

**Micro- and Macroeconomic Implications of the Patentability of
Software Innovations:
Empirical Results and Policy Recommendations**

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1. Introduction

On the European level, decisions about the patenting of software- and computer-related inventions are very much on the agenda. There is an open controversy: supporters on the patentability of software argue that patents on software - just like in other technological areas - foster innovation through giving an appropriate protection and incentive structure to innovators of new software, especially for radical, non-obvious and therefore risky innovations. Opponents, mainly but not inclusively from the Open Source community, argue that software development is characterised through a set of specialities (sequentiality, interoperability, interactive development etc.), that are severely restricted through patents. the question therefore is: should Europe follow the example of the USA and protect software² based inventions broadly, just like other technologies, or should the patentability of software be restricted or even fully abolished?

The object of this paper is to report on the main results of a an empirical survey conducted in German software and software related industry, which has been conducted on behalf of the German Ministry for Economic Affaires and Technology. in co-operation with the Max-Planck Institute for Foreign and International Patent, Copyright and Competition Law, which provided a juridical analysis of the issue. The survey asked for the modes of innovation, the actual situation as for protection of inventions and the attitudes/views of the software industry on the topic of software patents. It concludes with a set of policy recommendations that are geared towards a more adequate protection framework.

2. Empirical Study on the Economic Implications of the Patenting in the Software Sector

2.1 Method and Sample of the Survey

The study is structured as an Internet-based questioning of the enterprises developing software and independent software developers, which was carried out in spring 2001. Two types of enterprises were investigated: the first group, the so-called **primary branch**, is composed of enterprises whose main aim is the development of software (N=149) according to some current industrial classification (NACE) as well as a number of independent software developers (N=39), the second group, defined as the **secondary branch**, are enterprises from manufacturing industry, which stated that they produced software themselves (N=47). As a rule, the enterprises were found via a commercial database and approached in the sense of a full census in their whole sector. The representativeness regarding the distribution of company size can be taken as given.

2.2 Main results

Distinctive Features of the Innovation Behaviour in the Software Sector

The significance of patents in the software branch cannot be estimated without knowing the specifics of innovation behaviour. From the analysis of innovation behaviour it emerged:

- (1) Developments in the software area are characterised by very strong dynamics and short development times on the supply and on the demand side, both in the primary and the secondary branch.
- (2) The average development duration in both branches is correspondingly short.
- (3) Compared with other areas of the service sector, there are not more frequent market novelties in the software branch, but incremental further developments are clearly more frequent.
- (4) Rapid innovations and effective development processes are of even more decisive importance for competitiveness than in other service sectors.
- (5) Obstacles to conducting development work are thus even more serious in the software sector than in other branches of the economy.

Distinctive Features of Software Development

Software development is characterised by three particularities which are important for the question of patenting and its consequences: sequentiality, utilisation and availability of open code and the necessity to ensure interoperability:

- (1) The rate of code re-recycling (sequentiality) is very high, approx. one third of own developed software.
- (2) In both branches own developments are increasingly dependent on the availability of compatible external inputs, the cross-company co-operation in software developments is steadily increasing according to these data.
- (3) Open Source in the primary branch is already the most important external source of software components. This is the definite opinion of the independent developers. If the primary branch is considered without the independent developers, then the application of Open Source in the primary branch is only negligibly greater than in the secondary branch.
- (4) The importance of Open Source will increase very greatly, in both sectors.
- (5) Open Source has a generic character, i.e. in many cases it is a functional input which makes the development of own software more effective.
- (6) There is not *one* main argument for utilising Open Source, but a relatively well balanced set of motives (among others, adaptability, state-of-the-art, costs, quality).
- (7) Disclosure of code is mostly used as information strategy to diffuse information about own performance: quality seal and transparency for the customers

(primary branch), respectively signals for co-operation partners (secondary branch).

