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## Why do firms give away their patents for free?

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### A B S T R A C T

#### KEYWORDS:

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Within the trend of increasing patent commercialisation and open innovation, a recent phenomenon where firms give away their patents free of charge can be observed. This seems contradictory to the original intention of the patent system (enabling firms to create temporary monopolies to appropriate returns from their R&D investments). Consequently, this paper explores why firms make their patents available for free and which benefits they may gain from this behaviour. Adopting the open source software phenomenon as a background and using firm data from 26 patent release cases, we identify a typology consisting of four motives of 'free patent release approaches': *profit making*, *cost cutting*, *innovation catalysing*, *technology providing*. Further, we discuss the motives of these firms to offer their patents as 'open source'. We find that firms may obtain valuable technological input for subsequent innovations as well as social benefits in return for their free patent release.

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### 1. IP management in the open innovation paradigm

The open innovation paradigm in which firms increasingly share know-how and resources has reached many industries [1]. Prominent examples for open innovation in practice are Philips with its open innovation park, Siemens' open innovation program, or Bayer's Creative Center. Also Microsoft and SAP have initiated decentralised research labs to increase the absorption of external knowledge [2]. Many firms have recognised that internal idea development is only one part of successful innovation and that many valuable ideas are whirring outside of the firms' boundaries. In addition to the *outside-in* approach, open innovation also implies *inside-out* activities where firms externalise know-how to obtain monetary or strategic benefits in return [2,3]. This also impacts the firms' IP strategy, which traditionally focuses on protecting know-how and retaining freedom to operate. From an IP strategy perspective, opening up the innovation process means also to consider using IP, and especially patents, as a means to exchange and share knowledge. Extant literature on open innovation emphasises that IP should be considered as an enabler of open innovation instead of a disabler [4]. Out-licensing, cross-licensing, and selling of patents are the most prominent forms of how to use the IP portfolio in open innovation systems [5,6]. These external patent exploitation forms actively make use of the patent right system by

demanding a contractually fixed compensation for the use of the patented technology. In recent years, however, the scholarly debate has evolved around the question how patents can be effectively used other than by licensing or selling [7–9]. Also in practice one can observe cases where firms apply another form of external patent exploitation: they donate patents or make patents freely available either to the public or a specific community. At first sight, this behaviour stands in contrast to the original idea of the patent system. So the question arises why firms release technologies in which they have invested R&D resources and which they have protected through patents? Consequently, this article aims to answer this question by exploring why firms give their patents away for free.

While literature on open IP approaches mainly focuses on the software industry discussing the open source software (OSS) phenomenon [10,11], there has been, to our knowledge, no comprehensive discussion on providing IP free of charge in other industries. Furthermore, OSS is mainly based on copyrights, and the perspective of releasing patents is a new perspective on open IP strategies. Patent *release* or *give away for free* means that in contrast to classic licensing and cross-licensing agreements, there is no contractual definition of compensation from the receiving end to the original patent holder. Instead, the benefits for the original patent holder are either obtained indirectly through tax benefits in the case of donation, or they are highly uncertain, difficult to quantify, or based on a long-term perspective.

The article is structured as follows. Section 2 provides a theoretical background by reviewing extant literature related to open IP

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strategies and presents selected non-commercial patent pools. Section 3 describes the method used. In section 4, a typology of patent release approaches is developed and illustrated by 26 case studies. Finally, Section 5 discusses the findings.

## 2. Background

### 2.1. Motives for open IP strategies: evidence from open source software

In the software industry, the success of open innovation strategies through open sourcing is widely known and acknowledged. The open source approach to create software innovations has become a vital alternative to in-house developments for many firms. In fact, in OSS projects, the major innovations come from the users, the open source community [11]. Open source communities consist of people who voluntarily contribute to the OSS development by writing software code and sharing their modifications with the community and the original software supplier [11]. OSS projects are mostly based on copyright licenses. Historically, software was not patentable prior to the 1970s. Today, only the US and Japan allow software to be generally protected through patents. Some other countries such as China or the UK allow software patents under certain conditions, e.g., including a visible technical contribution [12]. However, in most IP regimes software patenting is not possible but falls under the copyright protection. Why firms contribute to OSS developments by releasing their software code and related IP rights to the public has been discussed during the last decade. OSS literature distinguishes between three major areas of motivations for participating in open source development: *economic, technological, social reasons* [13,14]. These three areas of motivations are briefly presented in the subsequent paragraphs.

