To Patent or Not to Patent: Which One is the Better Alternative?

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Abstract: Publishing of research findings is an important activity in the academic fraternity. However, if the research findings are novel it is better to patent protect first and then publish later in an open forum. An invention is owned by you until it is patented. Patent is the culmination process of knowledge production and thus must be protected and then exploited for socio-economic gain. The patent process is long and arduous and involves the Technology Transfer Office of the Directorate for Research & Innovation. The process involves patent search, appointment of patent attorney and then writing in legal language the scientific invention. This aspect is important as this cover the areas or loopholes where others might infringe on the patent. The patent search involves the searching of the invention in all patent databases so not infringe on other patents. The patent attorney is an expert on law and also in scientific matters and will guide you in the patent search and drafting the patent document that outlines your invention. Once the provisional or complete patent is filed and registered nationally and or international (Patent Cooperation Treaty), the inventor(s) can then proceed to harvest the benefits of the patent for the next 20 years. Now the paper can be published in peer reviewed journal (open public forum). The inventors also gain two things: the patent and the publication. The benefits accrue to the inventors and applicant, in this case the University where the research was conducted. University Rankings take into account the patents held by universities annually. Thus taking a patent has more benefits and it is better to patent protect the novel idea and then publish later.

Keywords: Publications; knowledge economy; patent protection; university rankings

1. Introduction

Worldwide there has been an increase and awareness in intellectual property rights (IPR) with some countries introducing patent laws and institutions, including in South Africa (Pouris & Pouris, 2011; Pandor, 2015; Rutenberg & Makanga, 2016). In South Africa, there has been a steady increase in the number of technology transfer offices (TTOs) in universities in order to patent the novel ideas that are being researched at these universities. The National Intellectual Property Management Office (NIPMO) is responsible for establishing TTOs at publicly funded universities. The number of patents generated in South Africa is lower in comparison to other members of the BRICS family (Patra & Muchie, 2017) and the Department of Higher Education & Training has introduced incentives in order to increase the number of patents (DHET, 2017). There is clear empirical evidence that the knowledge economy is linked to economic growth of a country as shown the citation intensity (King, 2004). The King report also showed the citation intensity was the number of citations in science and engineering journals relative to the country's gross domestic product (GDP). The knowledge economy was achieved through the training of doctoral students as per Department of Science and Technology (DST) in its Ten-year Innovation Plan (ASSAF, 2010) and National Planning Commission (NPC) and its 2030 vision (NDP, 2012). The active academics are involved in knowledge generation (research activity) as part of their teaching and lecturing activities while at the university. The academics also are involved in dissemination of their research either in conference presentations and or publications in peer reviewed journals and conference proceedings. As a result of the publication subsidy (financial rewards to researchers) from Department of Higher Education & Training (DHET) there has been 8.8% annual increase in publications in South Africa (Mouton & Valentine, 2016).

The increase in the number of patents world is also linked to increase in technology (improvement of standards of living), promotion of market economies (encourage competition, entrepreneurship and innovation) and Trade-Related Intellectual Property Rights (TRIPs) according to Sideri & Giannotti (2003). The coming of TRIPS has improved the standards and regulations "enforcement of Intellectual Property

rights: patents, copyright and related rights, trademarks, geographical indications, industrial designs, layout design of integrated circuits, undisclosed information", (Sideri & Giannotti, 2003). Also the availability of patents could spur economic growth in a country with "patent information facilitates technology transfer and investment; patents encourage R & D at universities and research centres; patents are catalysts of new technologies and business accumulate and use patents in licensing, joint ventures and other revenue generating transactions" (Idris, 2003).

The main objective of this paper is to assess the patent process in South Africa and how the patent can contribute to the economic development of South Africa as envisaged in the radical economic transformation. Also document my experiences in working in a black owned company in Zimbabwe which benefited from patents and how this can contribute to further economic development of a country such as South Africa. Here the academics can choose to publish or perish mentality results in an increased publication rate at the expense of patent output rate. But the academics can contribute to generating both patents and publications without compromising the desire to publish.

