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**Executive Summary of the
Study on the Interaction between Standardisation
and Intellectual Property Rights**

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Introduction

The primary objective of the conducted study was to achieve a good understanding of the relationship between standardisation and intellectual property rights (IPR). Based on these insights, recommendations can be derived in order to improve their interface.

The generation of new knowledge, inventions, their transformation into innovation and their widest possible diffusion, together with the attempt to prohibit parallel development, are considered to be essential factors for economic growth. Knowledge as such, however, is intangible and has the feature of a public good. Non-excludability of others from the use of produced knowledge makes it difficult for a knowledge-producer to recoup her/his expenditure on research and development (R&D). Intellectual property rights, covering patents, trademarks and copyrights, and standardisation are both tools for knowledge creation and diffusion.

The ways their influence work, however, are quite ambivalent. This ambivalence of industrial property rights and de facto industry standards or de jure standards for technological development is triggered off by two different economic mechanisms. Intellectual property rights (IPR) provide knowledge-producers with the temporary right of the exclusive exploitation of the benefits deriving from the new knowledge. In this way, IPR supply knowledge-producers with the publicly desirable incentive to invest in R&D. IPR, however, are only a second best solution. Firstly, they provide holders with a temporary monopolistic position, possibly causing negative effects on competition in the long run. Secondly, IPR influence the diffusion of knowledge. Some IPR, like patents, include a positive element of diffusion by publication of the right. In general, however, the restraint on the free flow of ideas and knowledge by IPR dominates. Potential users can either not gain access to required knowledge or have to pay for it via licensing.

In contrast to IPR, formal standards published by standards development organisations (SDOs) are decisive for the diffusion of new technologies. They not only make information about new technologies available to everyone, but also allow the use of this technical information in production processes or products for a small fee, and come near to being a classical public good. Participants of standardisation processes also have an intrinsic incentive to create knowledge within a standard document. The knowledge created through a standardisation process is different from private closed knowledge creation processes, since different actors contribute to the final output. And the added value being created can be interpreted as the coordination of the different inputs and the broad acceptance achieved for the final output, the standard document.

Summarising the major differences between IPR and standards, it can be said that IPR involve a more proprietary and standards more of a public domain aspect. Consequently, this difference entails a certain tension in their relationship, which may cause a broad scope for conflict and therefore a need for policy attention. Besides this, there has been a rising propensity to use patents, together with a growing reliance on standards activities. Since standardisation has moved more towards the co-ordination of technologies, it gains a more active role in knowledge-creation process. On the other hand, the pooling IPR has become an issue relevant for standardisation. This phenomenon is exacerbated by the increasing intensity of patenting in particular areas. The effect on how IPR and standards are being used, combined with some other changing framework conditions (like the internationalisation of markets, the convergence of technologies, and the increasing pace of technological change) has led to a growing tendency to conflict. Consequently, the dynamic balancing of private and public knowledge becomes a constant consideration both for SDOs and for government agencies.

Three constellations may illustrate how IPR and standards interrelate:

- a) the two are designed to complement each other, which promotes a 'virtuous circle' of creation and diffusion of new knowledge
- b) in a worst case, IPR, especially patents, can be exercised to block standards, with considerable downside welfare impacts
- c) however, in a growing number of cases there is a need to ensure more efficient licensing mechanisms, for example through equitable patent-pool schemes, which do not endanger the IPR regime, but allow their controlled diffusion into standardisation processes.

There has been a noted need to improve our empirical and theoretical understanding of the way IPR interact with technical standardisation. The primary objective of this study is to provide this understanding, and, on this basis, to provide recommendations designed to improve the interface between these two important institutions.

In order achieve this objective, different working steps have been undertaken. Consequently, the report is divided into four sections:

- In section 1, relevant literature is reviewed. This allows us to come to grips with the issues and to see how these issues have changed over time. In this section, the relevance of the potentially conflicting relationship between intellectual property rights and standardisation is considered in relationship to the framework RTD funding from the EU Commission.
- Section 2 presents a survey of a wide set of R&D managers and other relevant actors across Europe about the relationship. On this basis the study is able to show the relevance of the conflict and the problems caused.

- Section 3 supplements the survey by looking at 20 case studies. These provide necessary contextual information about the conditions that frame the interaction of IPR and standards.
- Section 4 sums up the results of the three approaches and derives recommendations for policy.