- (8) The classical Open Source mode, i.e. making the code accessible for public use *free of charge*, thus contributing to a widespread diffusion of the new code, is still a clear domain of the independent developers, although approx. 13 percent of the companies in the primary branch claim to use this custom.
- (9) Disclosure for special customers for a fee is practised by roughly a quarter of the companies in the primary and secondary sectors.
- (10) Disclosure is especially customary for systems software in the primary branch which tends to increase its importance.
- (11) For both branches, interoperability is a crucial aspect, whereby the interoperability with customer software is by far the most important.
- (12) Interoperability with customer and supplier software and with competitive and complementary products is achieved above all by the disclosure of interfaces, the disclosure of code plays a very subordinate role here.

Practices and Experience with Industrial Property Rights (especially Patents)

- (1) Of all protection possibilities, Industrial Property Rights have the least importance.
- (2) Patents especially are the least widespread of all formal and informal protective strategies and have the least significance in the primary branch. The actual trends in patent applications and above all patent awards in the software-relevant area however show a clear upward trend.
- (3) Innovative companies introducing market novelties patent more than less innovative enterprises, but the R&D intensity has no influence on the patenting behaviour. In accordance with other studies and other branches, small companies in the software branch patent less than large enterprises.
- (4) The theory that patents facilitate market access, above all for young companies, could not be confirmed.
- (5) Dealing with property rights is still not widely institutionalised in the primary branch, with the exception of the large enterprises, and where the need is recognised it is usually met via external consultancy.
- (6) Both branches (and in particular the small companies) have little knowledge about property rights, especially patents. However younger enterprises claim to have a somewhat better state of knowledge than older companies.
- (7) The reasons for patenting are manifold; the primary branch emphasises the defensive nature (protection from imitation), while the secondary branch sets more store by strategy (exploiting the market advantages, reacting to the conditions abroad).

- (8) Reasons for not patenting in the primary branch, besides costs and insecurities, are general reservations against the widespread effect of patents on innovation dynamics of the whole branch.
- (9) Even for the secondary branch, more experienced in patenting matters, the lack of verifiable proof, enforceability and thus protection afforded by patents in the software sector is a great problem.
- (10) The function of patents to inform is only perceived to a small extent in the software sector of the primary branch, especially by small enterprises, and if at all, for defensive reasons.
- (11) The negative aspects of patenting are based on:
 - legal quarrels: almost 20 percent of the primary branch and almost 40 percent of the secondary branch were already involved in lawsuits pertaining to the general area of Industrial Property Rights.
 - hindering own development activities: ca. one third of the companies in the primary branch and over two thirds of the independent developers have already been hindered in the execution of own projects by patents belonging to others.

Opinions and Estimations of the Companies on Possible Alternative Structures of the Legal Framework and Increased Patenting in the Software Sector

- (1) The independent developers reject patenting on principle and are in favour of a general exclusion of software from patenting, which would mean a restriction of current award practice.
- (2) The independent developers also reject administrative simplifications and support measures out of hand.
- (3) The companies of the primary and secondary branches are in favour of preserving the status quo and tend to have a sceptical attitude towards a spread of patenting practice in the software area.
- (4) The companies in the primary sector however are polarised, for over 25 percent of them are in favour of an expansion of patenting practice according to the US model. The supporters of such a broad patenting are more numerous in the primary branch companies than in the secondary branch companies.
- (5) In the primary sector the number of those who advocate the exclusion of software from patent protection is greater by several percent than those in favour of such an exceptional ruling, whereas in the secondary sector the number of opponents of an exceptional ruling clearly predominates.
- (6) An extension of patenting to include business processes is rejected by a great majority in the primary branch. The majority in the secondary branch also reject this, but not to the same extent, as over a quarter of the companies signalise agreement for the patenting of business processes.

