



Manageability of Technical Innovation through Technical Property Rights

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The term innovation is used in many respects and has been evolving over the last decades. This paper mainly focusses on managing technical innovation and differentiates this kind of innovation from others. For managing technical innovation, this work applies technical property rights, patents and utility models. The opportunity to protect the companies' technical knowledge legally is, apart from strategic measurements like trade secrecy, a very valuable tool to manage and commercialize innovation considering the shift from closed to rather open innovation. This paper discusses the applicability of legal protection measurements for the management of technical innovation containing a critical appraisal.

Keywords: innovation management, technical property rights, patent, utility model, technical innovation, open innovation, restrictions of technical protection rights

Introduction

The term innovation is commonly known and used in many respects, but widely differs in its content (Adams, Bessant, & Phelps, 2006, p. 22). Due to its etymological origin – lat. 'novus' (new), respectively 'innovatio' (renewal) – it seems to be clear that innovation is something which has not been existing, produced or processed in a particular way yet.

In the recent past, most authors attribute, in addition to novelty, a technological component to an innovation (Zahn & Weidler, 1995, p. 352f.; Trott, 2012, pp. 6, 15). This has changed in the past few years. Various authors demand a clear differentiation between innovation and a more technical related invention, whereas both are closely related to one another (Hauschildt & Salomo, 2011, p. 5ff.; Vahs & Brem, 2013, p. 20ff.; Pleschak & Sabisch, 1996, p. 6; Vahs & Burmester, 2002, p. 43f.; Roberts, 1987, p. 3).

Technical innovation in the context of this paper has to be understood as any innovation that is based on all fields of technology, such as engineering, chemistry, information technology or pharmacy.

This paper, based on existing and recent literature, advances the understanding of innovation management by simultaneously examining the term innovation and its determination criteria, technical property rights and their

substantial requirements, and the interdependencies between these two fields. More precisely, this theoretical research explores the benefits and restrictions of technical property rights for managing technical innovation. The paper introduces different criteria to determine whether innovation is apparent or not, followed by a pertinent description of types of measurements to manage technical innovation.

This paper, which builds on extant literature, discloses the lack of research regarding the restrictive applicability of technical property rights for managing innovation.

What Is Considered As Innovation?

To determine what can be considered an innovation, one can use the following criteria (Hauschildt & Salomo, 2011, p. 5; Corsten, Gössinger & Schneider, 2006, p. 10; Schmeisser & Solte, 2010, p. 27), which are briefly outlined below:

- Content-related dimension: What is new?
- Intensity of novelty: How new is it?
- Subjective assessment: New for whom?
- Process-oriented rating: Where does the novelty start and end?

This paper focusses on the management of the innovation process' result through technical property rights and the importance of knowing the requirements to obtain a technical property right during the innovation process.

Content-Related Dimension

Innovation can occur in several forms such as product, process, social, marketing or organizational innovation (Vahs & Brem, 2013, p. 52ff.; Corsten et al., 2006, p. 13f.; Vahs & Burmester, 2002, p. 72ff.; Trott, 2012, p. 16ff.; Pleschak & Sabisch, 1996, p. 14ff.). Zahn and Weidler (1995) subsume the different forms of innovation in three categories (p. 362ff.):

- Technical innovation: Products, processes, technical knowledge.
- Organizational innovation: Structure, culture, systems.
- Business innovation: Branches, markets, regulations.

Even though one can distinguish different forms of innovation, it is important to understand that the different types hardly ever occur separately. Usually, there exist interdependences between the different forms of innovation (Corsten et al. 2006, p. 13; Hauschildt & Salomo, 2011, p. 8; Schmeisser & Solte, 2010, p. 28). This paper focusses on the management of the technical innovation, which are mostly based on, or have a very close link to, invention.



Figure 1

The Degrees of Novelty
(adapted from Schröder,
1999, p. 990)

Intensity of Novelty

Additional to the differentiation regarding the form of appearance, one can also examine the degree of novelty. There exist various methods to evaluate the novelty of innovation. The spectrum reaches from dichotomous categories – very innovative vs. imperceptible innovative – to different gradual scales (for further information: Hauschildt & Salomo, 2011, p. 12ff.; Corsten et al., 2006, p. 15; Pleschak & Sabisch, 1996, p. 3f.). Each method uses the already existing technologies, state of the art and publicly available, codified knowledge as reference for the assessment of the scope of change. In academic literature, for example, one can often find the gradual distinction between basic innovation, improving innovation, adaptation innovation, imitation and pseudo innovation. The first one leads to a radical change (e.g., a new technology such as wireless internet) whereas the latter one describes an incremental change (e.g., a new product design, with no new technological features). Thus, the impact of the innovation is decreasing from a basic to a pseudo innovation (Vahs & Brem, 2013, p. 64ff.; Corsten et al., 2006, p. 18; Pleschak & Sabisch, 1996, p. 4; Trott, 2012, p. 10).