General Insights from the Literature

Intellectual property rights and standardisation are important social institutions that play active roles in technical innovation. They share certain similarities as institutions: for example, both patenting and standardisation essentially serve to codify technical information into unambiguous, replicable language. Furthermore, the use of intellectual property rights and technical standards requires a certain level of absorptive capacity on the part of the applicants. At the same time, their roles are essentially different.

A patent, the most comprehensive IPR, describes the parameters of a technology (product or process) which the patentee owns limited rights over, while standard specifications are elaborated by diverse interests in order to provide common ground for the further compatibility of different technologies. The patent commits the inventor in a binding relationship with the state or relevant regulatory body. In general, the inventor contracts to reveal detailed information about the invention in return for limited protection against others using that invention for the time and geographical area for which the contract is in force. In terms of the concessions made by the parties, there is a trade-off between the disclosure of detailed information by the inventor against the insurance of limited monopoly awarded by the state. In this sense, the patent system is designed as an incentive mechanism for the creation of new economically valuable knowledge and as a knowledge-dissemination mechanism to spread this information.

IPR, particularly patents, are generally envisioned as ‘appropriation mechanisms’ whose dominant function is to create an incentive for private R&D, where the market forces are not sufficient. However, they play at least three different roles in promoting technological diversity: in providing an *incentive* for R&D activity, in *diffusing* economically useful information and, more and more importantly, in aiding a desirable level of *co-ordination* for 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).

Standards can be differentiated as to *what* is standardised and as to *how* the standard is produced. As for the object dimension, there are product standards, control standards or process standards. As for the way standards are produced, there are again three categories: standards that are set through the market, on a de facto basis, stan-

dards that are set by government, through the regulatory process (mandatory standards) and standards that are negotiated through a voluntary consensus process. In general, it can be said that formal standardisation begins with the idea of the 'failure' or inefficiencies of markets. Therefore, their focus tends either to be on the reduction of transaction costs, especially related to information asymmetries, or on association with negative environmental or safety externalities or positive network externalities. Furthermore, standards encourage market entry and enhance competition by clearly defining what is required to serve a market. In addition, standards facilitate scale economies for suppliers, simultaneously allowing increased variety by making multiple combinations of components possible. Finally, standards may have features of a public good benefiting the whole society.

The potential for conflict between intellectual property rights and standardisation arises when the implementation of a standard, by its essence, necessitates the application of proprietary technology. During the past decade and a half or so, conflicts have escalated in number and severity.

Quantitative Results of the Survey

An empirical survey was conducted to assess the above sketched problems in a quantitative manner. More than 150 experts from European manufacturing companies, like R&D managers, IPR managers and standardisation experts, were approached to answer questions about their IPR management, their involvement in standardisation processes, and their experiences concerning the interaction between standardisation and IPR in general.

Among the strategies to protect their innovations, secrecy and related measures such as customer relations management, lead-time advantages and complex product design are most important. As already confirmed by other surveys, patenting is only of medium importance in comparison to other protection tools. The importance of patenting as a protection tool rises with the firm size, but so does the importance of secrecy. This is in particular true for patenting and R&D-intensive companies.

The protection of own technology from imitation has the highest importance as a motive to patent. This corresponds with the classical (defensive) use of patents, but also with the economic reasoning behind patenting. Aggressive forms of patenting are a more important issue with big companies. The business-related aspects of patenting such as the generation of licensing income and the acquisition of venture capital are of relatively low importance.

More than 50 % of the responding companies have been involved actively in standardisation in the last three years. The survey results confirm also the increasing importance of European and international standardisation. The most important reason to participate in standardisation is to exert influence and to prevent certain

specifications in standards. Companies that are involved in standardisation procedures file much fewer patent applications than those firms that are not involved in standardisation. This might be an indicator that the use of intellectual property rights, reflecting the success of own R&D activities, and participation in standardisation are to a certain degree alternative innovation strategies.

