

The Impact of Intellectual Property Reward Regime on the Competitiveness of Innovative SMEs

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Abstract. The paper aims to define which type of intellectual property (IP) reward regime increases the competitiveness of innovative SMEs. The authors analyse IP reward regimes and their impact on new knowledge and technology creation by SME, its IP, market, business model and other strategic issues related to collaboration of inventor, entrepreneur and investor. Two case studies and interviews have been used to map the main factors affecting IP and market strategies of biotech and electronic SMEs. The main conclusion is that IP reward regime has to be flexible and based rather on contractual arrangements than on rigid imperative legal norms.

Keywords: Competitiveness, intellectual property (IP) reward regime, IP strategy, knowledge-intensive SME.

I. INTRODUCTION

Innovative high-tech SMEs, especially of small country origin, need to become international in the very early stage of venture development [1] to cover their R&D expenses – “push” factor, because of very small domestic market and attractiveness of international markets – “pull” factor [2]. The role of intellectual property (IP) protection in the internationalisation process is manifold – to block competition and to attract financial investors – venture capitalists [1]. In some cases, SMEs prefer not to patent all their technical innovations in (global) niche markets and use trade secret in combination with patents [3]. In software business main protection methods include copyright and protection of source code as a trade secret. In the USA it is also possible to patent software.

All these different aspects demonstrate that the value of IP in new product development and business generally can manifest itself in very different ways. What is the role of inventor in that value creation, which part of the value comes from patented invention and other IP, the role of business strategy and business model – all these questions have no simple answer. Therefore, it is very important to understand relationship between the creator and entrepreneur and the framework, incl. legal aspects where this relationship could be most successful creating satisfactory reward to both.

IP systems are usually designed to strike a fair balance between the interests of main stakeholders: society, creators and industry. In this article we concentrate on creators (authors and inventors) and industry (entrepreneurs) and their role in entrepreneurial processes. It is difficult to overestimate the importance of creators in the development of knowledge-based business. After all, they create ideas which are later transformed into innovative products and services. This, however, does not mean that relationships between them and entrepreneurs have to be determined by strict legal norms guaranteeing creators a share of profit in case their inventions

are commercialized. The situation is that knowledge is increasingly perceived to be a strategic business asset. This approach is supported by scientific literature [4], [5], [6], [7] and policy documents [8]. Therefore, it is crucial that knowledge is treated just as any other asset (including physical). The emphasis has to be shifted from the producer of knowledge (author, inventor) to the owner of the knowledge. After the creation of knowledge it should be possible to transfer all rights relating to it. Having an IP system, which freely allows a separation of knowledge from its creator, could make a country an attractive environment for innovative companies.

The aim of this research paper is to define which type of intellectual property reward regime (IP regime) increases the competitiveness of innovative SMEs.

For this purpose, the authors analyse IP regimes and their impact on new knowledge and technology creation by SME, its IP and other strategic issues. Particular emphasis is given to IP strategy of knowledge-intensive SMEs of small country origin like Estonia due to their need of early stage internationalisation [1]. The following section introduces sample companies and methodology of the current case study research. Finally, the results of the empirical research and discussion are presented. The article ends with conclusions.

II. CONTROL OF IP AND REWARD REGIMES

Rapid evolvement of business environment, the globalization and the rise of knowledge-based economies in many countries have put pressure on countries to revise their IP regimes to enhance competitiveness of their companies.

IP system, which is designed to prioritize creators over other entrepreneurs, has its advantages. It is believed that legislative guarantees for creators to receive compensation enhances creativity and leads to more innovative solutions. For instance, the current Estonian copyright system has an extensive catalogue of the author’s moral rights, which gives an author the opportunity to control his/her work even when the economic exploitation rights have been transferred (sold). Similar situation exists in relation to inventions as well. Subsection 13 (8) of the Patent Act [9] states that “[a]n author has the right to receive fair proceeds from the profit received from the invention”. As a rule, proprietary rights attached to knowledge are licensable and transferable. However, the Estonian Patent Act has a provision which makes it questionable whether it is possible to license and transfer “the right to receive fair proceeds from the profit received from the invention”. According to Subsection 43 (1) of the Patent Act “[t]he transfer of the right to apply for a patent from the author to another person shall be performed on the basis of a separate