Subjective Assessment

The assessment of qualitative changes within the range of novelty of innovation is subjective by nature. Hence, innovative is what is perceived as innovative. Considering this, it is significantly dependent on the subject, entity or state that assesses the innovativeness (Hauschildt & Salomo, 2011, p. 18ff.; Corsten et al., 2006, p. 16f.; Pleschak & Sabisch, 1996, p. 4; Schröder, 1999, p. 990).

From Figure 1, one can derive that there exist separate levels of novelty that constitute the concept of subjective assessment. A product or process that is perceived as new by an individual might not be perceived as new by a company due to the different knowledge base. The same is evident if one compares a national economy with the global economy. Thus, if something is globally new, one leaves the area of subjectivity and reaches an objective novelty.

Process-Oriented Rating

The last distinguishing characteristic observes the innovation process. There are several phase models to describe the process of innovation creation (Corsten et al., 2006, p. 32ff.; Vahs & Brem, 2013, p. 231; Schmeisser & Solte, 2010, p. 37). They differ in their level of abstraction and the emphasis on parts of the process. However, the existing innovation process models have three main phases, explicitly or implicitly, in common. First, the models include the *idea generation*, which is followed by the *idea acceptance* and finalized by the *idea realisation* (Corsten et al., 2006, p. 34ff.; Vahs & Burmester, 2002, p. 83ff.). It is evident that some models are more precise in their description of the beginning and ending of the process and the content of the single phases. Nevertheless, all models, in particular their inherent phases, which do not occur separately but rather are overlapping and interdependent, are idealistic approaches (Corsten et al., 2006, p. 35; Vahs & Brem, 2013, p. 231).

Legal Measurements to Manage Technical Innovation

After having a conceptual framework to approach the term innovation and differentiate technical from other types of innovation, the next step is the systematic elaboration of how to manage it. Thereby, the main focus is on technical innovation. The managing part includes the systematic economic planning, organization, provision and control (Hauschildt & Salomo, 2011, p. 29; Schmeisser & Solte, 2010, p. 111f.), as well as the realization of protection mechanisms (Corsten et al., 2006, p. 39) to achieve an overall successful implementation (Vahs & Brem, 2013, p. 28) and exploitation (Tiefel & Dirschka, 2007, p. 8). As mentioned above, innovation is based on, or closely linked to, invention. Considering this and the innovation process, it is obvious that every innovation has an intangible component (Vahs & Brem, 2013, p. 21). To protect and manage innovation and its underlying technical intangible component, one can use strategic and/or legal measurements (Brockhoff, 1994, p. 72; Gassmann & Bader, 2011, p. 5; Jennewein, 2005, p. 102; Burr, Stephan, Soppe, & Weisheit, 2007, p. 250ff.; Trott, 2012, p. 155ff.), whereas the emphasis in this paper is on the latter.

Strategic measurements are, for example, lead time advantages, trade secrecy, complementary resources, creation of strong distribution channels or constructive product protection against reverse engineering (for detailed information: Jennewein, 2005, p. 176ff.; Gassmann & Bader, 2011, p. 5). All strategic measurements, in particular trade secrecy, have an inherent risk in case of commercialisation (Trott, 2012, p. 157). By the time competitors are capable of imitating, maybe copying, due to a lack of secrecy in the value chain or reengineering, one has no direct leverage against these competitors. That constitutes a significant difference to legal measurements.

Legal measurements to manage innovation are industrial property rights (Burr et al., 2007, p. 3ff.; Gassmann & Bader, 2011, p. 5), which in general include *patents, utility models, industrial designs* and *trademarks* (Vahs & Brem, 2013, p. 439ff.; Götting, 2014, p. 4; Eisenmann & Jautz, 2007, p. 1). The former two are explicitly technology related whereas the latter two are not (Vahs & Brem, 2013, p. 442; Götting, 2014, p. 6f.). All industrial property rights enable an innovator to secure and successfully use their innovation and gain comparative advantages over their competitors. By nature, all *legal measurements are restricted to a certain territory*, which normally is a country or association of states. On this account, it is necessary to define the legal basis of argumentation. The following description is mainly based on the international Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). Apart from TRIPS, this paper does also provide information about the US-American, European and German legal text. The TRIPS agreement admittedly underlies minimum standards regarding industrial property and other rights but also permits its more than 150 member states (Kraus, 2009, p. 61) freedom of interpretation, e.g., of the substantive patentability requirements (Straus & Klunker, 2007, para. 909; Lamping & Hilty, 2014, p. 14). Building on this, the following statements are generally valid. Derivative supplementary comments on territorial restricted specifications are highlighted as such.