The motives for participation in standardisation that assume a close relationship to R&D are rather weak. Both the improvement of the dissemination of own IPR and the reduction of R&D costs reach values below average. Therefore, the question has to be answered, what prevents companies from using the standardisation system and from transferring their research results into formal standardisation. The most important barriers reported are problems in connection with the standardisation process. Firstly, standardisation is too slow, secondly too costly, especially for small companies, and thirdly too inflexible, particularly for large companies. Furthermore, the co-ordination between research and standardisation organisations and the awareness by researchers are insufficient and have to be improved.

In order to improve the transfer of research results into formal standardisation processes, it is vital to raise the awareness of the benefits of standards. Financial incentives are especially suggested by small and medium-sized companies, which have emphasised the high costs as a major barrier to transferring their R&D results into the standardisation processes.

Besides the transfer problem, there are obviously numerous conflicts with IPR in standardisation processes. Most problems arise with patents. Over 30 % of the companies indicate that they had problems with own patents and over 40 % of them had problems with the patents of others within the standardisation process. Concerning the kind of problems, over 40 % of the large companies indicate that their licensing conditions have not been accepted. Over 35 % of the patent-intensive companies have experienced infringements of their IPR. The results also indicate that there is a real problem with IPR in standardisation, because over 50 % of the companies indicate that they have never found a solution to their conflicts. To purchase licenses and circumvent protected technologies are the most popular strategies to overcome this problem.

In order to overcome conflicts with IPR involved in formal standardisation processes, some measures have been proposed. However, both mandatory licensing, reduced terms of patents, and a shift of responsibility for screening of IPR involvement in standards to the IPR-holders are not assessed as being adequate solutions.

Qualitative Experiences from the Case Studies

In order to complement the sometimes puzzling quantitative results of the survey by qualitative information, case studies were performed to elucidate the relationship between IPR and standardisation in more depth.

Due to the numerous differing dimensions, a simple obvious clustering of the cases is not possible. Therefore, the dimension have been reduced to two, which reflect the core of our study. The selected cases can be classified according to the involvement of standards and IPR. Consequently, four types can be distinguished. Technologies, which are still at a very early stage, like nanotechnology, have both still a limited, but probably rapidly increasing number of IPR, like patents, and are dominated by scientific publications. Due to the emphasis on basic research, first applications will be realised in the future, therefore there is no need for standards at the moment. The second cluster of pharmaceuticals and biotechnology is characterised by a high density of IPR and a more mature stage in the life cycle of the technology. Only very few sectors have little IPR, like many service-related and software-based areas. Consequently, little or no problems with standardisation arise. In some cases, like in optical electronical metrology, we observe a simultaneous existence of IPR and standardisation activities on a medium level. In a pre-competitive field of technology, aeronautics, both IPR and standards in form of guidelines coexist beside each other without causing conflicts, since the group of involved actors is small and rather homogeneous. Finally, we have the large and growing field of information and communication technology (ICT). Here, the involved companies try to build up strong IPR portfolios. On the other hand, the need to generate positive network externalities requires the development of common, world-wide accepted standards. Consequently, the conflict potential is most intense. However, the pressure to find a common agreement is also very high, since only in exceptional cases are single companies able to enforce a proprietary de facto standard.

Coming back to the results of the questionnaire-based survey, it turned out that 40% of the respondents had problems with IPR of others in standardisation processes. This conflicting relationship between IPR and standardisation is also reflected in some of the cases analysed. The potential of conflict has been demonstrated for a number of cases, but what are the common characteristics when and why conflicts show up? With respect to the objective of the study, it is of particular interest to see under which conditions and why conflicts between intellectual property rights and standardisation emerge. The performed analysis gives some answers. A high potential of conflict between IPR and standardisation arose in particular in six cases of the presented case studies. All these technologies are highly relevant for IPR activities and most of these case studies showed involvement in formal standardisation procedures. These technologies are not at an early stage of development, but tend to be more mature technologies. Naturally the conflict potential rises with the complexity of the technologies, thus conflicts seem to be more likely with systemic

technologies than with non-systemic ones. Conflict potential for the mentioned cases also accompanied a high level of competition, with many participants in the market and with heterogeneous actors involved.

Policy Recommendations

Above all, the literature survey, the results of the questionnaire-based survey and the analysis of the case studies have shown the variety of interrelationships between IPR and standardisation. The review of the literature confirms that the relationship is a relatively new phenomenon, especially virulent in network industries, like telecommunications. The answers of the survey support the relevance of the issue, since conflicts of IPR in standardisation processes are much more likely than the existing literature, especially focused on specific cases, suggests. Furthermore, the IPR issue is indeed predominantly one involving patents, but both the survey and the case studies show that copyright and other rights may also be involved. Finally, the empirical evidence makes clear that many of the numerous conflicts between IPR and standardisation are not adequately resolved.