2. Methodology

I have documented my experiences as I have undergone the processes in registering patents, a complete and a provision patents, in South Africa in 2016 and 2017. Also I have documented my working years at Varichem Pharmaceuticals Pvt Ltd when I was the Head of Quality Assurance from 1994 to 1996, in Harare Zimbabwe. Added to this I have reviewed literature to fill the missing gaps in my narration. I have also added the comments that I have received from audience when I first presented a talk at the University of Zimbabwe, Department of Chemistry and the University of Venda at the Institute of Rural Development on the same topic of patents as a way of encouraging innovation among academics. On the two patents that form part of the discussion are: a complete patent entitled "Defluoridation Treatment of Water with Trimetal Magnesium/Cerium/Manganese oxide modified diatomaceous earth", number 2016/08590, and the inventors are: Gitari, Izuagie and Gumbo (2016) and provisional patent entitled " Method of Bioremediation of Acidic Mine Tailings with the Use of Banana Fruit waste ", number 2017/05279 and the inventors are: Mulaisi, Dacosta, Gumbo (2017).

3. Discussions

3.1 The Patent Process in South Africa

The other purpose of TTOs is to assist academics with registering of their novel ideas and innovative research with the Registrar of Patents as per South Africa Patent Act 1978 (*Act* No. 57 of *1978*, as amended) according to World Intellectual Property Organisation (WIPO). A patent is a novel idea that is protected and "...is an exclusive right granted for an invention, which is a product or a process that provides a new way of doing something, or offers a new technical solution to a problem..." according to Companies Intellectual Property Commission (CIPC) definition (http://www.cipro.gov.za/products_services/patents.asp). The patent is valid for a period of twenty years and grants the inventor legal rights to exploit the idea for financial gain. The TTOs are located within the university in order to gain the academics since these institutions receive financial support from the Government of South Africa as per IPRPFRD Act (Republic of South Africa, 2008).

In South Africa, any person can file for a patent with Patent Office but it is better legally to file the patent through the services of a patent attorney. The patent attorney is specialist in both the knowledge of the IPR landscape and has a particular scientific background, for example like scientific knowledge in the biotechnology field. Part of the responsibility of the patent attorney is drawing up the patent documents in legal jargon, carrying out patent searches to ensure that the patent has novelty. When a patent is novel, it means that this idea is unique and is able to solve a socio-economic problem. The patent searches are time consuming exercise but it has its benefits as the inventor gets the chance to learn from other inventors how they write their patent documents. The patent search involves going over websites dealing with patents such as www.*patentsearch.cipc.co.za (South Africa),* http://www.wipo.int*;* https://www.epo.org/searching-for-patents.html*;* https://www.google.com*;* https://patentscope.wipo.int*;* https://www.uspto.gov and https://patents.google.com*.*

There are two types of patents, namely the provisional patent application and the complete patent application. The provisional patent is *temporary patent* that protects the inventors while they carry further research for 12 months to gather more scientific data in order that will lead to the application

of a complete patent. For example, the invention of Mulaisi *et al*. (2017) evaluates the use of banana fruit waste in bioremoval of sulphate, the main driver in acid mine drainage (AMD) and the inventors have to carry out analysis to gather more scientific information that will enable them to then proceed to apply for a complete patent. In the meantime, the novel idea is protected by the provisional patent.

Once the complete data is gathered the inventor can then apply for a complete patent (nationally) and also file an international patent through the Patent Cooperation Treaty (PCT) of which cover 142 countries in the world including South Africa (CIPRO, 2017). For example, the complete patent by Gitari *et al*. (2016) this invention is aimed at solving a societal problem of drinking water with high level of fluoride (>1.5 ppm) as World Health Organisation water guidelines and is a major cause skeletal and dental fluorosis in developing countries. The invention is based on trimetal oxide (Mg/Ce/Mn) oxide-modified diatomaceous earth (DE) and to a method for the synthesis of trimetal magnesium (Mg) / cerium (Ce) / manganese (Mn) oxide-modified DE. This invention is complete as all the scientific information is available and the inventors need is the complete patent to protect their invention. Then the next logical process is to apply for PCT and protect the novel idea in 142 countries.