written agreement or on the basis of a contract or employment contract pursuant to Subsection 12 (2) of this Act. The specified agreement or contract shall contain provisions which ensure, pursuant to Subsection 13 (8), the right of the author to receive fair proceeds from the profit received from the invention during the entire period of validity of the patent". The requirement that a contract transferring the right to apply for a patent has to include a provision guaranteeing the inventor's right to compensation could constitute an obstacle which might complicate commercial exploitation of knowledge protected in the form of patents and utility models. The inventor's right to receive compensation for his or her efforts leading to a patentable invention is acknowledged and guaranteed in legal orders of other European countries as well (e.g., Germany) [10]. Therefore, several IP experts have raised the issue of harmonization of regulations on employees' inventions and employees' right to compensation [11], [12]. It has been correctly emphasized that "[b]ecause of the tendency toward more global company structures and the fact that an increasing number of research institutions work in a worldwide environment, the question of ownership of invention and remuneration for employees' inventions has also become an issue in an international setting and in particular for larger, world-wide operating enterprises"[12]. Based on the above, it could be concluded that problems related to service inventions have significance to many countries.

In principle, it is recommended that inventors are rewarded for their effort. Still, rewarding inventors are only one measure which needs to be considered when constructing an IP system that would enhance innovation. Additionally there are several other aspects which have to be borne in mind. Firstly, H. W. Chesbrough has been correct in suggesting that "technology by itself has no inherent value; that value only arises when it is commercialised through a business model" [13]. In other words, a patentable idea does not generate any profit on its own. Secondly, one product is usually based on several IP instruments such as patents, trade secrets, copyrights, trademarks, etc. This complicates the determination of the value of a single component (invention). Thirdly, an entrepreneur usually has several projects and only a limited number of them are profitable. Therefore, guaranteeing imperatively an inventor's right to compensation has an adverse effect on entrepreneurship because an entrepreneur has to share only its profits not loss. Fourthly, if the aim is to treat knowledge protected in any form of IP as a business asset and foster business research then the created knowledge has to be free from different encumbrances such as extensive moral rights in case of copyright and an inventor's claim to profits in case of patents.

The authors do not share the opinion that inventors should not be rewarded. Rewarding systems, however, have to be designed on organizational levels. The EU Commission has also emphasized that "IPR policy should therefore be designed as "enabling legislation" allowing for the management of IPR in the most efficient way" [14].

This raises the question regarding incentives for engineers to invent and disclose their inventions to their employer's management. There can be very different employee incentive schemes to compensate for submitting disclosures, filing

patent applications and finally – after getting a patent issued. At the same time, patenting could also entail psychological and emotional satisfaction needed by a creative engineer [15]. Patent attorney and former engineer and inventor Russ Krajec considers patenting an encouragement to engineers to be creative as they know that this has impact on the salary and employment opportunities later [15].

III. STRATEGIC IP ISSUES FOR SMES

IP can widen the range of opportunities for a company. Its utilization depends on available resources and means, product/service and related marketing mix. Good business models combine in the best way marketing, capabilities and different resources which allow developing further opportunities provided by IP ownership and in happy coincidence can lead to synergy effect that competitors do not possess.

Practitioners' view is that "patents provide a company with much more than the opportunity to protect a market space or product franchise", patents provide [16]:

- higher potential for obtaining cash and leveraging technology;
- better presumptions for collaboration through licensing;
- creation of attractive assets to potential investors, collaborators, and acquiring companies;
- instrument helping to remove roadblocks set by third-party patents through cross-licensing.

Besides these so-called "traditional functions", patenting has more exhaustive lists of purposes and methods how these general measures are used. These can include [17]:

- defensive publication;
- creating portfolio that secures against patent suits of competitors;
- advertising and marketing uses;
- offensive protection of marketplace, etc.

All these aspects are to be considered creating one's own patent strategy, three key elements of which could be the following [18]:

- filing strategy;
- internal communication and confidentiality;
- exploitation and enforcement.