For the policy dimension it is also notable, that it has become evident that the interface can either be located closer to the research and development area or already in the marketing phase of products. Consequently, the policy approaches have to cover both research and development, the IPR regime, the standardisation regime and competitive issues.

Sometimes, a recommendation concerning one policy area may contradict a proposal made from another policy perspective. For example, stronger IPR regimes may provide companies with additional incentives to perform more R&D. On the other hand, this change may increase the likelihood of IPR-related problems in standardisation processes. A final decision can only be made by regarding the specific framework conditions of the respective technology or market. Therefore, a comprehensive shaping of the interrelationship between IPR and standardisation has to take into account all the policy dimensions. However, since different institutions, like R&D funding organisations, patent offices, standardisation bodies, and institutions regulating competition are addressed by the policy recommendations, there are many difficulties in finding a consensus among their interests and developing co-ordinated actions.

Research Policy Recommendations

Although research policies are not directly linked to standardisation, the origin of new standardisation projects can often be found in publicly funded research projects. Furthermore, the direction of research activities can be more easily influenced by the design of public policy than by standardisation activities, which are mostly

driven by private interests. The evidence from the results of the survey conducted and some experiences from the case studies allow us to derive the following recommendations concerning future research policies:

- Increase awareness among researchers about the relevance and the implications of standards and standardisation processes by training or exchange of personnel.
- Integrate clear provision for support that may be needed in order to transfer project results into standards in public RTD programmes.
- Make sure that all research to develop test and measurement methods establish the scope for the development of a new standard at the very beginning.
- Identify promoters who are part of research teams as well as a members of relevant standardisation committees, since they may be able to support the transfer of research results into standards more effectively and efficiently.
- Improve the information flows between the public research institutes and the standardisation bodies, by recognising their scientific and technological contribution to standardisation processes in scientific evaluations of these institutions.
- Publish successful case studies of the co-existence of IPR and standards amongst the research community.

IPR Policy Recommendations

The characteristics of the IPR regime have major impacts on the effectiveness and the efficiency of standardisation processes. Although not only patents have been addressed in the survey and the case studies, they clearly dominate the relationship between IPR and standardisation. Therefore, the following recommendations are focused on changes in the patenting regime or practice:

- Assure a high level of quality of issued patents, thus reducing the risk of conflicts arising from weak patents.
- Promote a world-wide harmonisation of national IPR regimes in order to decrease the likelihood of conflicts caused by cross-border application of technical standards.
- Improve the transparency and accessibility of IPR material in order to make the monitoring activities in the IPR minefield easier.
- Allow for compulsory licensing provisions as last resort in the court system.
- The IPR Helpdesk, funded by the EU, should also provide services concerning the role of IPR in standards.

Standardisation Policy Recommendations

The following recommendations are addressed to the standards development organisations (SDOs), which may modify their guidelines according to the suggestions made. However, the existing ISO/IEC directives related to patents, which are

implemented by most standard development organisations, proved to be effective and efficient in most circumstances. Nevertheless, the proposals are mostly directed to general strategic standardisation policies, including licensing and disclosure rules.

- Encourage standardisation development organisations to identify promising new technologies in their very early stages and to start new standardisation processes instead of waiting for them to mature, since in the very early pre-competitive stage of technology life cycles there is some pressure on the actors to converge their interests.
- Increase the awareness among participants of standardisation processes of possible inputs from science.
- Prefer standards which do not specify the design of components, but their performance, in order to avoid conflicts with patents protecting these components.
- Limit the duration and the scope of an entire system as well as the level of detail of a standardisation process, in order to restrict the probability for IPR conflicts.
- Change the framework conditions of standardisation in such a way that the incentives of innovative R&D-intensive companies to join standardisation processes become more attractive in general (e. g. allow attractive licensing schemes, see below).
- Standardisation processes should become faster, cheaper and more flexible.

