standardization of GSM), reviews some approaches to deal with conflict, and discusses how the conflict has evolved and what this might mean. The article frames this discussion in terms of the of the distinct roles that standards development organizations and intellectual property rights play in the "innovation infrastructure" and contends that this process is bringing what are initially complementary functions in the innovation process into increased confrontation.

1. An essential tension in the innovation process[3]

The interrelationship between intellectual property rights regimes and standards development organizations is characterized by an inherent tension. This tension grows out of the fact that these institutions perform functions that complement one another in the innovation process. Conventional analysis of their respective roles provides an initial appreciation of how they can be construed as complementary and can thus indicate how tension might emerge between them.

1.1. An innovation perspective

Innovation involves a complex evolutionary process which essentially a complicated and heterogeneous process, the dynamics of which will tend to vary from case to case. In general terms the innovation process can however be understood to involve the sustainable generation, distribution and utilization of new economically-relevant knowledge which continuously accumulates and is recombined in the economy.[4] This process boils down to an ongoing interaction between the generation of technological variety and its selection. There is a complex set of factors that induce and promote the creation of diversity and that affect the selection process. It follows that there is likewise a complex interrelationship that keeps the virtuous circle of the two in swing. Intellectual property rights regimes and institutional standardisation are two central institutions that play complementary roles in perpetuating such

[1] The patent in question is the "Eolas patent", number 5,838,906. It is already the object of contention in a case Microsoft fame, since Microsoft has appealed a patent infringement suit, entitling Eolas to $520 Million. See also Washington Post (Jonathan Krim), November 13, 2003

[2] The standards body in question is World Wide Web Consortium (W3C)—a primary forum for internet standards-development. It is a standards forum or consortium and not a standards development organization.

[3] This section builds on Iversen 2000a; 2000b.

[4] E.g. David and Foray (1995).

a balance. This section briefly looks at these roles, indicating the implications of the roles coming out of balance.

2.1.1. IPRs: The economics literature tends to cast IPRs, particularly patents, as 'appropriation mechanisms whose dominant function is to create an incentive for private R&D where the market does not.[5] The creation of an incentive to invent is one of at least three different ways in which patents, in particular, contribute to the promotion of technological diversity in the economy. Patents also publish details of the invention to the economy. In this way it also diffuses economically useful information to future or parallel innovative activities, thus fertilizing future inventive effort. A further function that is more and more important in a climate where inter-firm collaboration is more intensive, is that patents also help provide the basis for a desirable level of coordination of collaborative R&D activity. Patents regimes are therefore essentially a combination of an incentive-oriented "appropriability" mechanism married— in a certain state of trade-off— to a diffusion oriented disclosure mechanism (i.e. publishing patents). In other words, "patents are designed to create a market for knowledge by assigning propriety property rights to innovators which enable them to overcome the problem of non-excludability while, at the same time, encouraging the maximum diffusion of knowledge by making it public." (Geroski, 1995: 97)

2.1.2. Standards: In this "market for knowledge", IPRs are thus most often identified as a promoter of a diversity of technological ideas. An instrumental consequence is that IPRs lay the basis for proprietary technologies. In contrast, the role standardization especially in standards development organizations (SDOs) plays in innovation[6] can be associated with a selection process to reduce variety and with the creation of non-proprietary goods; ideally, they work in the collective interest of all actors. In general the economics literature tends to associate the role of formal standardization with the idea of the 'failure' of markets. Schmidt & Werle (1998) indicate that the focus tends either to be on the reduction of transaction-costs, especially related to information, or on associated with network externalities. Standards are associated with, among other things, reducing uncertainty by controlling variety; enhancing competition by clearly defining what is required to serve a market (information); constituting markets by defining the relevant aspects of products (Tirole, 1988); facilitating scale-economies for suppliers, or influencing the distribution of cost and benefits of building and operating large complex technical systems. (Mansell, 1995: 217).

Standards play a particularly important role as 'selection mechanism' in the case of network technologies, where the importance of narrowing the diversity of network technologies in order that the industry can take advantage of network externalities is highlighted.[7] In short, network technologies are vulnerable to the generation of 'too much diversity'. These technologies rely on connectivity, and their worth therefore rises in proportion to their user bases. As a result, the unbounded proliferation of different, incompatible versions of an emerging radical technology may lead to a damaging Tower of Babel situation. The fight of individual alternatives to establish dominance in such a situation can be costly both for manufacturers, service providers and customers. In the end, a protracted fight for dominance

[5] See Arrow, Kenneth (1962). Economic Welfare and the allocation of resources for invention. (in The Rate and Direction of Inventive Activity: Economic and Social Factors.) For a recent empirical and theoretical contribution, see Cohen, Nelson & Walsh. Protecting their intellectual assets: appropriability conditions and why US manufacturing firms patent (or not). NBER Working PAPER No. 7552. Feb 2000.