#### 2.1.1. Economic reasons

Commercial firms are driven by maximising profits, thus the economic perspective behind releasing innovations free of charge is an important, although counterintuitive, aspect. Literature emphasises the selling of complementary services as a dominant strategy of firms to appropriate returns through OSS activities [14–16]. Complementary products and services such as installation, training, maintenance, consultancy, and certifications play a major role for firms to achieve competitive advantage [10]. Cost savings are an additional economic reason. By using the community in addition to internal development efforts, firms can lower internal R&D costs [17,18]. Without receiving any monetary compensation in return, developers from the community identify and report bugs and test the software [16,19].

#### 2.1.2. Technological reasons

By opening the innovation process to the open source community, firms can profit on the technology side through comments, ideas, and further developments [19]. Through this, firms can improve quality and applicability of their technologies [13]. Moreover, the open source concept allows the developers to base their developments and contributions on an already existent basis of technology [20]. Also, promoting a technological standard can be a reason for firms to freely release their software [13].

#### 2.1.3. Social reasons

Literature also points to social reasons to contribute to open source developments. On the one hand, firms aim to conform to the social norms of the open source community and feel a moral obligation [10,13]. On the other hand, due to rising public interest and attention to open source, firms have recognised that participating in this movement can enhance corporate reputation [13]. In a study on open innovation practices of firms in the UK, Holmes and Smart [21] analyse partnerships between firms and non-profit

organisations and find that firms commit themselves to cooperation, that is not purely economic-driven, but driven by social responsibility. Firms share their innovations voluntarily with non-profit organisations in exchange for social legitimacy [21].

### 2.2. Patent donation

Some studies exist regarding patent donation as a form of patent release. Patent donations are especially common in the US and are based on the concept that patent owners donate patents to non-profit organisations such as universities and other research institutions. For the patent donation, the original patent owner transfers the entire patent right including all obligations to the receiving party. By donating a patent, the original patent owner can gain both tax benefits and cost reductions, e.g., by reducing yearly patent maintenance expenses. On the side of the receiver, the donated patent is integrated in the research and development process with the aim to generate a new product; the patent donation is representing a potential source of income [9]. Additionally, both sides can benefit from strengthening their research network through cooperating during the patent donation process and subsequent collaboration [22]. While patent donations have been possible in the US since 1954, firms only began during the 1990s to recognise the potential benefit and to make use of it increasingly. At that time, the tax benefits were calculated based on the patent's fair market value. Because of increasing cases of abuse in which donors have overestimated their patents significantly, the law regarding patent donations was changed in 2004. Under the new law, tax benefits are now defined by the lower amount of either the patent's fair market value or its cost basis [23]. In a study with 36 US based firms, Carlsson et al. [24] analyse the role of patent donations within the firms' IP process. They find that generating good will, profiting from tax deductions and other financial benefits, and philanthropy were motives of the firms to donate their patents [24].

### 2.3. Non-commercial patent pools

Non-commercial patent pools are alliances in which patent owners license one or more patents on a royalty-free basis to an organisation that manages the patent pool. By doing this, the licensed patents are available for other members of the pool as well as non-member research institutions. In return, the patent owners are granted access to all patents within the pool, can initiate new research and business collaborations, reduce development costs and risks through shared efforts, and generate good will by serving society [25]. To shed light on how such non-commercial patent pools work and why firms participate, four non-commercial patent pools and their purposes are presented here.