However, some countries such as Ethiopia are not members of PCT and thus an individual patent application is required for such counties. The patent application process does involve costs and these costs are met upfront. Thus the costs are paid for by the University concerned and recover the costs from NIMPO. The annual fees for maintain the patent are also paid by the University and recovered from NIMPO. The purpose of the renewal fees is to ensure that the patent remains in force (Sideri & Giannotti, 2003). Once the patent is issued, the inventors can now proceed to commercialize the novel idea through the TTO and be able to generate money for themselves and the university. The inventors also have a number of options of commercializing their patent. These options can be the wholly transfer their patent to a third party in exchange of a large payment; hold the patent but transfer licensing rights to a number of geographic locations in exchange of annual royalties and or manufacture the product in their home country and sell the product to geographic locations with exclusive agents. For example, IBM has reaped US$1.7 billion in patent licensing in 2000 (Idris, 2003), thus showing how profitable patents are.

3.2 Issues of Public Disclosure

The academics can proceed to publish and or present their novel ideas at conferences and or publish in peer reviewed journals and conference proceedings once the patent is issued. Thus the patent confers the IPR to the inventor for a period of twenty years to allow for financial exploitation. However, if an academic first discloses the novel idea either presenting at a conference and or publishing in a peer reviewed journal and conference proceedings the novelty is lost. For example, Mungondori, Tichagwa, Katwire, & Aoyi, (2016) developed a novel method of removal of herbicides of nanoparticles imbedded polymaterial material. This is novel since herbicides are now found in food stuffs as shown by the study of Kaczyński (2017). The herbicides are applied to agricultural land to control pests and herbs in order to enhance the food productivity by limiting damage caused by pests and these herbicides find their way to water bodies as a result of diffuse pollution. Hence the removal of herbicides by the proposed of Mungondori *et al*. (2017) would provide a suitable method. However, the novel works of Mungondori *et al*. (2017) was published in as a peer reviewed journal and become available in a public domain and thus cannot be patented. As a result of this publication appearing in a public domain the inventors had lost the novelty.

Thus it is important to protect the novel idea by way of the patent first and then make a public disclosure once the patent is issued. Other issues of public disclosure such as a research proposal to National Research Fund (NRF), submission of dissertation to external examiners and Turnitin, means the novel idea is still protected by non-disclosure confidential agreements. The NRF reviewers (Kaniki, 2014) and external examiners and Turnitin cannot publicly disclose the novel idea as they have signed the non-disclosure agreements.

3.3 Benefits of Patent

There are benefits to the holder of a patent. These benefits include financial reward to inventor in the form of financial royalties, prestige to holder of the patent, promotion at work, increased recruitment of doctoral students, increased in publications and last contribute to the university's universal rankings.

On the financial rewards, Pandor (2015 stated that "first R1 millions of gross revenues, IP creators must receive a minimum of 20%. Thereafter they must receive at least 30% of net revenues". As from 2018, the DHET has introduced a subsidy of two units (financial rewards) for patents, copyrights and other IPR in order to increase the generation of patents in South Africa (Republic of South Africa, 2017).

3.4 Commercialisation of the Patent

In order to reap the economic gains and solve societal problems the patent must now be turned into a commodity and or a physical item that is manufacturable and preferably in South Africa. According to Pandor (2015), there is a need for "preference for local commercial partners, as well as small, medium and micro enterprises and broad-based black economic empowerment entities..." in order to enhance economic production in South Africa and contribute to radical economic transformation.