All legal measurements are an inherent part of innovation management (Gassmann & Bader, 2011, p. 6). Due to the focus on technical innovation, the following section addresses, after a brief description of designs and trademarks, fundamental aspects of patents and utility models.

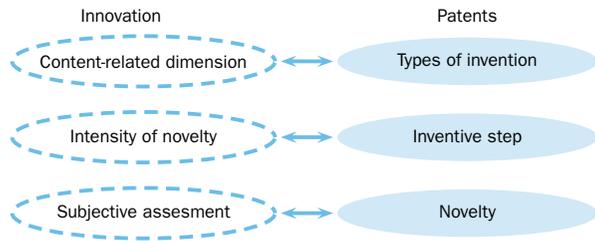
A design's purpose is the legal protection of a new or original independently created outward appearance of an article (TRIPS, 1994, Art. 25(1); Trott, 2012, p. 180f.), whereby a trademark's primary function is the indication of origin and differentiation of a good or service (TRIPS, 1994, Art. 15(1); Vahs & Brem, 2013, p. 449ff.; Trott, 2012, p. 173ff.; Götting, 2014, p. 64ff.; Remmert, 2009, p. 41).

Patents

Patents are exclusive rights in all fields of technology, which are essentially state granted, private law rights, which confer their owners to prohibit the 'making, using, offering for sale, selling, or importing' (TRIPS, 1994, Art. 28(1)(a)) where the subject matter of the patents are products. In case of a process, the patent owner may prohibit the usage of the process and the above mentioned acts for the product directly obtained by that process (TRIPS, 1994, Art. 28(1)(b)). However, the patent neither protects the product nor the process innovation itself. Instead, it protects the underlying invention, which is based on technical knowledge and manifests itself in the

Figure 2

Mapping of Innovation
Differentiation Criteria
and Technical Property
Rights Requirements



product or process (West, 2006, p. 111; Pretnar, 2009, p. 193f.; Pleschak & Sabisch, 1996, p. 48; Vahs & Brem, 2013, p. 442; Trott, 2012, p. 160; Götting, 2014, p. 29ff.). Simply put, a patent protects the immaterial core of an innovation.

The literature about innovation management, which considers technical property rights as a potential opportunity to protect and manage innovation, does not take into account that *not every technical innovation fulfils the requirements for a patent or utility model*. Some do not even mention utility models, because they are not expressly, but implicitly, mentioned in Art. 2(1) TRIPS (Gómez Segade, 2008, para. 136). It is rather a separate description of innovation and protection rights respectively (compare e.g., Trott, 2012; Pleschak & Sabisch, 1996; Vahs & Brem, 2013). To adequately apply technical property rights to the wide field of innovation, one has to cope with the relevant, territorially varying requirements. Thus, both protection rights and their requirements will be outlined in turn.

To obtain a patent for an invention in general, the invention has to be new, must involve an inventive step and needs to be capable of industrial application (Trips, 1994, Art. 27(1); Trott, 2012, p. 161; Kraßer, 2009, p. 119ff.; Gómez Segade, 2008, para. 135). These are the three substantive requirements for protection, whereas the industrial applicability is almost never an exclusion criteria (Kraßer, 2009, p. 189f.). On closer examination, the innovation criteria, except the process-oriented rating, and the substantive requirements reveal parallels, which allow the mapping of them as shown in Figure 2. Each mapped pair will consecutively be described.

The TRIPS agreement provides that patents can be granted for any inventions, whether products or processes, in all fields of technology (TRIPS, 1994, Art. 27(1)). This guideline is completely consistent with the European Patent Convention (EPC) and the German Patent Act (GPA) (Gruber & Zumbusch, 2012, para. 21.04ff.; EPC, 1973, Art. 52; GPA, 1980, § 9). The US Code Title 35 (2011) § 101 also includes product and process inventions but additionally mentions machines and compositions of matter. One important difference between the US Code and the other two legal texts is the lack of technical nature of inventions in the American Patent Law (Mayer &

Schlenk, 2012, p. 141). In the US, one uses the utility of inventions as a requirement for patent protection (Manual of Patent Examining Procedure, 2015, § 2107.01). Thus, the radius of protection through patents in the US is wider than in Europe (Laub, 2006, para. 634; US Code Title 35, 2011, § 100(a)). Comparing the content-related dimension of innovation with the geographical varying legislations, one may notice the similarity regarding the types of technical innovation and the types of protectable invention, namely products and processes.