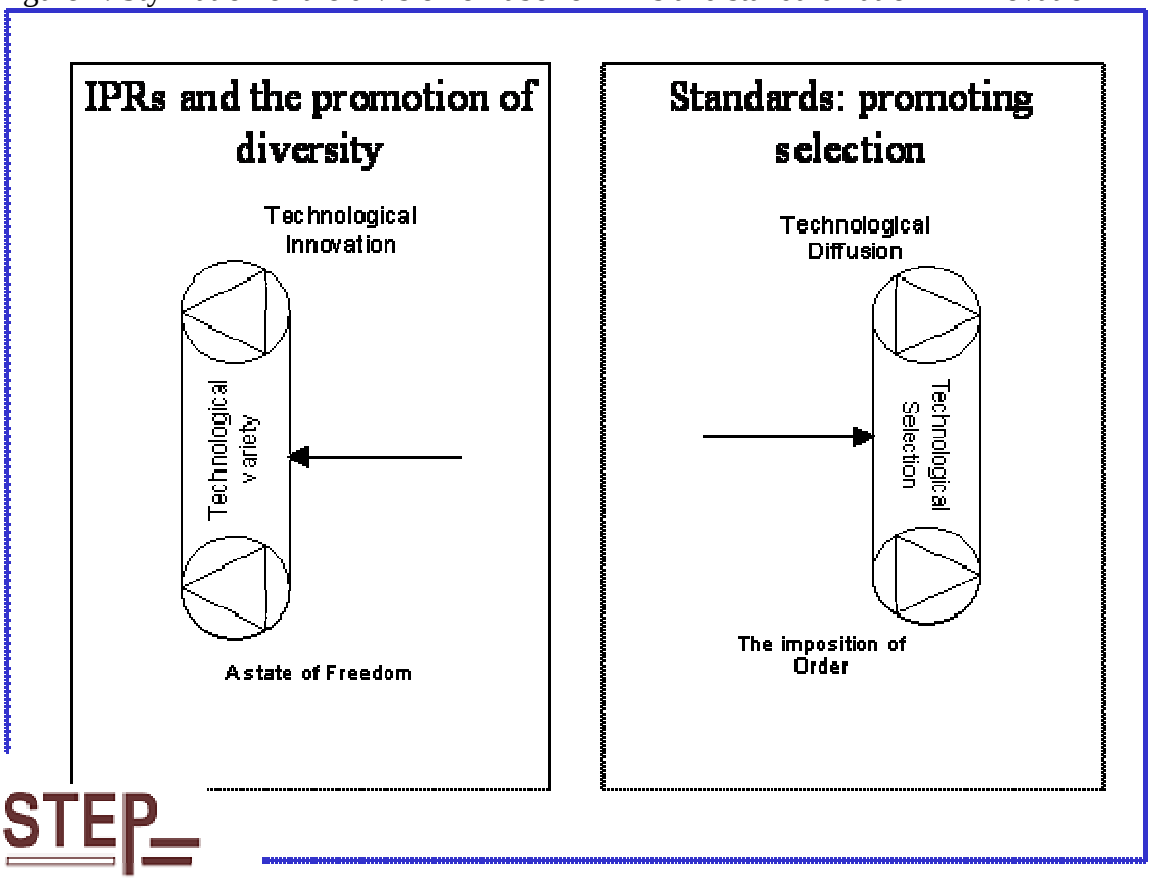
[6] See Iversen, 2000

[7] See Katz & Shapiro, 1985, Farrell & Salloner, 1985, David, 1987. For an alternate view—ie. that network-externalities are not important, see Liebowitz & Margolis, 1999.

might undermine the potential market for that emerging technology altogether, and remove it from the technology race. Networks will simply not be created in a sustainable way; the value of the component for the consumer will not be realised. Failing to amass a 'critical mass' of users, the technology risks missing its fabled window of opportunity. There are many examples of this situation of the type of Betamax or more recently of the CT-2/ Telepoint system.

2.1.3. Division of labor: In short innovation is dependent on the dynamic interaction between variety-creation and an ongoing selection process. IPRs and formal standards development organizations play important roles in the innovation infrastructure to keep this evolutionary relationship working generation after generation of technological change. Figure 1 illustrates the stylized division of labor where IPRs, especially patents, are most closely related as incentive mechanisms to the continuous generation of technical variety while formal standards bodies, especially voluntary SDOs, are most closely related to selection from among the ripening variety of technological solutions.

Figure 1: Stylization of the division of labor of IPRs and standardization in innovation



In reality, the roles are not this clear cut. The way IPRs and SDOs are used mixes their roles with regard to the creation of variety and the promotion of selection. On the one hand, the standardization process has moved further and further in front of the market, such that standards activities contribute to creating new solutions not provided for by the market; the semantic web standards are one example. On the other, the increasing strategic use of IPR to create defensive bulwarks against competing technologies for example can serve to mimic a selection mechanism; such strategies can limit the scope for competing technologies to

emerge and therefore reduce the gene pool from which new combinations of emerging technologies can develop and recombine.

Indeed the interaction between variety and selection— and the roles of IPRs and SDOs in it— are much messier than the figure suggests. It does however point to an essential trade-off in the innovation process, it indicates the complementary roles of IPRs and SDOs, and it suggests the essential tension that underlies that relationship. In this setting, maintaining balance is important. Too much variety may be bad since, "variety conveys efficiencies in specialization and customization that are offset by the failure to achieve network externalities and other economies of scale" (Steinmueller, 1995). Likewise, the opposite may also be the case since, "in reducing diversity, standardization curtails the potentialities for the formation of new combinations and the regeneration of variety from which further selection will be possible" (David, 1995). Therefore, in the ongoing interaction between the generation of technological variety and its selection, "effective long-term adaptation requires that these two processes be kept in balance" (Carlson & Stankiewicz, 1991).

2.1.4. Emerging Conflict: Since the mid-1990s, it has been observed (e.g. Iversen, 1996) that a set of forces has served to amplify the tension and has begun to threaten the balance. The prospect that the role of IPRs should come into conflict with the complementary role of formal standardization suggests that the way these institutions are each evolving is translating the inherent tension into conflict. (Iversen, 2000b)

The potential for conflict between intellectual property rights and standardization arises when the implementation of a standard, by its essence, necessitates the application of proprietary technology. The case of 'essential intellectual property rights'[8] is implicit to the tension between the two institutions. When a standardization development organization starts work to codify a standard specifications for a telecom system it will be working in an area where private agents have already researched and perhaps developed proprietary technologies. The risk that may emerge is that the codification of the standard specs will infringe the proprietary rights described in the IPRs of one or more such agents. The IPR will be considered 'essential' if the standard, by its depth and detail, necessitate the use of the proprietary technical solutions describe in it. Should it do so, the collective interest in the standard confronts the private interests of the IPR holder.[9]

A court is ultimately needed to establish whether or not the IPR (patent or software-copyright for example) is really 'essential'. At the same time, a court case would require considerable time and resources, and could jeopardize the collective standardization enterprise. So the difference between an IPR that is in reality essential and one that is potentially essential is not that great after all: both cases threaten to tie up the standardization process. Essential intellectual property rights in this sense should be further differentiated from 'Blocking IPRs' which definitively block the process.

1.2. The business perspective

Before looking at what situations blocking IPRs present for business, this section first reviews the potential benefits of standardization in today's world.

[8] For a description of the possible outcomes, see Lea & Shurmer, 1995. See Iversen, 1999 for the way ETSI IPR Policy addressed such outcomes.
[9] See Miselbach & Nicholson (1994) for a description of essential IPRs.