#### 2.3.1. Eco-Patent Commons

Eco-Patent Commons is an initiative providing an online repository of patents covering environmental friendly technologies that are provided by firms, without a need to license or to purchase. The Eco-Patent Commons patent pool was launched in January 2008 by the World Business Council for Sustainable Development (WBCSD) and a consortium. The objectives of the Eco-Patent Commons are to foster the sharing of technologies that help protect the environment. The patents included in the Eco-Patent Commons have to provide an environmental benefit and are selected by their International Patent Classification (IPC) class. Currently, thirteen firms<sup>1</sup> have joined the Commons and released

<sup>1</sup> Bosch, Dow, Dupont, Fuji Xerox, Hewlett–Packard, Hitachi, IBM, Nokia, Pitney Bowes, Ricoh, Sony, Taisei, Xerox.

specific environmental-related patents, among them Bosch, IBM, Nokia, and Sony. The patent holding firms grant access to members and non-members of the patent pool interested in further developments of the technologies. In return, the firms can profit from the innovative outcomes of this research collaboration and gain recognition through their contribution.

### 2.3.2. Golden Rice project

The Golden Rice initiative is dedicated to increase accessibility to agricultural technologies to users in developing countries. Golden Rice breed has been developed to fight diseases and deaths in developing countries in Africa and Asia caused by vitamin A deficiency. The Golden Rice is genetically modified in order to reach a higher level of vitamin A in the rice. Having started the project in 1992 as an initiative of the Rockefeller foundation, the project soon faced patent issues. Eleven patents belonging to different firms were identified as crucial to produce the vitamin-A rich rice. Thus, in 2000, the initiative successfully negotiated to pool the needed patents and to make them available to small farmers and humanitarian research institutions in developing countries free of charge. The firms contributing their patents to the Golden Rice pool are Syngenta, Bayer, Monsanto, Novartis, Orynova, and Zeneca Mogen. By providing their patents for a humanitarian cause the firms may gain positive public relations and reputation effects, especially towards the backdrop of the critics regarding patenting in the life sciences industry.

### 2.3.3. Medicines Patent Pool

The Medicines Patent Pool was established in 2010 by UNITAID, an international institution hosted by the WHO dedicated to improve the treatment of HIV/AIDS, tuberculosis, and malaria. The Medicines Patent Pool's objective is to improve the access to HIV drugs in developing countries. To date, the US National Institutes of Health (NIH) and Gilead have granted free-licenses to the pool and five more firms, namely Boehringer Ingelheim, Bristol Meyers Squibb, Roche, Sequoia, and ViiV Healthcare, are negotiating to contribute one or several patents to the pool. The main driver behind the Medicines Patent Pool is public health rather than commercial interests. Hence, the motivation of the patent holding firms to release patents to this pool is to express their responsibility for the supply of HIV drugs for developing countries and to generate a long-term reputation enhancement. Also, it offers the pharmaceutical firms an alternative to non-voluntary measures (e.g., compulsory licensing) and avoids dismay both from public as well as from generic drug firms.

### 2.3.4. WIPO Re:Search initiative

The most recent example of non-commercial initiatives to pool patents is the WIPO Re:Search initiative. It was established in October 2011 with the objective to provide a platform where firms and research institutions share their knowledge and IP regarding the treatment against neglected tropical diseases,<sup>2</sup> which affect approximately 1 billion people worldwide. WIPO Re:Search is based on the Pool for Open Innovation against Neglected Tropical Diseases (POINT), which was launched in 2009 by GlaxoSmithKline and Alnylam and is now sponsored by the WIPO and BIO Ventures for Global Health. Besides GlaxoSmithKline and Alnylam, also AstraZeneca, Eisai, MSD, Novartis, Pfizer, and Sanofi have joined the initiative and grant royalty-free access to their patents to promote the development of drugs, diagnostics, and vaccines against neglected tropical diseases. Moreover, drugs related to these patents are sold royalty-free in least developed countries. By

participating pharmaceutical firms can contribute to their role as important players for global health and generate a positive effect on their public perception.