The next pair that can be mapped is the intensity of novelty and the requirement of an inventive step. Both criteria are rather of qualitative nature (Kraßer, 2009, p. 304) and use the already existing as reference for the assessment of the scope of change. An invention bears an inventive step if it is not obvious to a person who possesses the knowledge of the state of the art (US Code Title 35, 2011, § 103; EPC, 1973, Art. 56; GPA, 1980, § 4) in the direct and peripheral field of the invention (Trott, 2012, p. 162; Götting, 2014, p. 141f.; Kraßer, 2009, p. 311; Gruber & Zumbusch, 2012, para. 14.26ff.). Consequently, the person skilled in the art is incumbent upon the evaluation of the invention. If one compares this requirement with the dichotomous categories or gradual scales of an innovation, one can assume that only radical or basic, improving and probably adaption innovation might be considered as being based on an inventive step, respectively.

Besides the inventive step, an invention has to be new but the novelty in terms of Patent Law and subjective assessment of an innovation are not congruent. TRIPS only stipulates novelty but leaves the final assessment to each territorial legislation. In European and German Patent Law, an invention is only new if it has not been available to the public in any way or anywhere before the date relevant for the priority of the patent application (EPC, 1973, Art. 54; GPA, 1980, § 3(1)). Hence, it is an objective (cf. Figure 1), formal and therefore absolute definition of novelty. In the US, the definition of novelty has been changed in the course of the American Invents Act (AIA) and is now almost equivalent to the European and German one (Münsterer, 2013, p. 270; US Code Title 35, 2011, § 102 (a)(1)). The only major difference is the still existing grace period of 12 month for an inventor (US Code Title 35, 2011, § 102(b)(1)). Using the three different legislations as reference to contrast the degree of novelty, which is inalienable for patent protection with the subjective assessment of novelty of innovation, it is clear that only a small portion of all innovation overcomes this hurdle.

Utility Models

The utility model is very similar to the patent but also shows some differences (Jennewein, 2005, p. 175). Like a patent, the utility model protects – generally speaking – an invention, which is new, involves an inven-

tive step and is industrially applicable (Gómez Segade, 2008, para. 135). The demanded requirements are overall less stringent than for a patent (Jennewein, 2005, p. 176). Due to the lack of European, let alone international, harmonisation, various countries interpret and apply the requirements differently (Gómez Segade, 2008, para. 135ff.). Some nations do not even have the utility model (Jennewein, 2005, p. 176; Gassmann & Bader, 2011, p. 14), but several, such as the majority of the 28 EU Member States (Gómez Segade, 2008, para. 138), Japan (Gassmann & Bader, 2011, p. 14), China, South Korea, South East Asia (e.g. Malaysia, Indonesia, Vietnam) and Latin America (e.g. Argentina, Brazil, Mexico) (Mak, 2014, p. 365f.) do offer utility model protection under various names, even though their legal systems vary widely. Commonly, utility models in all nations are cheaper, never require prior examination, which accelerates the granting, and their thresholds regarding novelty and the inventive step are usually lower.

This is contrasted by a shorter period of protection, weaker legal certainty (Gómez Segade, 2008, para. 135; Gassmann & Bader, 2011, p. 14), due to no prior examination and even more limited applicability (Jennewein, 2005, p. 176), e.g., no process protection in German Law (Kraßer, 2009, p. 187; Götting, 2014, p. 148). Nevertheless, it is an important protection right (Jennewein, 2005, p. 176), which has to be considered if it is available in the territory of choice.

After mapping most of the innovation criteria with the relevant requirements of technical protection rights, it is evident that not every underlying invention of an innovation can be protected by technical property rights. More precisely, patents and/or utility models can target a rather small fraction. At closer examination of the mapped pairs of innovation criteria and the substantial requirements (cf. Figure 2) of TRIPS for patents and the German legal text paradigmatic for utility models, one may directly recognize which kinds of innovation are protectable by patents or by utility models, respectively, as shown in Figure 3. Patents are only granted for technical products or processes, utility models merely for products. Depending on the method – dichotomous or gradual – one uses to determine the intensity of novelty, solely radical innovation or basic and improving innovation are patentable. The utility model again is designed more generously and even allows adaption innovation. Concerning the subjective assessment of novelty, only globally new technical innovations are eligible for patents. In contrast, utility models are to some extent restricted to a national novelty.

This interdisciplinary mapping simultaneously shows the lack of attention in literature to this topic and the necessity of a holistic approach due to the restrictive nature of technical property rights.