2.2.1. Business in a standardizing world: Business is increasingly aware of the benefits of standardization. The standardisation processes taking place in the formal settings of ITU, ETSI and IETF – as well as in industrial standardisations forums is taken seriously by businesses. Yet, not all companies have the resources to follow standardization activities; to contribute and try to get preferred solutions accepted is even more time consuming. Patenting is also expensive and time consuming. As indicated above, similarities do not end there. Both patents and standards are ways of codifying technology and, thereby increasing increased use and increased innovation. This means that any company that has a strategy that encourages competitors to use their technology will benefit - in theory. If the market adopts the technology, increased volumes will lower production costs. This is the effect of making a technology public.

This is what IBM and others have done with the PC market. IBM continues to profit from that strategy in part because they continue to license out technologies related to PCs. The basic technology for the PC is free, but there are many improvements for which IBM holds patents. So they developed an innovative strategy for licensing that roughly entails that they forgo suing PC manufacturers for patent infringement where "infringers" buy IBM hardware like disks and pointing devices.

Now, the PC standard is not a formal standard produced by a standardisation body. Instead it is (a set of) de facto standard(s) that has evolved continuously the last twenty years. IBM released the original AT specifications but then tried to force the Micro-Channel Architecture (a 16- and 32-bit bus standard) onto the hardware manufacturers. They objected, and the PCI standard evolved, which has now been replaced – but still most PCs have PCI-slots for add-on hardware. There are many vital parts of the PC-architecture that IBM lost control over (from processor and bus to operating system), but still IBM manages to earn money from licensing PC-related technology. This illustrates how a large industrial actor can benefit from spreading its own technology rather than using the exclusionary possibilities of IPR. Norwegian examples are how the Nordic Telecom Administrations opened their specifications for the mobile technology NMT.

2.2.2. Standardization in a business world: The link between a standards process, especially a continuous one in the software world, and business can be even closer, as the collective standards efforts take on the aspect of product in marketing. An increasingly prevalent tactic is that standards are branded and marketed as brands. This raises new considerations.

XML is a strong brand. It is however not a registered trademark, and the effect of this is that a company does not need a license from a standardisation forum to state that a product is based on XML[10]. The same goes for e.g. MP3 – the digital audio format [11], which has even become a consumer brand.

[10] XML as an industrial standard is promoted by OASIS http://www.oasis-open.org/. See also http://www.xml.org and http://www.w3.org/XML/ . XML was originally developed at the World Wide Web Consortium - W3C http://www.w3.org

[11] MP3 is the nickname for layer 3 of MPEG1 and was developed by Fraunhofer and Thomson, see http://www.iis.fraunhofer.de/amm/ . It is now an ISO standard, and Fraunhofer's patents are licensed by Thomson, see http://www.mp3licensing.com/ See http://www.mpeg.org/MPEG/mp3.html#licensing for papers on MP3 and IPR.

Blaupunkt	Thomson	Thomson	Grundig	Philips	Bluetooth SIG

FIGURE: Some registered trademarks for standards and their owners. The Blaupunkt and Grundig MP3versions are used proprietary. The CD logo is used on all CDs. A similar logo exists for DVDs. The users in an interest group own the Bluetooth trademark jointly.

For MP3 there are registered figure marks, but Thomson, who license the patents, do not require a licensee to use a particular logo, neither do MPEG-LA who do the licensing for MPEG-2 (used for your DVD-movies) and MPEG-4. MPEG-LA has a voluntary option to mark products that they are "licensed by MPEG LA®" – but that is hardly good brand building. A CD-player or most CD covers will include the "Compact Disc" logo that is a part of the licensing terms from Philips. Philips has full control over essential CD patents, so they can dictate such marking. As the CD-format now is so established that nobody thinks of the branding work and how it competed with e.g. Sony's MiniDisc. Nowadays there is not much to gain for a company to promote their products as Compact Disc compliant.[12].
The Bluetooth Special Interest Group (SIG) has developed a very successful branding programme [13] :

> "The Bluetooth logo is a licensed trademark of the Bluetooth SIG, Inc. Anyone wanting to use the trademark for commercial purposes must be licensed to use it. Licensing is simple. It only requires you to become a Bluetooth SIG member. You may do this by going to the www.bluetooth.org website and follow the instructions for becoming a member. Adopter level membership is free, but requires that you sign the Bluetooth Trademark Licensing Agreement, thus allowing you to use the logo for all purposes."

This promotes consistent use of the Bluetooth trademark and is a powerful way of promoting the standard. So any adaptor of that technology gets marketing assistance and accesses to a brand. This effect of standardisation is more and more taken into consideration in standardisation forums; other examples include how Apple licensed for free the FireWire brand for the IEEE 1394 standard and the logo programme from USB Implementers Forum for their competing standard.

During any standardisation process the participants will be asked what IPR they have related to the standard, and whether they are willing to license their IPR using "RAND" terms, i.e. Reasonable And Non Discriminatory terms. Statements about this are usually published at the website of the standardisation body.

A patent is the only way to get a legal monopoly in the private sector. When including patented technology in a standard, the owners are asked to waive the rights of refusing their fiercest competitors to use that technology – and to agree to stick to a price that is equal for all licensees. This is the trade-off for submitting a technology to a standard, and the return can be:

- A widespread use of the technology
- Easy identification of licensees, as they will say they follow the standard when promoting their products
- Help to spot infringers, as licensees will tell on others not paying license fees
- A patent pool[14] that can help to establish a licensing programme

[12] The DVD logo and format is licensed by DVD FLLC, see http://www.dvdfllc.co.jp/ for licensing terms.
[13] https://www.bluetooth.org/bluetooth/landing/brand_tools.php

For a company that will earn money from sales of the services or goods that are covered by the patents, it may be of little interest to earn money from a licensing programme. The main income will anyway be directly from their customers, and setting up a licensing operation, even through a pool may be a nuisance taking away focus from core business. But for an R&D institution or for a small high-tech company, this can be a good way of recovering R&D costs. It takes however long time to establish a pool, typically five years. This is not a good economic incentive for most organisations where the return horizon is less than three years. For companies like IBM, Ericsson or Philips, which have large patent portfolio and culture focusing on IPR, it is common to use standardisation combined with IPR for business purposes. For smaller companies, like eZ systems discussed in a case later in this article, it is difficult to participate in the standardisation processes, but successful products can be developed based on standards and IPR used actively in the business model. Standards are now branded actively, and Bluetooth ® serves as a good example.

