

SOFTWARE DEVELOPED BY RESEARCH VS. FREEDOM OF INFORMATION IN EU (OPEN ACCESS AND OPEN DATA)

by

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Recently, two conflicting demands have arisen concerning research results of public research institutions. These institutions are mainly represented by universities, academies of sciences and other public scientific institutions. First, there is a growing pressure from the part of the public granting institutions, currently struggling with budget restrictions due to the economic crisis, to carry out research co-financed by the private sector (e.g. cooperation in applied research). For example, the European Union, represented mainly by the European Commission and national funding agencies are strengthening their demands for cooperation with private partners. However, legal limitations of a larger cooperation between public research institutions and private partners are becoming more and more obvious. These limitations can be seen, among others, in demands for research results being made more accessible (Open Access and Open Data), in rules for public aid policy, in diverging interests of public and private partners involved in joint research projects, in legitimate principles of free access to information, in the mixture of various legal systems, laws and rules (e.g. national, EU, international and bilateral agreements, rules of granting agencies, policy of collaborating companies), etc. This paper deals especially with the issue of results of applied research cooperation. It focuses on current legal problems concerning the software developed thanks to the cooperation of public research bodies and private companies.

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1. INTRODUCTION

1.1. WHY SHOULD RESEARCH INSTITUTIONS COLLABORATE WITH PRIVATE PARTNERS?

At the very beginning we will make a short overview of positive aspects of cooperation of public research centres and universities with private partners such as SMEs or national and international companies. The benefits of this kind of collaboration are seen by public funding agencies (e.g. the European Commission, national or regional governments and research agencies), and that is, of course, the reason why they support these activities.¹

The main positive aspects are as follows:

- 1) The research results gained thanks to public funding or co-funding are useful for the society because they are applied in practice (e.g. some results are tested and used by private companies and from the taxes on the profit from the commercial use of these results other public welfare projects are financed).
- 2) Thanks to the cooperation with the private sector various research activities of public research institutions may be co-financed. Co-financing by a private partner helps boost the research budget of a research partner (as, for example, in the case of innovation vouchers²).
- 3) Cooperation with a private partner is generally regarded as a “seal of quality” for research activities of academic institution. It is a proof that this research is needed by somebody else and it may be seen as a symbol of prestige, too. It is also rewarding for the researchers that there is an interest from users (companies) in their research activities.
- 4) In some cases, cooperation with the private sector is an indicator for public funding bodies to continue their support of a particular re-

¹ See, for example, the Executive summary of an OECD evaluation report: Organisation for Economic Co-Operation and Development (OECD) 2004, Public-Private Partnerships for Research and Innovation: An Evaluation of the Dutch Experience, published on its website: <http://www.oecd.org/netherlands/25717044.pdf>, p. 5.

² For more information about innovation vouchers funding scheme, see the South Moravian Innovation Centre (JIC) 2013, ‘Innovation Vouchers’, published on its website: <http://www.jic.cz/innovation-vouchers>

search institution and it may be a condition sine qua non for obtaining further funding from the public budget.

- 5) Joint research projects speed up transfer of knowledge and innovation to the practice and onto the market.
- 6) Sharing facilities and resources (for example, research infrastructure, scientific instruments or human resources) may cut down costs and contribute to a more effective use of budgets of both public institutions and private companies.

1.2. WHAT IS THE DARK SIDE OF THE MOON IN COOPERATION OF ACADEMIA AND BUSINESS?

However, there are not only pros but also cons, and some of them are as follows:

- 1) In some cases it is not easy to combine interests of academia and business. Research institutions prefer to publish any research results. This meets scientometric criteria set by funding agencies and also common evaluation criteria set for the scientific career development of employees of such institutions, i.e. researchers, who have to follow the imperative “publish or perish”³. A nice example of interlinking publishing activities and the software development, and thus perfectly corresponding to the topic of this article, is the Australian software ‘Publish or Perish’ that retrieves and analyses academic citations. On the other hand companies are sometimes afraid of publishing some information or research results to avoid potential harm to their business activities⁴.
- 2) When cooperating with research institutions on projects co-funded by public institutions companies face an enormous administrative burden and the necessity to follow certain rules. This may be quite discouraging for them and there are often time losses due to the deadlines set by public funding bodies (e.g. wasted time while waiting for the grant agreement being signed by the public institution responsible for the implementation of the joint research project).