For the inventor it is very important to know that his or her patented invention is exploited in a product or service or in production process – that means direct application of the patent. Sometimes, in the rare simple cases its economic effect can be calculated, but in most cases it is not easy to link a new product/service with a new business model and new markets.

For a more sophisticated situation, Dutch researchers have tried to create a model for the estimation of business value of academic research outcomes, incl. patents, linking the contribution of R&D phases (basic, applied, development – in all these phases a new invention can be created) with the entrepreneurial process (opportunity recognition, opportunity preparation and opportunity exploitation), creating different values of IP: strategic, cultural, economic and social values [19]. Notwithstanding cognitive value of this

multidimensional model, its adaptability for the company's practice seems low.

Strategic issues above demonstrate many indirect applications whose evaluation can be more complicated than that of direct ones. The value from IP is extracted by launching a product or service to the market in the interaction of an inventor, entrepreneur and investor. Conflict of interests is reduced in very rare cases when all these roles are handled by the same person.

Due to high patenting costs the acquisition of IP rights is a strategic question for most companies. Many of technical solutions potentially patentable remain without patent protection because of various considerations, besides the costs. Real value of technology, especially for SMEs comes from successful leverage of technology domain(s) across the market domains via a business model as shown in earlier research [1]. In case of software, the best strategy can be the use of copyright and trade secret protection. Patents are often needed to block competitors or guarantee freedom to operate. Although it is possible to get funding for knowledge-intensive SMEs even without patents, SMEs are frequently acquiring IP to attract venture capital (VC).

Experienced venture capitalists evaluate an average success rate of new technology companies even after careful screening of inventions, technology and business ideas at approximately 10% [20]. This leads to several issues such as who assumes the risk for the rest of 90% and what is the fair compensation to a creator/inventor, entrepreneur and investor?

As demonstrated by many cases success of IP exploitation is determined by an adequate business model and strategy.

All these raised aspects complicate the evaluation of creators'/inventors' and entrepreneurs' contribution to business success or failure.

IV. EMPIRICAL RESEARCH AND METHODOLOGY

Determining the impact of IP regime on technology and market development, and other strategic aspects in internationalisation of SMEs provides valuable insights to facilitate strategy creation by businesses as well as for public authorities in forming IP and entrepreneurship regulations and policies. This also entails the need to analyse how IP is managed in the internationalisation process and what can be circumstances to agree that the patented invention or another IP has been applied in addition to its direct implementation.

Case studies were used for mapping the main factors affecting the IP strategy and IP reward regime in international technology-intensive SMEs of small country through the example of Estonia. The case studies were based on secondary data and personal interviews. This gave an opportunity to consider the aspects that researchers had already covered about the case companies. Historical facts and general overviews were collected from previous research results and mass media. Additionally, web-pages and annual reports of the companies were studied. Patent information was mapped using search engine esp@cenet and worldwide databases of the European Patent Office. The aspects previously not covered and newer trends were mapped. Several

interpretations were determined by interviews. Besides the interviews with the technology managers (CTOs) of the case study companies, some more interviews were recorded with other inventors-entrepreneurs.

V. FINDINGS AND DISCUSSION

Two case studies were used to map the main factors affecting IP strategies of knowledge-intensive SMEs from two different fields. Biotech company Icosagen and electronic technology company Defendec represent two different technologies with their specific characteristics of industry and R&D; the cases represent also two generations of entrepreneurs and researchers with different (not only) international experience. Original technology solutions and IP protected worldwide are common to both cases.

A. *The Case of Icosagen*

Development pattern of biotech company Icosagen (Table I) follows a quite typical university spin-off, and its trajectory has been significantly influenced by its high-level competence base created in university research; it comprised local service business-oriented growth with a smaller share of international transactions over several years. Selling a local market-oriented medical diagnostics subsidiary with a wide product range in 2008 to VC created a new situation for the company – now R&D and services can be more focused on the development of highly efficient QMCF technology and IP trade, as well as on services implementing the FITkit® technology. Intensive product development, licence deals and patenting ensured the real breakthrough with the standardisation of FITkit® technology in a specific field (quantitative detection of natural rubber allergens in rubber materials and products) on a global scale [21]. Icosagen has made heavy use of IP protection. Icosagen has patents and protected trademarks of FITkit®, E2Tag, and QMCF solutions. Moreover, Icosagen has invested their funds and efforts into standardising their technology. In 2008 ASTM International (www.astm.org) adopted a new standard for a test method that is based on Icosagen's FITkit® technology. As a result, biotech service SME has been transferred into the company dealing with its IP [22].