2.2.3. The balancing act: Standardization involves a trade-off between ensuring rapid deployment of a standard in the market place and maximizing profit on IPR. Time-to-market or time-to-money are two of the key decision factors for a telco when it introduces new services. International standards may be a catalyst for value creation if the actors across the value network adopt the standard. In the case of MPEG-4 (below) it is important that the chain from content provider to service provider, to network operator to end-user (terminal equipment) has adopted the standard. The sooner a standard reaches market-wide acceptance, the sooner the commercial success for the telco, as the economy of the teleco are largely based on volume of transactions (e.g. completion of a call or number of bits transferred). One of the main forces inhibiting rapid deployment of a standard is the battle between the vendors implementing technology based on the standards, as they want to maintain their uniqueness and maximise return on investment on research and development. This behaviour is very closely linked to the business models for the technology vendors that are usually licenses based on software, and pr. unit based for hardware. An open question is whether business models that are more closely linked to the success of actual services from the telco, would be more beneficial for both the technology vendors and the telcos. However, one obvious disadvantage for the technology vendors would be that “time to money” increases.

2.2.4. Facing up to blocking IPR: However, the interaction between business and standards increasingly raises the situation of the essential and blocking IPR. A blocking IPR can be a result of two main situations for companies. In the first general set, the IPR holder refuses to license or refuses to do so on a basis that is considered fair, reasonable and non-discriminatory (see below). The threat to withhold IPRs in this situation may be used as a bargaining chip. A flat refusal would be regarded with extreme suspicion. The existence of essential intellectual property rights among individual rights-holders outside the standardization work is much less predictable. Absent the necessary search processes, such rights may appear at any time during the life of the standard. The willingness of the rights-holder to license at agreeable terms is likewise not a bygone conclusion, especially if added to already agreed upon royalty-schemes.

The second set of cases involves a plurality of rights-holders. The relevance of this case—that more than one right held by more than one rights-holder—is itself testimony to the fact that

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[14] Patent pools are discussed many places in this article. A good overview is in “Robert P.Merges – The case for patent pools”, 1999 - http://www.law.berkeley.edu/institutes/bclt/pubs/merges/pools.pdf . Many more links and information can be found at http://www.cptech.org/cm/patentpool.html .

intellectual property rights and the work of standards development organizations have become much more inter-tangled. A variety of rights-holders complicates the licensing process which is supposed to be fair both for the licensee and licensor. What happens when the *cumulative royalty costs*, while fair to the individual rights-holder, become too high for potential licensee? The short answer is that the standard would die. This raises the question of different ways to address cases of conflict, which are becoming more and more common. Finding solutions to new challenges in the interaction however does not happen by itself.

2. Cases of mounting tension and conflict

By late 2003, a single SDO (ETSI[15]) reported that 95 companies had claimed 8,800 IPRs essential or potentially essential to the organization's work.[16] Twenty years ago, things were significantly different. No record would have been available, for one thing. For another, the assumption would that there would be few if any essential IPRs. In a relatively short period of time, essential patents have gone from being an exception to being the rule. This section will review some of the cases of conflict that have emerged over time which indicate that the number of cases of conflict has proliferated in number, type, and severity.

3.1. Early cases of conflict:

The first cases of conflict began to emerge in the 1980s when US courts heard several cases involving participants of standardization activities who had not disclosed their patents during standards work. The first relevant case appears to have involved a format for magnetically coding and storing information. This technology then became integrated into an ANSI's Group Coded Recording (GCR) standard, which was initiated by an existing licensee (IBM) of the patent. Mutter (2002) shows that, in it, the Potter Instrument Company participated actively in the elaboration of the ANSI standard without notifying the standards committee of its patents, in a contravention of ANSI committee policy. The company then sued another company who implemented the standard for patent infringement.

The ruling indicates what can be at stake in such a case when it concluded that, "Potter …gained a monopoly on the GCR industry standard without any obligation to make its use available on reasonable terms to competitors in the industry" (207 U.S.P.Q. 763: 769 (E.D. Va. 1980) cited in Mutter (2002). The patent holder was prohibited from enforcing the patent in question in what then was an unprecedented judgement. Several years went by when a similar case again emerged at ANSI involving an ATM card validation system in Stambler v Diebold, Inc (1988)[17]. Under somewhat similar circumstances, the patent holder left the standardization committee for what would become the THRIFT and MINT standards without disclosing relevant patents; he waited until the standard was implemented to assert the patents. Again according to the Mutter report, the court found that this behaviour was improper and that the undue delay in asserting the patent suggested to the market that the patent had been abandoned. The patent holder could not just, "assert that his patent covered what manufacturers believed to be an open and available standard."[18]

3.2. The GSM Case[19]

[15] ETSI (1998). IPRs; Essential, or potentially essential IPRs notified to ETSI in respect of ETSI standards. SR 000 314 v1.3.1.

[16] Caveats about dependability: duplicates, the claim of 'essential'. However on the other side other patents may be left out.

[17] See Mutter (2002).

[18] 8. 11 U.S.P.Q.2d 1715 (Fed. Cir. 1989: cited in Mutter (2002)). Contrast with the current Rambus case below.

[19] This case is draws on work in Iversen (2000), as well as Blind et al (2002).

At about the same time as Stambler v Diebold, Inc, a case had begun to materialize in Europe that today stands as the touchstone for the increasing conflict between standardization activities and IPR. This case involves the IPR controversy generated during the extensive standardization of the now popular GSM system. The GSM case is different both in quality and in degree from the earlier US cases. The immediate areas of contention for example did not actually wind up in court. It is rather the number and degree of rights implicated, the diversity of actors involved, the timing and intensity of the controversy, and its various by-products that presage a "new situation" and the need for new approaches to deal with it.