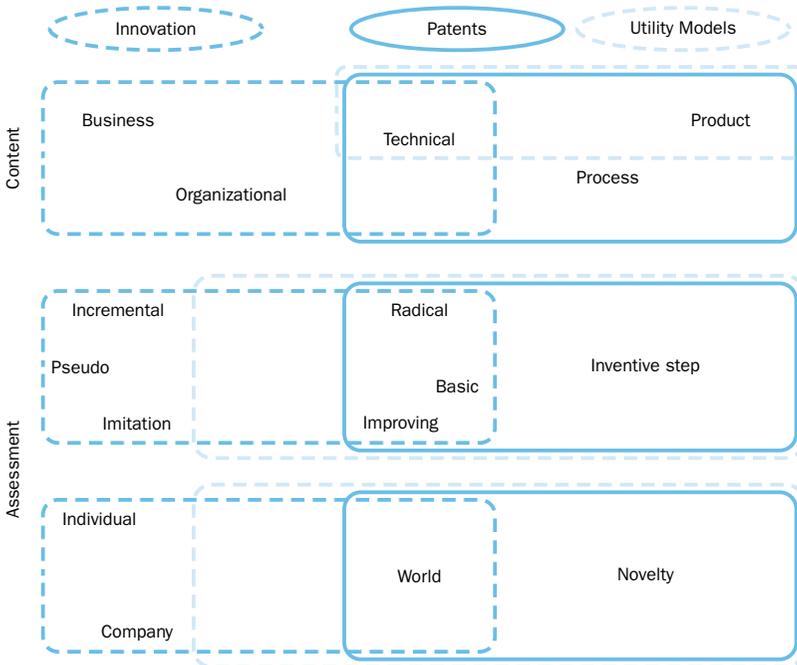


Figure 3 Protectability of Innovation through Technical Property Rights

Managerial Aspects of Technical Property Rights

By matching innovation criteria and legal requirements, it is getting clear that all protection rights focus on the output, the product or the process of the invention process, not the invention process itself (Götting, 2014, p. 50f.). That is why one cannot map the process-oriented innovation criteria with legal protection requirements. Nevertheless, it is very important to know where the process starts and ends to fulfil the requirements for patents or utility models. During the process, it is absolutely necessary to prevent the leaking of relevant information about the invention and the potential innovation to the public. Otherwise, it might not be possible to gain a technical property right. The management has to keep track of the flow of information, material and personal resources all along the innovation process, including the preceding invention process. This is inevitable to keep all options of protection and managing measurements available. The task of keeping track and control of the innovation process, including the restriction of information, material and personal resources to a certain enterprise or just a group of certain people, is getting more and more complex due to way the innovation process is evolving.

This implicates that the management not only has to assess its inno-

vation process but also the resulting innovation itself attentively (von Au, 2011, p. 21ff.). In case of a technical product or process, it is supposed to evaluate the substantial requirements of the technical property rights to see whether patent or utility model protection is feasible or not. If the innovation does not suit the requirements, other protection rights, e.g., designs or strategic measurements, might be possible to restrict the competitors' access to the innovation. If innovators are not aware of the appropriability of protection rights, they will be outperformed by their competitors more easily and will therefore be hindered to convert their technological success into a commercial one (Teece, 1986, p. 304; Tiefel, 2006, p. 6ff.).

The sole rely on first mover advantage, technological superiority or market infrastructure are just not contemporary anymore, in particular considering the way innovation is prospectively conducted.

From Closed to Rather Open Innovation

For several years, it has been common practice and is still a widespread mind-set for companies to generate, develop and commercialize their own ideas (Chesbrough, 2003, p. 36; Nestle, 2011, p. 60f.; Herzog, 2008, p. 19f.). This vertical integration model of a solely internal innovation process from idea generation to idea realization is known as closed innovation (Chesbrough, 2003, p. 36; Chesbrough, 2006, p. 1; Nestle, 2011, p. 60f.; Wagner, 2013, p. 8f.). In this model, the boundary of the firm is impermeable. Hence, only the proprietary technology base and research projects are considered in the innovation pipeline. During the process, some of the projects are stopped and not commercialized, whereas a few are chosen that go through to the market (Chesbrough, 2006, p. 2). Thus, all products and processes that cannot be commercialized over the existing distribution channels, as well as ideas or projects that require a specific technology, a lot of resources or do not fit the strategic orientation of the firm will either be set on the shelf or dropped (Nestle, 2011, p. 61; Chesbrough, 2006, p. 2). Due to the high upfront investment in internal research and development (R&D), it has become very important to protect the resulting intellectual property (Cleven, 2011, p. 10). In particular, patents are considered as a critical factor for success (Tiefel & Dirschka, 2007, p. 1; Ernst, 2002, p. 292f.). Companies that pursue the closed innovation approach consider an entirely internal and proprietary controlled innovation process from idea generation to the moment of sales, as a guarantee for high returns and innovation success (Wagner, 2013, p. 9). By reinvesting the profits, a new innovation cycle can be created (Cleven, 2011, p. 10). The closed innovation model worked well (Chesbrough, 2003, p. 37), but the competitive environment has changed (Wagner, 2013, p. 9).