## 3. Methods

To answer the question why firms release their patents free of charge to third parties, we investigated 22 firms in which a total of 26 patents release projects had been conducted. The data was collected by searching publicly available cases of patent donation and free-licenses (using data bases, press releases, firm reports, website information, and journal publications). We focused on mid and large sized firms that are pioneering in open innovation approaches. The investigated firms have their home bases in the USA (15), Switzerland (3), the UK (2), Germany (1), and the Netherlands (1) and operate in the pharmaceutical, chemical, life sciences, information technology, and electrical and mechanical engineering industries. In addition to the releasing firms and due to their eminent role for some of the investigated patent release cases, four major players in terms of non-commercial patent pool organisations were investigated. Here too, data was gathered through the pools' websites, reports, presentations, and journal publications. Subsequently, first the patent pools are presented, followed by the findings from the corporate cases.

Our study has to deal with several limitations that we would like to point out. Firstly, did we not get access to the patent managers that released the patents but had to go through secondary sources. We did actually get to talk to several managers, yet their request to stay anonymous paired with the small sample of firms engaged in patent releases made it impossible to use quotes from the interviews. Nor did we get access to a majority of the firms. Secondly, our study investigates the releases of patents by large corporations. We did not look into cases where SME would give away patents. It is plausible to assume that their motivations are similar to those of large corporations, yet we are not certain. It would be desirable to see further investigations that address the two main limitations of our study. Thirdly, this qualitative research is based on 26 cases. These were all the cases we could find and thus we argue that it provides a plausible underpinning of why firms give away patents for free. However, in case patent releases gain traction a quantitative validation of our model would be desirable.

## 4. Results: creating value through patent releases

The literature shows that firms engage in open source activities for economic, technological, and social reasons. For OSS activities, the economic reasons comprise reducing costs and selling complementary services to boost profits. In addition, the patent donation perspective emphasises the financial aspect of benefiting from tax deduction and reducing patent maintenance costs by donating patents to a non-profit organisation. Furthermore, literature also points to reasons that do not have a direct financial effect. Technological reasons such as profiting from feedback from the community as well as moral obligations, social responsibility, and generating good will seem to play an important role for firms to decide on opening up their innovations. This was also shown in the non-commercial patent pool examples, where firms mainly participate due to social reasons. Overall, based on the findings from literature as well as our case studies, we identified four different approaches towards patent releases. On the one hand, these types differ regarding financial and non-financial motives. One can argue that any firm has financial motives in its actions. Yet with the patent release cases we argue that it is helpful to distinguish between direct financial aspects and indirect ones. A firm that generates good will for instance has no direct financial motive. However, the good

<sup>2</sup> As listed by the World Health Organization (WHO).

will be generated to establish a reputation, which in turn might lead to new business. On the other hand, we differentiate regarding the type of patent. For example, donating patents – transferring the entire patent right to a third party – was solely applied for patents that had no more function for the firm, did no longer fit their business. We call this type of patent *non-core* patent. But firms also made patents available to others that were still in use within the firm, (e.g., in current or future products and processes). These patents are referred to as *core* patents in our typology.

Based on the differentiation we identified four types of motives: *profit making*, *cost cutting*, *innovation catalysing*, and *technology providing*. In the following, each type is described and illustrated by case studies. The four motives for patent release can be compiled into a typology differentiating between financial and non-financial motives of the firms to release their patents on the one axis, and between the releases of core versus non-core patents on the other axis (see Fig. 1).