3.2.1.Background: The GSM system is based on 10,000 pages of technical specifications, covering all aspects of the mobile-system. As described elsewhere (Iversen, 1996, 2000b), this is a case of a comprehensive and deliberately over-specified and wide set of standards that entered into a veritable IPR minefield. A variety of factors including the composition of participating parties, the variety of their home markets (in technical and geographical senses), and the rather unique circumstances for involvement in the project helped what was bound to involve sensitive navigation between the collective interests of the standards processes and the private ones of individuals into a confrontation.

The question of IPRs was a central challenge that began to emerge at a critical stage in the standard's development. Thomas Haug (2002), who led the work[20], reports that the first indications that the GSM work was "loaded with patents" emerged in 1985. Many areas of the formative standardization efforts in fact implicated patents although this was foremost the case in speech coding. This situation confronted CEPT policy which mandated that specifications should be avoided which involved technologies which were not available on non-discriminatory terms without royalties. In the event, efforts were made with the result that agreements were secured for two patents in the speech coding technologies: beyond these, "the IPR issue was going to cause a lot of difficulties in the work of the new Pan-European system" (Haug, 2002: p 20).

Time would show that 'essential patents' were claimed at all levels of the GSM system by a number of different actors. It is reported that by the late 1990s, over 20 companies claimed to hold about 140 patents which they construed as 'essential' to the GSM standard (Bekkers, 2000).[21] These are distributed among several types of technologies (switching, speech-coding, radio transmission, etc.). In addition, they accumulated over time. More than 60% of these were initially applied for after the GSM system had essentially taken shape in the late 80s; that is, at a time when the equipment manufacturers had already become involved. In this context, the later patents are less important to the important first stages of adoption of the GSM system.

[20] In the Special Group set up by the Committee for Coordiantion of Harmonization CCH of CEPT.
[21] This figure is based on the analysis by Bekkers et al. (2002) of first-filings of the patents reported to ETSI as being "essential".

Box 1. Timeline of mobile-communications

Mobile communications highlights

1946: First civilian mobile system launched in Missouri

1979: 900 MHZ band reserved by the World Administrative Radio Conference (WARC of the International Telecommunications Union). This substantively laid the basis for the development of mobile communications.

AMPS launched (Bell Labs)

1981: NMT (cooperation between Scandinavian PTTS and some manufacturers)

1982: First meeting of Groupe Spécial Mobile (GSM) in Stockholm

1985: TACS (AMP- based)

1986: Validations Systems tested

1987: GSM opted for 'the broad-avenue' digital approach

GSM Memmorandum of Understanding (MOU)

1988: ETSI instituted

IPR conflict commences with refusal of MOU terms

1989: GSM transferred to ETSI

1991: GSM phase I standards

1993: GSM phase II standards

Source: Iversen, 2000b.

In the event, work was handed over from CEPT[22] in 1988 to the new European Telecommunications Standards Institute (ETSI). The creation of this new European standards organization coincided with the move to deregulate the European telecoms markets. One implication is that the standardization process grew in the transition to include a set of vendors from inside and outside Europe.[23] Another consequence of the transition was that the IPR question was moved to the purview of the administrators of the crucial GSM Memorandum of Understanding (MoU) in 1987.

3.2.2. Memorandum of Understanding: coordination and conflict: The MoU was an agreement between the Telecom Operators primarily to coordinate the launch of the system in 1991. It was an agreement in which the TOs (at the time, the PTT administrations) of 15 CEPT countries entered in 1987, directly before the handover to ETSI. This agreement supplanted an earlier four party agreement from 1985 and put into place the logistics of a coordinated launch from the TO's point of view. In it the signatories committed themselves to a common organizational line on the deployment of the GSM system. It was imperative to the success of the GSM system that the launch be synchronized, that equipment-type be proven compatible and that there was a rolling commitment to its future development of system. It also laid the basis for the first commercial contacts to take place between customers (the Telecom Operators, TOs) and vendors (equipment suppliers) for the provision of equipment based on the GSM specifications. In several prominent cases, there were traditional allegiances between the national PTTs and equipment manufacturers (Ericsson, Nokia, Siemens, Alcatel).

[22] The European PTT body: Conférence européenne des administrations des postes et télécommunications

[23] The ETSI was established in line with the recommendations from the Green paper on the development of the common market for telecommunications services and equipment (COM (87) 290), which signalled the deregulation of the telecoms market in Europe. The ETSI included multinationals including companies with their headquarters outside Europe, for example Motorola.

What provoked the confrontation were the terms governing bidders' freedom to exercise their IPRs that were employed unilaterally by the 17 participating PNOs. What was contentious for the IPR-holders was that the contracts specified that equipment suppliers were obligated to undertake to license any "essential" patents royalty-free within the CEPT area and to license to all-comers outside the CEPT area at "fair, reasonable and on-discriminatory terms." This clause was appealing since it potential could defuse any risk that IPRs might pose to the collective launch of this "over specified system".

The controversial IPR clause has an interesting heritage. Appearances would suggest that it grew out of traditional relationships now being eroded between PPTs and national vendors, where contracts typically left the clearance of rights ("have-made rights" provisions) to the vendor (Iversen, 2000b). This may be one factor. But the real reason according to Stephen Temple, who led the MoU, had to do with the legacy of attempts during the mid-80s to lay the basis for an open mobile standard based on a Franco-German technology. In the event, the French and German governments together requested that this clause be included. The reason was that the R&D activities that had been funded by the Franco-German program in a bid to create an open standard on their own, were covered by such a clause (Temple, 2002:45).[24] Royalty free licensing provisions are not uncommon in publicly funded R&D. When Franco-German efforts were more fully integrated within the GSM work in the later 1980s, the governments were concerned that their vendors would be forced to license royalty free while other vendors could set their own terms.

3.2.3. Dissent and conflict: The terms pertaining to the equipment suppliers' exercise of IPRs that were codified in these preliminary contracts proved contentious for some of the manufacturers. The individual reactions of different suppliers must however be seen in terms of a set of factors that includes: how many patents a manufacturer held that could be construed as "essential" to the GSM standard; which technical area they were in; and, relatedly, the orientation of their IPR strategies. The other factor was whether or not they had been involved in R&D funded by the Franco-German work. In this setting, the US-based Motorola Corp held a wild-card position. It became the most vocal opponent to the GSM-MoU signatories' terms. Several features of this company can be linked to the vocal position it took, including the fact that its home-market was outside the EU, the structure of its markets were different (technically and geographically) from the other actors, and that it needed to strengthen its position in Europe while limiting the potential for competition with its other markets (for example the US).