³ Harzing, A.W., 2007, Publish or Perish, available from <http://www.harzing.com/pop.htm>

⁴ Peritz, for example, analyses these aspects in the USA and they seem similar to the European ones. Peritz, R., 2007, *Competition policy and its implications for intellectual property rights in the United States*, in Aderman S, Intellectual Property Rights and Competition Policy, Cambridge University Press, pp. 154-160.

- 3) Another reason for private partners to choose not to cooperate with public research institutions may be the risk of more checks and audits carried out by public authorities. When you cooperate with a public partner you may face, for example, the suspicion of breaching public aid rules⁵. The financial audit inspecting how the public money is spent in such cooperation may also be a discouraging factor for choosing not to cooperate. When you are being checked you not only have to explain to the auditors (from a grant agency such as the national ministry of research) the financial aspects of cooperation but you also have to describe the essence of the joint research project. This necessary communication with an external institution might jeopardise your company research activity if an auditor passes some information to your competitor (e.g. during another check carried out with the competitor). Naturally, there are strict legal rules for auditors as far as confidentiality is concerned. However, why should a company get into such risky situations? For a company it is not always desirable to show all the cards to public authorities.
- 4) In projects co-funded by public budgets there is quite a high degree of legal uncertainty about the rules established by the granting agency. For example, in the Czech Republic in the case of the EU funding the research development through the Research and Development for Innovations Operational Programme (RDIOP) there is a support of the development of new public research centers closely cooperating with private partners. The Czech managing authority, i.e. the Ministry of Education, Youth and Sports, published more than 20 methodological rules of project implementation for project beneficiaries during the implementation of the above mentioned programme in 2009-2013. Even if we may agree that not all of these rules concerned joint research activities these documents still had to be studied by the beneficiaries to find out if they had something to do with their projects.

⁵ In this context we may also see the risk of „price squeeze“, see, for example, Weiss, P.N., 2004, *'Borders in Cyberspace: Conflicting Public Sector Information Policies and their Economic Impacts'*, in Aichholzer G. & Burkert H. (eds.), *Public Sector Information in the Digital Age. Between Markets, Public Management and Citizens' Rights*, Edward Elgar Publishing Limited, Cheltenham, pp.145-149.

1.3. SOFTWARE AS A SYMBOL OF DISPARITY OF TWO WORLDS – ACADEMIA AND BUSINESS

In the development of new software based on the cooperation of private business partners and public research institutions⁶ we can see a symbol of disparity between two worlds – academia and business. Within this context software may be seen as a “litmus paper” showing the current situation in an arena where entrepreneurs, research institutions and granting agencies meet.

On one hand, software is still something new in our society. It has been a phenomenon of the last three decades. On the other hand, academic life is still influenced by traditions based on academic customs rooted in medieval universities. Business world is much more flexible in our fast changing and highly competitive world and by its very nature it follows its own interests. Public granting agencies are rather chaotic in their support of joint projects. Decisions made by public authorities are sometimes inappropriate due to their lack of persons experienced in respective fields and those making the decisions often tend to follow their own (business or academic) interests. Another aspect of this situation is that public authorities have, or should have, public welfare on their minds. In the case of software development financed by public money this is reflected in the tendency to give software to the public for free (e. g. through open access and open data models or models based on the legislation dealing with the re-use of public sector information – despite the fact that the EU legislation excludes software from the scope of this legal regulation).

2. WHAT IS SOFTWARE?

When discussing our topic it is necessary to define the meaning of the concept of software. The perspectives of legislation and scientometrics are important for the conduct of the two worlds mentioned above – academia and business.