- (7) Administrative simplifications and support measures are greeted by both branches (without the independent developers), with the exception of support of private initiatives on patent enforcement.
- (8) The existence of functional patent units, the possession of own patents, as well as knowledge about industrial property rights, tend to produce a more positive attitude towards patenting in the software area.
- (9) The size of the enterprise does not correlate with the attitude to the alternative structural possibilities.
- (10) Regarding the impacts of a broader patenting according to the model of the USA, opinions in the primary branch are divided. Whereas the independent developers foresee negative consequences in all dimensions, not only for their own business model (Open Source) but also for the development of the branch and technology in general.
- (11) The expectations of companies of the primary and secondary branches are ambivalent regarding their own enterprise and also the development of the branch as a whole. On the one hand they expect a strengthening of the national and international competitiveness, on the other hand they fear a restriction of innovation dynamics, product variety and of the development of Open Source.
- (12) After cost increases, the anticipated consequence most often mentioned is the reduction in the number of enterprises and resulting concentration in the software market.
- (13) Young companies have a more negative attitude towards patenting than established ones. The more companies know about patenting, the more positive their estimation of the consequences of patenting. The size of the company has no influence on the estimate of the economic and technological outcomes of patenting.

2.3 **Résumé of the Empirical Results**

- (1) Patents play a relatively small role at present, i.e. they hamper the development relatively little, but are neither a significant protective nor strategic instrument.
- (2) The actors in the software sector have widely varying estimations of the impacts of patents. Independent developers are completely negative in their attitude, feel that they are already greatly "hampered" and consider administrative simplifications and adaptations in the existing system for not target-oriented.
- (3) The majority of companies in the primary branch and many enterprises in the secondary branch are ambivalent to many questions about patenting, as a rule they have not developed an active patenting strategy and do not aspire to this. Knowledge and awareness are limited.

- (4) The number of companies which perceive the significance of patents as a strategic instrument is limited. These enterprises are as a rule internationally active and belong to the secondary branch.
- (5) The empirical survey confirmed basically, that software development is characterised by the three distinctive features sequentiality, utilisation and availability of open code and the most often necessary interoperability. The form of patenting possibilities regarding software has far-reaching implications for these three core elements of software development, in the opinion of the enterprises involved.
- (6) Basically, the majority of the enterprises calls for stronger support in patenting. In view of the fact that most enterprises claim that the state of their knowledge about patenting is low, or have not built up any in-house competence in this field, this is justified.
- (7) The impacts of more widespread patenting are judged differently. The independent developers, who also supply the most Open Source, are very negatively minded in all dimensions. The enterprises of the primary and secondary branch on the other hand see the impacts in a more differentiated way, and this differentiation points to a division in short- and long-term effects. In the short term, the enterprises will achieve a greater scope for action regarding their patenting activities through the wider-reaching options of the US system, which increases their competitiveness. In the long term however they see in the increasing proprietising of software dangers for competition and innovations dynamics. The further development of Open Source as a kind of public good, that on principle is available for use by all economic units and thus in the sense of the new growth theory promotes the general technical progress and therefore innovation dynamics is perceived to be in special danger.
- (8) A further basic demand is aimed at realising a globally uniform, binding and enforceable patent law. The question, in which direction a harmonisation should be pushed ahead, is not answered unambiguously. Adapting to US customs and making "software as such" generally patentable, is rejected out of hand by the independent developers and a majority of the companies in the primary and secondary sectors. Conversely, the option to maintain the status quo and to award a patent only on technical grounds, also did not meet with great approval. This means as a whole that the enterprises questioned (without the independent developers) – if they had the choice – would rather wish that their domestic system would assert itself world-wide.
- (9) The study confirms a recognisable trend that broader patenting does not find a large majority, even with those who do not utilise Open Source. This result agrees basically with the most recent results of the consultation with the British government and does not differ fundamentally from the results of the consultations with the EU Commission. A qualified majority – also from the companies - spoke in favour of not allowing patents for software-support business processes. This result corresponds to the British consultations.

- (10) Small changes in the existing regulations are thus no solution to the above dilemma, for modifications of existing patent law, such as the immediate disclosure of the patent document, or a reduction of the protection period are judged completely ambivalently. Only the introduction of a grace period for novelties could seem productive in view of the lukewarm approval of the enterprises and the fundamental rejection of the independent developers, as it makes possible the early publication of inventions and the prevention of sequentiality by patents.