The number of essential patents claimed by Motorola was three times as big as its rival (the range of 24-30, according to interviews.) This fact alone effectively raised Motorola's 'ante' and implied that it would want a larger part of the pot. Further, the technical area in which these patents were concentrated was important. The reason for this has to do with the different types of pay-off structures connected to different sorts of technologies. Because of the orientation of its technology, Motorola was dissatisfied with market prospects and was therefore unwilling to forfeit the additional returns afforded by licensing royalties. This raises a third characteristic about namely Motorola's aggressive in-house IPR policy coupled with its lack of market shares in Europe.

It became increasingly apparent that the emerging GSM system was extraordinarily exposed to the risk that either "cumulative" licensing costs would price GSM out of the market or that

[24] Stephen Temple led the administration of the MoU.

IPRs would not be licensed. The system was indeed perceived to be extremely vulnerable. Against this background, the North American company decided to utilize its patents to gain access to market shares in the dawning European market. Therefore when Motorola refused the terms of the MoU and demanded separate undertakings for individual contracts, a serious controversy was ignited with MoU signatories. Motorola's strategy of a selected number of cross-license agreements helped reduce the number of equipment suppliers effectively to five: Siemens, Alcatel, Nokia, Ericsson and Motorola.

The conflict mounted with accusations and recriminations. Concerns peaked when consensus around the IPR clause in the MoU began to breakdown, and procurement contracts were issued without it. Some telecom operators are reported to have launched something of a campaign at this point, claiming that Motorola was refusing to license its IPR: their concern was that Motorola's strategy would make GSM too expensive (which during the recession of 1991-2, when this occurred, was a general concern). The well publicized conflict began to involve talk of legal actions and Motorola, who said its reputation suffered as a result of the accusation, at one point considered a liable case. In the end, prices for network equipment and for handsets did not undermine the adoption strategy behind the standardisation of the GSM system. But controversy went on to breed more controversy in ETSI.

3.2.4. SDOs begin to readdress the IPR conflict : The adoption of the GSM standards represents something of a watershed in the relationship between formal standardization and intellectual property rights. This case presaged a proliferation of conflict since, involving different national and technological settings, and different types of rights (including copyrights) under different circumstances. It also set the stage for a somewhat different case in the related area of Terrestrial Trunked Radio standards[25], an interesting conflict involving software copyrights and irregularities in the SDO's procedures related to IPRs.

The legacy of the GSM conflict that is perhaps most important is that it directly led o the reappraisal of rules and guidelines not only in ETSI but in other SDOS, for addressing the increasing probability for conflict. ETSI's controversial search for procedures that departed from normal practice of other international SDOs tested the question of what sort of new provisions a modern SDO of needed to address the IPR question in the emerging environment was hotly contested. It became a lightning-rod for conflict and led ETSI into a protracted controversy both at the institutional, the legal and the political levels. ETSI's search for new procedures involved a total of five identifiable phases, and generated an unprecedented level and degree of controversy (see Iversen, 1999 for details), ultimately leading to a lawsuit before the European Commission. ETSI's search for an approach to IPRs that differed from normal practice subsequently sparked a revision in the ways other international SDOs address IPR policies. In parallel, the ANSI revamped its IPR policy in light of its experiences with the GCR, and the THRIFT and MINT standards. Although ETSI's attempts fell away from their initial trajectory and gravitated back towards normal practice, the minimal procedures of SDOs like ITU-t were subsequently updated in the wake of the ETSI work. The search entailed a difficult balance between more or less detailed procedures designed to address the increasingly complicated problem facing ICT standardization.

3. The emerging need to readdress the question

In addition to TETRA, a set of cases followed in the wake of GSM and ETSI's controversial search for new procedures is currently forcing the industry to re-examine the balance between

[25] See Bekkers (2000), Blind et al (2002).

IPRs and standardization. Standards bodies from the traditional ITU to the less traditional (and more idealistic) W3C have since introduced new guidelines to varying levels of controversy; IETF's attempts have consistently met with controversy. The overall tendency is that conflicts and concerns have grown as a series of new types of conflicts have evolved, and the question of what to do with 'essential IPRs' is a day-to-day concern. At the same time, there is an emerging need for new ways to deal with the increasingly common conflict, such as patent-pooling arrangements accompanied by some form for regulatory clearance. Other initiatives may involve reforming the way patents are granted, for instance as indicated in the W3C case involving Eolas.

3.1. Current signals from the Courts

A current case in the US has reopened the question of how individual IPR holders is to be balanced against the interests of collective standardization activities. Taking place on the heels of a landmark case which related non-dislosure to anticompetitive practices, [26] the Rambus case is now drawing into question this obligation in certain respects.

4.1.1. Rambus v. Infineon and FTC v. Rambus, Inc., FTC (No. 9302): The balance between the rights of right-holders and the collective interests of the standards is however in the process of being reopened by a current case. The original case, Rambus v. Infineon Technologies AG, pertains to patents on synchronous DRAM[27] held by Rambus, a company that manages IPRs. Four companies including Infineon were charged with infringing these patents when they produced to what was intended to be an open, royalty-free standard for SDRAM elaborated by the JEDEC Solid State Technology Association[28].

Rambus, the patent-holder, participated in the JEDEC committee work from 1992 until 1996 when it left prematurely. Rambus's departure reportedly coincided with the Consent Decree of Dell Computer Corp; and allegations are (Mutter, 2002) that a patent application that was pending while Rambus was on the committee where subsequently altered through a series of divisionals or continuations.

In October 2003, the Court of Appeals for the Federal Circuit (CAFC) however found in favour of the patent-holder (Rambus) in a remarkable 2-1 split decision which overturned a lower court that had found it guilty of fraud for failure to disclose patents[29] that it later tried to enforce. The two judge majority held that Rambus was not obligated under JEDEC's patent policy manual[30] to disclose pending patent applications.