Almost all industries are confronted with an increasing competitive pres-

sure. Shorter product life cycles, increasing cost of innovation, growing efficiency pressure and expectations from customers and stakeholders, pace and variety of scientific R&D, as well as higher numbers of competitors due to the globalization of economy, are some of the factors that indicate a higher competition (Mattes, 2010, p. 385; Tiefel & Dirschka, 2007, p. 1; Cleven, 2011, p. 8f.).

As a result of these changes, many companies rethink their way of innovation process (Mattes, 2010, p. 387; Ili, 2010, p. 28ff.; Gassmann & Reepmeyer, 2005, p. 240f.), and how innovation is conducted is changing according to the altered competitive conditions (Wagner, 2013, p. 9). Companies do not only rely on their internal R&D to generate ideas, inventions and launch innovation. Instead, they follow the approach that 'useful knowledge is widely distributed' (Chesbrough, 2006, p. 2) and that even very capable R&D firms are to some extent dependent on external knowledge sources (Cleven, 2011, p. 11; Wagner, 2013, p. 7). The inclusion of non-proprietary sources of knowledge and technology and the external use of proprietary knowledge, invention and innovation has been termed 'open innovation' (Chesbrough, 2006, p. 2f.; Wagner, 2013, p. 8ff.; Cleven, 2011, p. 11; Lichtenthaler, 2007, p. 22).

Open innovation describes a business model in which the firm boundaries are, opposing to closed innovation, permeable for in- and outflows of ideas, knowledge and technology throughout the entire innovation process, from idea generation to idea realization, to accelerate it (Chesbrough, 2006, p. 1; Poot, Faems, & Vanhaverbeke, 2009, p. 3). As a consequence of the permeability of firms' boundaries, even innovation that would have been dropped or set on the shelf in a closed innovation process can be taken to market through external channels (Chesbrough, 2006, p. 8; Chesbrough, 2003, p. 37; Lichtenthaler, 2007, p. 22; Cleven, 2011, p. 11). Regarding the inflow into the company, several sources have been identified in literature (von Hippel, 1988, p. 3ff.; Chesbrough, 2006, p. 6; Cleven, 2011, p. 13ff.; Herzog, 2008, p. 24): suppliers and customers, universities and government, independent experts, and competitors.

For the successful integration of the external influx, companies have to provide an organizational environment, such as research capabilities and adaptability (Chesbrough, 2006, p. 6f.; Herzog, 2008, p. 28ff.; Cleven, 2011, p. 22ff.; Wagner, 2013, p. 8; Adams et al., 2006, p. 29). Further, the inflow must match the proprietary requirements and fit to the business model (Hossain, 2012, p. 755f.). In addition, the company has to cope with the acceptance of external input like the 'not-invented-here' (NIH) syndrome (Nestle, 2011, p. 62ff.; Ili & Albers, 2010, p. 46ff.; Chesbrough, 2006, p. 6).

In addition, the outflow of knowledge, technology or inventions is an

endeavour that has to be well thought out, controlled and conducted with caution (Lichtenthaler, 2005, p. 231ff.; Gassmann & Bader, 2011, p. 243; Nestle, 2011, p. 68ff.; Lichtenthaler, 2007, p. 23). Potential opportunities to transpire proprietary knowledge, technology or inventions are licensing, ventures, spin-offs (Lichtenthaler, 2007, p. 22f.; Chesbrough, 2006, pp. 3, 9; Herzog, 2008, p. 21), alliances (Gassmann & Bader, 2011, p. 245f.; Chesbrough, 2006, p. 7; Nestle, 2011, p. 68f.; Lichtenthaler, 2005, p. 233ff.) and intermediate markets (Chesbrough, 2006, p. 7; Hossain, 2012, p. 761; Herzog, 2008, pp. 25, 39ff.).

The way of conducting innovation with a certain openness and permeability of a firm's boundaries has advanced to be a new paradigm (Chesbrough, 2006, p. 2), whereas there are critical and dissenting views (Trott & Hartmann, 2009; Dahlander & Gann, 2010). Overall, there is empirical evidence that applying open innovation has a positive, not negligible impact on the innovation performance (Poot et al., p. 5; Cleven, 2011, p. 69; Wagner, 2013, p. 8), which results in an increasing proactive external commercialization of all proprietary knowledge (Lichtenthaler, 2005, p. 231f.).