#### 4.1. Type 1: profit making

The *profit making* approach represents firms releasing selected core patents mainly based on financial motives by benefiting from community activities (Table 1). This open source strategy is mostly to be found in the software industry where firms have become aware of the potential of know-how and ideas of communities to improve products and thus secure a dominant market position and boost profits. In 2005, for example, IBM made 500 valuable patents freely available to the open-source software community with the objective to stimulate the flow of innovation. An earlier example refers back to the 1970s when Dolby decided to free-license patents covering its noise-reduction technology through releasing pre-recorded cassettes encoded with this technology. Instead of gaining licensing fees directly from the patents, Dolby successfully profited from the lock-in effect of its noise-reduction technology and earned its profits through the sales of the tape players using this technology. A third case study for the *profit making* comes from Sun Microsystems where in 2005 the company made 1670 patents of their operating system Solaris available to stir community

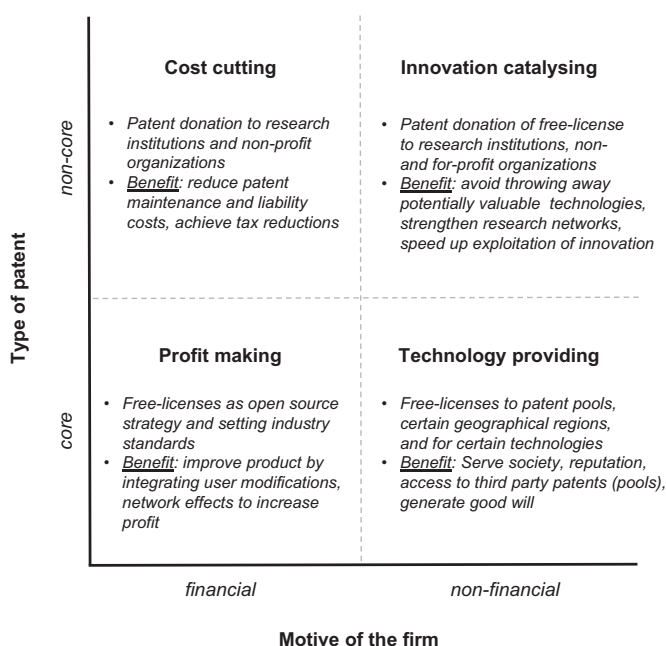
**Table 1**  
Examples for the type *profit making*.

Form of patent release	Firm	Year	Description
Free-license	Dolby	1970	Licensed patents covering its noise-reduction technology on pre-recorded tapes for free.
Free-license	IBM	2005	Made freely available 500 patents to the open software community.
Free-license	Sun Microsystems	2005	Made freely available 1670 patents, mostly related to the Solaris operation system, to the open source community.
Free-license	ARM	n/a	Made freely available specific parts of its patent portfolio to current and potential clients.

development. The last case is the semiconductor firm ARM that made specific parts of its portfolio available to clients to have them co-develop innovations.

#### 4.2. Type 2: cost cutting

In the *cost cutting* category, firms donate obsolete patents to universities, other research institutions, and non-profit organisations with the main motive to reduce their costs (Table 2). These costs include on the one hand maintenance fees, which have to be paid to the patent offices to keep up the patent, and on the other hand any liabilities attached to the patent, e.g., costs for enforcement in case of infringement. Furthermore, in the USA firms can benefit from tax deductions. During the last decade, firms such as DuPont, Shell, Kellogg and Lubrizol donated patents worth several millions US dollars to universities and institutions such as the Mid-America Commercialization Group, or the National Institute of Standards and Technology and enjoyed substantial tax savings. Often, patent donations are caused by a firm's shift in business strategy so that prior valuable patents become obsolete. In the late 1990s, Shell, for example, shifted its core business to petrochemicals and gave up its specialty chemicals technologies [26]. Towards this backdrop, Shell donated the patents covering its Carilon and Carilite technologies, which were considered to be applicable across a wide spectrum of industries, to the non-profit research institute SRI who incorporated the patents into its own polymer technology portfolio. In 2001 Caterpillar donated patents that valued 50 million USD to the Mid-America Commercialization Group. One year later Kellogg donated patents valued at 49 million USD to the Michigan State University. Also in 2002 Lubrizol donated patents valued at 22.4 million USD to the National Institute of Standards & Technology. Since a change of law regarding tax benefits through patent donations in 2004 [23], the incentives for firms to donate moved away from mainly being financial-drive towards a combination of financial benefits and fostering innovation. In 2007, DuPont and Hercules donated 255 patents that had become obsolete to their businesses to the Delaware Economic Development Office (DEDO). One of Hercules' patents, for example, was considered particularly promising as an environmentally friendly alternative to a current technology impacting the depletion of the ozone layer. Instead of abandoning the patent and to ensure its further development and exploitation, Hercules donated the patent to the DEDO, which licenses such patents to entrepreneurs to commercialise the technologies via new business ideas. In this model, the patent maintenance fees are covered by the state of Delaware [27].