B. *The Case of Defendec*

Similarly to the first case, initial technology idea of the company comes from the university researchers' work (Table I). Although founders of the company come from a younger generation than in the previous case study, they have already had international experience in business and technology. Two entrepreneurs and a researcher looked for implementation of new software technology ideas. The result was several patent applications on monitoring systems and launching technology SME designing new solutions, number of development team reaches 18. Production is organized using sub-contractors. Now Defendec has its own branch business offices or representation offices worldwide [23] (see also <http://www.defendec.com/contact>).

TABLE I
GENERAL DATA AND IP STRATEGY OF TWO CASE STUDY COMPANIES

Company name, founders, founding data	Icosagen (until March 2009, Quattromed), 1999; university spin-off, four researchers led by Prof. Mart Ustav	Defendec (until 2010, Smartdust Solutions OÜ), 2006, Jaanus Tamm, Tauri Tuubel, Jürjo-Sören Preden
Product/service, launched: date	Medical molecular diagnostics: Estonian hospitals, 1999	Wireless sensors' networks and monitoring system, 2009
Domestic period	Small share of export; active growth in the Estonian and neighbouring markets until 2008	Very short period after winning the bid for Estonian border guard, 2009-2010.
Globalisation	2008, ASTM intern. standard D7247 on FITkit®; 2009, QMCF tech licences to global pharmacies	2011, branches and representatives worldwide
Production development	ISO 15189, 2004; ISO 9001: 2000, 2007	Sub-contract production
Target markets (countries)	The European Union, Switzerland, the USA	The European Union, Eastern Europe, Eastern Asia, South America, the USA
Details about business model (BM)	B2B; Local & neighbouring market service. B2B has transferred into R&D and IP business mainly	B2B; Direct sales globally
Competitive edge	R&D based service methodology; low cost R&D intensive service; strong growth orientation	R&D base; international experience; patented solutions (IP)
Strategy & IP	Patenting; standard creator; merge of local business in 2006, sold in 2008; transition from service to global IP business	Patenting; IP contracts with employees – requirement of investor

Similar for both companies is that the owners (or some of them) are also inventors. Therefore, their position in the question about the role of inventor in business success could be better considered than by the technology specialists only.

Firstly, the role of IP strategy in high tech company's success depends strongly on the business field and behaviour of competitors, and how the company uses its own IP. Here we can meet very different approaches between commercial advertising function, freedom to operate and blocking competitors [23]. One of inventors and CTOs of the SME in the cutting-edge field has mentioned that many of patent applications remain without the following procedures and the goal of filing application is to have a confusing or even deterring instrument against competitors – they do not know the range of protection of filed technical solution and they are not ready to file themselves [24].

Secondly, an entrepreneur-inventor in the interview says that “the system must be favourable for the entrepreneur” as he/she maybe “has invested ten years into the development” process [23]. As can be understood without incentives for the company/entrepreneur there is no favourable environment for creative people in the company.

Thirdly, a new invention patented or remaining trade secret characterizes creativity and professional capacity of an engineer, whose salary should reflect/respond to his/her value creation for an employer [23].

By generalizing the discussion of the authors of the current paper and an inventor-entrepreneur it can be summarized that the IP reward regime prioritizing an inventor has an adverse impact on entrepreneurship in the following aspects:

- An entrepreneur has usually several costly projects and only few of them are commercially successful. If an inventor has, in addition to the negotiated compensation, an additional non-transferable right to claim compensation from a successful commercialization of a patented invention then the entrepreneur may not be able to cover the costs of his/her other projects. In this case the

entrepreneur has all the risks but has to share success with the inventor.

- It is also very complicated to determine the amount of fair compensation as required by law to be paid to an inventor since the value of patented technology is often determined by a business model which is developed by an entrepreneur and as a rule a commercialized product encompasses more than one IP instrument.