Meaning of Technical Property Rights for Open Innovation

The outflow in the open innovation approach requires careful consideration and contains the risk of disclosing relevant aspects to potential partners, who then get access at almost zero marginal cost (Lichtenthaler, 2005, p. 235; West, 2006, p. 116; Cleven, 2011, p. 69; Straus & Klunker, 2007, para. 923). Nevertheless, the disclosure is to some extent necessary, because without providing insights into the offered information, it is hardly possible to evaluate it (Dahlander & Gann, 2010, p. 704; Wurzer & Frey, 2009, p. 363; West, 2006, p. 116).

To reduce the risk of disclosing knowledge, technology and invention, one can use utility models and patents, because they enable the evaluation of the assets without their leak due to the exclusive nature, which these protection rights confer (Wurzer & Frey, 2009, p. 363; Lichtenthaler, 2007, p. 24; West, 2006, p. 116). The strength of exclusivity is dependent on the quality of the utility model or patent, respectively (Lichtenthaler, 2007, p. 28). The stronger the patent the more difficult it is to invent around it. The same applies for utility models. In general, intellectual property rights, and thus utility models and patents, are considered critical elements. Some authors even view them as requirement (West, 2006, p. 109; Dahlander & Gann, 2010, p. 704) for the external exploitation of knowledge, technology and invention (Chesbrough, 2006, p. 10; Lichtenthaler, 2007, p. 27; Lichtenthaler, 2005, p. 235; Wurzer & Frey, 2009, p. 367f.; Herzog, 2008, p. 40).

Thus, both utility models and patents are an important component for the

exploitation within open innovation. As already stated, the two considered protection rights do not cover everything that is subsumed under technical innovation. They protect the applicatory knowledge inside the innovation (Pretnar, 2009, p. 193), which is new, capable of industrial application and involve an inventive step.

During the closed innovation era, technical protection rights have primarily been used for protecting the freedom to operate for internal R&D preventing the loss of intellectual property and avoiding costly litigation (Chesbrough, 2006, pp. 4, 10; Lichtenthaler, 2007, p. 22; Herzog, 2008, p. 19f.). Over time, the understanding of innovation changed towards an increased interaction with a firm's environment. Merely the acquisition of external knowledge, technology and invention has been conducted and may nowadays be regarded as standard behaviour (Gassmann, 2006, p. 223f.; Lichtenthaler, 2007, p. 22; Poo et al., p. 5). Gradually, it could be observed that companies started to open their organizational boundaries even further and actively commercialized their technological knowledge externally (Lichtenthaler, 2005, p. 231; Herzog, 2008, p. 40f.; Dahlander & Gann, 2010, p. 704). Technical property rights, in particular patents, are an important tool to capture value from these invention, technology and knowledge transactions (Lichtenthaler, 2007, pp. 27f., 35, 37f.; Gassmann, Enkel, & Chesbrough, 2010, p. 219; Tiefel & Dirschka, 2007, pp. 1f., 12; Pretnar, 2009, p. 193; Wurzer & Frey, 2009, p. 368f.; Gassmann, 2006, p. 225). Patents even bear a dominant position within the protection measurements (Ernst, 2002, p. 318f.; Jennewein, 2005, p. 185; Anand & Galetovic, 2004, p. 73).

Comprehensively, the importance and scope of duties of technical property rights will be briefly summarized in turn for closed and open innovation, respectively. In a closed innovation approach, utility models and patents are merely used for internal R&D protection, prevention of litigation and applicable knowledge leak and are not a source of revenue or capturing value. The entire innovation process is conducted by one single company. Thus, technology is invented, protected, developed, brought to market and distributed internally. The exploitation is restricted to the internal business model. As a matter of prioritizing, several good ideas and inventions are set on the shelf without ever performing.

In contrast, in an open innovation approach technical property rights are not only used for protection and prevention. They additionally can be understood as assets (Laurie & Sterne, 2009, p. 455f.; Gassmann, 2006, p. 225) with several functions (Reinhardt, 2009, p. 234ff.; Gassmann & Bader, 2011, p. 241ff.; Jennewein, 2005, p. 166ff.; Burr et al., 2007, p. 36ff.), which can and are supposed to be managed through an adequate business model. These functions include, among others, the exchange, transfer, licensing and sale of invention with its underlying technical knowledge or

technology. Through openness to external collaborators, e.g., customers, suppliers, universities or competitors, business models and the use of internal and external R&D and inventions, one can capture value, maybe even create a reliable source of revenue (Lichtenthaler, 2007, p. 27f.; Ernst, 2002, p. 293f.). A precondition to manage, transfer and commercialize innovation, invention and technology in an open environment is the proprietary protection or the approval or license of the original owner (Graham & Mowery, 2006, p. 184f.; West, 2006, pp. 115, 129).