3. Preliminary Policy Recommendations

Based on the empirical survey, which collected both facts about the innovation and patenting behaviour and the preferences for different models of the patent systems from software developing companies, a set of conclusions and preliminary policy recommendation can be derived, which have to be discussed with policy-makers, patent offices and software companies in order to find a feasible consensus:

- (1) Against the background of innovation activities and the self-assessment of the software developing companies, at present neither a radical restriction nor an incremental expansion of the patentability of software can be recommended. Consequently, Germany resp. Europe should not pursue the US American development and accordingly not broaden the patenting of software. This also – and especially – applies to business process methods.
- (2) The strategic benefit of patents in international competition is obvious, but concentrated on very few large companies.
- (3) The strategic, especially long-term cost of patenting for the dynamics of innovation and the variety of software seem to be higher, based on the results of this study. The greatest danger is seen for the further development of Open Source as a kind of public good, that on principle is available for use by all economic units and thus in the sense of the new growth theory promotes the general technical progress and therefore innovation dynamics. Furthermore, negative effects for competition are expected, because the number of companies will shrink according to the assessment of the respondents.
- (4) Policy makers should try to clarify the issue of patentability and to come to a framework that allows flexible and adequate decisions. However, experience shows that changes on the legal, normative level are very hard to obtain, especially on the European level. As a first step it is therefore recommended to come to a clearer, up-to-date definition of the patentability of computer programmes via an improvement of the examination guidelines of the patent offices in line with the results of this study.
- (5) These guidelines should not only be based on the “technological” requirements of an invention, but should rather be defined by a group of experts from

as the concept of technology is amorphous in itself and does not provide grounds for a very differentiated judgement of the patentability in a legal sense. Rather, the guidelines should take into account the particularities of the software branch (interoperability, sequentiality) and its dynamics. It is further recommended to institutionalise this expert body and have it revise the guidelines on a regular basis.

- (6) The dynamic development of Open Source and its increasing economic significance make it necessary to keep the future of the Open Source development under close observation. Should a further dynamism of patenting set in, and at the same time the Open Source development be hindered, then a legal special ruling should be considered. For example, a privilege for open-source software of the content, that the use of open-source software for non-business purposes is excluded from patent protection. However, such a privilege would entail a change in the legal framework conditions, which especially on the level of TRIPS would meet severe opposition. However, attempts should be made in this direction if in the future it transpires that Open Source software is of crucial significance for the development of the software sector and for the worldwide economy, and is being massively and lastingly damaged by patenting.
- (7) Below the level of legal changes, there are a number of starting points to improve the existing system. Most important appears to be to increase knowledge about patenting in the software area. The study revealed, even to those enterprises which actively use patents or feel themselves threatened by patents, a clear need to learn more about the patent system. The knowledge deficit is particularly obvious in the area of SMEs.
- (8) In order to support in particular SMEs and also independent developers, measures to systematically reduce the costs for application and enforcement of patents, which are often complained about, should be implemented.
- (9) At the same time, when making the patent examination more effective, it must be reflected how the idiosyncrasies of the software branch can thereby be better taken into consideration. In particular, the patent offices should have sufficient skilled personnel who are able to conduct the demanding examination in the software area, especially in view of the required non-obviousness, in order not to hinder the sequential innovations through trivial patents.
- (10) In order to make patent administration more effective with regard to computer-implemented patents one should further think of introducing an additional code for "computer- and software-implemented inventions". This code should be allotted to all patents which are based on computer- and software-implemented inventions in addition to their original first classification. Since such a systematic change would not be easy to be negotiated within WIPO, one could think of new guidelines in the German or European patent offices. For example, in the German Patent Office there already exists a special code for all inventions that have some effect on the environment. Such an additional code would simplify the research for software-related patents. Further-

more, one should think of an additional patent requirement to hand over to the patent office the source code of a software-related invention, next to the regular patent description.

- (11) Should, under the assumption of careful examination of the required non-obviousness, a patent be awarded for a software invention which proves to be crucial for the further development of the entire branch, then the possibility of a compulsory licence (as "ultima ratio") must be examined, albeit this should be the ultima ratio and must only be realised after serious examination of the social benefit and the individual and social cost of a compulsory licence.