The other benefits of the commercialisation of the patent is creation of sustainable jobs and spin offs of local companies that will contribute to a wider tax revenue base and increase in wealth and ease unemployment crises (Wolson, 2007). Also the export of goods emanating from the patent to other countries will contribute foreign income that will augment the foreign reserves held the South Africa Reserve Bank.

The other alternative is licensing of the patent in foreign countries and then accrues of incomes in form of royalties. A good example of foreign licensing is a patent held by Pliva, a Croatian company that was licensed to Pfizer, and the sales of this patented antibiotic drug reached USD1.5 billion in 2001 and this resulted huge inflows of royalties into coffers of Pliva (Idris, 2003). Thus due to patent royalties, Pliva became a multinational in Central Europe producing pharmaceuticals.

The patent data base is available source of technical about to expire and entrepreneurs can target (Cloete, Nel, Theron, 2006). The patent as a novel product is designed to solve societal challenges such as our patent on defluoridation of fluoride in groundwater (Gitari, Izuagie, Gumbo, 2017). Thus rural communities in South Africa most rely on groundwater for their drinking purposes and this water has fluoride (>1.5 mg/l) in excess of World Health Organisation guidelines for drinking water (Izuagie, Gitari, Gumbo, 2016). Too much fluoride in drinking water contributes to dental and skeletal fluorosis when the contaminated water is consumed over a long period (Patel, Patel, Zulf, Yagnik, Kajale, Mandlik, & Joshi, 2017).

3.5 Access to Patent Information Promotes Black Owned Generic Manufacturer in Zimbabwe

Varichem Pharmaceuticals Pvt Ltd is a black owned company that was established in 1985 in Harare, Zimbabwe for the purposes of manufacturing of generic pharmaceutical medicines for distribution in Zimbabwe and the Southern African Development Community (SADC) (Banda, Wangwe, & Mackintosh, 2016). The basis for the technical information on the manufacture and formulation of the generic pharmaceutical medicines is patents. I joined and worked for this company as the head of quality assurance and quality control in 1994. Part of my portfolio was to track the expiry of patents for targeted branded medicines. Once the patent had expired (after 20 years), the information I was able to extract the relevant documents from ARIPO, Harare, Zimbabwe. ARIPO is the centre where the patent register is kept. While at Varichem we formulated and developed a fixed dosage combination generic medicine for the treatment of tuberculosis (TB) and we carried out bioavailability study (Nyazema, Rabvukwa, Gumbo, Ndudzo, & Chitemerere, 1999). The fixed dose combination was composed of rifampicin and isoniazid in the form of a tablet. The World Health Organisation advocates for the replacement of individual TB medications such as Rifampicin (capsules), Isoniazid, Pyrazinamide and Ethambutol tablets with fixed dose combinations to ensure patient drug uptake (WHO, 1999).

During the era of economic challenges in Zimbabwe, Varichem and Caps Pharmaceuticals were contracted to supply USD4 million worth of pharmaceutical medicines in Zimbabwe under the Extended Support Programme of the European Union and UK Department for International Development (Chataway, Banda, Cochrane, & Manville, 2016). These pharmaceutical companies were manufacturing other generic medicines which were targeting malaria and tuberculosis infections in Zimbabwe and making the generic medicines available in the public health sector.

During the HIV/AIDS pandemic in Zimbabwe, Varichem was granted a compulsory licensing by the

Government of Zimbabwe to manufacture and distribute the anti-retrovirals (ARVs) in Zimbabwe with three quarters of ARVS reserved for public health sector (Oh, 2006). The Patent Law of Zimbabwe authorises (as read with Section 34 and 35) for the granting of such as compulsory license, in 2002, in light of HIV/AIDS state of emergency declared "In view of the rapid spread of HIV/AIDS among the population of Zimbabwe, the Minister hereby declares an emergency for a period of six months, with effect from the date of promulgation of this notice, for the purpose of enabling the State or a person authorised by the Minister under section 34 of the Act:

(a) to make or use any patented drug, including any antiretroviral drug, used in the treatment of persons suffering from HIV/AIDS or HIV/AIDS related conditions;

(b) to import any generic drug used in the treatment of persons suffering from HIV/AIDS or HIV/AIDS-related conditions. (Wipolex).