Rambus is today in a position to assert patent rights pertaining to the relevant JEDEC standards, that would entitle it to an estimated[31] billion dollars in royalties from memory manufacturers producing in compliance with those standards. In addition, its patent position is

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[26] Federal Trade Commission v. DELL Computer Corporation – 1996.

[27] According to Nuts & Volts Magazine: http://www.nutsvolts.com/Encyclopedia.htm: "(Synchronous DRAM) A type of dynamic RAM memory chip that has been widely used starting in the latter part of the 1990s. SDRAMs are based on standard dynamic RAM chips, but have sophisticated features that make them considerably faster"

[28] Once known as the Joint Electron Device Engineering Council.

[29] According to The Inquirer (http://www.theinquirer.net/?article=9224), the original patent application was filed in 1990 before Rambus became involved with JEDEC. This application subsequently led to numerous divisionals and continuations, such that the case currently involves 31 unique U.S. patents.

[30] No 21i. 1993

[31] See FTC Complaint. http://www.ftc.gov/opa/2002/06/rambus.htm

expected to knock-on to several other markets. This has laid the basis for a Complaint lodged by the Federal Trade Commission against Rambus on antitrust charges, alleging the "deception of Standard-Setting Organization and violation of Federal Law." The assertion is that,

> Had Rambus properly complied with JEDEC's rules and abstained from any misleading conduct, the FTC contends that this likely would have impacted the content of the organization's SDRAM standards, the terms on which Rambus could license any pertinent patent rights, or both. That is, according to the FTC, the royalties that Rambus has been able to charge SDRAM manufacturers would not likely have been sustainable without the pattern of misleading and deceptive conduct outlined in the complaint. (FTC, 2002)[32]

The complaint concurs with the lower court ruling, and is under consideration before the FTC Administrative Law Judge (ALJ). One key question is whether patent applications, which have not been published in the US until recently, should have to be disclosed. The interpretation of the ALJ is expected to have a set of important implications. In general, the line taken in the CAFC ruling seems to take balance between IPR holders and SDOs in a significantly different direction to that established in the Consent Decree in re Dell. It will have significant implications for how JEDEC and indeed all US SDOs approach IPR disclosure rules. A clarification is awaited with considerable expectation by JEDEC, who is currently reconsidering its IPR policy in light of the CAFC ruling, and by the industry.

3.2. Patenting pooling: MPEG 4

The pooling of patents is an increasingly utilized method for standards to deal with the situation of multiple patents in the hands of various actors. It has been used recently for DVD technologies, but perhaps most notably in terms of different MPEG standards. One pool that has been hailed as a success is the pool established for the MPEG-2[33] standard in 1997. It is managed by the Denver-based company MPEG LA, and was set up to provide an easy, reasonable, fair and non-discriminatory way for users to access the necessary patent rights to develop digital video. The licensees receive at one set price access to all rights needed in order to meet the MPEG-2 standard.

4.2.1. Background: The MPEG2 patent pool proved to be a tremendous success for the licensors, and the standard achieved wide spread acceptance in the market place. The critical success factors in this licensing scheme was:

- A royalty scheme that was perceived to be fair and reasonable in the market place
- A professional licensing administrator with the ability to deal with a large number of licensees and closing contracts
- A critical mass of licensors with credibility in the market place, and the financial ability to enforce the rights if necessary.

With this success in mind, the MPEG-4 Visual patent pool was set up in 2000 to serve the commercial interests of the essential patent holders in the standard. In 2002, patent holders and the licensing administrator agreed on licensing terms for the pool. The patent holders are approximately the same as those participating in the MPEG-2 patent pool, with some new entrants including Telenor. A total of 22 companies hold essential patents in the pool. At present 103 companies have signed up for licenses. Equipment manufacturers and software

[32] FTC Issues Complaint Against Rambus, Inc. Deception of Standard-Setting Organization Violated Federal Law http://anon.user.anonymizer.com/http://www.ftc.gov/opa/2002/06/rambus.htm

[33] MPEG-2 is the technology that underlies the effective transmission, storage and display of digital video, which feeds over media including satellite and personal computers.

companies dominates this list of companies, even though the license is also targeted at telecommunication service providers. The reason for this is mainly that there is currently a very limited number of operators that facilitate streaming MPEG-4 over their networks.

For the telecommunication operators, this is a new set of circumstances. Traditionally telecommunication operators bought equipment from vendors through contracts that had patent indemnity clauses. These clauses protected the operator patent from getting entangled in litigation with third parties (see have-made rights). With the Internet the distinction between platforms and services has become more blurred. In the case of the MPEG-4 Visual license, the telecommunication operator now provides a service that is streaming MPEG-4 video, becomes a licensee. This is a completely new business model, where the patent holders in the MPEG-4 Visual patent pool are actually claiming a royalty for every MPEG-4 video streamed by the telecommunication operator.

One main difference between MPEG-2 and the competitive environment surrounding MPEG-4, is the availability of competing proprietary technologies. Major competing technologies include Microsoft Windows Media Player, Apple Quicktime and Real Networks. One implication of this arrangement is that a licensor in the MPEG-4 Visual patent pool like Microsoft has had access to all information regarding the formation of the patent pool and the license terms. In launching a version of its proprietary *Windows Media 9 series platform* in 2003, Microsoft created its own licensing terms explicitly to compete with the pools, claiming, "Microsoft's new licensing agreements give greater flexibility to developers and cost significantly less than MPEG-4, MPEG-2 and other mainstream technologies" (Gartner Research, 2003).

This is the beginning of the battle for rich media content distribution on the Internet. In contrast to the more software driven vendors like Microsoft, the equipment vendors are more in favour of MPEG-4 and want to promote the open standard. At the moment, competing solutions coexist, and there are no signs of who is winning the war.