When trying to look up the legal definition of “software” or “počítačový

⁶ On the contrary, Etzkowitz sees so many benefits in the cooperation of industry and academia that he talks about a second revolution in academia. This radical change is incorporating economic and social development as part of the academic mission. The first academic revolution made research an academic function in addition to teaching. Now the emerging entrepreneurial universities integrate the economic development as an additional function. Etzkowitz, H., 1998, *The norms of entrepreneurial science: cognitive effects of the new university-industry linkages*, Research Policy, vol. 27, no 8, pp. 823–833.

program”⁷ in the Czech legislation we are not lucky. This kind of legal definition does not exist. Thanks to the membership of the Czech Republic in the European Union we can try to search the legal definition in the EU law. However, in the vast ocean of the EU legislation we cannot find any specific legal definition, either. Even when examining the most appropriate legal act, i.e. the Directive 2009/24/EC of the European Parliament and of the Council of 23 April 2009 on the legal protection of computer programmes, we cannot find any definition of that kind. There is only a juristic attempt to explain “function” of computer programs in the Preamble of Paragraph 10 of the Directive 2009/24/EC. The function of computer programs is explained by an EU legislator as “to communicate and work together with other components of a computer system and with users and, for this purpose, a logical and, where appropriate, physical interconnection and interaction is required to permit all elements of software and hardware to work with other software and hardware and with users in all the ways in which they are intended to function”. In this legal description we see a little circular explanation as the word “software” is used in a narrow sense.

Why is the legislator avoiding a legal definition of “computer programme” or “software”? According to various experts it would be too risky to create a legal definition of such a phenomenon that is developing so quickly.⁸

In terms of the EU, avoiding a specific definition may be caused by the fact that there is no single regulation dealing with this as each member state has its own legislation. From this perspective it is understandable that the EU prefers a minimum legal harmonisation. This view may be supported by the following argument: the Slovak legislation, for example, defines computer program⁹ as “a set of commands and instructions used directly or indirectly in a computer. Commands and instructions can be written or expressed in source code or in computer code. The background materials necessary for its development shall form an integral part of computer program

⁷ In English ‘computer programme’.

⁸ See, for example, Kustein, V., 2011, ‘Fenomén svobodného softwaru’, *Revue pro právo a technologie*, vol. 2, nb. 3, p. 60. Or Sedláčková, I., 2012, ‘Kompatibilita svobodných licencií’, *Revue pro právo a technologie*, vol. 3, nb. 5, p. 122.

⁹ See s. 7, para 1, the Slovak Copyright Act (No. 618/2003 Coll.) *Zákon o autorskom práve a právach súvisiacich s autorským právom, ve znění pozdějších předpisů*: „Počítačový program je súbor príkazov a inštrukcií použitých priamo alebo nepriamo v počítači. Príkazy a inštrukcie môžu byť napísané alebo vyjadrené v zdrojovom kóde alebo v strojovom kóde. Neoddeliteľnou súčasťou počítačového programu je aj podkladový materiál potrebný na jeho prípravu; ak splňa pojmové znaky diela.

if it fulfils characteristic of work".¹⁰ At first sight we can say that the Slovak legal definition is written in quite a good way and may be seen viable even in the future with new technological developments. However, on further reflection we can have some doubts. For example, what about mobile applications? Are they computer programmes? Is a smart phone seen as a computer in the Slovak legislation? And what about "software" in a chip used in a wheel of the car regulating the spinning of the wheel?

After a juristic trip to the Slovak legislation let us go back to the Czech Republic. We can try to look at the scientometry methodology which defines software, among other research results. This methodology is regularly prepared by the Czech National Research, Development and Innovation Council. This body is responsible for evaluations of the results of research organizations and of the results of finished project programmes. These evaluations are carried out in accordance with the Government-approved Guidelines for the Evaluation of the Results of Research Organizations and the Results of Finished Project Programmes. The R&D&I Council works in compliance with its rules that were approved by the Resolution of the Government of the Czech Republic No 286 of 18 April 2012. The rules are based on the Act No. 130/2002 Coll. on Support of Research, Experimental Development and Innovation from Public Funds and on Amendment of Some Related Acts (the Act on the Support of Research and Development). The Council is also an advisory body to the Government of the Czech Republic. Among other tasks we may point out the preparation of the National Research, Development and Innovation Policy in cooperation with the Ministry of Education, Youth and Sport. Other important tasks of the Council include negotiations with the research, experimental development and innovation advisory bodies of the European Communities (European Union) and with the research, experimental development and innovation bodies of individual Member States of the European Communities (EU) and other countries.

For the topic discussed in this paper there exists an important document dealing with the methodology of research evaluation issued by the Czech R&D&I Council. The document deals with software as one of the results of research activities of public research bodies. This document entitled the

¹⁰ See translation from Slovak to English in Poremska, M., 2010, 'ICT in Public Procurement Can Lead to Cybercrimes?', *Masaryk University Journal of Law and Technology*, vol. 4, nb. 2, p. 167.