**Fig. 1.** A typology of different patent release activities and motives.

**Table 2**  
Examples for the type *cost cutting*.

Form of patent release	Firm	Year	Description
Donation	DuPont	1999	Donated patents valued at 64 million USD to Pennsylvania State University (6 million USD), University of Iowa (35 million USD), and Virginia Polytechnic Institute (23 million USD).
Donation	Eaton	1999	Donated 57 patents valued at 17 million USD to Kansas State University.
Donation	Shell Technology Ventures	2000	Donated patents and equipment valued at 83.5 million USD to University of Texas.
Donation	Caterpillar	2001	Donated patents valued at 50 million USD to Mid-America Commercialization Group.
Donation	Kellogg	2002	Donated patents valued at 49 million USD to Michigan State University.
Donation	Lubrizon	2002	Donated 17 patents valued at 22.4 million USD to National Institute of Standards & Technology.
Donation	Shell	2002	Donated patents on Carilon and Carilite technologies to SRI International, a non-profit research institute.
Donation	DuPont	2007	Donated 250 patents to the Delaware Economic Development Office (DEDO)
Donation	Hercules	2007	Donated 5 patents to the Delaware Economic Development Office (DEDO)

#### 4.3. Type 3: innovation catalysing

Firms also release parts of their patent portfolios for non-monetary reasons. The *innovation catalysing* firm gives away non-core patents to universities or other research institutions in order to trigger innovation activities and open up new fields of business (Table 3). Boeing, for example, developed a material they used in aircraft antenna units but which, due to its bio-compatibility, strength, and density, also showed remarkable potential for being used in the medical sector to replace bones in humans. Since the medical area is very different from Boeing's business and the firm also lacks respective know-how, Boeing donated the patent covering these applications to the University of Pennsylvania, where the technology was further developed [28]. Also Celera granted free access to patents, which were beyond Celera's core business to a non-profit organisation, the Institute for OneWorld Health, whose mission is to develop affordable drugs against neglected parasitic diseases. The patents cover a drug against the Chagas disease, a tropical parasitic disease affecting approximately 18 million people in Central and South America. Celera did not expect financial benefits by releasing its patents, but wanted to make the patented drug component available for further clinical development. Another example is Procter & Gamble, which started in the late 1990s to increasingly donate patents to third parties. The company realised that they were creating more technologies than they could finalise into a product and decided to open its doors and make its patented technologies available to other institutions. One example is the donation of 196 patents and all associated IP covering chemical compounds which have the potential to become a new 'super aspirin' drug, i.e., a new drug without the gastric side effects of the current aspirin drug. For this patent donation, Procter & Gamble selected the patent receiver carefully according to its

**Table 3**  
Examples for the type *innovation catalysing*.

Form of patent release	Firm	Year	Description
Donation	Procter & Gamble	2000	Donated 196 patents covering a technology with potential for a 'super aspirin' drug to the Vanderbilt University. Besides the patents, P&G provided funds to maintain the patents as well as assistance for development.
Donation	Procter & Gamble	2001	Donated a patent for testing manufacturing process emissions with the potential of being used in ca. 4000 manufacturing utilities to the Midwest Research Institute.
Donation	Boeing	2001	Donated patents with potential applications in the medical sector to the University of Pennsylvania.
Donation	DuPont	2001	Donated patents for a new papermaking technology to the University of Maine for further development and implementation at an industrial scale. Besides the patents, DuPont employees support the continuing studies.
Free-license	Celera	2002	Granted an exclusive free-license of patents covering compounds to treat the Chagas disease to the Institute for OneWorld Health.

competence for developing the technology further. In the end, they considered the Vanderbilt University as the most appropriate institution and provided besides the patent rights also technical assistance as well as financial assistance to cover the patents' maintenance fees for three years [28].