The state of emergency was later extended for a further period of five years, from Januray 2003 to December 2008 (Pfumorodze, Chitsove & Morolong, 2014). According to Chander, Choudhary, & Kumar, (2013) this declared state of emergency is justifiable since: "A compulsory licensing is the key process of granting the licence to the third party by the government in order to utilize the patent and other form of intellectual property without the consent of the patent holder, which allows regulators to a break a patent holder's monopoly in situations where the monopoly is abused to deny access to innovation to a very large number of people specially in case of necessary emergencies".

Varichem has achieved WHO pre-qualification accreditation in the manufacture of generics in Zimbabwe and is the sole supplier of ARVs of locally manufactured ARVs in Zimbabwe (Russo & Banda, 2015) and the first manufacturer in Africa to produce generic ARVs in October 2003 (Rovira, 2006). Thus, Varichem was able to manufacture seven ARV medications and their retail price namely; (a) Varivar tablets 60s at US$13.95 (this is the generic version of Combivir –the trade name of double fixed dose combination of Zidovudine and Lamivudine produced by GlaxoSmithKline, which holds the relevant patent on Combivir in Zimbabwe); (b) Nevirapine 200mg tablets 60s at US$7.15; (c) Stanalev-40 (fixed dose combination of Stavudine 40mg, Lamivudine 150mg and Nevirapine 200mg) tablets 60s at US$14.45; (d) Stanalev-30 (as Stanalev-40 except for Stavudine 30mg) tablets at US$14.25; (e) Stavudine 30 mg capsules 60s at US$2.40; (f) Stavudine 40mg capsules 60s at US$3.25; and Lamivudine 100mg tablets 60s at US$5.25), according to (Oh, 2006). The entry of Varichem in the manufacture of generic ARVs resulted in a 50% drop in the retail price of ARVs from US$30 to US$15 (Osewe, Nkrumah, Sackey, 2008). Thus, the entry of local players in the manufacture of generic ARVs generated two advantages to the HIV/AIDS patients by greatly reducing the retail prices of ARVs thus making these affordable and readily available as there were no longer imported ARV medications. The other advantage was the access to information on ARVs allowed the local company Varichem to develop capabilities of manufacturing and quality control of ARVs.

3.6 Remuneration of Patent Holder

On the issue of remuneration of patent holder for access of a registered patent as a result of the compulsory use of patented ARV information, there is mixed success. According to WHO (2010) some countries opted to pay a fixed amount of monetary reward to owners of the patented ARVs and while other countries did not pay any form of monetary amount citing the HIV/AIDS state of emergency. However, these countries that opted not pay for the patent holder and went on to restrict the sale of ARVs in their home countries only and banned export of the generic ARVs. An example is Varichem, which sold 75% of the generic ARVs to the public health sector and 25% to the private sector and banned any exports of their ARVs to neighbouring countries and the issue of compensation of the patent holder, there is no information at present (Oh, 2006). But what happens after the expiry of the emergency to the manufacturer of generic ARVs?

4. Conclusion

This paper, therefore, concludes that:

- It is wise to protect your novel idea, thus apply for a patent, either a provisional patent if there still further research to be carried out and or a complete patent once the data is available,

- The patent document can then be published in a peer reviewed journal

- Thus the inventors have both a holder of a patent and a peer reviewed publication.

- The benefits of a patent are available and these range from financial rewards to solving economic challenges (creating decent jobs, increase in foreign reserves, widening tax revenue base) and societal problems (such as reducing F in groundwater sources intended for human consumption).

- The patent information has contributed to the development of manufacturing capabilities of a black owned pharmaceutical company in Zimbabwe.

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