Methodology of Evaluation of Research Organizations and Evaluation of Finished Project Programs (Government Regulation No. 1417/2013-RVV) is valid for the period of 2013-2015. Previously, these methodological documents were published by the Council (after a governmental legislative approval) and were valid for shorter periods. It should be noted that this evaluation methodology is one of the main bases of scientific evaluations of research activities of Czech public institutions and it is a key instrument for allocating financial means from the public budget to the future research activities¹¹. When you have a higher evaluation score then you obtain more money from the public budget for your annual institutional budget¹².

According to Annex 2 of the currently valid methodology guidance mentioned above software is considered to be one of the research results (outputs) which were achieved during a particular activity and with support provided according to the law. A research activity (here the development of a new software) where the author has not participated in a particular activity cannot be considered a research result, either. Furthermore, one result of a research activity can be submitted to the Information Register of Research and Development Results (RIV) only once by each submitter and only such a result type that characterizes the achieved result the most will be designated the research result. Annex 2 also explicitly states that patent, among others, is “not a protection of rights to a variety or software issued by the appropriate national patent office” (e.g. variety protection issued by the US Patent Office, Russian software protection, etc.). In Annex 2 we can also find a definition of software for the purposes of scientific evaluations. Software is considered to be a research result when there are “realized original results of a research and development which were created by an author or a team of which the author was a member. It is such a result when the software was provably created within a research activity and its author is a person or persons participating in the research activity with the beneficiary (or another participant) and it can be used in accordance with license conditions of the owner according to Section 16 of the Act No. 130/2002 Coll.” (the legislation mentioned above).

¹¹ D. Hicks, however, states in her analyses that this performance-based research evaluation and funding does not increase equity or diversity nor enhances the economic aspect. Hicks, D., 2012, ‘Performance-based university research funding systems’, *Research Policy*, vol. 41, no. 2, pp. 251–261.

¹² The effects of this performance-based research funding in the Czech Republic are analysed in Vanecek, J., 2014, ‘The effects of performance-based research funding on output R&D results in the Czech Republic’, *Scientometrics*, Vol. 98, Nb. 1, pp 657-681.

R&D&I Council defined software negatively in Annex 2 (apart from the above mentioned patents). According to this governmental regulation software in the legal sense is not:

- 1) Software which the beneficiary created solely for his own needs and which is used only by the beneficiary or another person;
- 2) Software which is meant to be exclusively for the needs of the provider (i.e. if its development need not meet requirements of the legal regulation).¹³

From the definition of the software for the purposes of evaluation described above you can see that what was defined was rather the scientific process of the software creation (development) than software itself. Even if we accept that the R&D&I Council avoided providing a precise legal definition of “software” (perhaps trying to avoid speculations and attempts of some researchers or research institutions to present pseudo software results) it is more than desirable to have a more elaborated definition or description of software. However, even this short definition is a bit clumsy. For example, in the current situation one cannot present as a result such software that was developed with a private partner (e.g. with a company) and that can only be used for its own business purposes. Why should a private company share this software with its competitors when it is a legitimate result of a joint research activity? Unfortunately, we cannot find in this methodological document answers to the following questions:

- 1) What would happen if a company officially distributed this kind of software onto the market at extremely high prices, thus discouraging anyone from buying it?
- 2) What about if a company, in agreement with its research partner, put a time embargo on the newly created software (running for several years) banning the sale of this software? Would be the criterion of publicity met (even after several years when the software becomes outdated and not interesting for anyone)?
- 3) Or what about if the company, hand in hand, with its research partner created two versions of the software? One useful version used only for business activities of the company and the other one (say a

¹³ See the English translation of the Methodology of Evaluation of Research Organizations and Evaluation of Finished Programmes (valid for 2013-2015) with annexes, accessible on the R&D&I Council website <http://www.vyzkum.cz/FrontClanek.aspx?idsekce=695512>.

“beta version”) sold on the market not giving access to all functions, working slowly or being less user-friendly.

In my experience with the previous annual scientific evaluations carried out by the R&D&I Council the software evaluations will depend on ad hoc reviews of the R&D&I Council evaluators. This means that such individual assessments may bring about legal uncertainty and a feeling of unfairness in those who are evaluated.