3.3. Combining copyleft in licensing arrangements: the example

The collective efforts of software developers has taken on qualities of a standardization process. Such efforts have faced the challenge of combining proprietary contributions into collective frameworks in novel ways. The case of *eZ systems* illustrates one strategy that combines copyright with copyleft.

eZ systems"[34]develops an open source framework for Content Management Systems. eZ produces software and publish all their code. It is based on a voluntary community that contributes to testing, improvements and bug fixing – and they earn their money from selling services and from their licensing model, where you have two choices. You can either buy a professional license by which you have the sole rights to whatever software you build based on their framework, or you can have a free license based on the GNU General Public License.[35] The GPL licensing terms mean no licensing fees for the user on the one hand but commits him to a set of do's and don'ts' on the other. The user commits for example to disclose source code on his contributions publicly and freely and to assure the code to be free

[34] see http://www.ez.no

[35] http://www.gnu.org/copyleft/gpl.html The notion "copyleft" is used in favour of Copyright. The legal framework and IPR however is that Copyright. Read more about GNU and the Free Software Foundation at http://www.gnu.org/.

open source software (no rebranding nor bundling with proprietary systems). By committing to these terms, the user avoids paying licensing fees while being able to use the software, to distribute modifications, as well as to sell services based on the software.

These limitations are typical for "copyleft" licensing. Note that eZ systems insists that all copies must have a proper copyright notice and that any added code must be public and cannot be licensed. If you buy a "professional licence" even if you have the rights to the additional source code you have written, if another programmer wishes to make changes to that she will also need a professional license.

The code eZ systems publishes is based on international standards including XML and PHP programming libraries. So in order to actually use the framework, a developer will depend on standardized technology. The nice touch in eZ's business model is that they will benefit independently of what licensing option a programmer chooses. If she goes for the free copyleft license, she will share her results with eZ. If she pays and go for the professional license, she will pay eZ and if she shares the results, the new programmers will also pay. eZ benefits from the standards that are an integrated part of their framework; they could have developed it all by themselves – but the rapid adaptation of their framework is of course due to the confidence that standards promotes. Many standards are good brands, and XML is one that eZ benefit from.

The arrangement also benefits from the work that the standardization bodies do to ensure that the technology does not infringe others IPR. So, the XML-standardisation bodies like W3C have a patent policy [36] that ensures that XML can be used without paying royalties or taking a license[37]. This is also connected to the discussions on patenting and software in general, an area, which is still open in Europe after the EU parliament did not manage to pass the directive on software patents.[38] In brief, eZ use copyright and copyleft and a licensing scheme to promote their technology. It is based on standards, and benefit from both their branding and the patent policies of the standardisation bodies.

3.4. The Eolas patent and the W3C Complaint

The balancing act between IPR holders and standardization activities not only involves the procedures of standards development organizations in dealing with essential IPR; it also involves the quality of the corpus of intellectual property currently building up in the ICT area. The World Wide Web Consortium (W3C) complaint mentioned in the introduction implies that the way patents are granted unnecessarily exacerbates the potential for conflict in promoting new standards ultimately facilitating innovation. The complaint contributes to a gathering critique of patent quality in the US.[39] One instrumental element is the recommendations of the Federal Trade Commission for ways to reform the patent system in the US.

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[36] http://www.w3.org/Consortium/Patent-Policy-20040205/

[37] There are hundreds of patent applications on XML-based technology. Microsoft was awarded a US patent in February 2004. More details and references are at http://news.com.com/2100-7345_3-5158432.html

[38] Håkon Wium Lie, chief technology officer of Opera Software, said to ECT News Network August 26, 2003 indicated that software patents are not helpful to software development.

[39] See Updegrove, Andrew (2003). Do IT Patents work? And: Patents: Too Easy to get, too hard to challenge. (htm//www.consortiuminfo.org/bulletins/nov03.php.

The complaint draws into question in particular two aspects of patent granting procedures at the United States Patent and Trademark Office; patent novelty and patent scope. The "Eolas" patent[40] was originally granted to the University of California for a technology that provides web browsers to access interactive features on a web page. The patent was subsequently licensed to Eolas Technologies Inc.

Eolas is not a vendor, but rather an IPR management company that lives by creating and, more to the point, enforcing IPRs. It recently won a patent infringement suit against Microsoft on the same '906 patent, rewarding Eolas $520 Million. Companies like Eolas play a non-traditional role in the market since they do not vie for market share. The live by 'leveraging' IPR. Accordingly their market considerations are much different than traditional IPR holders, who create and maintain IPR portfolios as a means to support their manufacturing activities. This means, among other things, that their behaviour will not necessarily comply with the market logic that brings together the different interests into the standardization process to begin with. In this setting the IPR portfolios of IPR management companies have the potential to become loose cannons in the standards setting environment. This type of player poises a challenge to standards development organizations and consortia. It is interesting to note that the W3C activities had not yet led to litigation by Eolas patent, only to the Microsoft case which has caused something of an IPR outcry. The fact that W3C and Microsoft are active advocates against the Eolas patents indicates how widespread the outcry has been.

Two issues are raised in the W3C which have deeper implications for the way the USPTO grants patents. The first is that the USPTO granted a patent that does not fulfil the novelty criterion required by the patent system. The second is more fundamental and involves the changing role of the patent regime: the standards body complained that by granting exclusive rights on the technology in question, the USPTO can inadvertently help undermine the future development of HTML, the main language used on the web.

4. Conclusion

The scope for conflict between IPRs and standardization continues to increase, generating considerable uncertainty. The increasing prevalence of the conflict has brought into question how standardization efforts can better deal with the potential conflict, and it even has actualized calls to improve patent quality. The potential for conflict raises a set of challenges for policymakers, patent offices, standards development organizations, and business.

The article contributes to increasing awareness in these environments. It briefly surveyed the genesis of this conflict by first looking at the conceptual basis for conflict in terms of the innovation process. The article went on to review cases that illustrate the potential for imbalance between IPR and standardization and that indicate ways to deal with this increasingly likely situation. The cases surveys different conflicts in different settings, including those related to the non-disclosure of granted patents (e.g. the GCR standard), US patent applications (Rambus), as well as copyright questions (DVSI in TETRA). Emphasis was however placed on the GSM case. This case, and ETSI's subsequent search for a new IPR policy, stands as a lightning rod for the increasingly delicate balancing act between IPR and standardization. This European case further raised issues related to multiple patents spread among diverse interests, including concerns of cumulative royalties. In the US, the

[40] Patent number 5,838,906, covering technology that allows Web browsers to access interactive features on a Web page.

recent cases involving the Federal Trade Commission have more recently served to reopen the question of the balance especially in light of factors that are unique to the US environment.

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