Also the need to maintain creativity among engineering teams in setting up company's own personnel recognition system was mentioned. This also means that it is more reasonable to implement psychological and emotional incentives in combination with financial compensation (via salary) by the employer that could be agreed between the actors themselves; there seems to be no need for legal regulatory intervention.

VI. CONCLUSION AND RECOMMENDATIONS

The analysis of researchers' and practitioners' writings has demonstrated a wide range of problematic issues if an entrepreneur needs to follow an imperative legal norm of compensation of IP to a creator as it is required by legislation of some countries, incl. Estonia. Discrepancy from this seemingly fair regulation comes from an economic reason as business development expenses of the company include success as well as failure stories. This IP reward regime is especially unfavourable for start-up SMEs with limited resources. Another aspect is complications to evaluate the contribution of an entrepreneur and investor in this innovation process, sometimes a main success factor can be just a right business model and right timing of investments. This means – competitiveness of SME besides IP is the result of best combination of several other strategic issues managed by an entrepreneur. None of these factors can be the sole determinant of business success, but preferring IP in this list can paralyze nascent SME and innovative activity in general. There is no reason to suspect employers not wishing to

facilitate creative behaviour among employees and employees not understanding their own value by signing an employment contract.

In interviews inventors-entrepreneurs have justified theoretical presumptions that the entrepreneur has all the risks which an employee-inventor does not have. Besides, it is very complicated or even impossible to evaluate the financial contribution of one of actors of triad “inventor-entrepreneur-investor” into success considering concrete strategic issues.

The authors’ main argument is that the IP reward regime has to be flexible and based on contractual arrangements rather than on rigid imperative legal norms.

The research results can be used to construct a more favourable business environment for innovative SMEs by improving a regulatory framework of IP. The results also identify possible IP management strategies within different IP regimes.

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T. Mets, A. Kelli. Intelektuālā īpašuma regulējuma ietekme uz inovatīvo MVU konkurētspēju

Zinātniskā raksta mērķis ir noskaidrot, kāds intelektuālā īpašuma (IP) tiesiskais regulējums palielina mazo un vidējo uzņēmumu (MVU) konkurētspēju. Dažādi IP regulējumi parasti atbalsta vai nu izgudrotājus, vai uzņēmējus.

Raksta autori analizē dažādus IP regulējumus, to ieteikumus uz jaunu zināšanu un tehnoloģiju rašanos MVU, uzņēmumu IP, tirgu, biznesa modeļiem un citām stratēģiskām sastāvdaļām, kas skar izgudrotāju, uzņēmēju un investoru sadarbību.

IP var ievērojami palielināt kompānijas attīstības iespējas. To pielietojums ir atkarīgs no pieejamiem resursiem un līdzekļiem, produktiem/pakalpojumiem un attiecīga „mārketinga mix”. Labi biznesa modeļi iekļauj sevī mārketinga, spēju un dažādu resursu pieejamību kombināciju, ļaujot attīstīt iespējas, kuras ir radītas, pateicoties IP tiesībām un kuras veiksmīgas sakrītības gadījumā rada sinerģētisku efektu, nodrošinot kompānijai priekšrocību attiecībā pret konkurentiem. Stratēģiskie jautājumi, par kuriem iet runa šajā rakstā, norāda uz to, ka, neskaitot IP tiešo pielietojumu produktos/pakalpojumos, biznesā ir bieži sastopams netiešs IP pielietojums. Otrajā gadījumā situācijas novērtējums var būt daudz sarežģītāks, nekā pirmajā.

Lai iezīmētu galvenos faktorus, kas ietekmē IP un tirgus stratēģijas zināšanu ietilpīgajos MVU, kas darbojas medicīnas biotehnoloģiju un elektroniskā monitoringa sistēmu jomā, tika izmantota „case study” metode un veiktas ekspertu intervijas.