3. FREEDOM OF INFORMATION AND SOFTWARE

What would happen if somebody wanted to have access to the software developed by a public research centre or university? Can legislation on freedom of information be used to obtain this kind of “information product”?¹⁴

At the European level we do not have uniform legislation dealing with free access to information in the whole of the European Union. However, there is the Regulation (EC) No. 1049/2001 of the European Parliament and of the Council of 30 May 2001 regarding public access to the European Parliament, the Council and the Commission documents. According to Paragraph 8 of the Preamble of the Regulation this legislative act also applies to all agencies established by the above mentioned EU institutions. Consequently, the Regulation might also include European agencies dealing with research activities, for example, the Joint Research Centre (JRC) based at five different sites in Italy, Germany, Belgium, the Netherlands and Spain. This centre is the European Commission's in-house science service providing EU policies with independent, evidence-based scientific and tech-

¹⁴ Similar questions (applied to governmental institutions in general) are dealt with by B. Fitzgerald in Fitzgerald, B. and Suzor, N. (2005) ‘Legal issues for the use of free and Open Source Software in government’, *Melbourne University Law Review*, Vol. 29, pp.412–447; In Fitzgerald, B. (2005) ‘Has Open Source Software a suture?’, in J. Feller (Ed.): *Perspective on Free and Open Software*, The MIT Press, London, pp. 93–106 and Laszlo, G. (2007) ‘Issues and aspects of Open Source Software usage and adoption in the public sector’, in Kirk St Amant and Brian Still (Eds.): *Handbook of Research on Open Source Software: Technological, Economic, and Social Perspectives*, IGI Global, London, pp. 445–459. Their conclusions can also be used analogically for academic institutions that are funded from the public budget: ‘Where a government is using public funds to develop a software application, great care must be taken when choosing a licensing strategy. If there is a large commercial market for the unmodified application, a traditional closed source licensing approach can be used to generate income. If the only commercial market for the software consists of software developers who would heavily modify or integrate the software, then a dual licensing approach could be taken to provide an income stream from those developers while still allowing the benefits of publicly-funded software to flow back to the community. Finally, where there is no commercial market for the software, and any sensitive or confidential information has been removed, there is a strong argument that the government should release the software under a free licence’ in Fitzgerald, B. and Suzor, N. (2005) ‘Legal issues for the use of free and Open Source Software in government’, *Melbourne University Law Review*, Vol. 29, p. 434.

nical support throughout the whole policy cycle. Working in close cooperation with the European Commission's Directorate-General, the JRC addresses key societal challenges while stimulating innovation through developing new methods, tools and standards, and sharing its know-how with the EU member states, the scientific community and also with international partners.

Other agencies of this kind may include Global Navigation Satellite System Agency (GSA) seated in Prague or the European Geostationary Navigation Overlay Service (EGNOS) operated jointly by the European Space Agency, the European Commission and EUROCONTROL.

According to the Regulation No 1049/2001 any EU citizen can ask for a document defined in Article 3, Paragraph a) as "any content whatever its medium (written on paper or stored in electronic form or as a sound, visual or audiovisual recording) concerning a matter relating to the policies, activities and decisions falling within the institution's sphere of responsibility". This definition is so broad that it might include also software and computer programmes. Especially, if we accept the general definition applied in all EU member states where software is understood in terms of the definition of the World Intellectual Property Organization Copyright Treaty and the respective implementing national copyright laws as a literary work protected by the Berne Convention for the Protection of Literary and Artistic Works. From this point of view this assumption would be a supportive argument for including software within the scope of "document definition" of the EU Regulation No 1049/2001.

The request for access to software might be probably refused by an institution or an agency. The refusal might be justified on the grounds that enabling such access could undermine protection of commercial interests of natural or legal persons, or even rights of third parties (e.g. a business partner in a joint research project).

However, we can see that EU agencies are willing to publish software developed by them. For example, EGNOS has published the EGNOS Software Development Kit on its website allowing "application developers to take advantage of the benefits of EGNOS, and to use these in any software they develop for mobile devices".