Restrictions of Technical Property Rights

Overall, technical property rights are, because of their functionality, very valuable for fulfilling the managerial tasks, in particular in terms of controlling, protecting and exploiting innovation in a wider sense (Hundertmark, 2009, p. 150ff.; Burr et al., 2007, pp. 36ff., 89; Gassmann & Bader, 2011, p. 241ff.; Omland, 2005, p. 402f.). After describing the term innovation and its scope and subsequently matching it with the substantive requirements for patents and utility models, it becomes apparent that not every technical innovation can be protected by technical property rights (Jennewein, 2005, p. 164). Only the applicable and codified technical knowledge, which manifests in form of a product or process invention and presents a world novelty, involves an inventive step and is industrially applicable, can be protected by patents (Adams et al., 2006, p. 29f.; Fabrizio, 2006, pp. 138, 160). For the utility model, it is even more restrictive. Due to the lack of international minimum standards, there are various differences from one country to another. In Germany, for instance, only products, not processes or biotechnology in general, can be protected by utility models. However, it has a lower demand on the novelty than the patent, offers a grace period of six months (German Utility Model Act, 1986, § 3(1)) and is a lot cheaper (Appendix of German Patent Cost Act 2). In contrast, the Austrian utility model provides protection for all kinds of invention that can be patented, processes included. One difference is the threshold regarding the inventive step, which is lower for utility models than for patents (Gassmann & Bader, 2011, p. 14).

This again reflects the territoriality of technical property rights and intellectual property rights in general. Companies have to keep this territorial restriction in mind, in case they open their innovation process, because open innovation does not have any territorial restrictions (Straus & Klunker, 2007, para. 916f., 925; Jennewein, 2005, p. 189f.). In addition to the territorial restrictions, the effectiveness of technical property rights is dependent on several aspects, primarily the quality (Lichtenthaler, 2007, pp. 35, 37; Ernst, 2002, p. 304), but also other aspects like the life cycle of technology (Ernst, 2002, p. 301f.; Hundertmark, 2009, p. 144f.; Jennewein, 2005, p. 181) or the branch (Lichtenthaler, 2007, p. 27; Teece,

1986, p. 287; Jennewein, 2005, p. 165f.; Ernst, 2002, p. 302; Gassmann & Bader, 2011, p. 163ff.). Competition law may also limit the effectiveness of technical property rights in case of a discriminating or abusive use of them (Kraus, 2009, p. 66; Burr et al., 2007, p. 13; Lamping, 2014, p. 10; Frost, 1964, p. 49ff.).

Depending on the technical object of reflection, there sometimes exist more appropriate ways of protection than technical property rights (Jennewein, 2005, p. 184; Gassmann & Bader, 2011, p. 22). In such cases, one has to evaluate other means of protection to be still capable of preventing the unintended access from third parties. These measurements may either be other industrial property rights or even strategic measurements (Teece, 1986, p. 287ff.; Pretnar, 2009, p. 199f.; Jennewein, 2005, p. 185).

Conclusion

This paper has shown that managing technical innovation is a complex, interdisciplinary task, which requires more than just knowledge about technical property rights. Both the development of what is considered as innovation and which kind of technical property rights exist have been described separately. The term innovation itself has a very wide scope. To distinguish different types of innovation, one uses mainly four criteria. These criteria show similarities to the substantive requirements of technical property rights, which allows the mapping of them. One main result is the fact that not every technical innovation can be protected legally. It is rather a small fraction of innovation, considering the broad term and the differentiation criteria of innovation, which can be placed under the protective shield of utility models and patents.

Nevertheless, technical property rights as part of the wider field of intellectual property rights are an inalienable necessity for the external commercialization without a leak of the underlying knowledge, technology or invention of a technical innovation. They provide and improve the conditions for capturing value, help to control the utilization and, therefore, provide the freedom of choice about the exploitation of technical innovation and its underlying invention. The benefits of technical property rights are restricted. The major limits of patents and utility models for innovation protection are territoriality, the allowed types of innovation, as well as the requirement regarding the inventive step and novelty.

These restrictions determine that a profound approach for protecting and managing technical innovation needs to be holistic, contain legal and strategic measurements, and needs to be individually adjusted for the considered type of innovation (Ernst, 2002, p. 318f.; Jennewein, 2005, p. 183ff.). Therefore, technical property rights are merely one, but very im-

portant, piece of the puzzle for a successful management (Sailer, 2009, p. 158f.) and commercialization (Wurzer & Frey, 2009, p. 367f.) of technical innovation considering a shift from closed to rather open innovation. Therefore, by building upon the results of this paper, the value of the presented theoretical approach can be improved by future empirical studies that support and/or refine the outcomes regarding the appropriability of technical property rights in the evolving innovation process.

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