Interviju gaitā izgudrotāji-uzņēmēji apstiprināja teorētiskos pieņēmumus par to, ka uzņēmējs saskaras ar tiem riskiem, kuri neskar izgudrotājus-darbiniekus. Turklāt ir ļoti grūti (vai gandrīz neiespējami) novērtēt konkrēta indivīda – izgudrotāja, uzņēmēja vai investora – ieguldījumu panākumos naudas izteiksmē, ņemot vērā stratēģiskus jautājumus. Tādēļ saistības dalīties ar panākumiem nav juridiski pamatotas; uzņēmējs nevar dalīties arī ar „neveiksmi” (saskaņā ar darba likumu). Daudz prātīgāk ir līdz ar naudas kompensācijām izmantot psiholoģisko un emocionālo pamudinājumu sistēmu, par ko procesā iesaistītie indivīdi var savstarpēji vienoties, t.i., nav nepieciešamības iesaistīt tiesisko regulēšanu no ārpusēs.

Autoru galvenais arguments ir tāds, ka IP atbildības regulējumam jābūt elastīgam un jāpamatojas vairāk uz līgumiem, nekā uz stingrām tiesību normām.

Pētījuma rezultāti var tikt izmantoti labvēlīgas MVU biznesa vides izveidē, uzlabojot IP normatīvi tiesisko bāzi. Rezultāti arī norāda uz iespējamām IP vadības stratēģijām dažādu tiesisko regulējumu ietvaros.

T. Mets, A. Kelli. Влияние режима интеллектуальной собственности на конкурентоспособность инновационных малых и средних предприятий

Данная научная статья ставит своей целью определить, какой тип правового режима интеллектуальной собственности повышает конкурентоспособность инновационных малых и средних предприятий. Различные режимы интеллектуальной собственности, как правило, или поощряют изобретателей, или уделяют первостепенное внимание предпринимателям.

Авторы статьи анализируют различные режимы интеллектуальной собственности, влияние этих режимов на создание новых знаний и технологий в малых и средних предприятиях, интеллектуальную собственность предприятий, рынок, бизнес модель и другие стратегические составляющие, относящиеся к сотрудничеству между изобретателем, предпринимателем и инвестором.

Интеллектуальная собственность может существенно расширить возможности развития. Ее использование в компании зависит от доступных ресурсов и средств, продуктов/услуг и соответствующего маркетинг-микса. Хорошие бизнес-модели включают в себя комбинацию маркетинга, способностей и доступности различных ресурсов, позволяющую развивать возможности, которые предоставляет владение интеллектуальной собственностью, и которые, при удачном совпадении, могут привести к появлению синергетического эффекта, что является явным преимуществом перед конкурентами. Стратегические вопросы, освещенные в статье, показывают, что, помимо прямого применения интеллектуальной собственности в продуктах/услугах, в бизнесе часто встречается ее косвенное применение. Во втором случае оценка ситуации может быть намного более сложной, чем в первом.

Чтобы обозначить основные факторы, влияющие на интеллектуальную собственность и рыночные стратегии наукоемких малых и средних предприятий в сфере медицинских биотехнологий и систем электронного мониторинга, был использован метод «case study» и проведены экспертные интервью.

В ходе интервью изобретатели-предприниматели подтвердили теоретические предположения о том, что предприниматель имеет дело с теми рисками, которые не касаются изобретателей-сотрудников. Кроме того, очень сложным, или даже невозможным, представляется оценить вклад конкретного лица в денежном выражении – изобретателя, предпринимателя или инвестора – в успех, принимая во внимание конкретные стратегические вопросы. Следовательно обязательство делиться успехом представляется не вполне юридически обоснованным, ведь предприниматель не может поделиться «не успехом», или неудачным исходом (в соответствии с трудовым законодательством). Более разумным видится использование системы психологических и эмоциональных поощрений помимо денежных компенсаций со стороны работодателя, о чем вовлеченные в этот процесс лица могут договориться друг с другом, т.е. отсутствует необходимость во внешнем юридическом вмешательстве.

Основной аргумент авторов сводится к тому, что режим интеллектуальной собственности должен быть гибким и строиться на базе договорных отношений, а не на жестких правовых нормах.

Результаты исследования могут быть использованы для создания более благоприятной для инновационных малых и средних предприятий бизнес-среды путем совершенствования нормативно-правовой базы интеллектуальной собственности. Результаты также указывают на возможные стратегии управления интеллектуальной собственностью в рамках различных правовых режимов.