4. OPEN DATA AND SOFTWARE

In the case of national legislation of the EU member states there is a common legal background due to the EU Directive No 37/2013 of the European Parliament and of the Council of 26 June 2013 amending the Directive No 98/2003 on the re-use of public sector information (PSI Directive). This legislation supports the re-use of information held by public institutions publishing the respective information in the form of open data accessible to anyone for any purposes (e.g. meteorological data for transport purposes)¹⁵. However, in the case of software developed by public research institutions there are two reasons why the Directive, or the national legislation implementing it, cannot be applied.

Firstly, according to Article 1, Paragraph e), the PSI Directive, documents of educational and research institutions, including organizations established for the transfer of research results, schools and universities, except for university libraries, are exempt from the application of this directive¹⁶.

Secondly, according to Paragraph 9 of the preamble of the PSI Directive, the definition of "document" is not intended to cover computer programs. This is a paradox because in the case of EU institutions and agencies the PSI Directive is not applicable. As mentioned above, it is regulated by the Regulation No 1049/2001. This regulation defines 'document' so broadly that computer programs and software might be included in it. The PSI Directive *expressis verbis* excludes computer programs. However, there is a question if "software" is also excluded even though this is not explicitly mentioned in the Regulation No 1049/2001.¹⁷

5. OPEN ACCESS AND SOFTWARE

There is no legal definition of open access in the EU law or the Czech law. However, the European Commission supports, through research and grant-

¹⁵ Positive effects on business due to the PSI Directive are described and analysed in: European Commission, 2014, Commercial exploitation of Europe's public sector information - executive summary. [on-line]. Brussels: European Union, accessible on ftp://ftp.cordis.europa.eu/pub/econtent/docs/2000_1558_en.pdf

¹⁶ The current situation when research institutions are not included in the PSI directive is criticised, among others, by Jančík, M. B., Pusser, J., Sappa, C., Torremans, P., 2012, 'Policy Recommendation as to the Issue of the Proposed Inclusion of Cultural and Research Institutions in the Scope of PSI Directive – Working Group 5', Masaryk University Journal of Law and Technology, vol. 6, no. 3, pp. 353-372.

¹⁷ In the context of the EU legislation (PSI Directive) a legislative policy recommendation on trade secret is given, for example, by Dinca, R, 2012, *Policy Recommendation Regarding the Interface Between the Protection of Commercial Secrecy and the Re-Use of Public Sector Information*, Masaryk University Journal of Law and Technology, vol. 6, no. 3, pp. 321-336.

ing schemes (e. g. by FP7 or Horizon 2020) publication of research results in the open access mode. The Commission defines open access on its website as “the practice of granting free Internet access to research articles”¹⁸. A research article is not generally understood to include ‘software’ or ‘computer programme’. That is why we can exclude software from the Commission’s definition of ‘open access’. In this context the open access regime is not used for publishing software and computer programmes. We can presume that if the European Commission had wanted to include software into the open access regime it would have used the term ‘research results’ instead of ‘research articles’ in its definition of ‘open access’.

6. CONCLUSION

From the legal point of view, software is in the EU currently accessible only in the regime of free access to information legislation but this must not be explicitly excluded by the respective legislation (e.g. by a national legislation because in the EU freedom of information legislation is autonomously regulated at the national level and there is only the PSI Directive at the EU level). For example, the Czech Act No. 106/1999 Coll. on Free Access to Information, Section 3, Para 4, establishes that “a computer program shall not be considered information”.

Among other limiting factors are rights of third parties (e.g. a business partner of a joint research project) that may block free publication of the software.

However, there are certain exemptions. At both the EU level and national levels we can find some research institutions voluntarily publishing software for free. This type of publication can be considered open access publication even though the above mentioned definition of the European Commission is too narrow thus indirectly excluding software and computer programmes¹⁹.

¹⁸ See European Commission: *Open Access*. [online]. Brussels: European Union, accessible on <http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&id=1294&lang=1>

¹⁹ There is an inspiring legal analysis of the Australian legal regulation of open software by M. Huang. She brings a proposal for an amendment of the Australian copyright legislation concerning specifically open software. The reason is that the current Australian law fails to deal with technological intricacies of software. Consequently, applying the copyright law to software in a broad manner only restricts the capacity of the law to deal with the relationships between different types of software and software subcomponents, and with the continuous development and innovation of software. Huang, M., 2012, ‘The problems of openness – effective regulation of open source software’, *International Journal of Technology Policy and Law*, vol. 1, no. 1, pp. 48–68.

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