#### 4.4. Type 4: technology providing

The fourth type, the *technology providing* firm, is characterised by making specific core patents freely available to third parties. The motive of this behaviour is mostly a combination of creating good will, serving society, and accessing third party patents via patent pools (Table 4). In serving society these companies argue that patenting and afterwards releasing the patent guarantees that the technology remains open. In 2010, for example, Hewlett–Packard pledged three patents on a battery recycling technology to the Eco-Patent Commons patent pool. Although the technology had the potential of generating earnings for Hewlett–Packard, the company made the patents available without any purchase or royalty obligations in order to support the green technology initiative of the Eco-Patent Commons. Syngenta released patents on a specific rice breed to the Golden Rice patent pool. Since the patents of Syngenta entailed the key patents for this technology, new inventions based on these patents were assigned to Syngenta, so that the company received in return an advanced, nearly marketable technology with relatively little internal R&D effort. In another case, Boehringer Ingelheim, a German-based pharmaceutical company, granted a free-license of patents covering a HIV drug to Aspen Pharmacare, a South African pharmaceutical manufacturing company. This free-license allows Aspen to produce and distribute the HIV drug in South Africa as well as in thirteen other countries of the South African Development Communities at an affordable price. For Boehringer Ingelheim, this voluntary free-license marks a step towards its commitment to fight HIV. As Boehringer Ingelheim, other pharmaceutical firms have realised the need to bundle efforts to provide medical treatment also to the poorest regions of the world. GlaxoSmithKline in 2009 granted free-licences to more than 800 patents on tropical diseases to a patent

**Table 4**  
Examples for the type *technology providing*.

Form of patent release	Firm	Year	Description
Free-license	Syngenta	2000	Granted free-license of patents covering a technology to produce vitamin A enriched rice to the Golden Rice patent pool.
Free-license	Boehringer Ingelheim	2002	Granted free-licenses of patents covering a HIV drug for a period of 5 years to Aspen Pharmacare, a South African pharmaceutical manufacturer.
Free-license	Alnylam	2009	Granted free-licenses of more than 1500 patents to the pool for Open Innovation against Neglected Tropical Diseases.
Free-license	GlaxoSmithKline	2009	Granted free-licenses of more than 800 patents to the pool for Open Innovation against Neglected Tropical Diseases.
Free-license	Hewlett–Packard	2010	Granted free-licenses of 3 patents covering a technology for battery recycling to the Eco-Patent Commons pool.
Free-license	Gilead	2011	Granted free-licenses of patents covering certain HIV drugs to the Medicines Patent Pool.
Free-license	Roche	2011	Started negotiations for free-licenses of HIV patents to the Medicines Patent Pool.
Free-license	Novartis, Roche	Ongoing	Do not file or enforce patents in least developed countries

pool. Further pharmaceutical firms such as Roche and Novartis do not file or enforce patents, especially related to antiretroviral drugs, in least developed countries,<sup>3</sup> thus providing free access to its patents to express their social responsibility.

## 5. Discussion and conclusion

This paper conceptualised why firms make their patents available for free to other firms or institutions and which benefits they gain from doing so. Adopting insights from open source literature and based on 26 patent release cases, a typology with four different types of patent release approaches was developed. Based on this, four major findings can be derived. First, comparing our results with those from OSS literature, which is mainly based on copyright aspects [12], we find that the firms' motives to give away patents for free are more diverse. Within the economic reasons, the main motivations are reducing costs through saving R&D efforts as well as cost reduction in terms of maintenance fees when patents are donated [9,24]. Furthermore, tax deductions through patent donation [23] is a benefit. Within the technological reasons, our results are in line with OSS literature finding that speeding up the innovation process and profiting from network effects are important motives [10,19,29]. In addition, donating or making patents freely available is also seen by the firms as an option to avoid 'throwing away' potentially valuable technologies that do not fit the firms' current strategy.