Disclosure Rules

Disclosure rules enable the SDOs to obtain information about whether technologies under consideration for inclusion in the standard are proprietary and subject to licensing. They thereby reduce the potential for a technology to be included in a standard without the knowledge that a technology owner, with intellectual property that impinges on the standard, may try to extract royalties for the use of his technology.

- Because of differences across industries in the reward afforded by patent protection and in the needs for compatibility and standardisation, no disclosure rule would be optimal for all situations.
- Increase the transparency of IPR relevant for standards by building up publicly available databases with IPR that are potentially 'essential' for their standards.

Licensing Policy

Having learned through disclosure which elements of the standardised technology may be proprietary and subject to royalties, the SDOs are still left with the problem of drafting guidelines for setting licensing fees the technology-owner should charge after the standard is determined. The typical policy mandating that a royalty be "fair, reasonable and non-discriminatory" gives little guidance for royalty determination because "reasonable" can mean different things to a technology-owner and a technology-buyer.

- Make databases available which contain details of exemplary licensing cases, which provide guidelines for the negotiations between the IPR-holders and potential licensees.
- Take into account the IPR-holders' pre-selection negotiation and conclusion of licenses with individual licensees in the standard selection process.
- Encourage SDOs to set up some means of dispute resolution within the organisation to help resolve royalty disagreements, since this will be quicker and cheaper than resorting to the courts.

Patent Pools

Since usually not only a single patent has to be considered for integration into a standard, patent pools may represent an organisational model to save transaction cost regarding both disclosure and licensing of IPR, compared to multilateral negotiations. They are also able to resolve conflicts both among IPR-holders themselves and between IPR-holders and standards users. Nevertheless, to establish and run patent pools efficiently, and to promote their general welfare advantages, some conflict potentials and potential disadvantages, like their misuse as a price-fixing mechanism, have to be taken into account and the following recommendations should be considered.

- Pool patents early, in order to avoid constellations with two or more pools driven by different interests.
- Use public non-profit research institutions as key gravitational force for creating patent pools, since they can more easily balance the often controversial interest of the companies.
- Involve companies in patent pools which are successful in distributing new products and technologies, since this may guarantee the successful acceptance of a new standard in the market.

Competition Policy Recommendations

Both the outcome of the IPR regime, like granting a temporary monopoly via patents, and the results of standardisation processes, like the specifications of a standard causing heterogeneous implementation costs at the user side, may have negative impacts on competition. However, standardisation may also foster competition by levelling the playing field.

In general, competition policy makers have to develop a better understanding of the scope of conflict between IPR and standardisation and its impact on competition policy issues. In general, a more intensive dialogue between all parties involved can be a first step to this better understanding.

Besides this general suggestion, the following proposals focus less on different consequences of the IPR regime for standardisation and competition, but more on the consequences of the interaction of IPR and standards on competition.

- If IPR-protected technologies are integrated in a standard, be very careful about possible negative impacts on competition, since this constellation may increase the monopoly power of the IPR-holder. A remedy could be the prescription of compulsory licenses, although this instrument should be used very restrictively, because of its negative incentive signal to innovative companies interested in standardisation.
- In the case that standards become mandatory via reference in other regulations, solutions have to be found to deal with IPR-holders who refuse to give licenses away for no or very small fees.
- Consider also standardisation as an instrument to solve antitrust problems, since it allows that all interested parties influence both the specifications of a standard and implement it, leading to a common level in the playing field of competition. Therefore, standardisation may also substitute the regulation of competition by governmental institutions.
- Standards are able to devalue the brand loyalty, which is built up during the terms of patents, after the patent protection comes to an end, since standards may speed up the substitution process after the termination of the patent protection period.
- Increase the pro-competitive aspects of patent pools by the involvement of competition policy authorities in laying out allowable licensing arrangements of patent pools. Furthermore, a patent pool notification scheme increases the transparency for these institutions and alleviates and improves their decision-making process.

Conclusion

Since the rationales and objectives of the four policy areas differ in general, there are tensions between the recommendations proposed. In addition, the recommendations address different institutions. Consequently, there is a need for coordinated action in order to improve the relationship between standardisation and IPR, also taking research and competition policy aspects into account. A first step towards a comprehensive action is to covoke the responsible authorities and encourage an intensive exchange of ideas. Based on a better understanding, further steps towards an integrated policy approach can be undertaken.