Second, we find that the importance of the motives differs between the OSS phenomenon and our investigated firms. Firms engaging in OSS are mainly driven by economic and technological reasons, while social reasons are less vibrant [13]. In contrast, we find that social reasons play a major role for releasing patents. Especially the examples of green technologies and the medical sector show that

firms feel a need to respond to their social responsibility. Towards this backdrop, non-commercial patent pools seem to be a platform that is accepted by many firms for the free release of patents without direct financial benefits; this is illustrated by Syngenta, GlaxoSmithKline, Hewlett–Packard, Gilead, Roche, and Alnylam.

Third, releasing non-core patents free of charge is only reasonable for valuable patents. Releasing a patent, either through donation or free-licensing, always involves a certain effort for the patent owner [9]. Identifying an appropriate organisation to receive the patent, going through the formal process of donation and providing technical assistance only makes sense for the patent owner if the patent in question is considered to be valuable. If this is not the case, the firms would rather abandon the patent [30]. The patents in the Eco-Patent Commons pool, for example, are assessed to be more valuable than the average patent of the participating firms [31]. At the investigated firms, patents for donation and free-licensing were selected carefully and covered technologies that were considered valuable but did not fit into the firms' business strategy. This is in line with earlier findings on external technology exploitation that emphasise the need to put effort into commercialising technologies based on a business decision [32,33].

Fourth, our results indicate that releasing patents can be effective outside the software industry. This finding contributes to the question asked by Lerner and Tirole [[16], p. 230] if "the open source process can be transported to other industries". They state that even though the OSS model may not be easily adopted in other industries, there are a number of aspects that are not industry specific. As an example they compare the selling of additional services with giving away razors to sell more razor blades [16]. In our sample, Dolby used this strategy by offering its noise reduction technology for free in order to gain returns by selling the tape player using it. Furthermore, in the current dynamic and fast development of high technologies, most technical progress is based on a foundation provided by earlier innovators [20]. Thus, participating in this extreme form of open innovation [34] by sharing know-how and IP free of charge can be a viable strategy in many high-tech industries to foster innovation.

In conclusion, releasing patents by making them freely available to research partners, customers, users, and suppliers, can help firms to establish a sustainable innovation ecosystem. The results of this article contribute to the burgeoning literature on managing IP within the open innovation paradigm by highlighting the importance of open IP strategies and exploring how firms can benefit from opening up their patent portfolios. With this article we hope to encourage research in a field where many questions are still open. A large-scale survey on firms' motives to give away their patents freely could provide important statistical evidence testing the conceptual findings of our article. Furthermore, details on which sort of patents are considered for releasing as well as an analysis of industries would be an interesting research avenue. Lastly, investigating the long-term effects of patent release in terms of benefits or losses for the original patent owner would shed light on the impact of such strategies on firm performance.

### 5.1. Further research

The future importance of releasing patents is yet to be examined. Today, this phenomenon is a rare event compared to the overall count of patents. However, we see traction in what is called the "open hardware movement" where methods and work environments from OSS are translated into hardware environments. As described earlier, software patents are only common in few IP regimes. Yet, hardware inventions are protected by patents all over the globe, which makes the development in open hardware a possible engine for further patent release cases. It would be

<sup>3</sup> As defined by the United Nations.

desirable to investigate if open hardware technologies such as the RepRap 3D printer or the Arduino circuit board are going to gain traction. If their markets are growing in a similar fashion to the OSS market, patent releases will become more popular in the future. More research on the interplay between intellectual property protection and open hardware is wanting.

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